

**Tatyasaheb Kore Institute of Engineering and Technology, Warananagar**

**An Autonomous Institute**

National Education Policy (NEP ) 2020 Structure

**Department of Chemical Engineering**

**Multidisciplinary Minor (MDM) Courses**

**Piping Engineering**

Sr. No	Semester	Course Code	Category	Name of Course	Teaching Scheme			C	H	Examination & Evaluation Scheme			
					L	T	P			Component	Marks	Min for Passing	
1	III	23UGMDM1-CH306T	MDM - 1	Material Science Engg.	1	1	--	2	2	ISA	50	20	20
2	IV	23UGMDM2-CH405T	MDM -2	Corrosion Engg.	1	1	--	2	2	ISA	50	20	20
3	V	23UGMDM3-CH505	MDM -3	Pipe Basic & Revision	4	-	--	4	4	ESE	60	24	24
										ISE	40	16	16
4	VI	23UGMDM4-CHE606L	MDM -4	Piping Material	2	-	--	2	2	ISA	50	20	20
5	VII	23UGMDM5-CH705L	MDM -5	Piping System Design & Layout	2	-	--	2	2	ISA	50	20	20
6	VIII	23UGMDM6-CH804L	MDM -6	Piping Insulation	2	-	--	2	2	ISA	50	20	20
					<b>11</b>	<b>2</b>	<b>--</b>	<b>14</b>	<b>14</b>		<b>350</b>	<b>150</b>	<b>150</b>



**Department of Chemical Engineering**  
**Multidisciplinary Minor (MDM) Courses**

**Piping Engineering**

**MDM-1**

**23UGMDM1- CH306T Material Science Engineering**

<b>Course Code: MDM UGCHE-306</b>			
<b>Teaching Scheme</b>		<b>Evaluation Scheme</b>	
<b>Lectures</b>	: 1 hrs per week	<b>ISE</b>	: --
<b>Credits</b>	: 1	<b>ESE</b>	: --
<b>Tutorial</b>	: 1 hrs per Batch	<b>ISA</b>	: 50 Marks
<b>Credits</b>	: 1	<b>POE</b>	: --
<b>Total Credits</b>	: 2	<b>Total Marks</b>	: 50 Marks

<b>Course Objectives:</b> The objective of the course is to	
<ul style="list-style-type: none"> <li>• Learning the principles of material science engineering, imitation and practice apply.</li> <li>• Understand the basics of manufacture properties and applications.</li> <li>• Understand the basics of metals, ceramics, polymers and composites as well their properties and applications.</li> </ul>	

<b>Course Outcomes:</b>		
	<b>At the end of successful completion of the course the student will be able to</b>	<b>Blooms Taxonomy</b>
CO1	Relation between material science and engineering.	Recall
CO2	Calcification of engineering materials.	Understand
CO3	Fundamentals of Phase diagram for the composites.	Applying
CO4	Properties of engineering material	Understand
CO5	Analysis and calculations for stresses	Analyze
CO6	Morphological study of different metals.	Evaluate

<b>Course Contents</b>		
<b>Unit No:1</b>	<b>Fundamentals of Material Science and Engineering:</b> Effect of structure on properties, Process-Structure-Properties-Performance relationship, Selection of material criterions.	<b>3 hrs</b>



<b>Unit No:2</b>	Engineering Materials: Classification of metal, ceramic and polymer materials, Phase diagrams of steel, brass, cuprous-nickel, composites material and its applications.	<b>4 hrs</b>
<b>Unit No:3</b>	Direct and bending stresses: Introduction, Direct and eccentric loading, limits of eccentricity, core of section for rectangular, circular, section, wind pressure problems on core of the section and stress developed at four corners of section due to eccentric loading, Problems based on direct and eccentric loading.	<b>4 hrs</b>
<b>Unit No:4</b>	Failure of material: Introduction, Crystal defects, plastic deformation. Types of mechanical failure, fracture, fatigue and creep, Problems based on deformation of material.	<b>4 hrs</b>

### Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable			
													PSO1	PSO2	PSO3	
CO1	3															2
CO2												2				
CO3																
CO4									2							
CO5					2											
CO6					1											

Text Books	
1	The Essence of Materials for Engineers, Robert W. Messler, Jr.
2	Materials Science and Engineering, Raghavan V
Reference Books	
1	Materials Science and Engineering, Van Vlack L.H.
2	Engineering Materials and Applications, Flin R.A., Trojan P.K.
3	Coulson & Richardson 'Chemical Engineering', Volume VI, Pergamen Press .
4	Bhattacharya B.C., 'Selection of materials and fabrication for Chemical Process Equipment, Chemical Engg.', Educational Development Centre, IIT Madras



## MDM-2

### 23UGMDM2-CH4051T Corrosion Engineering

Course Details: Corrosion Engineering					
Teaching Scheme			Evaluation Scheme		
Lectures	:	1 hr per week	ISE	:	--
Credits	:	1	ESE	:	--
Tutorial	:	1	ISA	:	50 Marks
Credits	:	1	POE	:	--
Total Credits	:	2	Total Marks	:	50 Marks

Course Objectives: The objective of the course is to		
<ol style="list-style-type: none"> <li>1. Comprehend corrosion types (e.g., uniform, galvanic, localized) and their mechanisms.</li> <li>2. Perform and interpret corrosion testing techniques</li> <li>3. Understand various corrosion prevention and control measures.</li> </ol>		
Course Outcomes:		
Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Explain the principles and mechanisms of corrosion, including electrochemical reactions, thermodynamics, and kinetics.	Recall
CO2	Identify and classify various types of corrosion (e.g., uniform, galvanic, pitting, crevice) and understand their underlying mechanisms.	Understand
CO3	Recommend and justify appropriate corrosion control measures, such as material selection, protective coatings, inhibitors, and cathodic protection techniques	Understand

Description:
<p>Corrosion is a natural process that deteriorates materials, typically metals, due to chemical or electrochemical reactions with their environment. Corrosion engineering aims to understand the fundamental mechanisms behind corrosion, predict its occurrence, and develop effective strategies to control and prevent it.</p>



<b>Unit 1</b>	<b>Introduction:</b> Cost of Corrosion, Corrosion Engineering, Definition of Corrosion Corrosion Damage Classification of Corrosion <b>Corrosion Principles</b> Introduction, Corrosion Rate Expressions Electrochemical Aspects, Electrochemical Reactions Polarization Passivity	<b>5</b>
<b>Unit 2</b>	<b>Forms of Corrosion</b> Uniform corrosion, Localized corrosion (pitting, crevice corrosion), Intergranular corrosion, Selective leaching, Stress corrosion cracking (SCC), Hydrogen embrittlement	<b>5</b>
<b>Unit 3</b>	<b>Corrosion Testing</b> Introduction, Classification, Purpose, Materials and Specimens, Surface Preparation, Measuring and Weighing, Exposure Techniques, Duration Planned-Interval Tests, Aeration, Cleaning Specimens After Exposure 167 4-12 Temperature 169 4-13 Standard Expressions for Corrosion Rate	<b>5</b>
<b>Unit 4</b>	<b>Corrosion Prevention :</b> Materials Selection: Metals and Alloys, Metal Purification, Nonmetallics Alteration of Environment : Changing Mediums, Inhibitors Design : Wall Thickness, Design Rules Cathodic and Anodic Protection : Cathodic Protection, Anodic Protection Comparison of Anodic and Cathodic Protection Coatings : Metallic and Other Inorganic Coatings, Organic Coatings ,Corrosion Control Standards, Failure Analysis	<b>5</b>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1						1								
CO2	1						2								
CO3	1						1								

**References:**

Text Books	
1	Corrosion Engineering (MCGRAW HILL SERIES IN MATERIALS SCIENCE AND ENGINEERING by <b>Mars Fontana</b>
2	"Corrosion Engineering: Principles and Practice" by Pierre R. Roberge
Reference Books	
1	"Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering" by R. Winston Revie

