

Bloom's Taxonomy Levels: 1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation

Programme Name: P. G. Diploma in Corrosion Technology

Programme Specific Outcome (PSO)

PSO1 To understand the concepts of engineering materials and criterion for selection of materials for metallurgical applications.

PSO2 To understand principles and forms of corrosion.

PSO3 To understand chemical theories and relevant experiments of corrosion process.

PSO4 To develop understanding related to environmental influences on corrosion process.

PSO5 Basic understanding of electrode kinetics and testing of corrosion resistant materials.


PSO6 To understand literature and small projects related to corrosion research.

Applied Chemistry Department
Faculty of Technology and Engineering, The Maharaja Sayajirao University of Baroda
Vadodara-390001

**Teaching and Examination Scheme for the Two Semester Course in
PG Diploma in Corrosion Technology**

<u>Sr. No.</u>	<u>Code No.</u>	<u>Subject</u>	<u>Teaching hrs/week</u>	<u>Examination Marks</u>	<u>Total Marks</u>
<u>First Semester of PG Diploma in Corrosion Technology</u>					
1.	MME4101	Material Science	6	100	
2.	ACH4103	Principles of Corrosion	4	100	
3.	ACH4102	Forms of Corrosion	4	100	
4.	MME4103	Chemistry of Corrosion Environment	4	100	
5.	ACH4104	Theory of Inhibition and Control of Corrosion	4	100	
6.	ACH4105L	Laboratory Practical-I	8	100	
			30		600
<u>Second Semester of PG Diploma in Corrosion Technology</u>					
5.	MME4201	Electrode Kinetics and Corrosion Testing	4	100	
6.	MME4202	Corrosion Resistant Materials and Selection	4	100	
7.	ACH4202	Corrosion Prevention and Surface Protection	4	100	
8.	ACH4203L	Laboratory-II	8	100	
9.	ACH4204	Seminars	2	50	
10.	ACH4205	Projects	4	100	

			26		550
				Total	1150

 <p>The Maharaja Sayajirao University of Baroda Faculty Technology and Engineering Department of Metallurgical and Materials Engineering</p>	The Maharaja Sayajirao University of Baroda		Academic Year		2020-21				
	P.G. Diploma in corrosion Technology: Regular Programme								
Year	I	Core / Elective / Foundation MME4101: Material Science	Credits / Hours per week		06				
Semester	I	Year of Syllabus Revision: 2021	Maximum Marks / Grade		100				
Mode of Transaction		Lectures and Tutorials							
Course Outcome (CO): MME4101 CO1 Introduction to engineering materials and Criterion for selection of materials for Engineering application. CO2 Study of crystal structure CO3 Knowledge of Mechanical properties of materials. CO4 Study of Phase Diagram and Imperfections in Crystals. CO5 Study of Ceramic Materials and Composite material. CO6 Study of Corrosion and its prevention. CO7 Knowledge of Electrical and electronic materials and Magnetic material & Advance Material.									
Unit No.	Topic/Unit	Contact Hours	Weightage	BT Level	CO	PSO	Elements of Employability (Emp)/	Relevance to Local (L)/ National (N)/ Regional(R)/Global	Relation to Gender (G), Environment and Sustainability (ES),

			(%)				Entrepreneurship (Ent)/ Skill Development (SD)	(G) developmental needs	Human Values (HV) and Professional Ethics (PE)
1	Classification of engineering material like Metallic materials, ceramic Material, Polymers, composite and Nano materials, Criterion for selection of materials for Engineering application.	08	12	1,2,3	CO1	PSO1	Emp	G	ES
2	Crystallography, Atomic structure and structure of crystalline solids, Lattices, unit cells, crystal systems, Bravais lattices, indexing of directions and planes, notations, interplanar spacing and angles, co-ordination number, packing factors stacking sequence in BCC, FCC & HCP.	12	14	2,3,4,5	CO2	PSO1			
3	Concept of Stress and strain, Stress strain Diagrams, Study of Tensile Test, Study of elastic and plastic deformation, Toughness behaviour and Impact & hardness Testing.	10	12	2,3,4	CO3	PSO1			
4	Types of solid solution, Study of Hume Rothery's rules and Gibbs phase rule, Phase diagrams for Binary systems like Isomorphous system, Eutectic system and Eutectoid system. Imperfections in Crystals and their effect on properties: 1. Point defect, 2. Line defect, 3. Surface defect, 4. Volume defect, Burger vectors and its representation, define of grain, Determine grain size number.	12	14	1,2,3,4	CO4	PSO1			
5	Introduction of ceramic material, Classification of ceramic, Study of ceramic crystal structure, processing of ceramic and properties of ceramics, Types	10	13	1,2,3,4	CO5	PSO1			

	of glass and solidification of glass. Composite material: Introduction and classification of composite material, Metal matrix, polymer matrix and ceramics matrix.								
6	Types of corrosion, dry and wet corrosion, study of electro chemical and oxidation (chemical) corrosion, Corrosion prevention anodic and cathodic prevention and coatings.	09	12	1,2,3	CO6	PSO1			
7	Study of Intrinsic and extrinsic semi conductivity, Die electric material, Piezo electric material. Magnetic materials: Introduction and classification of magnetic materials, Knowledge of soft and hard magnetic materials.	09	12	2,3,4	CO7	PSO1			
8	Study of nano materials & its application, metallic glasses, super conducting material, Optical Fibres, Smart materials.	08	11	1,2,3	CO7	PSO1			

Reference Books

1	Askeland D.R.,& P. P. Fullay (2007), The Science and Engineering of Materials –4th Cengage Learning Publishers 45
2	William D. Callister, Jr (2008), Callister's Materials Science and Engineering, (Adopted by R. Balasubramaniam) Wiley-Eastern
3	A.S. Edelstein and R.C. Cammarata Ed. (1998), Nano Materials: Synthesis, Properties and Applications, Inst. Of Physics Publishing, UK
4	Raghavan V (2007), Materials Science and Engineering - A First Course, Prentice Hall, India
5	James F. Shackelford (1996), Introduction to Materials Science for Engineers, Prentice Hall, India



The Maharaja Sayajirao University of Baroda
Faculty Technology and Engineering
Department of Applied Chemistry

Academic Year

2020-21

Post Graduate Diploma in Corrosion Technology: Regular Programme

Year	I	Core / Elective / Foundation ACH4103: Principles of Corrosion	Credits / Hours per week	04
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Semester	I	Year of Syllabus Revision: 2021	Maximum Marks / Grade	100
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Mode of Transaction	Lectures and Tutorials			
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Course Outcome (CO) ACH4103

- CO1** To learn about basic concepts of corrosion including chemical and electrochemical theories and reactions of corrosion.
- CO2** To understand the various types of films, scales and corrosion products of metals.
- CO3** Gaining knowledge about the fundamentals of corrosion in aqueous solutions
- CO4** To learn about various types of localized corrosion.
- CO5** To understand the basics of bimetallic corrosion, conditions necessary for bimetallic corrosion.
- CO6** To explore the basics of lattice defects, types of semiconductor oxides and their role in corrosion.
- CO7** To learn about continuous/ discontinuous oxide films to solve metallurgical and materials engineering issues.


Unit	Topic/Unit	Contact	Weightage	BT	CO	PSO	Elements of	Relevance to	Relation to
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No.		Hours	(%)	Level			Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Local (L)/ National (N)/ Regional (R)/ Global (G) developmental needs	Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional Ethics (PE)
1.	Basic concept of corrosion Acidity and Alkalinity, Corrosion as a Chemical Reaction, Redox potential, Electrochemical series, Chemical and electrochemical theories and reactions, electrochemical cells.	07	13	1,2	CO1	PSO2	Emp	G	ES
2.	Nature of films: Surface film, air-formed films of oxides, precipitated films of hydroxides, Scales and corrosion products of metals.	06	12	2,3,4	CO2	PSO2			
3.	Corrosion in aqueous solutions: Types of water, Corrosion and water quality, Corrosion in acids, Corrosion in neutral and alkaline solutions.	06	12	1,2,4	CO3	PSO2			
4.	Localized corrosion Types of localized corrosion: Pitting Corrosion, Crevice Corrosion, Material prone to localized corrosion.	06	12	2,3,5	CO4	PSO2			
5.	Bimetallic corrosion General theory, Conditions necessary for bimetallic corrosion, Bimetallic corrosion without physical contact, Bimetallic corrosion in some common environment: Sea water, Atmosphere and Acids.	07	13	1,2,3,4	CO5	PSO2			
6.	Lattices defects in metal oxide Introduction of unit cell and lattice, Lattice defects, Motion of	07	13	1,2,4	CO6	PSO2			

	lattice defects, types of semiconductor oxides: n-type and p-type oxides and their role in corrosion.								
7.	Continuous oxide Mono-layer and films of oxides, Thin oxide films, Surface reactions, Effects of alloying: a few examples.	06	12	1,2,3	CO7	PSO2			
8.	Discontinuous oxide films Rate laws for discontinuous oxide films, Volume change, mass transport in growing oxide layers, Oxide drift and pore formation.	07	13	1,2,3	CO7	PSO2			
Reference Books:									
1.	Corrosion Engineering: Principles and Practices, Pierre R. Roberge, McGraw Hill, 2008.								
2.	Corrosion, Vol. I, Edited by L. L. Shreir								


							Develop ment (SD)	develop mental needs	Human Values (HV)and Professio nal Ethics (PE)
1.	Galvanic corrosion Two-metal or dissimilar metal corrosion, Galvanic series, Area effects, Deposition corrosion, Some case studies.	06	12	1,2,3	CO1	PSO2	Emp	G	ES
2.	Crevice corrosion Introduction, Ideal Crevice, Crevice corrosion in acidic and electrolytic solutions, Real-World Crevices: Cars and related accessories.	07	13	1,2,3	CO1	PSO2			
3.	Pitting Condition of pitting, Pitting Morphology, Different stages of Pitting and their Mechanism, Pitting on Stainless Steels in Chloride-Containing Solutions	07	13	1,2,3	CO1	PSO2			
4.	Intergranular corrosion Introduction, Impurities and Segregations, Mechanism of intergranular corrosion in a stainless steel, Prevention of Intergranular Corrosion, weld decay, Intergranular Corrosion of Nickel Alloys.	07	13	2,3,4	CO2	PSO2			
5.	Dealloying Introduction, Selective leaching, Graphitic corrosion, dezincification, Dealuminification.	06	12	1,2,3	CO3	PSO2			
6.	Erosion corrosion Introduction, Impingement, Mechanisms of Erosion Corrosion, Prevention and Prediction of erosion-corrosion.	06	12	1,2,4	CO1	PSO2			
7.	Stress corrosion Introduction, Mechanisms of Stress Corrosion Cracking, Prevention of Stress Corrosion Cracking: a few case studies.	07	13	1,2,3	CO1	PSO2			
8.	Hydrogen damage Introduction, Hydrogen embrittlement: Hydrogen stress	06	12	1,2,3,4	CO4	PSO2			

	cracking, Hydrogen environment embrittlement, Loss in tensile ductility, Degradation of other mechanical properties, Control of hydrogen damage.								
Reference Books:									
1.	Corrosion Engineering: Principles and Practices, Pierre R. Roberge, McGraw Hill, 2008.								
2.	Corrosion Science and Engineering, Pietro Pedferri, Springer, 2018								
3.	Corrosion Engineering, Mars G. Fontana, Norbrt D. Greene.								

	The Maharaja Sayajirao University of Baroda Faculty Technology and Engineering Department of Metallurgical and Materials Engineering		Academic Year		2020-21					
	Post Graduate Diploma in Corrosion Technology: Regular Programme									
Year	I	Core / Elective / Foundation MME4103: Chemistry of Corrosion Environment	Credits / Hours per week						04	
Semester	I	Year of Syllabus Revision: 2021	Maximum Marks / Grade						100	
Mode of Transaction		Lectures and Tutorials								
Course Outcome (CO) MME4103										
<p>CO1 To learn about various types of atmospheric/ aqueous corrosion environment, factors affecting atmospheric corrosion and their measurements.</p> <p>CO2 To learn about effect of concentration, velocity and temperature on corrosion reactions.</p> <p>CO3 To learn about corrosive effect of the type of soils in the systems.</p> <p>CO4 To learn about corrosion in lubricant systems and food and beverage industries.</p> <p>CO5 To learn about corrosion by fused salts.</p>										
Unit No.	Topic/Unit		Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship	Relevance to Local (L)/ National (N)/ Regional	Relation to Gender (G), Environment and Sustaina


							(Ent)/ Skill Develop ment (SD)	(R)/Glob al (G) develop mental needs	bility (ES), Human Values (HV)and Professio nal Ethics (PE)
1.	Environments Types of environment, environmental factors and their effects on corrosion, atmospheric corrosion on different materials	05	11	1,2,4	CO1	PSO3, PSO4	Emp	G	ES
2.	Effect of concentration, Velocity and temperature Effect of anion concentration, effect of solution velocity on the rate of dissolution, Velocity induced corrosion, erosion corrosion, cavitation, some effects of temperature on corrosion reactions.	07	13	1,2,4	CO2	PSO3, PSO4			
3.	Atmosphere Types of corrosive atmospheres, factors affecting atmospheric corrosion, measurement of atmospheric corrosivity factors, atmospheric corrosion tests.	06	12	1,2,3	CO1	PSO3, PSO4			
4.	Aqueous Environment Importance of water, corrosion and water quality, Types of water: Natural water, treated water and sea water, Water treatment: Corrosion inhibitors, scale control, microorganisms.	07	13	1,2,3	CO1	PSO3, PSO4			
5.	Soil in the corrosion process Soil classification, soil parameters affecting corrosivity, soil corrosivity classifications, auxiliary effects corrosion cells.	06	12	2,3,4	CO3	PSO3, PSO4			
6.	Corrosion by food stuffs Microbiological induced corrosion in the food industry, stainless steel in the food industry: Dairy industry, Beverage industry, Canned food products.	07	13	2,3,4,5	CO4	PSO3, PSO4			
7.	Corrosion in fused salts Fused salts, Corrosion by Fused Fluorides, Corrosion by Fused	07	13	2,3,4,5	CO5	PSO3, PSO4			

	Chlorides, Corrosion by Fused Hydroxides, Corrosion by Other Fused Salts.								
8.	Corrosion in lubricant systems Deterioration of lubricants in use, Lubricant additive interactions, Corrosion by sulphur additives, Engine lubricants, Steam lubricants.	07	13	2,3,4,5	CO4	PSO3, PSO4			
Reference Books:									
1.	Corrosion Engineering: Principles and Practices, Pierre R. Roberge, McGraw Hill, 2008.								
2.	Corrosion, Vol. I, Edited by L. L. Shreir								
3.	Corrosion in Different Environments by Einar Bardal, Springer								
4.	Corrosion by Fused Salts and Heavy Liquid Metals—A Survey by Hiroshi								
5.	Corrosion in the Food Industry and Its Control by Benjamín Valdez Salas, Michael Schorr Wiener, Margarita Stoytcheva, Roumen Zlatev and Monica Carrillo Beltran								
6.	Corrosion in lubricant systems by Dr. Tony Smith								


	The Maharaja Sayajirao University of Baroda Faculty Technology and Engineering Department of Applied Chemistry		Academic Year		2020-21					
	Post Graduate Diploma in Corrosion Technology: Regular Programme									
Year	I	Core / Elective / Foundation ACH4104: Theory of Inhibition and Control of Corrosion	Credits / Hours per week					04		
Semester	I	Year of Syllabus Revision: 2021	Maximum Marks / Grade					100		
Mode of Transaction		Lectures and Tutorials								
Course Outcome (CO) ACH4104										
<p> CO1 To learn about passivity in metals, mechanism and theory of passivity CO2 Understanding of basic principles behind cathodic and anodic protections. CO3 To understand about corrosion inhibitors/environmentally friendly corrosion inhibitors together with citing examples of corrosion inhibition. CO4 To learn about corrosion prevention causes of failures in context of design and corrosive environment. CO5 To learn about various types of corrosion control and surface finishing processes. CO6 To learn about various industrial applications of corrosion inhibition. </p>										
Unit No.	Topic/Unit		Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship	Relevance to Local (L)/ National (N)/ Regional	Relation to Gender (G), Environment and Sustaina

							(Ent)/ Skill Develop ment (SD)	(R)/Glob al (G) develop mental needs	bility (ES), Human Values (HV)and Professio nal Ethics (PE)
1.	Passivity and passivation Passivity in Metals, Mechanism and Theory of Passivity, Electrochemical Methods for Investigating Passivity, Passive Systems, Passivity by Alloying.	06	12	2,3,4	CO1	PSO3, PSO4	Emp	G	ES
2.	Cathodic protection How cathodic protection works in water, soils, concrete, sacrificial cathodic protection, impressed current cathodic protection, cathodic protection components.	07	13	2,3,4,5	CO2	PSO3, PSO4			
3.	Anodic protection Introduction, Principles of anodic protection, methods of anodic protection, some selected examples of anodic protection.	06	12	2,3,4,5	CO2	PSO3, PSO4			
4.	Inhibition and inhibitors Corrosion Inhibitors, classification, Adsorption of Inhibitor at the Metal Surface, Anodic Dissolution and Adsorption, Structure–Activity Relationships, Corrosion Inhibition of Reinforcing Steel in Concrete, Corrosion Inhibition in Coal–Water Slurry Pipelines, Corrosion Inhibition in the Mining Industry, Atmospheric Corrosion Inhibition.	07	13	1,2,3,4	CO3	PSO3, PSO4			
5.	Environmentally Friendly Corrosion Inhibitors Green Inhibitors, Hybrid Coatings and Corrosion Inhibitors, Corrosion Prevention of Copper Using Ultrathin Green Organic Monolayers, Corrosion Control in the Electronics Industry.	07	13	2,3,4, 6	CO3	PSO3, PSO4			
6.	Corrosion Prevention by Design Causes of failures in the context of design, Corrosive environment, Stages in the design process, Consideration of	06	12	2,3,5,6	CO4	PSO3, PSO4			

	areas requiring attention at design stage, Soldering and threading, Design to control corrosion in various pipelines.								
7.	Corrosion control and Surface Finishing Corrosion control: Electroplating, Spray Coating, Galvanization, Painting, Anodizing, Chemical Vapor Deposition (CVD).	06	12	2,3,4	CO5	PSO3, PSO4			
8.	Industrial Applications of Corrosion Inhibition Corrosion Inhibition: Reinforcing Steel in Concrete, Coal-Water Slurries, Cooling Water Systems, Acid Solutions, Oxygen Scavengers, Inhibition of Corrosion by Organic Coatings, Corrosion Resistance of Several Metals and Alloys.	07	13	2,3,5,6	CO6	PSO3, PSO4			
Reference Books:									
1.	Passivity and Protection of Metals Against Corrosion, Nikon D. Tomashov and Galina P. Chernova, Plenum Press, New York, 1967.								
2.	Anodic Protection: Theory and Practice in the Prevention of Corrosion by Olen Riggs								
3.	Green Corrosion Inhibitors: Theory and Practice, V. S. Sastri, John Wiley & Sons, Inc., 2011.								
4.	Principles of Corrosion Engineering and Corrosion Control, 1 st Edition, Zaki Ahmad, Elsevier, 2006.								


	The Maharaja Sayajirao University of Baroda Faculty Technology and Engineering Department of Applied Chemistry		Academic Year		2020-21					
	Post Graduate Diploma in Corrosion Technology: Regular Programme									
Year	I	Core / Elective / Foundation ACH4105L: Laboratory Practical-I		Credits / Hours per week					08	
Semester	I	Year of Syllabus Revision: 2021		Maximum Marks / Grade					100	
Mode of Transaction		Practical/TW/Viva								
Course Outcome (CO) ACH4105L										
<p>CO1 To determine the amount of weight loss of varying metals in varying volume percentage of acidic/basic solutions.</p> <p>CO2 To determine the strength and normality of ferrous sulphate solution in redox titration.</p> <p>CO3 To determine dissolved oxygen in water sample.</p> <p>CO4 To measure the electrode potentials of varying metals/ fabrication of standard calomel electrode and agar-agar bridge.</p>										
Unit No.	Topic/Unit		Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development	Relevance to Local (L)/ National (N)/ Regional (R)/ Global (G) development	Relation to Gender (G), Environment and Sustainability (ES), Human Values

							(SD)	needs	(HV)and Professio nal Ethics (PE)
1.	To determine the amount of weight loss in Cu, Fe and Al in 5% HCl solution.	14	13	2,3,4	CO1	PSO3	Emp	G	ES
2.	To determine the amount of weight loss in Cu, Fe and Al in 5% H ₂ SO ₄ solution.	14	13	2,3,4	CO1	PSO3			
3.	To determine the amount of weight loss in Cu, Fe and Al in 5% NaOH solution.	14	13	2,3,4	CO1	PSO3			
4.	To determine the amount of weight loss in Cu, Fe and Al in varying volume percentages of NaOH solution.	14	13	2,3,4	CO1	PSO3			
5.	To determine the strength and normality of given KMnO ₄ solution using N/10 ferrous ammonium sulphate solution and estimation of Fe in the given iron filling.	08	09	1,2,4	CO2	PSO3			
6.	To determine the dissolved oxygen in the given water sample.	08	09	1,2,3,4	CO3	PSO3			
7.	To measure the electrode potentials of different metals in various environments using standard calomel electrode.	15	15	2,3,4	CO4	PSO3			
8.	Preparation of standard calomel electrode and agar-agar salt bridge.	15	15	2,3,4	CO4	PSO3			
Reference Books:									
1.	Corrosion: Fundamentals, Testing, and Protection, Stephen D. Cramer and Bernard S. Covino, Jr., ASM International, 1987.								


	The Maharaja Sayajirao University of Baroda Faculty Technology and Engineering Department of Metallurgical and Materials Engineering		Academic Year		2020-21						
	Post Graduate Diploma in Corrosion Technology: Regular Programme										
Year	I	Core / Elective / Foundation MME4201: Electrode Kinetics and Corrosion Testing	Credits / Hours per week				04				
Semester	II	Year of Syllabus Revision: 2021	Maximum Marks / Grade				100				
Mode of Transaction		Lectures and Tutorials									
Course Outcome (CO) MME4201											
<p> CO1 To learn about basics of electrode kinetics, mixed-potential theory and mixed electrodes. CO2 Understanding of passivity with mechanism of growth. CO3 To understand the common themes running through modern theory and applications of corrosion. CO4 To learn about various laboratory corrosion tests/ intergranular corrosion testing/ stress corrosion cracking testing. CO5 To explore various corrosion monitoring techniques. </p>											
Unit No.	Topic/Unit		Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship	Relevance to Local (L)/ National (N)/ Regional	Relation to Gender (G), Environment and Sustaina	

							(Ent)/ Skill Develop ment (SD)	(R)/Glob al (G) develop mental needs	bility (ES), Human Values (HV)and Professio nal Ethics (PE)
1.	A. Electrode kinetics: Exchange current density Activation polarization 3. Concentration polarization 4. Combined polarization, Combined polarization	07	13	2,3,4	CO1	PSO5	Emp	G	ES
2.	Mixed – potential theory, Mixed electrodes	05	11	1,2	CO1	PSO5			
3.	Passivity, Mechanism of the growth and breakdown of passive film	05	11	1,2	CO2	PSO5			
4.	Modern theory and applications: Predicting Corrosion Behaviour, Effect of Oxidisers, Velocity Effects, Galvanic Coupling, alloys evaluation	07	13	2,3,4,5	CO3	PSO5			
5.	B. Laboratory corrosion tests Corrosion rate Measurement : Linear Polarization, Potentiodynamic testing, Cyclic polarization testing	07	13	2,3,4	CO4	PSO5			
6.	Intergranular corrosion testing: EPR test. ASTM A262 practices A-E.	07	13	2,3,4,6	CO4	PSO5			
7.	Stress Corrosion Cracking Testing: Proof Ring test, slow strain rate testing, Atmospheric tests: Salt Spay Testing	07	13	2,3,4	CO4	PSO5			
8.	Corrosion Monitoring Technique: On-Line Corrosion Monitoring by coupons, electrical resistance (ER) and inductive resistance, linear polarization resistance (LPR), electrochemical impedance Spectroscopy (EIS).	07	13	2,3,4,6	CO5	PSO5			
Reference Books:									
1.	Corrosion Engineering – Mars G. Fontana and Norbert D. Green, Mcgraw-Hill International Book Company, New Delhi								

2.	Corrosion and Corrosion Control- An Introduction to Corrosion Science & Engineering, -Herbert H. Uhlig. John Wiley & Sons Inc., New York
3.	ASM Handbook 13-A: Corrosion: Fundamentals, Testing, and Protection ASM INTERNATIONAL ® The Materials Information


	The Maharaja Sayajirao University of Baroda Faculty Technology and Engineering Department of Metallurgical and Materials Engineering		Academic Year		2020-21						
	Post Graduate Diploma in Corrosion Technology: Regular Programme										
Year	I	Core / Elective / Foundation MME4202: Corrosion Resistant Materials and Selection		Credits / Hours per week						04	
Semester	II	Year of Syllabus Revision: 2021		Maximum Marks / Grade						100	
Mode of Transaction		Lectures and Tutorials									
Course Outcome (CO) MME4202											
<p>CO1 To learn about various types of metals and alloys including metallic glasses and refractory metals.</p> <p>CO2 To learn about natural and synthetic rubbers/elastomers.</p> <p>CO3 Upon completion of the course, the students will have the knowledge of variety of thermo-plastics and thermoset together with non-metallic materials.</p> <p>CO4 Concept of materials selection process, design and details to minimize corrosion.</p>											
Unit No.	Topic/Unit			Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship	Relevance to Local (L)/ National (N)/ Regional	Relation to Gender (G), Environment and Sustaina

							(Ent)/ Skill Develop ment (SD)	(R)/Glob al (G) develop mental needs	bility (ES), Human Values (HV)and Professio nal Ethics (PE)
1.	Metals and alloys: Stainless steels, Nickel & its alloys, Titanium & its alloy, Aluminium & its alloys	06	12	1,2,3	CO1	PSO5	Emp	G	ES
2.	Metals and alloys: Metallic glasses, Refractory Metals	06	12	2,3,4,5	CO1	PSO5			
3.	Non Metallics: Natural & synthetics rubbers, elastomers	06	12	2,3,4,5	CO2	PSO5			
4.	Thermo-plastics: Nylon, Acrylics, PVC, Polystyrene, Poly ethylene	07	13	2,3,4	CO3	PSO5			
5.	Thermo-setters: Epoxies, Polyester, Silicones Urea.	06	12	2,3,4	CO3	PSO5			
6.	Other non metallics: Ceramics, Carbon & graphite, wood	06	12	2,3,4,6	CO3	PSO5			
7.	Materials selection-2: The Materials Selection Process, Selecting Materials to Avoid or Minimize Corrosion such as general corrosion, Localized Corrosion, Galvanic corrosion,, Intergranular corrosion, Stress-corrosion cracking Hydrogen Damage, Erosion corrosion	09	15	2,3,4,5	CO4	PSO5			
8.	Materials selection-2: Design Details to Minimize Corrosion	06	12	2,3,4,5	CO4	PSO5			
Reference Books:									
1.	Corrosion Engineering – Mars G. Fontana and Norbert D. Green, Mcgraw-Hill International Book Company, New Delhi								
2.	Corrosion and Corrosion Control- An Introduction to Corrosion Science & Engineering, -Herbert H. Uhlig. John Wiley & Sons Inc., New York								
3.	ASM Handbook 13-A: Corrosion: Fundamentals, Testing, and Protection ASM INTERNATIONAL ® The Materials Information								


	The Maharaja Sayajirao University of Baroda Faculty Technology and Engineering Department of Applied Chemistry		Academic Year		2020-21						
	Post Graduate Diploma in Corrosion Technology: Regular Programme										
Year	I	Core / Elective / Foundation ACH4202: Corrosion Prevention and Surface Protection			Credits / Hours per week			04			
Semester	II	Year of Syllabus Revision: 2021			Maximum Marks / Grade			100			
Mode of Transaction		Lectures and Tutorials									
Course Outcome (CO) ACH4202											
<p>CO1 Exposure to some organic/inorganic/polymeric/plastic materials used for corrosion prevention.</p> <p>CO2 To learn about various types of corrosion resistant linings.</p> <p>CO3 To get acquainted with various types of organic/inorganic/metallic rubber coatings.</p> <p>CO4 To learn about protection mechanism, composition and types of paint systems.</p> <p>CO5 To acquire knowledge about components, classification and selection of corrosion protective varnishes.</p> <p>CO6 To understand concept of protective lining, role of noble metals in protective linings and acid resistant concretes.</p> <p>CO7 To gain the knowledge about design and economic aspects of corrosion.</p>											
Unit No.	Topic/Unit			Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/	Relevance to Local (L)/ National	Relation to Gender (G), Environ

							Entrepreneurship (Ent)/ Skill Development (SD)	(N)/ Regional (R)/Global (G) developmental needs	ment and Sustainability (ES), Human Values (HV) and Professional Ethics (PE)
1.	Materials for corrosion prevention Natural materials, Inorganic materials: metallic and non-metallic materials, organic materials: plastics and reinforced plastics, hybrid materials, polymeric materials, bio-materials.	07	13	1,2,3	CO1	PSO1, PSO5	Emp	G	ES
2.	Lining Corrosion resistant linings: Glass Linings, ceramic and concrete linings, rubber linings, organic linings, sheet linings.	06	12	1,2	CO2	PSO1, PSO5			
3.	Coating with rubber Types of coatings: Organic coatings, Inorganic coatings, Metallic coatings, Rubber for Corrosion Protection.	06	12	1,2	CO3	PSO1, PSO5			
4.	Corrosion prevention with polymer and plastics Introduction, polymer/plastic films, plastic coatings, polymer composites containing inhibitors: compatibility and their effectiveness.	06	12	2,3	CO1	PSO1, PSO5			
5.	Paint systems Protection mechanism of paint systems, Composition of paints, Types of paints, Preparation and application conditions for paint systems, Economical considerations.	07	13	1,2,4	CO4	PSO1, PSO5			
6.	Varnishes Introduction, components of varnishes, classification of varnishes, selection of varnishes, corrosion protective varnishes.	06	12	1,2,4	CO5	PSO1, PSO5			
7.	Marking and lining apparatus with acid resistant materials Protective linings and sheats, acid resistant lining, noble metals,	07	13	1,2	CO6	PSO1, PSO5			


	role of noble metals in protective linings, acid resistant concretes.								
8.	Design and economic aspects of corrosion Cost of designing of a plant, Annual Direct Cost of Corrosion, Corrosion costs and economics, selection of materials based on economy of the process.	07	13	1,2,3	CO7	PSO1, PSO5			
Reference Books:									
1.	Corrosion prevention practice: I. Sapronova.								
2.	Handbook for Corrosion Protection of Steel Surfaces by Painting, TEKNOS OY, 2013.								

	The Maharaja Sayajirao University of Baroda Faculty Technology and Engineering Department of Metallurgical and Materials Engineering		Academic Year					2020-21				
	Post Graduate Diploma in Corrosion Technology: Regular Programme											
Year	I	Core / Elective / Foundation ACH4203L: Laboratory-II	Credits / Hours per week					08				
Semester	II	Year of Syllabus Revision: 2021	Maximum Marks / Grade					100				
Mode of Transaction		Practical/TW/Viva										
Course Outcome (CO) ACH4203L												
CO1 To Measure rate of corrosion by weight loss method.												
CO2 To acquire knowledge about various testing methods viz. salt spray, potentio-dynamic, passivation, cyclic polarization, EPR, EIS and proof ring testing.												
Unit No.	Topic/Unit		Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional (R)/ Global (G) development	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and		

								needs	Professional Ethics (PE)
1.	Corrosion rate measurement using weight loss method	14	15	1,2,4	CO1	PSO5	Emp	G	ES
2.	Salt Spray Test	13	12	2,3,4	CO2	PSO5			
3.	Potential-dynamic Testing	13	12	2,3,4	CO2	PSO5			
4.	Passivation study	13	12	2,3,4	CO2	PSO5			
5.	Cyclic Polarization Testing	13	13	2,3,4	CO2	PSO5			
6.	EPR Testing	13	12	2,3,4	CO2	PSO5			
7.	EIS Testing	13	12	2,3,4	CO2	PSO5			
8.	Proof Ring testing	13	12	1,2,3	CO2	PSO5			
Reference Books:									
1.	Corrosion Engineering – Mars G. Fontana and Norbert D. Green, Mcgraw-Hill International Book Company, New Delhi								
2.	Corrosion and Corrosion Control- An Introduction to Corrosion Science & Engineering, -Herbert H. Uhlig, John Wiley & Sons Inc., New York								
3.	ASM Handbook 13-A: Corrosion: Fundamentals, Testing, and Protection ASM INTERNATIONAL ® The Materials Information								

	The Maharaja Sayajirao University of Baroda Faculty Technology and Engineering Department of Applied Chemistry		Academic Year		2020-21						
	Post Graduate Diploma in Corrosion Technology: Regular Programme										
Year	I	Core / Elective / Foundation ACH4204: Seminars		Credits / Hours per week			2				
Semester	II	Year of Syllabus Revision: 2021		Maximum Marks / Grade			50				
Mode of Transaction		Term Work, Viva-Seminar									
Course Outcome (CO) ACH4204											
CO1 To understand about literature survey, selection of topic, preparation of report and its presentation.											
Unit No.	Topic/Unit			Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional (R)/ Global (G) developmental needs	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional Ethics (PE)

1.	Preparation, presentation and report of seminars based on topics related to Corrosion.	26	100	2,4,5,6	CO1	PSO6	Emp, SD	G	ES
Reference Books/ Journals/Information:									
1.	Various Scientific Journals/ Newsletters related to ACS, RSC, Elsevier, Wiley, Springer publishing groups etc.								

	The Maharaja Sayajirao University of Baroda Faculty Technology and Engineering Department of Metallurgical and Materials Engineering		Academic Year		2020-21						
	Post Graduate Diploma in Corrosion Technology: Regular Programme										
Year	I	Core / Elective / Foundation ACH4205: Projects		Credits / Hours per week				4			
Semester	II	Year of Syllabus Revision: 2021		Maximum Marks / Grade				100			
Mode of Transaction		Project Assignment									
Course Outcome (CO): ACH4205											
CO1 To understand and carry out independent literature survey, design and execution of experiment based small research problems, analysis/compilation/ interpretation of data together with making of a scientific dissertation report followed by presentation.											
Unit No.	Topic/Unit			Contact Hours	Weightage (%)	BT Level	CO	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional (R)/ Global (G) developmental needs	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional Ethics

									(PE)
1	Literature survey, design, execution, analysis of results, presentation and report of small research problems based on advanced topics related to Corrosion.	52	100	2,3,4,5,6	CO1	PSO6	Emp, SD	G	ES
Reference Books/Journals:									
1.	Various Scientific Journals related to ACS, RSC, Elsevier, Wiley, Springer publishing groups etc.								