



SRIVENKATESWARACOLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Page 1 of 6

Department of Applied Chemistry	LP: SubCode Rev.No: 00 Date: 14-11-2022
B.EMARINE ENGINEERING Sub.Code/Sub.Name: CY22154/CHEMISTRY FOR MARINE ENGINEERING Unit: I	Regulation: 2022

Unit Syllabus: WATER TECHNOLOGY: Water its sources, classification and types of impurities – Significance of impurities such as turbidity, colour, acidity, alkalinity, hardness, chlorides, sulphates, iron and manganese. DO. BOD. COD. Impurities in fresh water, sea water, distilled water. Boiler feed water- Introduction and requirements, purpose of water treatment in boilers, scale and sludge - causes, effects and prevention.

Objective:

- Students will have a basic knowledge about the various sources and possible impurities of water.
- Students will know the purpose of feed water treatment for boilers
- Students will gain knowledge about the scale formation, its detrimental effects and prevention methods

Session No*	Topic to be covered	Ref	Teaching Aids
1.	Water – Sources, classification and types in detail	T1, Ch-1, Pg 1-2	LCD
2.	Significance of various impurities in water – types and example	T1, Ch-1, Pg 2	LCD
3.	Impurities in fresh water	T1, Ch-1, Pg 1-2	LCD
4.	Impurities in sea water	T1, Ch-1, Pg 1-4	LCD
5.	Impurities in distilled water	T1, Ch-1, Pg 1	LCD
6.	Purpose of water treatment in boilers	T1, Ch-1, Pg 8-14	LCD
7.	Scale formation – causes and explanation	T1, Ch-1, Pg 8-9	LCD
8.	Detrimental effects of scale formation	T1, Ch-1, Pg 9-10	LCD
9.	Prevention of scale formation	T1, Ch-1, Pg 9-10	LCD

Content beyond syllabus covered (if any): Rain water harvesting.

* Session duration: 50 minutes



Sub.Code/Sub. Name: CY2215-1- Chemistry for Marine Engineering
Unit: II

Unit Syllabus: WATER TESTING: Hardness, disadvantages of hard water in domestic field, industrial field, estimation of hardness by EDTA method, treatment for hardness (internal and external conditioning methods), total dissolved solids, dissolved oxygen test, test for partial and total alkalinity, chloride, sulphite, phosphate test, salinometer and its uses, use of litmus paper, typical test values for smoke and water tube boilers.

Objective:

- Students understand the concept of hardness, its types, estimation technique and removal methods.
- Students will have knowledge about the typical values for the different types of boilers.

Session No*	Topic to be covered	Ref	Teaching Aids
10.	Hardness concepts in detail	T1, Ch-1, Pg 4-5	LCD
11.	Types and Units of Hardness	R2, Ch-4, Pg 5-7	LCD
12.	Estimation of hardness by EDTA method	T1, Ch-7, Pg 34-36	LCD
13.	Treatment for hardness - Internal conditioning	T1, Ch-7, Pg 19-21	LCD
14.	External Treatment - Demineralization & Zeolite process	T1, Ch-7, Pg 37, 29	LCD
15.	Treatment for TDS and DO Test	T1, Ch-7, Pg 15-16	LCD
16.	Test for partial and total alkalinity & chloride, sulphite, phosphate test.	T1, Ch-7, Pg 30-32, 166-167	LCD
17.	Salinometer explanation in detail & use of litmus paper.	T1, Ch-7, Pg 163	LCD
18.	Typical test values for smoke and water tube boilers.	T1, Ch-7,	LCD

Content beyond syllabus covered (if any): Determination of sodium content of water sample by flame photometry

* Session duration: 50 mins



SubCode/Sub Name: CY22154 - Chemistry for Marine Engineering

Unit: III

Unit Syllabus : WATER TREATMENT: Lime and Soda treatment – Hot lime and cold lime soda process, pH treatment, use of coagulants, caustic soda treatment, condensate line treatment, Demineralization, Zeolite process, Desalination of water - reverse osmosis and electro-dialysis, priming, foaming and control, effects of salts and gases in feed water, domestic water treatment – primary treatment and disinfection (UV, ozonation, chlorination and breakpoint chlorination)

Objective:

- Students understand the various water treatment methods.

Session No*	Topics to be covered	Ref	Teaching Aids
19.	Lime Soda treatment	T1, Ch-1, Pg 14-17	LCD
20.	pH treatment	T1, Ch-1, Pg 10-11	LCD
21.	Salinometer explanation in detail	R2, Ch-4, Pg 163	LCD
22.	Use of litmus papers. Test for partial and total alkalinity	R2, Ch-4, Pg 163, T1, Ch-1, Pg 30-32	LCD
23.	Test for chloride, sulphite, phosphate	T1, Ch-1, Pg 1, R2, Ch-4, Pg 166-167	LCD
24.	Caustic soda and condensate treatments	T1, Ch-1, Pg 2, R2, Ch-4, Pg 156-159,	LCD
25.	Desalination R.O. and electro-dialysis	T1, Ch-1, R2, Ch-4, Pg 161	LCD
26.	Priming, foaming concepts and control - Effects of salts and gases in feed water	T1, Ch-1, Pg 13-14, T1, Ch-1, Pg 8-14,	LCD
27.	Domestic water treatment – primary treatment and disinfection (UV, ozonation, chlorination and breakpoint chlorination)	T1/CH 1/Pg : 20-25	LCD

Content beyond syllabus covered (if any): Determination of Sulphate content of water sample



SubCode/Sub Name: CY22154- Chemistry for Marine Engineering

Unit: IV

Unit Syllabus : CHEMISTRY OF CORROSION & ITS CONTROL: Introduction – Dry or chemical corrosion – mechanism. Pilling Bed worth rule, Wet or Electrochemical corrosion - mechanism - fretting, pitting corrosion, corrosion fatigue, types and causes of corrosion, dezincification and stress corrosion, factors influencing corrosion, Corrosion control - methods of mechanical and chemical de-aeration - material selection and design, sacrificial anodic protection, impressed current cathodic protection, Protective coatings – galvanizing, tinning, electroplating and paints.

• Students will have a better understanding about the concepts of boiler corrosion, their types and causes.

• Students will also have a good knowledge in corrosion control techniques.

Session No*	Topics to be covered	Ref	Teaching Aids
28.	Introduction – Types and causes of corrosion, Pilling Bed worth rule.	T1, Ch-7, Pg 320-326	LCD
29.	Mechanism of dry and wet corrosion.	T1, Ch-7, Pg 316-317	LCD
30.	Fretting corrosion mechanism.	R2, Ch-4, Pg 144	LCD
31.	Pitting corrosion and corrosion fatigue.	T1, Ch-7, Pg 313 R2, Ch-4, Pg 144	LCD
32.	Dezincification and stress corrosion .	T1, Ch-7, Pg 316 R2, Ch-4, Pg 143-144	LCD
33.	Factors influencing corrosion.	T1/Ch7/ Pg : 342-345	LCD
34.	Corrosion control: mechanical and chemical de-aeration methods.	T1, Ch-7, Pg 332, T1, Ch-1, Pg 12-13	LCD
35.	Corrosion control: material selection and design, sacrificial anodic protection, impressed current cathodic protection.	T1/CH7/ Pg : 345-349	LCD
36.	Protective coatings – galvanizing, tinning, electroplating and paints.	T1/CH7/ Pg : 374-375	LCD

Content beyond syllabus covered (if any): Protective coatings for phosphating.



SubCode/Sub Name: CY22154 - Chemistry for Marine Engineering

Unit: V

NANOCHEMISTRY AND ENERGY SOURCES: Introduction – Distinction between molecules, nanomaterials and bulk materials, size dependent properties, properties of nanoparticles, nanoclusters, nano rods and carbon nano tubes. Synthesis of nanomaterials – chemical vapour deposition and laser ablation method - applications of nanomaterials in medicine, agriculture, electronics, fuel cells and catalysis. Batteries- primary battery (dry cell) secondary batteries – alkaline batteries – lead acid, Ni-Cd and Li batteries, principles and applications of solar cells, wind energy, hydrogen and oxygen- fuel cell and next generation batteries

Objective:

- Students will have good understanding about Energy sources, Nano chemistry and its significances.
- Students will know more about these secondary storage devices, fuel cell and solar energy.

Session No*	Topics to be covered	Ref	Teaching Aids
37.	Introduction to energy sources and nanochemistry, Distinction between molecules, nanomaterials and bulk materials.	T1, Ch-15, Pg 640, 651, 653	LCD
38.	Size dependent properties- properties of nanoparticles, nanoclusters, nano rods and carbon nano tubes- electrical, mechanical and vibration.	T1/CH 37/Pg: 1304, 1332	LCD
39.	Synthesis of nanomaterials – chemical vapour deposition and laser ablation method.	T1/CH 37/Pg: 1317	LCD
40.	Applications of nanomaterials in various fields.	T1/CH 37/Pg: 1304	LCD
41.	Batteries - Definition, Primary batteries- Construction & working principle of dry cells, Zinc-Carbon batteries and alkaline batteries.	T2/CH4/Pg :129	LCD
42.	Secondary batteries - (Rechargeable)- Construction, working principle and uses of Lead - Acid storage battery, Nickel-Cadmium and Lithium battery.	T2/CH4/Pg :132	LCD
43.	Principles and applications of solar cells and wind energy.	T1, Ch-1, Pg 654, 658	LCD
44.	Construction and working principle of hydrogen and oxygen- fuel cell.	T1, Ch-1 Pg 654,	LCD
45.	Next generation batteries- Higher energy density – Construction, working principle and advantages of Aluminium- Air battery and Lithium ion solid battery.	T2/CH4/Pg :131, 134	LCD

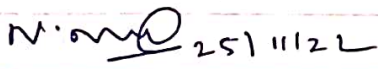
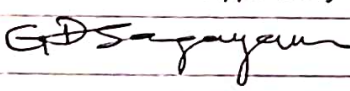
Content beyond syllabus covered (if any): Hydrogen and air- fuel cell.

**TEXTBOOKS:**

1. Jain P.C. and Monika Jain, Engineering Chemistry, 4th Edition, Dhanpat Rai & Sons, New Delhi, 2002.
2. Milton and Leech, "Marine Boilers" Butterworth Publishers, UK

REFERENCES:

1. Uppal M.M., A Textbook of Engineering Chemistry, 7th Editions, Khanna Publishing, 1988.
2. Water treatment by J.D. Skelly, Imarest Publication, London
3. Jackson, L. Morton, TD, "Reed's General Engineering Knowledge for Marine Engineers", Bloomsbury USA, 2010.

	Prepared by	Approved by
Signature	 25/11/22	
Name	Dr. N. Nachiappan & Dr. S. Stanly	Dr. G. Devasagayam
Designation	Assistant Professor & Asso. Professor	Professor
Date	14-11-2022	14-11-2022
Remarks*:		
Remarks*:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD