



Department of Applied Chemistry		LP: CY16251
B.E/B.Tech. : I year (except BT & MR)		Rev. No: 00
Sub. Code / Sub. Name : CY16251 / Engineering Chemistry II		Date: 02.01.2017
Unit : I		

### Unit Syllabus: Unit syllabus: Water Technology

Introduction to boiler feed water- Requirements - formation of deposits in steam boilers and heat exchangers - disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) prevention of scale formation -softening of hard water -external treatment zeolite and demineralization – internal treatment- boiler compounds (phosphate, calgon, carbonate, colloidal) - caustic embrittlement-boiler corrosion-priming and foaming- desalination of brackish water –reverse osmosis.

Objective: To impart knowledge on water characteristics and treatment of water for industrial purpose.

Session No*	Topics to be covered	Ref.	Teaching Aids
1	General interaction with the students & overview of the syllabus. Sources of water.	R5: CH 1; pp 1	PPT / BB
2	Hardness, its types and substances responsible.	R5: CH 1; pp 3 & 4	PPT / BB
3	Boiler feed water - requirements, disadvantages of hard water in boilers and heat exchangers - scale and sludges formation and their preventive methods.	R5: CH 1; pp 5-6	PPT / BB
4	Priming & foaming, caustic embrittlement – explanation with the elimination of these problems.	R5: CH 1; pp 9-12	PPT / BB
5	Boiler corrosion due to various agents and its prevention	R5: CH 1; pp 10 & 11	PPT / BB
6	Softening of hard water (external conditioning) - Zeolite process, advantages & limitations.	R5: CH 1; pp 15 & 16	PPT / BB
7	Softening of hard water (external conditioning) – demineralization (Ion exchange) process – explanation	R5: CH 1; pp 17-19	PPT / BB
8	Internal conditioning methods (phosphate, calgon, carbonate, colloidal)	R5: CH 1; pp 8 & 9	PPT / BB
9	Desalination methods- Reverse Osmosis.	R5: CH 1; pp 25 & 26	PPT / BB
<b>Content beyond syllabus covered (if any):</b> Estimation of alkalinity of water.			

\* Session duration: 50 minutes



Sub. Code / Sub. Name: CY16251 / Engineering Chemistry II

Unit : II

### Unit Syllabus : ELECTROCHEMISTRY AND CORROSION

Electrochemical cell - redox reaction, electrode potential- origin of electrode potential - oxidation potential - reduction potential, measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems). Corrosion- causes- factors- types chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control – material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Paints- constituents and function. Electroplating of Copper and electroless plating of nickel.

**Objective:** To impart knowledge on electrochemical cells, corrosion its types and methods of control.

Session No	Topics to be covered	Ref.	Teaching Aids
10	Electrochemical cells and its types. Electrode potential – oxidation and reduction potential.	T1: CH 2; pp 39-42	PPT / BB
11	Measurement of electrode potential and its applications. Electro chemical series and its significances	T1: CH 2; pp 45-50	PPT / BB
12	Derivation of Nernst equation, problems based on this equation..	T1: CH 2; pp 51-54	PPT / BB
13	Causes for corrosion, its types – Mechanism of dry and wet corrosion.	T1: CH 3; pp 87-94	PPT / BB
14	Factors influencing corrosion – nature of metal and nature of environment	T1: CH 3; pp 97-100	PPT / BB
15	Corrosion control - selection and designing of materials, Sacrificial anodic and Impressed current cathodic	T1: CH 3; pp 100 – 102	PPT / BB
16	Paints – definition, various constituents and their functions.	T1: CH 3; pp 103 & 104	PPT / BB
17	Electroplating – definition and conditions, method of electroplating of copper	T1: CH 3; pp 107-111	PPT / BB
18	Electroless plating - definition and conditions, electroless plating of nickel.	T1: CH 3; pp 112 & 113	PPT / BB

**Content beyond syllabus covered (if any):** Measurement of single electrode potential.

\* Session duration: 50 mins



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Unit : III

### Unit Syllabus : ENERGY SOURCES

Introduction- nuclear energy- nuclear fission- controlled nuclear fission - nuclear fusion- differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator classification of nuclear reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells: Types of batteries- alkaline battery- lead storage battery nickel-cadmium battery- lithium battery- fuel cell H<sub>2</sub> -O<sub>2</sub> fuel cell- applications

**Objective:** To impart knowledge on renewable energy sources like nuclear, solar and wind and to impart knowledge on energy storage devices.

Session No *	Topics to be covered	Ref.	Teaching Aids
19	Nuclear energy - differences between nuclear reaction & chemical reaction –Nuclear fission & fusion reactions with	T1: CH 4; pp 119-123	PPT / BB
20	Light water nuclear power reactor – principle - components with examples & functions	T1: CH 4; pp 124 & 125	PPT / BB
21	Breeder reactor and wind energy.	T1: CH 4; pp 125 & 126	PPT / BB
22	Solar energy conversion and solar cells - principle & applications	T1: CH 4; pp 128-131	PPT / BB
23	Batteries - definition, characteristics, types - alkaline batteries	T1: CH 4; pp 142-144	PPT / BB
24	Lead acid battery - discharging and charging process	T1: CH 4; pp 147-148	PPT / BB
25	Ni-Cd battery, lithium batteries - reactions and uses	T1: CH 4; pp 148 & 149	PPT / BB
26	Fuel cells – types - hydrogen & oxygen fuel cell – Principle of working and applications.	T1: CH 4; pp 138-140	PPT / BB
27	Summarization of topics.		PPT

**Content beyond syllabus covered (if any):**

\* Session duration: 50 mins



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Unit : V

### Unit Syllabus : FUELS AND COMBUSTION

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (OttoHoffmann method) - petroleum- manufacture of synthetic petrol (Bergius process)- knocking- octane number - diesel oil- cetane number - natural gas- compressed natural gas(CNG)- liquefied petroleum gases(LPG)- producer gas- water gas. Power alcohol and bio diesel. Combustion of fuels: introduction- theoretical calculation of calorific value- calculation of stoichiometry of fuel and air ratio ignition temperature- explosive range - flue gas analysis (ORSAT Method).

**Objective:** To impart knowledge on different types of fuels(solid ,liquid ,gas ,primary , secondary and synthetic) and about combustion.

Session No *	Topics to be covered	Ref.	Teaching Aids
37	Fuels – definition, classification, calorific value, Gross and Net.	T1: CH 6; pp 199-203	PPT / BB
38	Theoretical calculation of calorific value. Solid fuel - coal- classification. Proximate analysis of coal.	T1: CH 6; pp 204, 209-213	PPT / BB
39	Ultimate analysis of coal - Carbonization process - Otto Hoffmann process.	T1: CH 6; pp 213-218	PPT / BB
40	Liquid fuel - Petroleum processing and fractions.	T1: CH 6; pp 219-221	PPT / BB
41	Manufacture of synthetic petrol by Bergius process. Knocking – octane and cetane number.	T1: CH 6; pp 225-228	PPT / BB
42	Gaseous fuels – CNG, LPG, water gas and producer gas.	T1: CH 6; pp 229-233	PPT / BB
43	Power alcohol and bio-diesel.	T1: CH 6; pp 233-236	PPT / BB
44	Combustion- Introduction and theoretical calculation of air.- problems	T1: CH 6; pp 236 & 237	PPT / BB
45	Flue gas analysis by Orsat method.	T1: CH 6; pp 237-239	PPT / BB

**Content beyond syllabus covered (if any):** Determination of calorific value.

\* Session duration: 50 mins



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Unit : IV

### Unit Syllabus: ENGINEERING MATERIALS

Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of alumina, magnesite and silicon carbide, Portland cement- manufacture and properties - setting and hardening of cement, special cement-waterproof and white cement–properties and uses. Glass - manufacture, types, properties and uses.

**Objective:** To impart knowledge on method of manufacture, properties and uses various engineering materials

Session No *	Topics to be covered	Ref.	Teaching Aids
28	Abrasives - definition and classification, Natural abrasives and synthetic abrasives.	T1: CH 5; pp 155-157	PPT / BB
29	Abrasives – manufacturing of grinding wheel, abrasive paper and cloths.	T1: CH 5; pp 157 & 158	PPT / BB
30	Refractories –classification - Properties of refractories – refractoriness, refractoriness under load.	T1: CH 5; pp 158-160	PPT / BB
31	Properties of refractories – dimensional stability, porosity, dimensional stability, thermal spalling.	T1: CH 5; pp 160 & 161	PPT / BB
32	Manufacture of alumina, magnesite, zirconia.bricks.	T1: CH 5; pp 161-163	PPT / BB
33	Manufacturing methods of Portland cements.	T1: CH 5; pp 165-169	PPT / BB
34	Properties of cement – setting and hardening. Special cement- waterproof and white cement.	T1: CH 5; pp 169 & 170	PPT / BB
35	Special cements – water proof and white cements.	T1: CH 5; pp 171 & 172	PPT / BB
36	Glass manufacture – types, properties and uses.	T1: CH 5; pp 173-178	PPT / BB
<b>Content beyond syllabus covered (if any):</b>			

\* Session duration: 50 mins



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### TEXT BOOKS

1. Vairam S, Kalyani P and SubaRamesh, "Engineering Chemistry", Wiley India PvtLtd., NewDelhi., 2011
2. DaraS.S, UmareS.S. "Engineering Chemistry", S. Chand & Company Ltd., New Delhi , 2010.

### REFERENCES

1. Kannan P. and Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009
2. AshimaSrivastava and Janhavi N N., "Concepts of Engineering Chemistry", ACME Learning Private Limited., New Delhi., 2010.
3. RenuBapna and Renu Gupta., "Engineering Chemistry", Macmillan India Publisher Ltd., 2010.
4. Pahari A and Chauhan B., "Engineering Chemistry", Firewall Media., New Delhi., 2010
5. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub. Co., New Delhi

	Prepared by	Approved by
Signature		
Name	Dr.M.Thirumalaikumar	Dr.G.Devasagayam
Designation	Assistant Professor	Professor & Head
Date	02.01.2017	02.01.2017
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.



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**Module Coordinator**

CO	Statements	RBT* Level
CO-1	Understand the usage of water for both domestic and industrial purpose and to examine the practical aspects of managing the problems by water treatment methods.	1,2
CO-2	Understand the operating principles and mechanisms of electrochemical processes and apply the knowledge to protect the materials from corrosion.	3
CO-3	Students should able to apply the knowledge on non-conventional energy sources to the analysis and design of advanced energy storage devices.	3,4
CO-4	Knowledge on manufacture, basic chemical and physical properties and uses of various engineering materials in industries.	1,2

\* Revised Bloom's Taxonomy

**Mapping CO – PO - PSO:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	A	C	C	C	A	A	B	C	C	C	C	C		
CO2	A	B	A	A	B	A	B	C	C	B	B	B		
CO3	A	B	A	A	B	A	A	C	C	B	B	B		
CO4	C	C	B	C	C	B	C	C	C	C	C	C		

A – Strong ; B – Moderate; C - weak

**Course Requirements**

1. Scientific Calculator
2. Interest Tables

**Assessment Methods**

1. Assignment 1 + CAT 1
2. Assignment 2 + CAT 2

} Internals - 20 Marks



## SRI VENKATESWARA COLLEGE OF ENGINEERING

## COURSE DELIVERY PLAN - THEORY

3. Assignment 3 + CAT 3
4. Attendance (Not applicable for R2016)
5. End semester exam - 80 Marks

<b>Signature of Faculty / Course Coordinator</b>	<b>Signature of Module Coordinator</b>