SEMESTER: I PART:III	22UICHA01: INDUSTRIAL CHEMISTRY – I	CREDIT: 03 HOURS: 60

COURSE OBJECTIVES

1) To enable the learners to understand the significance of Inorganic Cementing Materials.
2) To know the details of, Portland cement, Glass, Ceramics, and Plasticity of Clay.
3) To impart knowledge of Refractoriness and Portland cement.
4) To be familiar with the details of adhesives.
5) To understand the basic concepts and application of an Abrasives, Pulp and paper.

UNIT-I: INORGANIC CEMENTING MATERIALS HOURS: 12

Introduction - Lime and its manufacture - Gypsum Plaster - Cement - Types of cement. - Chemical Composition Manufacture of Portland cement - Chemical Composition of Portland Cement - Setting and Hardening of Portland Cement. The Heat of Hydration of Cement - Special Cement – Concrete and RCC - Decay of Concrete.

UNIT-II: GLASS AND CERAMICS HOURS: 12

Introduction - Manufacture of Glass - Varieties of Glasses. **2.2** Plasticity of Clay - White wares - Glazing - applications - Earthenware 'sand stoneware' – Optical Fibres.

UNIT-III: REFRACTORIES HOURS: 12

Introduction - Classification - Manufacture of Refractoriness - Cermets - Insulating refractoriness - Requirements of a refractory.

Combustion - Mass analysis from volume analysis and vice-versa Flue gas analysis- efficiency of combustion.

UNIT-IV: ADHESIVES HOURS: 12

Introduction - Classification of adhesives - Adhesive Action - Development of Adhesive Strength. Solvent Responsive, Adhesives - Uses of Solvent Responsive, Adhesives. Chemically reactive, adhesives.

Preparation of adhesives - Synthetic resin adhesives – Rubber - based adhesives - Cellulose and silicate adhesives - Uses of adhesives.

UNIT-V: ABRASIVES HOURS: 12

Introduction - Natural Abrasives - Artificial Abrasives – Grinding Wheels. Pulp and paper - Introduction - Manufacture of pulp - Sulphate pulp - Soda pulp - Rag pulp - Beating, refining, filling, sizing and colouring - manufacture of paper.

COURSE OUTCOMES

1) Describe the distinction between Mass analysis from volume analysis and vice-versa.
2) Write down the Applications of Glasses, ceramics.
3) Describe the Chemical Composition of Setting and Hardening of Portland Cement.

4) Write down Development of Adhesive Strength. Solvent Responsive.
5) Describe the Manufacture of pulp and Paper.

TEXTBOOKS: (IN API STYLE)

1) E. Stocchi: 1990, Industrial Chemistry, Vol-I, Ellis Horwood Ltd,London.
2) J. A. Kent, 1997, Riegelís Handbook of Industrial Chemistry, CBS Publishers, 9th edition, New Delhi.
3) P. C. Jain, M. Jain, Engineering Chemistry, Dhanpat Rai & Sons, 15th edition, New Delhi.

SUPPLEMENTARY READINGS

1) Ullmann's Encyclopedia of Industrial Chemistry, Vol. B1, Fundamentals of Chemical Engineering,Hans-Jürgen Arpe.
2) A.K. De, Environmental Chemistry, New Age International Pvt Ltd., 2nd edition, New Delhi.

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	3	3
CO2	2	3	3	3	3
CO3	3	2	3	3	2
CO4	3	3	2	2	3
CO5	3	3	3	3	2

(1-Low, 2-Moderate, 3-High)

SEMESTER: II PART: III	22UICHA02 INDUSTRIAL CHEMISTRY – II	Credit: 3 HOURS: 45

COURSE OBJECTIVES

1) To understand the elaborate study of Fuels Introduction.
2) To study the basic concepts and Classification of Coal by Rank.
3) To know about the basic concepts of coking and gaseous fuels.
4) To have a knowledge of Liquid fuels and Refining of Gasoline.
5) To know the details of Residual fuel oils, Power alcohol.

UNIT-I **HOURS: 9**

FUELS AND COMBUSTION

Introduction - Classification of Fuels - Calorific Value – Theoretical Calculation of Calorific Value of a Fuel Gross calorific value and net calorific value – Characteristics of a Good Fuel - Solid fuels - Wood.

Coal - Classification of Coal by Rank - Selection of Coal - Analysis of Coal and its significance

UNIT-II **HOURS: 9**

SOLID AND GASEOUS FUELS:

Types of coking - Types of Carbonization of Coal - Role of Sulphur in Coal - Role of Ash in coal.

Gaseous fuels - Producer Gas - Water Gas - Natural Gas – Oil Gas - Biogas - Components - Composition - preparation – advantages - disadvantages and applications of Coal gas - Gobar gas – LPG

UNIT-III **HOURS: 9**

LIQUID FUELS

Petroleum-Cracking - Advantages of catalytic cracking over thermal cracking - Synthetic Petrol.

Refining of Gasoline – Reforming - Knocking - Octane number of Gasoline - Diesel Engine Fuels - Diesel - Octane number of Diesel Oil - Diesel index.

UNIT-IV **HOURS: 9**

RESIDUAL FUEL OILS AND ANALYSIS OF FUELS:

Asphalt - Aviation fuel - advantages -Kerosene as a fuel.

Analysis and testing of liquid and gaseous fuels - Utilization of fuels - Solar power.

UNIT-V **HOURS: 9**

Other sources of energy – Electricity Power - Modern Concept of Fuel - Fuels for Metallurgy.

Power Alcohol - Recent Advances In Fuel Technology. Alternative Fuels – Alcohols – Promising Bio fuel: An Alternative Source to Diesel and Gasoline - Control of Pollution in Refineries.

COURSE OUTCOMES

1) Describe the types of Calorific Value of Fuels. The Octane number of fuels.
1) Demonstrate knowledge acquired in solar power.
2) Write down applications of Gaseous fuels.
3) Classify Alternative Fuels based on their function.
4) Describe the advantages of Residual fuel oil.

TEXTBOOKS:(IN API STYLE)

1) E. Stocchi: 1990, Industrial Chemistry, Vol-I, Ellis Horwood Ltd; UK
2) J. A. Kent, 1997, Riegelís Handbook of Industrial Chemistry, CBS Publishers, 9th edition, New Delhi.
3) P. C. Jain, M. Jain, Engineering Chemistry, Dhanpat Rai & Sons, 15th edition, New Delhi.
4) A.K.De, Environmental Chemistry, New Age International Pvt; Ltd; 2nd edition, New Delhi.
5) S.P. MAHAJAN: Pollution control in process industries, Tata McGraw-Hillpublishing Company Limited, New Delhi.

SUPPLEMENTARY READINGS

1) C.k. Varshney: Water Pollution and Management, Wiley Eastern Limited, Chennai.
2) Rachida El Morabet, in Encyclopedia of Environmental Health,Vol-II (Second Edition), Future industrial coal utilization: forecasts and emerging technological and regulatory issues,
3) J.K. Alderman, in The Coal Handbook: Towards Cleaner Production: Coal Utilisation, 2013.

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**2**	**3**
CO2	**2**	**2**	**3**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**2**
CO4	**3**	**2**	**3**	**3**	**3**
CO5	**2**	**3**	**3**	**2**	**3**

(1-Low, 2-Moderate, 3-High)

SEMESTER: II PART:III	22UICHAP1 INDUSTRIAL CHEMISTRY PRACTICAL - I	CREDIT: 3 HOURS: 45

COURSE OBJECTIVES

1) To enable the learners to apply the principle in total dissolved solids, and suspended solids in the given water sample.
2) To analyze samples with the best utilization of techniques that provides structural information.
3) To get in-depth knowledge to determine the acid-neutralizing power of a commercially available antacid tablet.
4) To understand the principles of standardizing a solution of the base using the analytical technique known as titration.
5) To know about the practical applications of calcium in chalk - Permanganometry and pH .
6) To enable the learners to acquire knowledge on an acid-base scale.

EXPERIMENTS

1) Estimation of total dissolved solids in the given water sample (**TDS**) (Only for demonstration)
2)
3) Estimation of total suspended solids in the given water sample (**TS**S) (Only for demonstration).
4) Determination of total permanent and temporary hardness of water using EDTA.
5) Determination of acetic acid in commercial vinegar using NaOH.
6) Determination of alkali content in antacid tablet using HCl.
7) Estimation of calcium in chalk - Permanganometry.
8) Limit test for Sulphate, Chloride, Iron & Lead

COURSE OUTCOMES

1) Understand the basic concepts of water pollution.
2) Understand different types of solids in the given water sample.
3) Understand various environmental factors that effect on water.
4) Analyse alkali content of antacid tablet.
5) Educated in various measurements and monitoring techniques of analytical titration

TEXTBOOKS:(IN API STYLE)

1) Sundaram, Krishnan, Raghavan,1996,Practical Chemistry (Part III), S.Viswanathan Co. Pvt., Ltd;Chennai.
2) E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK
3) W. D. Kingery, H. K. Bowen, D. R. Uhlmann, Introduction to Ceramics, Wiley Publishers, New Delhi.
4) J. A. Kent, Riegelís Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
5) P. C. Jain, M. Jain, 2019, Engineering Chemistry, Dhanpat Rai & Sons, 17th Edition, New Delhi.

SUPPLEMENTARY READING

1) Felder R. M., and RousseuR. W., 2000, *Elementary Principles of Chemical Processes*, Wiley Publications, 3rd Edition, New York.
2) Sanders R. J., 1976, *The Anatomy of Skiing*. Denver, CO: Golden Bell Press, New Delhi.
3) CrynesB. L.,FoglerH. S., 1981, *AICHE Modular Instruction Series E*: *Kinetics*, Vols. 1 and 2., New York.
4) Austin G. T., 1984, *Shreve's Chemical Process Industries*, McGraw-Hill, 5th Edition, New York.
5) Vogel,A.I., Vogel's Text Book of Quantitative Chemical Analysis, Prentice Hall, New Jersey.

SCHEME OF VALUATION

Internal assessment: 40 marks
External assessment: 60 marks
Total: 100 marks
Record: 10 marks
Limit test: 10 marks
Estimation: 40 marks
Error upto 2% 40 marks
2.1- 3% 30 marks
3.1-4% 20 marks
4.1- 5% 10 marks
> 5% 5 marks

For incomplete or wrong calculation, deduct 20% of total marks scored.
For no calculation, deduct 40% of total marks scored.
For each arithmetic error, deduct 1 mark.

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	**2**	**2**	**3**	**3**	**3**
CO2	**3**	**3**	**2**	**2**	**3**
CO3	**3**	**3**	**3**	**3**	**2**
CO4	**2**	**3**	**3**	**3**	**3**
CO5	**3**	**2**	**2**	**2**	**2**

(1-Low, 2-Moderate, 3-High)