

DEPARTMENT OF CHEMISTRY				CLASS: II B.Sc. Chemistry				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	SBE	20U3CSM1	Industrial Chemistry	2	2	25	75	100

Nature of Course			
Knowledge and skill			Employability oriented
Skill oriented	✓		Entrepreneurship oriented

**Objectives:** *The objective of this course is to make the student*

- (i) *To impart the knowledge about the different kinds of fuels and principles of combustion*
- (ii) *To learn types of cracking in petroleum products and synthetic petrol*
- (iii) *To aware about non-petroleum products*
- (iv) *To gain basic knowledge of fireworks, explosive*
- (v) *To enable the students to understand various protective coating methods*

Unit	Description	Hours	K-Level	CLO
I	<b>Fuels and Combustion</b> Introduction, Classification of fuels, Characteristic of good fuel, Calorific fuel, Determination of Calorific value of solid fuel by Bomb Calorimeter – Determination of calorific value of gaseous fuel, boy's gas calorimeter, Theoretical calculation of calorific value, Combustion, calculation of air qualities.	6	K2	CLO-1
II	<b>Petroleum Products</b> Fractional distillation of crude petroleum, Cracking, Definition and classification and types of cracking:, fixed bed catalytic cracking, moving bed catalytic cracking, Synthetic petrol – polymerization, Bergius method, Octane number, Knocking and Anti-knocking number, Gasoline, Reforming, Cetane number.	6	K3	CLO-2
III	<b>Non Petroleum Products</b> Manufacture of power alcohol from lignocellulose, natural gas, coal gas, oil gas, synthetic gas, producer gas and water gas.	6	K3	CLO-3
IV	<b>Fireworks and Explosives</b> Fireworks, Definition-Composition of fireworks Principle behind explosion of Fireworks and safety measure of fire works Explosives, definition, characteristics of good explosive, classification of explosive, precaution during storage of explosive, manufacture of some important explosive – Mercury fulminate, (TNT), Nitro glycerine, PETN	6	K4	CLO-4
V	<b>Protective Coatings</b> Introduction, Metallic coatings – Electro plating, Definition, Characteristics, Factors influencing electro plating, General Methods of Electroplating – Electro plating of copper and nickel- Organic coating, paint – Definition Requisites of Good paint, Constituents and their role in paints, formulation of paints, disadvantageous of paint film	6	K2	CLO-5

### **Books for Study:**

1. P. Kannan, A. Ravikrishnan, Engineering Chemistry, Sri Krishna Hitech Publishing Company, 10<sup>th</sup> edition, 2013.
2. O. P. Vermani, A. K. Narula: Industrial Chemistry, Galgotia Publications Pvt. Ltd., New Delhi, 2000.
3. M.G. Arora, M. Singh, Industrial Chemistry, Anmol Publications, 1<sup>st</sup> edition, Reprint 2004.

### **Books for Reference:**

1. P. C. Jain, M. Jain, Engineering Chemistry, Dhanpat Rai & Sons, Delhi. 16<sup>th</sup> edition, 2018.
2. B.K. Sharma - Industrial Chemistry – (Goel Publishing House, Meerut) 2000.
3. S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi, 2000.
4. Gavhane, K. A. Chemical reaction engineering-I, NiraliPrakashan publications, 17<sup>th</sup> edition, 2016.
5. S. Chawla, Theory and practices of engineering chemistry– Dhanpat Rai & Co, 2008
6. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi 2000.

### **Web Resources:**

1. [https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004132159500424ranvijay\\_engg\\_Fuels.pdf](https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004132159500424ranvijay_engg_Fuels.pdf)
2. [https://stannescet.ac.in/cms/staff/qbank/CSE/Notes/CY8151-Engineering%20Chemistry-1908708516-unit\\_4.pdf](https://stannescet.ac.in/cms/staff/qbank/CSE/Notes/CY8151-Engineering%20Chemistry-1908708516-unit_4.pdf)
3. [https://hithaldia.in/faculty/sas\\_faculty/Dr\\_Gora\\_Das/Class%20Notes%20\(CH-101%20&CH-201\)%20Module-5%20\(Industrial%20Chemistry\).pdf](https://hithaldia.in/faculty/sas_faculty/Dr_Gora_Das/Class%20Notes%20(CH-101%20&CH-201)%20Module-5%20(Industrial%20Chemistry).pdf)
4. <https://nptel.ac.in/content/storage2/courses/103103029/pdf/mod2.pdf>
5. <https://www.erforum.net/2016/01/engineering-chemistry-by-jain-and-jain-pdf-free-ebook.html>
6. <https://nptel.ac.in/content/storage2/courses/103103029/pdf/mod2.pdf>

### **Rationale for Nature of the course**

This course should enable the students to get exposure about industries of Petroleum and Non-Petroleum products,. Further students to know principles of combustion and gain the basic knowledge about Fireworks, Explosives and know about the various types of corrosion and their basic prevention techniques

### **Activities having direct bearing on Skill development/ Employability/Entrepreneurship**

The Students observing the various industrial operation and capable of correlating those process with basic principle and The Techniques studied in this course .Finally They have been asked to prepare and submit the summary of Report which comprise of what they observe, understand and Analyse

### **Pedagogy**

- Chalk-Talk class room activities
- Group Discussion
- Seminar/Assignment
- Quiz through ICT- Mode

### Lesson Plan

Unit	Descriptions	Hours	Lecture Mode
I	<b>Fuels and Combustion</b>		
	Introduction, Classification of fuels, Characteristic of good fuel, Calorific fuel, Determination of Calorific value of solid fuel by Bomb Calorimeter .	2	BB
	Determination of calorific value of gaseous fuel, boy's gas calorimeter,	2	BB/PPT
	Theoretical calculation of calorific value, Combustion, calculation of air qualities.	2	BB
II	<b>Petroleum Products</b>		
	Fractional distillation of crude petroleum, Cracking, Definition and classification and types of cracking:, fixed bed catalytic cracking, moving bed catalytic cracking,	3	BB/PPT/
	Synthetic petrol – polymerization, Bergius method, Octane number, Knocking and Anti-knocking number, Gasoline, Reforming, Cetanenumber	3	BB/ PPT
III	<b>Non-Petroleum Products</b>		
	Manufacture of power alcohol from lignocellulose and natural gas.	2	BB
	Manufacture of coal gas and oil gas	2	BB/PPT
	Manufacture of synthetic, gas producer gas and water gas.	2	BB
IV	<b>Fireworks and Explosives</b>		
	Fireworks, Definition-Composition of fireworks Principle behind explosion of Fireworks and safety measure of fireworks	2	BB/PPT
	Explosives, definition, characteristics of good explosive, classification of explosive, precaution during storage of explosive.	2	BB/PPT
	Manufacture of some important explosive – Mercury fulminate, (TNT), Nitro glycerin, PETN	2	BB/PPT
V	<b>Protective Coatings</b>		
	Introduction, Metallic coatings – Electro plating, Definition, Characteristics, Factors influencing electro plating	2	BB/PPT/Animated Videos
	General Methods of Electroplating – Electro plating of copper and nickel- Organic coating	2	BB/PPT/Animated Videos
	Paint – Definition Requisites of Good paint, Constituents and their role in paints, formulation of paints, disadvantageous of paintfilm	2	BB/PPT/Animated Videos
<b>Total Hours</b>		<b>30</b>	

BB-Block board/Chalk and Talk

PPT-Power point presentation

CLOs	CLO statement	Knowledge level
CLO1	Learning classification of fuels and calorific value	Up to K2
CLO2	Know cracking of petrol and synthetic petrol preparation	Up to K3
CLO3	Study the manufacture of non-petroleum products	Up to K3
CLO4	Understand the basic principle fireworks, explosive and propellants	Up to K4
CLO5	Gain the knowledge of various coating methods	Up to K2

### PO and CLO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	1	2	2	2	3
CLO2	1	1	1	2	3
CLO3	1	1	1	2	3
CLO4	1	1	1	2	3
CLO5	1	2	1	2	3

### PSO and CLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO1	3	1	2	1	2	2	1
CLO2	1	1	1	1	1	2	1
CLO3	2	1	1	1	1	2	1
CLO4	1	1	1	1	1	2	1
CLO5	2	1	2	1	1	2	1

3-Advance application;

2-Intermediate level;

1-Basic level

## Learning Outcome Based Education(LOBE) & Assessment

### Formative Examinations I & II -Blue Print

#### Articulation Mapping - K Levels with Course Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K- Level	No. of Questions	K- Level			
1	CLOx	Up to K2/K3	2	K1& K2	2	K1,K2	2 (K2&K2)	1(K2/K3)	
2	CLOy	Up to K3/K4	2	K1& K2	1	K2	2 (K3&K3)	2 (K3, K3/ K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

**Learning Outcome Based Education(LOBE) & Assessment**  
**Summative Examination -Blue Print**  
**Articulation Mapping - K Levels with Course Outcomes (CLOs)**

S.No.	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1 & K2	1	K2	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 2	2	K1 & K2	1	K2	2 (K1&K1)	1(K2)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

**Distribution of Section-wise Marks with K Levels**

K levels	Section A (No choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42
K4	-	-	10	10	20	16.67	16
<b>Total Marks</b>	10	10	50	50	120	100.00	100

**Name of the course Designer**

1. Dr. P. Gajendran
2. Prof. S. Vidhyasankar