KU4SECCHE102: FUEL CHEMISTRY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	SEC	100	KU4SECCHE102	3	60

Learning Approach (Hours/ Week)		Marks Distribution			Duration of ESE (Hours)
Lecture/ Tutorial	Practical/ Internship	CE	ESE	Total	
2	2	30	45	75	1.5

Course Description: The course comprises of modules on history of fuels, coal, petroleum and petrochemical industries, gases and lubricants and a teacher specific module giving hands on experience through practical sessions, field visits, surveys and presentations**.**

Course Prerequisite:

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Students would be able to understand the different types of fuels obtained from renewable, non-renewable and artificial sources.	U
2	Classify the various types of fuels like liquid, solid and gaseous fuels available.	U
3	Understand the scientific Importance of renewable fuel sources.	U
4	Scientific knowledge on various types of fuels such as coal, petroleum and non-petroleum, petrochemicals and their uses will be enhanced after studying the course.	A

5	Knowledge on lubricants and their applications and properties	U
6	Develop skill in checking quality of lubricants.	A
7	Able to evaluate different fuels and their advantages and disadvantages and arrive at the most appropriate fuel choice which is environmentally benign.	E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	2	3	2	3	3	2
CO 2	2	1	3	1	2	2	2
CO 3	3	2	3	2	3	3	3
CO 4	3	2	3	2	3	3	2
CO 5	2	1	3	1	2	2	2
CO 6	3	1	2	2	2	3	2
CO 7	3	2	3	2	3	3	3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**HISTORY OF FUELS**		**7**
	1	Review of energy sources (renewable and non-renewable). History of solid, liquid and gaseous fuels	
	2	Definitions and properties of solid fuels, Definitions and properties of liquid and gaseous fuels	
	3	Production and Consumption pattern of fuels Various measurement techniques	

2	**COAL**		**7**
	1	Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value-Introduction of coal, uses of coal (fuel and non-fuel) in various industries (at least three examples), its types and composition, carbonization of coal	
	2	Coal gas, producer gas and water gas—composition and their uses, uses of coal-tar based chemicals	
	3	Requisites of a good metallurgical coke, Coal liquefaction and Solvent refining	

3	**PETROLEUM AND PETROCHEMICAL INDUSTRY**		**8**
	1	Composition of crude petroleum, Refining and different types of petroleum products and their applications	
	2	Fractional distillation (principle and process), Cracking (thermal and catalytic cracking), Reforming petroleum and non-petroleum fuels (LPG, CNG, LNG, biogas, biofuels derived from biomass),	
	3	Fuel from waste, synthetic fuels (gaseous and liquids), clean fuels,	
	4	Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives Xylene	

4	**GASES AND LUBRICANTS**		**8**
	1	Natural gas and LPG, Producer gas, Water gas, Hydrogen, Acetylene	
	2	Classification of lubricants, lubricating oils (conducting and non-conducting) -Solid and semisolid lubricants, synthetic lubricants	
	3	Properties of lubricants (viscosity index, cloud point, pore point) and their determination	

5	**TEACHER SPECIFIC MODULE**		**30**
		Laboratory practices& **a)** Study of properties of lubricants-viscosity index, cloud point, pore point **b)** distillation process **c)** Preparation of hydrogen gas, any 2 simple methods **d)** Hydrogen a clean and versatile fuel-presentation **Open ended** (any 2 from **e,f** and **g)** **e)** Field visit (fuel from waste) and report	

		f) Surveys to compare the advantages and disadvantages of CNG and LPG **g)** Setting of biogas plant / surveys to experience its advantage as a fuel source for domestic purposes.	

Essential Readings:

1.Stocchi, E. Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK (1990).

2.Jain, P.C. & Jain, M. Engineering Chemistry Dhanpat Rai & Sons, Delhi.

3.Sharma, B.K.& Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996)

4.Vermani, O. P.; Narula, A. K. (2004), Industrial Chemistry, Galgotia Publications Pvt. Ltd., New Delhi.

5.Bhatia, S. C. (2004), Chemical Process Industries, Vol. I & II, CBS Publishers, New Delhi.

6.Gopalan, R. Venkappayya, D.; Nagarajan, S. (2004), Engineering Chemistry, Vikas Publications.

7.A. Bahl and B.S. Bahl, Advanced Organic Chemistry, 1st Multicolour Edition, S. Chand &Company, New Delhi, 2010 3. K.S. Tewari, N.K. Vishnoi and S.N. Mehrotra,

8.A Textbook of Organic Chemistry, 2nd Edition, Vikas Publishing House (Pvt.) Ltd., New Delhi, 2004.