MAHATMA GANDHI UNIVERSITY

Kottayam, Kerala

Undergraduate Programmes (HONOURS)
2024 Admission Onwards

SYLLABUS						
SIGNATURE COURSE						
Name of the College	Al- Ameen College, Edathala					
Faculty/ Discipline	Chemistry					
Programme	BSc (Hons) Chemistry					
Course Coordinator	Dr. Leji Latheef					
Contributors	Dr. Shibini Mol PA, Dr. Shadiya MA					
Course Name	PRODUCTION OPERATIONS					
Type of Course	DSE					
Specialization title	Petrochemicals					
Course Code	To be prepared by the University					
Course Level	200					
Course Summary	This course provides a foundational and practical understanding of petrochemicals and petroleum refining processes. It begins with an overview of the petrochemical industry, including the classification of petrochemicals based on the number of carbon atoms and their sources such as light hydrocarbons (C1–C5), syngas, and aromatic compounds. The course emphasizes key refining technologies, including thermal cracking, catalytic cracking, hydrocracking, coking, and reforming. Students will explore the principles, mechanisms, and industrial applications of each process, gaining insight into the types of reactors, catalysts, and conditions used to optimize production and efficiency. Special focus is given to the role of process variables, feedstock properties, and reaction pathways in determining product yields and quality. In addition to physical and catalytic processes, the course also covers essential chemical reactions involved in refining and petrochemical synthesis. These include ammoxidation, hydrogenation, hydroformylation, oxidation, and hydration reactions, along with their commercial relevance in producing key intermediates such as acrylonitrile, terephthalic acid, ethyl alcohol, and acetaldehyde. Through this course, students will develop a strong understanding of the interplay between chemical engineering principles and industrial practice in petroleum refining. The knowledge gained will be valuable for careers in the petrochemical industry, energy sector, and further academic research in chemical and process engineering.						
Semester	3	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4				60
Pre-requisites, if any	Nil					

Course Outcomes (CO)

Number of COs		**4**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Understand the fundamental principles of petrochemicals and demonstrate thermal cracking processes in petroleum refining and their industrial applications.	U	PO1, PO2

Number of COs		4	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
2	Formulate the principles, mechanisms, and industrial applications of catalytic and hydrocracking processes	AN	PO2, PO3
3	Demonstrate an understanding of coking and reforming processes used in petroleum refining for improving fuel quality	U	PO2
4	Construct important Reactions in Refining	AN	PO2, PO6

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	1	3	-	-	-	-	-	-	-	-
CO 2	-	3	2	-	-	-	-	-	-	-
CO 3	-	3	-	-	-	-	-	-	-	-
CO 4	-	3	-	-	-	3	-	-	-	-

'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).

Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Fundamentals of Petrochemicals and Thermal Crackin			
	1.1	Introduction to petrochemicals. Classification of petrochemicals based on number of carbon atoms. Petrochemicals from C1, C2, C3, C4, C5, syngas and aromatics.	5	["1"]
	1.2	Cracking- Cracking operations: different types of cracking- Thermal cracking of petroleum products, mechanism of cracking. Types of thermal cracking- mixed phase cracking, vapour phase cracking, selective cracking, visbreaking. Factors influencing thermal	10	["1"]
2	Catalytic and Hydrocracking Processes in Petroleum			
	2.1	Catalytic cracking—principle, advantages, mechanism of catalytic cracking, Types of thermal cracking: fixed bed, moving bed, and fluidized bed. Catalysts for cracking processes, factors influencing catalytic cracking, and industrial application.	10	["2"]
	2.2	Hydrocracking: Introduction and importance of hydrocracking, feedstock characteristics, types of hydrocracking processes, factors influencing hydrocracking, and commercial catalysts.	5	["2"]
3	Coking and Reforming Processes in Petroleum Refini			
	3.1	Coking: Principle, types, advantages, uses, manufacture by hot oven method, thermal cracking, fluidized coking, delayed coking. Factors influencing coking process.	8	["3"]
	3.2	Reforming: Principles of Reforming, Types of Reforming Processes: Thermal reforming, catalytic reforming, fixed bed reforming, Moving Bed Reforming	7	["3"]

Module	Units	Course Description	Hrs	CO No.
4	Important Reactions in Refining			
	4.1	Ammoxidation—Applications, preparation of acrylonitrile, Terephthalic acid (Lummus process) Hydroformylation (oxo process)—Modifications and uses of the oxo process, hydrogenation, Aldox process, Aldol condensation, and oxidation. Hydration—categories of	15	["4"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** ●Interactive instruction (chalk& board method, multimedia presentation) ● Group discussion ● Peer teaching

Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Assignments/MCQ/Class test/Viva **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – B. End Semester Evaluation (ESE) Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ◦ PART - A ◦ Short answer - (5 out of 7) – 5 × 4 = 20 ◦ PART - B ◦ Short Essays/Problems - (5 out of 7) – 5 × 7 = 35 ◦ PART - C ◦ Essays - (1 out of 2) – 1 × 15 = 15

References

- 1. Speight, J. G. (1991). The chemistry and technology of petroleum. Marcel Dekker. 2. Tripathi, G. N. (2007). Indian petroleum directory. Indian Petroleum Publishers. 3. Nelson, W. L. (1949). Petroleum engineering. 4. Sharma, B. K. (2000). Industrial chemistry. Goel Publication. 5. Jain, P. C., & Jain, M. (2018). Engineering chemistry (17th ed.). Dhanpat Rai Publishing Company. 6. Dara, S. S. (2018). A textbook of engineering chemistry (12th ed.). S. Chand Publishing. 7. Waddams, A. L. (1969). Chemicals from petroleum (2nd ed.). 8. Hatch, L. F., & Matar, S. (1981). From hydrocarbons to petrochemicals. 9. Matar, S., Mirbhach, M. J., & Tayim, H. A. (1989). Catalysis in petrochemical processes. Kluwer Academic Publishers.

Suggested Readings

- 1. Naderpour, N. (2009). Petrochemical production processes. SBS Publishers and Distributors Pvt. Ltd. 2. Sah, S. L. (2003). Encyclopaedia of petroleum science and engineering (Production) (Vol. 4). 3. Rathi, R. (2007). Petroleum refining processes. 4. Bhaskara Rao, B. R. (2018). Modern petroleum refining processes. 5. Spitz, P. H. (1988). Petrochemicals: The rise of an industry. 6. Bhaskara Rao, B. K. (2004). Text on petrochemicals. 7. Sah, S. L. (2003). Encyclopedia of petroleum science and engineering: Processing, interpretation, and reservoir engineering (Vol. 2).

Affidavit

- We, Al- Ameen College, Edathala and Dr. Leji Latheef, retain the copyright of this syllabus and expressly prohibit its distribution in complete form to any institution outside our own.
- We, Al- Ameen College, Edathala, agree to appoint a new course coordinator for the proposed Petrochemicals in the event of the unavailability of the currently nominated coordinator. This appointment will ensure the continued coordination of course delivery, assessments, and all related academic responsibilities necessary for the successful implementation of the specialization, for as long as the college offers this programme.
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SYLLABUS						
SIGNATURE COURSE						
Name of the College	Al- Ameen College, Edathala					
Faculty/ Discipline	Chemistry					
Programme	BSc (Hons) Chemistry					
Course Coordinator	Dr. Leji Latheef					
Contributors	Dr. Shibini Mol PA, Dr. Shadiya MA					
Course Name	MANUFACTURE OF PETROCHEMICALS I					
Type of Course	DSE					
Specialization title	Petrochemicals					
Course Code	To be prepared by the University					
Course Level	200					
Course Summary	This course provides a comprehensive understanding of the industrial manufacture and applications of petrochemical-derived compounds, polymers, plastics, elastomers, and synthetic fibres. It begins with the production of key industrial chemicals such as sulphur, hydrogen, and nitrogen-based compounds through cracking operations and advanced chemical methods, emphasizing their roles in the petrochemical industry. Students gain in-depth knowledge of polymer science, including the distinction between natural and synthetic polymers, types of polymerization reactions, and the classification of polymers based on structure and intermolecular forces. The course covers the manufacture of commercially important addition and condensation polymers such as polyethylene, polypropylene, PVC, nylon, and PET, highlighting their industrial significance and applications. The course also explores various plastic materials, their properties, constituents, and the roles of additives like stabilizers, fillers, and plasticizers in modifying performance and processability. Key plastic processing techniques such as injection moulding, compression moulding, and extrusion are discussed in detail to provide insight into the manufacturing lifecycle of plastic products. In the final part, students study elastomers and synthetic fibres, including their classification, production methods, and commercial relevance. Emphasis is placed on the synthesis and processing of materials such as styrene-butadiene rubber (SBR), nitrile rubber, acrylic fibres, and rayon. By the end of the course, students will have a solid understanding of the chemistry, processing technologies, and industrial applications of various petrochemical products, preparing them for roles in the polymer, plastic, and petrochemical industries.						
Semester	4	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4				60
Pre-requisites, if any	Nil					

Course Outcomes (CO)

Number of COs		**4**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**

Number of COs		4	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Deduct the production of compounds from cracking operations	U	PO2, PO6
2	Understand industrial manufacturing processes of commercially important polymers and evaluate their properties and applications in various industries.	AN	PO2, PO6
3	Gain knowledge of the moulding constituents of plastics, and apply appropriate processing techniques for manufacturing plastic articles.	U	PO2, PO6
4	Understand manufacturing processes, and applications of synthetic elastomers and fibres, and analyze the spinning techniques used in fibre production.	AN	PO2, PO6

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	-	3	-	-	-	3	-	-	-	-
CO 2	-	3	-	-	-	3	-	-	-	-
CO 3	-	3	-	-	-	3	-	-	-	-
CO 4	-	3	-	-	-	3	-	-	-	-

'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).

Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Manufacture of compounds by cracking operations			
	1.1	Manufacture of sulphur from underground- Freush process, From hydrogen sulphide- Partial oxidation method, major engineering problems. Hydrogen- hydrogen as a fuel-manufacture of hydrogen using steam, from hydrocarbons by partial oxidation. Nitrogen compo	15	["1"]
2	Manufacturing of Commercial Polymers			
	2.1	Polymers: Natural vs synthetic polymers, Classifications—based on molecular arrangements—linear, branched, and cross-linked polymers; based on intermolecular forces—elastomers, fibres and plastics; based on types of monomers—homopolymers and copolymers. P	5	["2"]
	2.2	Manufacture of commercially important addition polymers—polyethylene (PE), polypropylene (PP), polystyrene (PS), Polyvinyl Chloride (PVC), Polytetrafluoroethylene (PTFE), Polyacrylonitrile (PAN), Polymethyl methacrylate (PMMA)	5	["2"]
	2.3	Manufacture of commercially important condensation polymers: polyamides—nylon 6 (from caprolactam) and nylon 6,6 (from adipic acid and hexamethylene diamine); polyesters—polyethylene terephthalate (PET) and polybutylene terephthalate (PBT)	5	["2"]
3	Plastic Materials and Processing Technologies			
	3.1	Plastics: Properties—uses - Thermoplastics-thermosetting plastics (phenol formaldehyde, urea formaldehyde, melamine formaldehyde). Moulding constituents of a plastic—resins, plasticizers, stabilizers, fillers, lubricants, pigments, and reinforcements— Rol	15	["3"]

Module	Units	Course Description	Hrs	CO No.
4	Manufacture of Elastomers and Synthetic Fibres			
	4.1	Elastomers—Introduction to Elastomers: Definition, properties, and comparison with plastics and fibres, Classification: Natural vs synthetic elastomers, Manufacturing processes: Emulsion polymerization, solution polymerization. Manufacture of styrene buta	15	["4"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** ●Interactive instruction (chalk& board method,multimedia presentation) ● Group discussion ● Peer teaching

Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Assignments/MCQ/Class test/Viva **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – B. End Semester Evaluation (ESE) Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ◦ PART - A ◦ Short answer - (5 out of 7) – 5 × 4 = 20 ◦ PART - B ◦ Short Essays - (5 out of 7) – 5 × 7 = 35 ◦ PART - C ◦ Essays - (1 out of 2) – 1 × 15 = 15

References

- 1. Faith, W. L., Keyes, D. B., & Clark, R. L. (1950). Industrial chemicals. 2. Speight, J. G. (1991). The chemistry and technology of petroleum. Marcel Dekker. 3. Tripathi, G. N. (2007). Indian petroleum directory. Indian Petroleum Publishers. 4. Stevens, M. P. (1999). Polymer chemistry: An introduction. 5. Billmeyer, F. W. (2007). Textbook of polymer science. 6. Maiti, S. (2002). Introduction to petrochemicals. 7. ASTM International. (n.d.). ASTM methods, Indian standards: Methods of test for petroleum and its products.

Suggested Readings

- 1. Nicholson, J. W. (2017). The chemistry of polymers. 2. Kothandaraman, B. (2009). Rubber materials. Anne Books India. 3. Gowariker, V. R., Viswanathan, N. V., & Sreedhar, J. (2021). Polymer science. 4. Matar, S., & Hatch, L. F. (2001). Chemistry of petrochemical processes. Gulf Professional Publishing. 5. Lee, S. (1996). Methane and its derivatives. 6. Franck, H. G., & Stadelhofer, J. W. (1988). Industrial aromatic chemistry: Raw materials, processes, products. 7. McIntyre, J. E. (2004). Synthetic fibers: nylon, polyester, acrylic, and polyolefin. CRC Press. 8. Franta, I. (2012). Elastomers and rubber compounding materials (Studies in Polymer Science 1). Elsevier.

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SIGNATURE COURSE						
Name of the College	Al- Ameen College, Edathala					
Faculty/ Discipline	Chemistry					
Programme	BSc (Hons) Chemistry					
Course Coordinator	Dr. Leji Latheef					
Contributors	Dr. Shibini Mol PA, Dr. Shadiya MA					
Course Name	MANUFACTURE OF PETROCHEMICALS II					
Type of Course	DSE					
Specialization title	Petrochemicals					
Course Code	To be prepared by the University					
Course Level	300					
Course Summary	This course provides an in-depth understanding of the industrial production of key petrochemicals derived from natural gas, methane, propylene, and acetylene. It focuses on the chemistry, processes, and applications of various compounds that serve as critical building blocks in the chemical and energy industries. Students begin by exploring the manufacture of chemicals from natural gas, including methanol, carbon black, hydrogen cyanide, and acetylene black. Emphasis is placed on different manufacturing methods such as catalytic hydration and various thermal and catalytic processes, along with their industrial relevance, properties, and applications. The course then delves into methane-derived chemicals like chlorinated methanes (methyl chloride, chloroform, carbon tetrachloride), carbon disulfide, formaldehyde, formic acid, and dimethyl ether (DME). The production technologies and their environmental and energy implications, such as DME's use as a clean fuel alternative, are also discussed. Further modules cover the transformation of propylene into commercially significant compounds such as isopropanol, glycerin, acrylic acid, and various alcohols and acrylates, highlighting both synthetic routes and downstream industrial uses. The course concludes with the manufacture of chemicals from acetylene, including vinyl chloride, acetaldehyde, chloroprene, acrylonitrile, vinyl acetate, and trichloroethylene. Technical aspects such as manufacturing challenges, economic factors, and industrial safety are also addressed. By the end of the course, students will have gained comprehensive knowledge of modern industrial petrochemical production processes, preparing them for careers in the chemical, petrochemical, and allied industries.						
Semester	5	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4				60
Pre-requisites, if any	Nil					

Course Outcomes (CO)

Number of COs		4	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Describe the industrial importance of natural gas derivatives and analyze manufacturing processes of key products such as methanol, carbon black, and hydrogen cyanide.	AN	PO2, PO3, PO6
2	Demonstrate methane-based chemical processes by explaining the production methods and industrial applications of key derivatives	AN	PO2, PO3, PO6
3	Describe the industrial conversion of propylene into commercially important chemicals, detailing their properties, applications, and manufacturing processes.	U	PO2, PO3, PO6
4	Illustrate the utilization of acetylene as a chemical feedstock by explaining the industrial manufacturing methods, properties, uses, and limitations of key acetylene-derived products.	AN	PO2, PO3, PO6

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	-	3	3	-	-	3	-	-	-	-
CO 2	-	3	3	-	-	3	-	-	-	-
CO 3	-	3	3	-	-	3	-	-	-	-
CO 4	-	3	3	-	-	3	-	-	-	-

'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).

Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Manufacture from Natural gas			
	1.1	Methanol—properties and uses - Manufacturing methods—catalytic hydration method. Carbon black—uses and properties - Channel black—furnace black (gas and oil) - thermal black - Acetylene black manufacture, hydrogen cyanide uses and properties - manufacture	15	["1"]
2	Manufacture from Methane			
	2.1	Chlorinated methane uses: manufacture of methyl chloride, methyl dichloride, chloroform, and carbon tetrachloride.	5	["2"]
	2.2	Carbon disulfide—uses and manufacture by the Thacker process. Acetylene, uses, manufacture by the Sachse process, Wulf process.	5	["2"]
	2.3	Formaldehyde—Uses and production from methanol Formic acid—production from carbon monoxide and methanol Dimethyl ether (DME)—as an alternative fuel, synthesis from methanol	5	["2"]
3	Manufacture from propylene			
	3.1	From Propylene: Isopropanol---uses, properties, manufacture by hydration method. Glycerin—uses, natural glycerin, synthetic glycerin—manufacture by allyl chloride, manufacture via acrolein. Manufacture and uses of acrylic acid, n-butanol, isobutanol, 2-et	15	["3"]

Module	Units	Course Description	Hrs	CO No.
4	Manufacture from Acetylene			
	4.1	Vinyl chloride—uses, manufacture, engineering problems, economics. Acetaldehyde—uses, properties, hydration of acetylene, process of manufacture, Chloroprene uses, neoprene manufacture, acrylonitrile uses, properties, manufacture by hydrogen cyanide proc	15	["4"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** ●Interactive instruction (chalk& board method, multimedia presentation) ● Group discussion ● Peer teaching

Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Assignments/MCQ/Class test/Viva **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – B. End Semester Evaluation (ESE) Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C , D Answer Type: ◦ PART - A ◦ MCQ - (10 out of 10) – 10 × 1 = 10 ◦ PART - B ◦ Short answer - (8 out of 10) – 8 × 3 = 24 ◦ PART - C ◦ Short Essays - (3 out of 5) – 3 × 7 = 21 ◦ PART - D ◦ Essays - (1 out of 2) – 1 × 15 = 15

References

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Affidavit

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Faculty/ Discipline	Chemistry					
Programme	BSc (Hons) Chemistry					
Course Coordinator	Dr. Leji Latheef					
Contributors	DR. Shibini Mol PA, Dr. Shadiya MA					
Course Name	PETROCHEMICAL INDUSTRIES IN INDIA					
Type of Course	DSE					
Specialization title	Petrochemicals					
Course Code	To be prepared by the University					
Course Level	300					
Course Summary	This course offers a comprehensive overview of the petrochemical and petroleum refining industry with a focus on the Indian context. It begins with an introduction to the structure of the synthetic organic chemical industry, covering primary chemicals, intermediates, and end products. Students learn about feedstocks, the value chain of petrochemical products, and the strategic role of petroleum and petrochemical industries in the Indian economy. It also explores the role of major public and private sector entities such as ONGC, IOC, BPCL, HPCL, Reliance, and Nayara Energy. The course emphasizes the significance of refinery configuration in determining product output and profitability. It explains how crude oil type, market demand, environmental regulations, and investment capabilities influence refinery design. Case studies of major Indian refineries help students understand the operational layout and technological capabilities of simple and complex refinery systems. Another critical aspect of the course is the study of supporting processes and pollution control in refineries. Students examine sulphur recovery units, water and air pollution from refinery operations, wastewater treatment processes, and environmental quality standards such as MINAS and national pollution control norms. The final section introduces oil transportation and global oil trading, addressing topics such as crude oil characteristics, trading mechanisms (spot, futures, options), price determination, and the influence of geopolitics, inflation, and market dynamics on oil pricing. Overall, the course equips students with a strong understanding of the technical, economic, and environmental dimensions of the petroleum and petrochemical sectors.						
Semester	6	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4				60
Pre-requisites, if any	Nil					

Course Outcomes (CO)

Number of COs		**4**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Understand the structure of the petrochemical industry	AN	PO2, PO6

Number of COs		4	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
2	Analyze Major Indian Refinery Configurations.	AN	PO2, PO6
3	Understand Environmental Protection Practices:	U	PO2, PO6
4	Understand the Fundamentals of Oil Trading	U	PO2, PO6

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

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CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
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CO 3	-	3	-	-	-	3	-	-	-	-
CO 4	-	3	-	-	-	3	-	-	-	-

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Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Profile of Petrochemical Industry			
	1.1	Introduction: synthetic organic chemical industries—primary chemicals, intermediate chemicals, end chemicals, primary raw materials, and basic and secondary intermediates. Primary petrochemicals, Overview of the petrochemical industry, petrochemical plant	15	["1"]
2	Refinery Configuration in India			
	2.1	Introduction to Refinery Configuration: Importance of configuration in determining product slate and profitability. Factors affecting configuration: crude type, product demand, environmental norms, and investment capacity.	5	["2"]
	2.2	Classification of Refineries: Simple Refineries and Complex Refineries. Major Indian Refinery Configurations—Case Studies: IOC Refineries: Panipat, Mathura, Gujarat—configuration and units. BPCL Refineries: Mumbai and Kochi. HPCL Refineries: Mumbai and Vi	10	["2"]
3	Supporting Process and pollution control			
	3.1	Sulphur recovery (hydrodesulphurization), pollution from the petroleum industry—refinery pollution, water pollution, and the effect of oil pollution. Water quality parameters—MINAS parameters—pH, sulfide, phenol, oil & grease, total suspended solids, COD,	15	["3"]
4	Oil Transportation and Trading			
	4.1	Introduction to oil trading-International market and geopolitics-crude oil characteristics-marketing and trading of crude oil -ways of trading oil-oil spot price, oil futures, oil options-crude oil pricing mechanism and oil price elasticity-inflation and	15	["4"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** 1. Interactive instruction (chalk& board method, multimedia presentation) 2. Group discussion 3. Peer teaching

Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Assignments/MCQ/Class test/Viva **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – B. End Semester Evaluation (ESE) Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ◦ PART - A ◦ Short answer - (5 out of 6) – 5 × 4 = 20 ◦ PART - B ◦ Short Essays - (5 out of 7) – 5 × 7 = 35 ◦ PART - C ◦ Essays - (1 out of 2) – 1 × 15 = 15

References

- 1. Speight, J. G. (1991). The chemistry and technology of petroleum. Marcel Dekker. 2. Tripathi, G. N. (2007). Indian petroleum directory. Indian Petroleum Publishers. 3. Razavi, H., & Fesharaki, F. (1991). Fundamentals of petroleum trading. Bloomsbury Academic. 4. Long, D. (1995). Oil trading manual. Woodhead Publishing Limited. 5. Ricardo, C. (2016). How to trade black gold: Crude oil investing and trading for beginners. 6. Maiti, S. (2002). Introduction to petrochemicals. 7. Johnston, D. (2003). International exploration economics: Risk and contract analysis. PennWell Books.

Suggested Readings

- 1. Johnson, O. (2022). 40 classic crude oil traders: Real life examples of innovative trading. Routledge. 2. Gopinathan, P. (2021). Crude oil trading: 5 strategies to trade crude in India MCX for retail traders. Independently published. 3. Waddan, A. L. (1969). Chemicals from petroleum. 4. Dara, S. S. (2011). Textbook of environmental chemistry and pollution control. 5. Ahluwalia, V. K. (2013). Manual of environmental pollutants estimations: Air, water and soil. 6. Van Loon, G. W., & Duffy, S. J. (2013). Environmental chemistry: A global perspective (3rd ed.).

Affidavit

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- We, Al- Ameen College, Edathala, agree to appoint a new course coordinator for the proposed Petrochemicals in the event of the unavailability of the currently nominated coordinator. This appointment will ensure the continued coordination of course delivery, assessments, and all related academic responsibilities necessary for the successful implementation of the specialization, for as long as the college offers this programme.
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