

## Module (Course Syllabus) Catalogue 2023-2024

College/ Institute	Koya Technical Institute	
Department	Petroleum Technology	
Module Name	Petroleum Refinery	
Module Code		
Degree	Technical Diploma <input checked="" type="checkbox"/>	Bachelor <input type="checkbox"/>
	High Diploma <input type="checkbox"/>	Master <input type="checkbox"/> PhD <input type="checkbox"/>
Semester	4 <sup>th</sup>	
Qualification	PhD	
Scientific Title	Lecturer	
ECTS (Credits)		
Module type	Prerequisite <input type="checkbox"/>	Core <input checked="" type="checkbox"/> Assist. <input type="checkbox"/>
Weekly hours		
Weekly hours (Theory)	( 2 )hr Class	( )Total hrs Workload
Weekly hours (Practical)	( 2 )hr Class	( )Total hrs Workload
Number of Weeks	12	
Lecturer (Theory)	Dr. Barhm Abdullah Mohamad	
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Lecturer (Practical)		
E-Mail & Mobile NO.		
Websites		

# Course Book

<b>Course Description</b>	This course will focus on the Demonstrating the basic concepts of petroleum refinery process and covering process related to petroleum refinery such as Desalting process, Crude distillation unit (CDU), Vacuum distillation unit (VDU), Thermal cracker, Hydrotreaters, Fluidized catalytic cracker, Separators, Naphtha splitter, Catalytic Reformer and Alkyltion and isomerization.				
<b>Course objectives</b>	<ul style="list-style-type: none"> <li>• Providing knowledge about fundamentals of petroleum process.</li> <li>• Analysing how petroleum process occur.</li> <li>• Educating students to solve problems.</li> </ul>				
<b>Student's obligation</b>	<ul style="list-style-type: none"> <li>• Attending classes and participate in the lecture.</li> <li>• Make reports and studies on different topics.</li> <li>• Assignment preparations.</li> <li>• Make quizzes and exams to make sure they got necessary knowledges.</li> </ul>				
<b>Required Learning Materials</b>	<ul style="list-style-type: none"> <li>• Handouts, notes and references.</li> <li>• Showing necessary videos and reports.</li> <li>• Showing equipment on different sites if possible.</li> </ul>				
<b>Evaluation</b>	<b>Task</b>	<b>Weight (Marks)</b>	<b>Due Week</b>	<b>Relevant Learning Outcome</b>	
	Paper Review				
	Assignments	Homework	5		
		Class Activity	2		
		Report	10		
		Seminar	10		
		Essay			
		Project			
	Quiz	8			
	Lab.	15			
	Midterm Exam	10			
	Final Exam	40			
	Total	100			
<b>Specific learning outcome:</b>	<ol style="list-style-type: none"> <li>1- Theory of petroleum process.</li> <li>2- Analyzing problems.</li> <li>3- Solving petroleum refinery process problems.</li> </ol>				

**Course  
References:**

1. Rzepa, H.S, (2005) *Möbius Aromaticity and Delocalization*, Chem. Rev. 105, 3697-3715. <https://doi.org/10.1021/cr030092l>
2. Gary J.H., Handwerk G.E., and Kaiser M.J. (2007) *Petroleum Refining: Technology and Economics*, 4<sup>th</sup> Edition, Marcel Dekker Inc., New York.
3. Jones D. S. D. and Pujado P. R. (2006) *Handbook of Petroleum Processing*, Springer, Netherlands.

<b>Course topics (Theory)</b>	<b>Week</b>	<b>Learning Outcome</b>
Introduction	1	General information about petroleum refinery
Oil characteristics	2	Importance of types of tests done on the oil
Oil composition	3	The main composition of oil and characteristics
Overview of refinery processes	4	The overview of various refinery processes
Refinery flow sheet	5	Units presented in the refinery process diagram are categorized
Crude distillation unit	6	The basics design of atmospheric distillation unit
Vacuum distillation unit (VDU)	7	The unit description and operating conditions of VDU
Corrosion	8	The type of corrosions in the fuel pipes and the engine cylinder and the production of sulfur dioxide during combustion
Lubricant production	9	The characteristics of lubricant
Grease manufacturing	10	The manufacturing process of grease

PIDs	11, 12	The reading of Pipe and instrument diagrams
<b>Practical Topics</b>	<b>Week</b>	<b>Learning Outcome</b>
Temperature Measurements and Calibration	1	Thermometer readings and calibration technique
Thermal conductivity	2	Measuring thermal conductivity of materials
Free and Forced Convection	3	Concepts of convection heat transfer
The effect of varying flow rate-parallel flow double pipe heat exchanger	4&5	Basic design of heat transfer
The effect of varying water flow rate on the performance of mechanical draught cooling tower	6	The approaches of mechanical draught cooling tower

### Questions Example Design

1. The table shows the octane numbers of some hydrocarbons. Hexane has the lowest octane number of the four compounds listed. What structural feature of hexane contributes to this?

Name	Formula	Octane No.
Hexane	C <sub>6</sub> H <sub>16</sub>	25
Cyclohexane	C <sub>6</sub> H <sub>12</sub>	83
Benzene	C <sub>6</sub> H <sub>6</sub>	100
2,2,4Trimethylpentane	C <sub>8</sub> H <sub>18</sub>	100

2. What two structural features of 2,2,4-trimethylpentane results in it having a high octane rating in same table above?
3. List Lead compounds were used in the past to increase the octane number of fuels. Why are lead compounds unsuitable as additives for petrol in modern cars?
4. What are the economic advantages of catalyst cracking (Reformer) support you answer by chemical equation?
5. Why is sulfur removed from the petroleum products?

6. How we regenerate catalyst in catalytic reformer?
7. In catalytic reformer outlet naphtha temperature from furnace around (450-500) C° why?
8. What's meant by capacity of a refinery being 6 MMTPA?
9. Draw atmospheric distillation processes unit?
10. What are the advantages of stripper?
11. Draw a stripper process unit?
12. What is reflux? And what the advantage of reflux?
13. Draw a reflux processes unit?
14. Define catalyst reforming? And draw a semi-continuous catalyst reforming processes unit?
15. What is the product of catalyst reforming?
16. What are the difference between catalyst reforming reactor and distillation column? Write three.
17. What's meant by capacity of a refinery being 6 MMTPA ,16 MTPA and 16000 BPD?
18. What's the difference between de-mineralized water (DM water) and boiler feed water (BFW)?
19. Draw a steam boiler system and write the advantage of each part and equipment that included in the system?
20. How many type of steam can generate in system of steam boiler and at which temperature?
21. What is octane number meter? And what is the different between RON, MON and AKI?
22. What are auto ignition phenomena? And why we use anti-knock additives?
23. Draw Otto cycle (P-V) and (T-S) diagram and show at which stroke auto ignition occur?
24. What is cetane number meter? And what is the chemical structure of cetane compound?
25. What is standard range of cetane number? What will happen if it's NOT quality?
26. What is mean by delay time? Describe with drawing (P-V) and (T-S) diagrams of diesel cycle?
27. Which phase is high speed of combustion gas /gasoline/gasoil?
28. Define pour point of crude oil and crude oil products?
29. In what material or content pour point depend on? Why?
30. Find out pour point of TAQ-TAQ crude oil? Why?
31. What is the different between freezing point and pour point?
32. In which condition or material freezing point equal to pour point?
33. Define sour crude oil?
34. How we manage sour crude oil?
35. What are disadvantage of sulphur content?
36. Describe and draw the processes of removing H<sub>2</sub>S or sulphur from crude oil?
37. (a) Define the following:
 

1-Reflux	2- Claus process
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38. what are difference between atmosphere distillation and vacuum distillation? Right two point for both processes.
 

(b) What is reformer process? Support your answer by chemical equation.
39. Write a component of the distillation tower?

## Extra notes:

**External Evaluator**