

# TEMPLATE FOR COURSE SPECIFICATION (STORAGE & TRANSPORT OF CRUDE OIL & PETROLEUM PRODUCTS)

## HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

### COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	<b>University of Technology</b>
2. University Department/Centre	<b>Chemical Engineering Department</b>
3. Course title/code	<b>CE.310/ Storage &amp; Transport of Crude oil &amp; petroleum Products</b>
4. Programme(s) to which it contributes	<b>CE.310</b>
5. Modes of Attendance offered	<b>Fall time</b>
6. Semester/Year	<b>1 semester/year</b>
7. Number of hours tuition (total)	<b>3</b>
8. Date of production/revision of this Specification	
9. Aims of the Course	
1. To provide an understanding of the general principles of the transfer of fluids through piping and equipment to allow students to make sensible options given a storage & transport of crude oil and petroleum products task (hydrocarbon liquid, gas flow, two phase flow, diameters, unsteady state mass and heat transfer, transportation and storage).	

2. A comprehensive understanding of the storage and transport processes related to chemical engineering operations, with focus on both theory and applications.
3. Ability to select of appropriate equipment for the storage of the materials in process plant.
4. Introduce and develop an understanding of concerned mainly with the physical nature of the processes that take place in industrial units, and, in particular, with determining the factors that influence the rate of transfer and storage of material.
5. Provide practice at developing critical thinking skills, solving open ended problems and to work in teams.

## **10• Learning Outcomes, Teaching, Learning and Assessment Method**

### **A-Knowledge and Understanding**

- A1. Basic information, concepts and terminology of the general principles of the transfer of fluids through piping and equipment and theory of fluid mechanics and practical & empirical methods of sizing lines and auxiliary equipment will be emphasized.
- A2. Demonstrating a broad and integrated knowledge and a deep understanding of issues related to transport and storage processes in a chemical process and important role it plays in the success of the process both economically and environmentally.
- A3. Ability to design gathering system for the effective transportation and the solution of storage problem.

### **B. Subject-specific skills**

- B1. The economic, management and statutory requirements involved in the practice of transport and storage processes in chemical and petrochemical engineering.
- B2. Gain and/or improve their ability to synthesize, integrate and utilize process information in gathering systems and solving the transportation and storage problems.
- B3. Give an awareness and understanding of professional responsibilities concerned mainly with nature of the transportation processes that take place in chemical and petrochemical units, and, in particular, with determining the factors that influence on the transfer and storage of material.

### **Teaching and Learning Methods**

Lectures, Tutorials, Example Classes, Informal and formal teamwork, Weekly homework problems

<b>Assessment methods</b>
Midterm exams ,Final exam ,Quizzes, Weekly homework, Team and homework problems , partial test (Oral questions :- multiple choice ,alternative response),Open questions that have a definite answer , or do not have a definite answer
<b>C. Thinking Skills</b> C1.An ability to apply effective, creative and innovative solutions, both independently and cooperatively, to current and future problems in transportation and storage processes. C2. Apply course concepts in solving interdisciplinary problems, solve the problems through logic and improve their ability to work effectively in a group of peers.  C3.Present and evaluate information and ideas in the transportation and storage processes. C4. Analyze and solve storage problems often on the basis of limited and contradictory information.
<b>Teaching and Learning Methods</b>
Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems , Practical Applications
<b>Assessment methods</b>
Midterm exams ,Final exam ,Quizzes, Weekly homework, Team and homework problems , partial test (Oral questions :- multiple choice ,alternative response ), Open questions that have a definite answer , or do not have a definite answer

**D.General and Transferable personal development).**

**Skills (other skills relevant to employability and**

**Non**

**11.Course Structure**

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
<b>1<sup>st</sup> semester</b>					
1	3	provide an understanding of the general principles of fluid flow	Properties and unit, energy balance of a flowing flow, liquids, fitting and valves, example (press. Drop in Non-isothermal liquid flow.	Lectures, Example Classes	partial test (Oral questions :- multiple choice ,alternative response ), Open questions that have a definite answer , or do not have a definite answer
2		provide an understanding of the general principles of fluid flow	Calculation of pressure drop at points in system, calculation of pipe diameter for given pressure drop and flow rate, calculation of pipe capacity for given diameter and press. Drop	Lectures, Example Classes	Open questions that have a definite answer , or do not have a definite answer
3		Provide the fundamental thermodynamic equations of fluid flow	Complex flow system, hydrocarbon gas flow ,principles, summary of common gas pipeline equations, example, sizing a line based on velocity, static pressure, example, pipe line network	Lectures, Tutorials , Example Classes	Exams , Weekly homework, homework problems , Open questions that have a definite answer
4		Provide the fundamental thermodynamic equations of fluid flow	complex flow system, single phase vertical gas flow	Lectures, Tutorials , Example Classes	Exams , Weekly homework, homework problems , Open questions that have a definite answer
5		provide an understanding of the general flow models in pipe line	Importance of two phase flow, two phase flow and related dimensionless numbers,	Lectures , Example Classes Tutorials	Weekly homework, homework solve problems , Open questions that have a definite answer , or do not have a definite answer
6		provide an understanding of the general flow models in pipe line	vertical and horizontal two phase flow regimes, correlations, two phase flow in grid system	Lectures , Example Classes Tutorials	Open questions that have a definite answer , or do not have a definite answer
7		Evaluate the suitable sizing of pipe diameter	Optimum pipe diameter, pipe diameter, economic diameter, unsteady state flow	Lectures , Example Classes Tutorials	Exams , Weekly homework, homework problems

8		provide an understanding of the general unsteady state of ideal gas in line and vessel	Transient pipeline flow, blow down and purge	Lectures, Tutorials , Example Classes	Exams , Weekly homework
9		provide an understanding of the general unsteady state of ideal gas in line and vessel	pressure surges on closing a valve, pressure testing	Lectures, Tutorials , Example Classes	Exams
10		evaluate information and ideas in the pump and compressor stations account for a small of the total investment cost of pipeline	Pump and compressor stations, assembly of pumping stations, selection of storage type and its pressure	Lectures, Tutorials , Example Classes , Informal and formal team work , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer
11		evaluate information and ideas in the pump and compressor stations account for a small of the total investment cost of pipeline	Storage of liquids, storage losses, leakage losses, breathing loss, reducing tank losses	Lectures, Tutorials , Example Classes ,	Exams , Weekly homework, Open questions that have a definite answer , or do not have a definite answer
12		Evaluate the suitable basic design for a particular vessel	Homogenous model, separated flow models	Lectures, Tutorials , Example Classes , Informal and formal team work , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer
13		Evaluate the suitable basic design for a particular vessel	High flow rates in wells and vertical flow line	Lectures, Tutorials , Example Classes	Exams , Weekly homework
14		Evaluate the suitable basic design for a particular vessel	Duns and rose method to determine the flow rate	Lectures, Tutorials , Example Classes	Exams , Weekly homework

15	Evaluate the suitable basic design for a particular vessel	Vessel design, general design consideration	Lectures, Tutorials , Example Classes	Exams, homework
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## 12.Infrastructure

<p>Required reading:</p> <ul style="list-style-type: none"> <li>· CORE TEXTS</li> <li>· COURSE MATERIALS</li> <li>· OTHER</li> </ul>	<ul style="list-style-type: none"> <li>○ Lecturers</li> <li>○ Book -References</li> </ul> <p>Campbell, J.M (1981) Gas conditioning and processing, vol. 1, published by: Campbell Petroleum Series, Inc.</p> <p>Nelson, N.L (1963) Petroleum Refinery Engineering, 4<sup>th</sup> ed. McGraw Hill book company, Inc.</p> <p>Jacques Vincent Genod (1984) Fundamentals of pipeline engineering gpc.</p> <p>Sinnot, R.K (1983) Chemical Engineering Design vol.6, 4<sup>th</sup> ed. Elsevier.</p> <p>Billad, W.F and Davidson R.L (1967) Petroleum Processing Handbook, McGraw Hill Book co.,nc.</p> <p>Couper, J.R, Penney, W.R, Fair, J.R, and Walas, S.M, Chemical Process Equipment Selection and Design c 2005, Elsevier, Gulf Professional Publishing.</p> <p>King, R.C (1930) Piping Handbook (5<sup>th</sup> edition 1973), McGraw Hill.</p> <p>Szilas, A.P (1975) Production and transport of oil and gas, Elsevier Scientific Publishing Company.</p> <p>Noel de Nevers (1991) Fluid mechanics for chemical Engineering, McGraw Hill chemical Engineering Series.</p>
Special requirements (include for example workshops, periodicals, IT software, websites)	<b>Websites</b>
Community-based facilities (include for example, guest Lectures, internship, field studies)	<b>field trips</b>

## 13. Admissions

Pre-requisites	Before undertaking this module the student should have undertaken the following: Basic Principles of chemical engineering I and II , chemistry , mathematics I and II , Physical chemistry , as well simultaneous courses:- Thermodynamics , and applied mathematics
Minimum number of students	Central Admission
Maximum number of students	Central Admission