

Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NPED509	Flow Assurance	3	0	0	3
<b>Course Objective</b>						
<ul style="list-style-type: none"> <li>Understanding flow assurance challenges in hydrocarbon production</li> <li>Diagnosis of flow assurance problems and possible solutions</li> </ul>						
<b>Learning Outcomes</b>						
Upon successful completion of this course, students will:						
<ul style="list-style-type: none"> <li>Apply fluid hydraulics and fluid characterization for addressing flow assurance challenges.</li> <li>Understand and apply advanced techniques for smooth flow operations</li> </ul>						
Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome			
1	Flow assurance: definition, flow assurance in project life cycle, flow assurance in offshore developments, role of flow assurance, fluid related issues, and pipeline/flowline/tubing design related issues.	4	Primary knowledge about flow assurance. Learn about role of Flow assurance in Oil and Gas production related Project in different aspects			
2	Application of fluid hydraulics and fluid characterization for addressing flow assurance problems, phase behavior, and operating regions for smooth operations (wax deposition, hydrate formation, and scaling).	5	Get idea about the suitable range of Temperature, pressure and other operating variables to avoid flow assurance problems			
3	Flow assurance challenges for gas hydrates, thermodynamics and kinetics of gas hydrates formation and dissociation, prevention and remedies for hydrate formation and agglomeration.	6	Knowledge on the influential parameters and its range for hydrate formation and dissociate. Know about the preventive measures to prevent hydrate formation and agglomeration			
4	Modelling of hydrate formation/inhibition, industry practice: rules of thumb – for hydrate management.	5	Deep knowledge to handle hydrate management. Gain knowledge about the method of handling hydrate in industry in wider range of operating conditions			
5	Wax and asphaltene as flow assurance problems, determination of wax appearance temperature, impact on production, wax and asphaltenes management, downhole deposition of wax and asphaltenes and their assessment, inhibition and remediation.	6	Knowledge on role and impact of wax and Asphaltenes on the flow assurance problem. Aspects Wax and Asphaltenes management and their differences. Inhibition and remediation methods to handle wax and asphaltenes deposition and their differences.			
6	Modelling and optimization of flow in onshore and offshore pipelines.	5	How to model and design flow in onshore and offshore considering all impacts of flow assurance problems. How to optimize the flow to get economic production in offshore and onshore.			
7	Scale: mechanism of scale formation, common scaling minerals, scale mitigation and remediation, and scale management.	6	Knowledge of scale depositional problems in oil fields. Its impact on production and reservoir management. Scale prevention, remediation and management			
8	Corrosion : pipeline corrosion examples, corrosion predictions, reducing corrosion, and corrosion monitoring.	5	Knowledge of corrosion problems in oil and gas fields and its prediction. Impact on production. Corrosion inhibition, remediation and management. How to monitor corrosion and manage it			
	<b>Total</b>	<b>42</b>				

#### Text Books:

- Applied Multiphase Flow in Pipes and Flow Assurance: Oil and Gas Production, Elsa M. Al-Safran and James P. Brill, SPE Text Book Series, 2017.
- Flow Assurance Solids in Oil and Gas Production, Jon Steinar Gudmundsson, CRC Press, 2017.

#### Reference Book:

- Natural Gas Hydrates, John Carroll, Elsevier, 2014