

B.E.Civil-2012 course. w.e.f.June 2015
Open Elective **Subsea Engineering**

Marks: 100
Th. paper : 3 hrs

Unit 1

Introduction to oil and gas industry: general view of oil and gas industry, technological challenges and future developments. Overview of deepwater developments: introduction, deepwater areas and potential, challenges, route for development. Metocean and environmental conditions: Overview of the determination of Metocean conditions (meteorological and oceanographic) and the influence of wave, wind, tide and current on marine operations. Introduction to marine ecology and its impact on marine operations.

Unit 2:

Introduction to subsea infrastructure development: Summarizes the current state of the art and highlights the design challenges. Outlines the way in which water depth influences the architecture and technology of Oil and Gas infrastructure.

Flow assurance: overview of flow assurance and the fundamentals of flow management for subsea production systems, analysis of flow assurance issues like paraffin deposition; hydrate formation and blockage; Asphaltene precipitation; emulsions; experimental methods, flow assurance assessment methods; prevention, mitigation and remediation tools for flow assurance issues; thermal management and insulation materials.

Unit 3:

Subsea installation and intervention: Overview of the installation of subsea plant, risers and pipelines and the main intervention methods including AUVs, ROVs and divers.

Subsea operations and control: An overview of the principle methods of subsea control including electrical, acoustic and hydraulic systems.

Subsea processing and artificial lift: introduction the analytical and numerical models used to design subsea processing systems for sustained recovery of hydrocarbons

Unit 4:

Reliability and integrity management: Introduction to Risk Assessment, FMECA and HAZOPS, Monitoring, Intervention and Inspection Methods, Data Management

Field economics and future challenges: An overview of economic decision making in field development and a view of future challenges such as deep water, high temperature, remote fields.

Unit 5

Subsea field equipment, structures and architectures: scale of operations, environmental factors, A description of each of the pieces of the subsea infrastructure, their use and interconnection including subsea trees, flow lines, umbilicals, risers, moorings and pipelines

Materials and corrosion: material selection and analysis, structure property relationship and harsh environment. Types of corrosion found in the oilfield with emphasis on the effects of acid gases (CO₂ and H₂S).

Unit 6

Pipelines and design: Introduction to pipeline engineering, the main pipeline design challenge in deepwater. Analysis and design methods of pipelines that address stress analysis, buckling and collapse of deepwater pipelines. Limit state based strength design methods. Geotechnical aspects of pipeline design and its installation.

Deepwater risers: different design options available for deepwater risers, and defines the key design drivers for each. General principles of stress analysis: An introduction to the principles of stress analysis and the principles of reliability based design, finite element analysis.

References:

1. A Primer of Offshore Operations by Petex

2. Subsea Engineering Handbook Hardcover by Yong Bai (Editor), Qiang Bai (Editor)

3. Norsok standard Common requirements Subsea structures and piping system
U-cr-001 Rev. 1, January 1995.

4. Norsok codes, DNV codes : Design specifications for subsea system.