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Template syllabus of the revised courses

Course Name : Pipelines and Risers
Number of credits : 3 (5 ECTS)

Period: Spring semester

Cooordinator	**Assoc. Prof. Ir. Dr. Zahiraniza Mustaffa**
Credits	3 credits (5 ECTS)
Lecturers	**Assoc. Prof. Ir. Dr. Zahiraniza Mustaffa**
Level	Undergraduate
Host institution	Universiti Teknologi PETRONAS
Course duration	12 weeks
New/revised	Revised

Summary

This course will cover the fundamental concept of pipeline and riser designs. The scope of the course is further elaborated into the knowledge of pipeline route selection and installation methods. New pipeline innovation and technology is introduced to suit the needs for the Fourth Industrial Revolution.

Target student audiences

Final year undergraduate students from Bachelor of Civil and Environmental Engineering with Honours.

Prerequisites

Required courses (or equivalents): None

Aims and objectives

1. To design offshore pipelines and risers.
2. Evaluate proper route selection for the pipelines.
3. Evaluate suitable pipeline installation methods.

The Authentic Tasks are:

General learning outcomes:

By the end of the course, successful students will be able to:

1. Evaluate proper route selection and installation methods for offshore pipelines.
2. Calculate the conceptual design considerations of offshore pipelines.
3. Explain design concepts of riser and flexible pipelines.

Overview of sessions and teaching methods

The course will make most of interactive and self-reflective methods of teaching and learning.

Learning methods

- Lecture
- Field trip
- Adjunct Lecture

Course outline

Topic 1
Introduction to Subsea Field Components
- Risers
- Tie-in spools/Jumpers
- Flowlines/Pipelines
- Subsea structures (SSIVs, Manifolds etc.)
- Xmas Trees
- Umbilicals
- Deepwater Manifold and Templates
- PLETS

Topic 2
Carbon Manganese Steel Pipeline
- Production
- Construction: ERW welding, UOE/SAW welding, helical/spiral welding, seamless

Topic 3
Pipeline Route Selection
- Field layout and pipeline route selection
- Example on case studies
- Introduction to subsea tie-ins, pipeline and cable crossings
- Pipeline protection from fishing gear, shore approaches
- Pipeline trenching.

Topic 4
Pipeline Installation Method
- S-lay method
- J-lay method
- Tow-in methods:
  surface tow method, bottom tow method, off-bottom and mid depth tow method
- Reel lay method
- Example on case studies

Topic 5
Pipeline Design
- Diameter and wall thickness design
- Hydrodynamic stability
- Pipeline span
- Operating stresses
- External corrosion protection, cathodic protection (CP) design
- Local (upheaval and lateral) buckling
- Global buckling

Field trip to a pipeline construction company.

Topic 6
Pipeline Innovation and Technology
- Composite pipelines design and testing
- Smart pipelines

Topic 7
Risers
• Pipeline riser design
• Introduction to flexible pipelines

Literature

Main Reference:

1. Guo, B., Song, S., Chacko, J. and Ghalambor, A., Offshore Pipelines, Elsevier Inc., 2005.

Optional References:

1. Palmer, A. and King, R., Subsea Pipeline Engineering, 2nd Edition, Pennwell Books and, 2008.
2. Chakrabati, S., Handbook of Offshore Engineering, Volume 2, Elsevier, 2005.
3. Braestrup, M.W., Andersen, J.B., Andersen, L.W., Bryndum, M.B., Christensen, C.J. and RishØj, N., Design and Installation of Marine Pipelines, Blackwell Publishing, 2005.

Course workload

The table below summarizes course workload distribution:

Activities	**Learning outcomes**	**Assessment**	**Estimated workload (hours)**
In-class activities (44 hours)			
Guided Learning and Moderated in-class discussions	1. Evaluate proper route selection and installation methods for offshore pipelines.	Class participation and preparedness for discussions	16
Guided Learning and Moderated in-class discussions	2. Calculate the conceptual design considerations of offshore pipelines.	Class participation and preparedness for discussions	12
Guided Learning and Moderated in-class discussions	3. Explain design concepts of riser and flexible pipelines.	Class participation and preparedness for discussions	16
Independent work (76 hours)			
Self-Learning (Independent Learning)	1. Evaluate proper route selection and installation methods for offshore pipelines.	Assignment/Project, Test, Final Exam	28
Self-Learning (Independent Learning)	2. Calculate the conceptual design considerations of offshore pipelines.	Assignment/Project, Test, Final Exam	24
Self-Learning (Independent Learning)	3. Explain design concepts of riser and flexible pipelines.	Assignment/Project, Test, Final Exam	24
Total			***120***

Grading

The students' performance will be based on the following:

Assessment	Coursework (Tests, Assignments, Project)- 40%: Final Exam – 60%
Evaluation	A (85 - 100) A- (80 – 84.9) B+ (75 – 79.9) B (65 – 74.9) C+ (55 - 64.9) C (50 – 54.9) D+ (45 – 49.9) D (40 –44.9) F (<40)