



ESCOLA POLITÉCNICA DA UNIVERSIDADE DE SÃO PAULO

PMI-5926

***Application of ROVs to Petroleum and
Mining Engineering***

Class 01

Introduction (2017)

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CONTENTS

- *Course objectives*
- *2017 schedule*
- *Course evaluation*
- *What is an ROV?*
- *The ROV Business*
- *References*
- *2017 course project*



COURSE OBJECTIVES

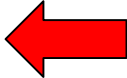
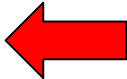
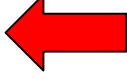
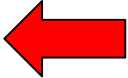
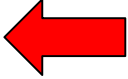
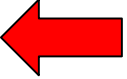
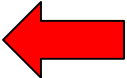
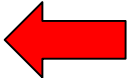
Learning aims and outcomes

At the end of the course, students will be expected to have:

- *understood the principles of the operation of ROVs and their main components;*
- *learned the main applications of ROV for oil & gas and subsea mining;*
- *understood the importance of team work and proactive attitude in the operation of ROVs;*
- *discussed the challenges of ROV-driven inspection processes;*



COURSE CONTENTS

1. *Basic Definitions* 
2. *ROV Classification* 
3. *ROV Components:* 
 - *Control Cabin Design and Function;*
 - *TMS/Vehicle Components & their Operating Principles;*
 - *ROV Launch and Recovery Systems;*
 - *ROV systems maintenance concepts.*
4. *Concepts of operation and simulation of ROVs* 
5. *Safety aspects in the operation of ROVs* 
6. *Case studies and examples* 
7. *Lab practice*  *(Monday, Tuesday & Wednesday PM)*
8. *Group project (ROV inspection activity)*  *(Thursday AM and PM)*



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2017 COURSE SCHEDULE

AM	Nov 27 th	Nov 28 th	Nov 29 th	Nov 30 th
9:00 PM to 10:00 PM	Class 01 Introduction: course contents & schedule	Class 05 Case Study: ROV practical application	Class 07 Case Study: ROV simulation	Lab: ROV project G1 and G2
Break	Break	Break	Break	Break
10:30 PM to 11:30 PM	Class 02 What is an ROV: Classes & Applications	Class 06 2018 MATE ROV competition	Class 08 Case Study: ROV inspection	Lab: ROV project G3 and G4

PM	Nov 27 th	Nov 28 th	Nov 29 th	Nov 30 th
2:00 PM to 3:00 PM	Class 03 ROV Components Overview	Lab: ROV operation and navigation G1-3	Class 09 Lab: ROV operation and navigation G4-6	Lab: ROV project G5 and G6
Break	Break	Break	Break	Break
3:30 PM to 4:30 PM	Class 04 Lab visit and practice	Lab: ROV project practice G1-3	Class 10 Lab: ROV project practice G4-6	Class 11 Concluding remarks



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COURSE EVALUATION

***Final Grade = 50 % Inspection process grade +
50 % Inspection outcomes grade***

Inspection process = Grading of the group compliance with the ROV inspection process, including:
[✓] ***Mission readiness check-list***
[✓] ***Mission logbook***
[✓] ***Work order***

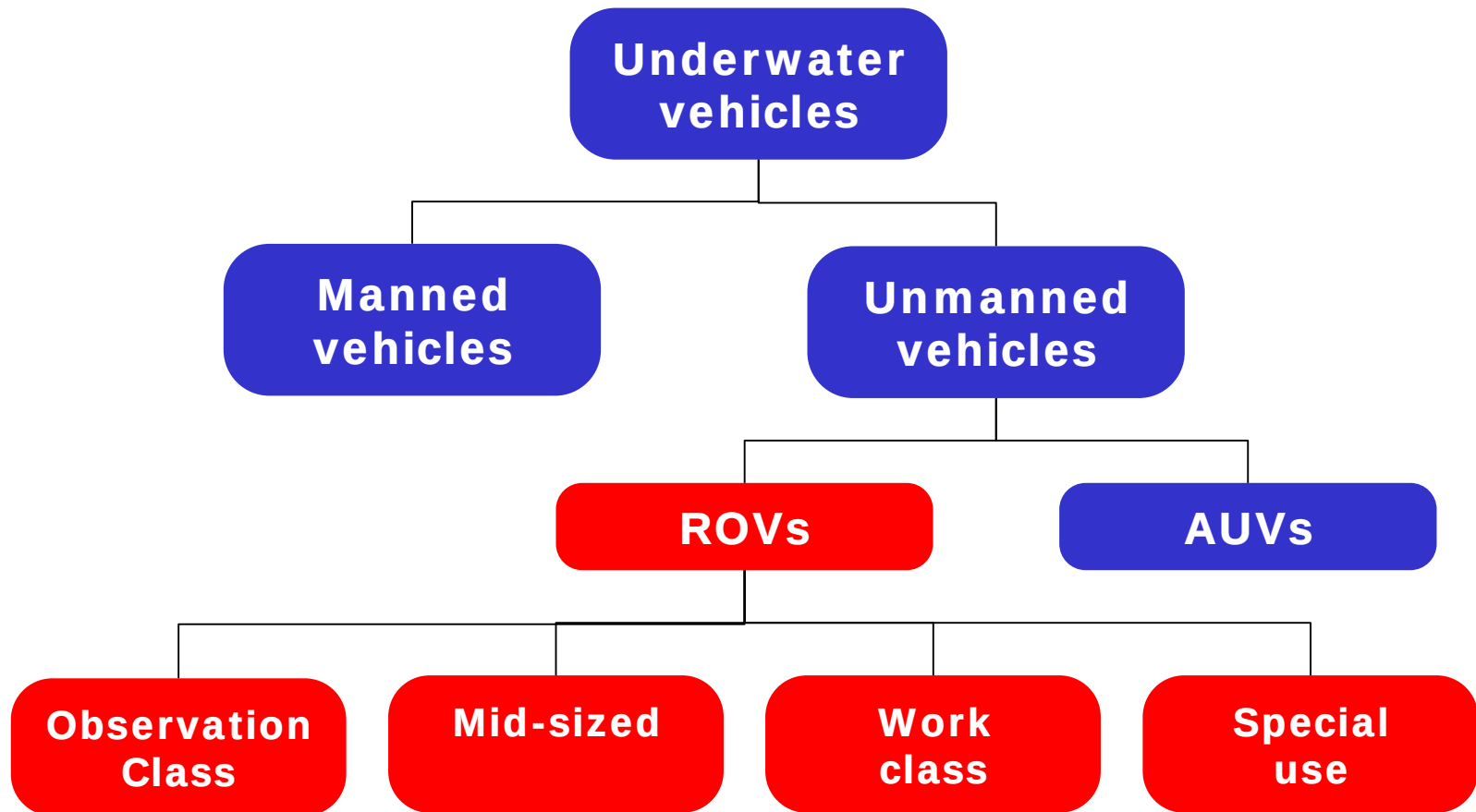
Inspection outcomes = Grading of the inspection outcomes (readings, works order & activity outcome)



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What is an ROV?





What is an ROV?

An ROV, or a “**Remotely Operated Vehicles**” is an unmanned underwater robot that is connected to a ship by a series of cables.

These cables transmit command and control signals between the operator and the **ROV**, allowing remote navigation of the vehicle.



The ROV Business

- The application of ROVs is increasing within the **marine & underwater industries**.
- However, the successful deployment of ROVs depends not only in its **technical aspects**; it relies very heavily on its **business aspects**.
- The ROV business, as the aviation and marine counterparts, requires a **committed support structure**, with state-of-the-art **maintenance** and a through **training** program with careful **management of procedures and controls**.
- As a continuously developing, high-tech sector, ROV is a **financially risky business** full of regulatory & economic challenges.
- Continuous **training** and a **proactive attitude** are essential requirements for all personnel involved in the ROV business.



References

Christ, R.D. & Wernli, R.L. (2014). The ROV Manual: A User Guide for Remotely Operated Vehicles. Second Edition. Elsevier, 2014.

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MIAMI SCIENCE MUSEUM (2016). Introduction to Remotely Operated Vehicles (ROVs). [http://www.marinetech.org/files/marine/files/Curriculum/Other Curriculum Resources/RiseNet Intro to ROVs Learning Card_Final.pdf](http://www.marinetech.org/files/marine/files/Curriculum/Other%20Curriculum%20Resources/RiseNet%20Intro%20to%20ROVs%20Learning%20Card_Final.pdf)

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Class Project: Scope & Components

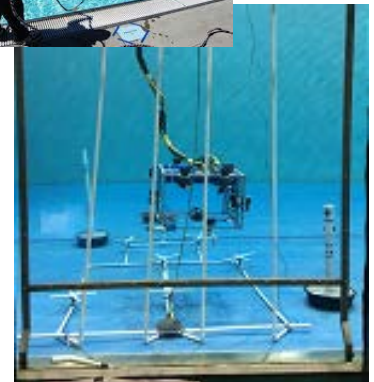
Scope: To fly an observation class ROV ^[1] inside a pool ^[2] containing a number of pipelines ^[3] and open /close valves.



[1]: Observation class ROV



[2]: Steel frame pool



[3]: Pipeline and valve structure



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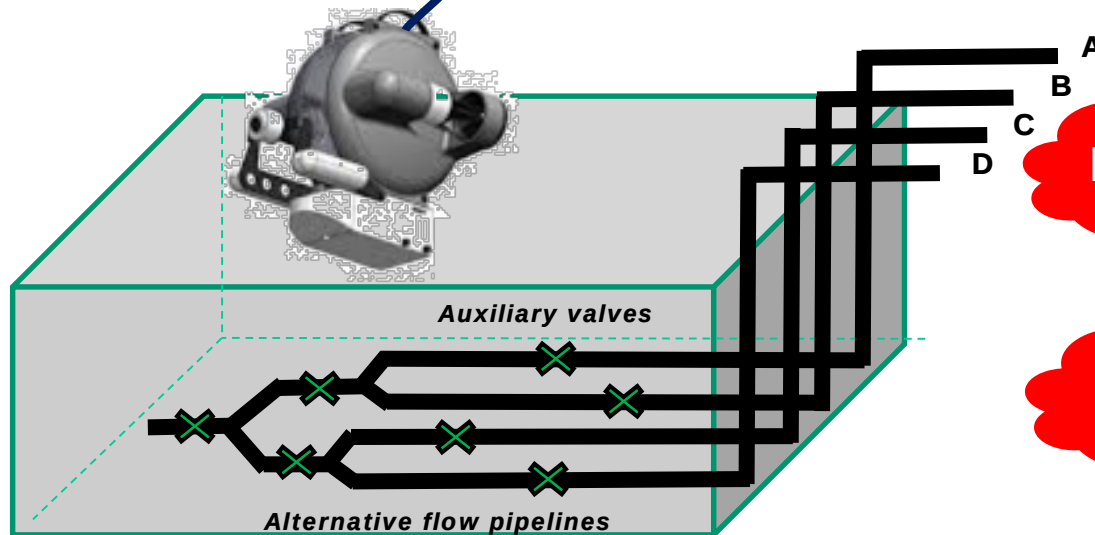
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Class Project: Setup

*Observation ROV
and umbilical*

Check-list

**Inspection
Instructions**



Logbook

**Work
Order**

The objective of the project is to fly the observation class ROV around the steel frame pool containing a number of alternative flow pipelines and open/close valves.

Each group will have a task to issue a WORK ORDER determining which valves have to be open and closed in order to achieve the flow in their assigned throughput alternative.



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NEXT SUBJECTS

- ***ROV Overview***
- ***ROV Classes***
- ***ROV Components (internal & external)***
- ***Preparation for the group projects:***
 - [✓] Mission team***
 - [✓] Roles & Responsibilities***
 - [✓] Naming the teams & roles***