Underwater Robotics

This unique course is aimed at giving the budding engineers the deep insight to what exists deep beneath the water and why is it difficult to navigate inside water. Scientists and engineers all over the world are working towards this very different field of science, what we call it as Underwater Robotics. The Students will know about the various mechanism considering the modularity and hydrodynamics of water vehicles including Autonomous Underwater Vehicle popularly known as AUV, Remotely Operated Vehicle, Submarines and Ships. The second part will be its control system. We will move from the discussion of Remotely Operated ones to Autopilots and Dynamic positioning. Some understanding of physics is expected.

Content:

Topics to be covered on day – 1

Underwater Robotics – Basics and why is it different?
- What is already in place
- Types of underwater robot
- Application of underwater robotics
- What can you do in the future

Time: 1 hour

Maneuvering of Underwater/Surface water vehicles:
- Conventional thruster based System
- Surface water locomotion
- The all thruster Models
- Fin Rudder Models
- Bio-mimic mechanisms

Time: 1.5 hour

Understanding the underwater Sensing System:
- Depth Sensors and Altitude sensors
- Sonar (side scan sonar, over look sonar)
- Acoustic Ranging (USBL,SSBL,SBL,LBL)
- GPS for surface water vehicles
- Compass and IMU
- Accelerometers and Gyroscopes
- Underwater cameras

Time: 1.5 hour

Fabrication of a Remotely Operated Vehicle (ROV) using the kit provided
- Open loop Behavior can be tested in the water tank
- Understanding of Degree of Freedom of vehicle

Time: 2 hours

Discussion on the topics covered
Time: 1 hours

Topics to be covered on day-2
Application of sensors to develop different kind of abilities for vehicles
- Station-keeping
- Depth-only keeping
- Obstacle avoidance
- Towing arrays
- Acting as surface beacon for communication
- Survey Vehicle (Remember discovery of titanic wreck?)

Time: 1.5 hours

Modeling of System
- Understanding the Importance of Hydrodynamics
- Modeling the vehicle for control

Time: 0.5 hours

Control and Navigation
- Remotely Operated control.
- Autonomous Navigation using feedback control.
- Various kinds of Autopilot.
- Dynamic Positioning of Vehicle.
- Online system identification.

Time: 2 hours

The Development on the kit and the testing in the tank
- Develop mission deployment plan and program the vehicle to do that - Dead reckoning.
- Depth keeping deployment.

Time: 4 hours

Kit Content:
- A unique hydrodynamic robot chassis.
- Actuators: 3 Water Proof thrusters made from DC Pumps.
- Controller: a microcontroller kit with thruster drivers, DC-DC converter, programmer and high voltage
driving circuit.
- USB Cable and Other Connectors
- Insulation tape
- Cable Ties
- Additional weight for water balancing.
- Documentation of workshop.
- Codes

The Faculty:

The faculties are people from top academic institutions, industries and research institutions. They have experience in the industries at the same time had the best education in this field. In fact some of them are pursuing master and Doctorate at Top notch universities to build their knowledge base.

Note: Techfest, IIT Bombay Certificates to all participants (only if participant attends all the sessions).

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