



Indian Institute of Technology

Course Details Report

Course No: OE2034

Course Name: Ship Resistance and Propulsion

Course Type:

Theory

Description:

To enable the students to get basic knowledge on ship resistance components, ship power estimation methods, ship propulsion systems, propeller design methods, ship model tests for the determination of ship resistance, ship propeller model tests and application to ship design.

Course Content:

Components of resistance; Form factor; Wave making resistance - ship wave systems, interference effects, theoretical calculation of wave making resistance, wave breaking resistance, bulbous bows and their effects. Dimensional analysis - laws of comparison – geometrical, dynamical and kinematical similarity, Newton's, Froude's and Reynold's laws, model-ship correlation; Model testing – tank testing facilities, testing, prediction of resistance from model tests, extrapolation (ITTC 78), Froude's Concept, laminar influence and tank wall effect, comparison of resistance prediction with results of full scale trials. Air and wind resistance, resistance of appendages, added resistance in waves; Resistance in restricted waterways – resistance in shallow water, resistance in canals; Determination of resistance from series test results; Resistance of planing crafts, multi-hull vessels, hovercrafts, hydrofoils, SES. Introduction to different propulsion systems in ships; Screw propeller-screw propeller geometry, sections, propeller drawing; Propeller theories - momentum theory, blade element theory, circulation theory. Interaction between hull and propeller- wake and wake fraction; thrust deduction factor, propulsive efficiency in open water and behind conditions, hull efficiency, quasi propulsive coefficient; Powering; Cavitation - types, cavitation number, effects of cavitation, prevention of cavitation, design for minimum cavitation, cavitation tests. Propeller design - propeller series, open water diagrams, design charts; Propeller design and performance study using design charts; Engine selection; Propeller model tests - test facilities, laws of comparison, open water test, self propulsion test; Strength of propellers
Practicals: 1. Resistance calculation using Gulddammer - Harvald series 2. Shallow water resistance calculation 3. Propeller design using series chart 4. Propeller drawing
Experiments: 1. Model test for ship resistance determination 2. Flow-line test for identifying bilge keel position 3. Propeller model open water test in towing tank 4. Model test for wake fraction determination 5. Self propulsion model test for thrust deduction fraction determination

Text Books:

- ? John Letcher, Randolph Paulling: Principles of Naval Architecture series-Ship Resistance and flow, SNAME, U.S.A., 2009.
- ? Antony F Molland, Stephen R turnock, Ship resistance and propulsion-practical estimation of propulsive power, 2011.

Reference Books:

- ? Harvald S.A.; "Resistance and Propulsion of Ships", John Wiley & Sons., 1983. 137
- ? John Carlton, Marine Propellers and propulsion, 2007. Baker George Stephen, Ship form, Resistance and screw propulsion, Hard press publishing, 2013.
- ? D. W. Taylor ; Resistance of Ships and Screw Propulsion, Unikum, 2012.
- ? J P GHOSE and R P GOKARN. Basic Ship Propulsion, KW Publishers Pvt Ltd. 2015.