SUBJECT PROPOSAL

Subject title:	**Advanced Marine Propulsion**	
L-T-P:	3-0-0	Credit: 3
Semester:	Spring	
Level:	PG	
Type:	Elective	

Objective

This elective course is aimed to provide a detailed understanding of design, analysis and operational aspects of marine propulsion. The objective is to provide knowledge on different propulsor types, energy saving devices, as well as to focus on certain aspects regarding the characteristics of screw propellers which are not covered in the compulsory courses. This course would provide a suitable platform for students and researchers planning to work in different areas of naval architecture, typically ship resistance and powering estimation.

Prerequisite

Basic understanding of hydrodynamics and naval architectural terminology.

Overlap

About 10% with *'Resistance and Propulsion'* (NA31005)

Text and Reference books

1 Carlton, J. 2012. **Marine Propellers and Propulsion**, 3rd Edition. Publisher: Butterworth-Heinemann.

2. Ghose, J.P. and Gokarn, R.P. 2015. **Basic Ship Propulsion.** KW Publishers Pvt. Ltd.

3 Bose, N. 2008. **Marine Powering Prediction and Propulsors.** SNAME Publication.

4 Molland, A.F. and Turnock, S.R. 2011. **Ship Resistance and Propulsion.** Publisher: Cambridge University Press

Course Instructor

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Contents and Lecture Hours

Topic of lecture(s)	Lecture No.s
1 Introduction (a) Marine propulsion devices, history and types (b) Screw Propeller: Geometry and blade sections	2
2 Propeller theory (a) Outline of axial momentum theory and blade element theory (b) Lifting line and lifting surface models (c) Vortex lattice, boundary element, and CFD methods	4
3 Propeller characteristics and hull-propeller interaction (a) Dimensional analysis and propeller coefficients (b) Ship wake field: Characteristics, parameters, measurement, and scaling (c) Propeller-rudder-hull interaction	4
4 Powering prediction for ships (a) Self-propulsion model tests, Laws of similarity and extrapolation (b) Powering prediction for ships (c) Engine-propeller matching	4
5 Unconventional propulsion devices (a) Controllable pitch propellers (b) Ducted propellers (c) Azimuthing and Podded propellers (d) Waterjets (e) Other devices: Contra-rotating, cycloidal, and oscillating propulsors	7
6 Cavitation and ventilation (a) Theory of cavitation theory and types of propeller cavitation (b) Cavitation considerations in design, bucket diagram, supercavitating propellers (c) Damage due to cavitation, testing methods (d) Propeller ventilation	4
7 Propeller blade strength (a) Bending moment on propeller blades (b) Blade stresses, design factors, material properties	2
8 Propeller Design (a) Propeller design and analysis loop, propeller types (b) Design using methodical series data (c) Design using circulation theory	4
9 Miscellaneous topics (a) Scale effects on propeller characteristics, ITTC scaling method, other approaches (b) Unsteady propeller loading (c) Propulsion in a seaway	5
10 Energy saving devices (a) Concept, types and working principles (b) Energy Efficiency Design Index (EEDI), influence on ship powering (c) Some pre-swirl and post-swirl devices	4
Total	**40 hrs**