

Propulsion Course Outline 2018-2019 Academic Year

Contents	Time	Date	Week
1. Propulsion Systems a) History and Development of Screw Propeller b) Modern Propulsion Systems i- Fixed pitch propellers ii- Ducted propellers iii- Contra-rotating propellers iv- Overlapping propellers v- Controllable pitch propellers vi- Waterjet propulsion system vii- Cyclodial propellers viii- Paddle wheels ix- Superconducting electric propulsion system x- Azimuth podded propulsion system	2 hours	13.11.2018	8th
AYOCOL 2018	3 hours	15.11.2018	8th
2. Propeller Geometry a) Frames of Reference b) Propeller Reference Lines c) Pitch d) Rake and Skew e) Propeller Outlines and Areas f) Blade Sections (NACA Definition of Thickness and Camber)	2 hours	20.11.2018	9th
Example (Wageningen B series offset) g) Propeller Drawing	3 hours	22.11.2018	9th
3. Hydrodynamic Characteristics of Propellers a) Open Water Characteristics b) Propeller-Hull Interaction-Wake i- Wake field characteristics ii- Wake field definition (nominal wake field, effective wake field) c) Thrust deduction d) Relative-rotative efficiency e) Propulsive efficiency and propulsion factors f) Summary of efficiencies in powering g) Standard Series Propeller Data	2 hours	27.11.2018	10th
4. Basic Outlines of Propeller Design Example (Propeller Design - Stage 1) Example (K_T , K_Q , η_0 and $B_p\text{-}\delta$)	3 hours	29.11.2018	10th
2nd Mid-Term Exam	2 hours	04.12.2018	11th
5. Propeller Theories a) Momentum Theory b) Blade Element Theory c) Profile Characteristics d) Profile Series e) Lifting Line Theory f) Lifting Surface Theory g) Boundary Element Methods	3 hours	06.12.2018	11th

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6. Cavitation <ul style="list-style-type: none"> a) The basics of cavitation <ul style="list-style-type: none"> i- Physics of cavitation ii- Historical development iii- Cavitation number (inception) iv- Effect of angle of attack on cavitation 	2 hours	11.12.2018	12th
<ul style="list-style-type: none"> a) Types of cavitation experienced by propellers <ul style="list-style-type: none"> i- Location on a blade ii- Physical appearance of cavitation b) Effects of Cavitation on Propellers <ul style="list-style-type: none"> i- Performance breakdown ii- Noise iii- Vibration iv- Erosion 	3 hours	13.12.2018	12th
<ul style="list-style-type: none"> c) Cavitation Considerations in Design <ul style="list-style-type: none"> i- Cavitation criteria ii- Cavitation bucket diagrams h) Preventing Cavitation Example (NACA pressure distribution, KT-KQ)	2 hours	18.12.2018	13th
7. Propeller Design <ul style="list-style-type: none"> a) Design and Analysis Loop b) Design Constraints c) Choice of Propeller Type d) Propeller Design Basis e) The use of Standard Series Data in Design f) Basic Design 	3 hours	20.12.2018	13th
<ul style="list-style-type: none"> g) Detailed Design (Wake Adaptation) h) Engine Selection Example (Propeller Design - Stage 2+3, Cavitation Criteria)	2 hours	25.12.2018	14th
8. Propeller Tests <ul style="list-style-type: none"> a) Open Water Tests b) Self Propulsion Tests 			
<ul style="list-style-type: none"> c) Cavitation Tests d) Other Tests Lab visit Example (Self propulsion tests)	3 hours	27.12.2018	14th