“Handbook of mairine craft”, pp. 401, eq. (12.230) is non linear model for thrust configuration of rtatable thrusters.

Idem, pp. 408, sec. 12.3.4, Constrained Control Allocation for Azimuth Thrusters

“Optimal thrust allocation for marine vessels”:

* Q1: examples of singular configuration with infinite thruster needed

Notes from meeting 07-09-2023

current and wind are low low (constant) disturbance, current speed and direction are constant. Wind and current NOT same direction. These are the primary concerns for dp.

the waves can be modelled in different waves. The dp should filter ut so not to stress the actuators. The vessel, for waves with longer wavelength than the vessel (first order waves), is a point. Second order waves introduce drift to the vessel, pushing it in some direction.

Modeling questions:

Is DP a subset of maneuvering?  
How to deal with added mass and potential damping. Regarding the graphs at pp 110, what frequency are they referring to? Is ti safe to assume as in pp 113 a zero-frequency model? (Equations 6.15 and 6.16)

**Viscous damping and ocean current forces:** pp 122

* **Potential damping**: from added mass, damping and restoring. Encountered when forced to oscillate **in absence of incident waves (?).** Also referred as *linear-frequency-dependent potential damping* ***B****(omega)*.
* **Skin friction**: Linear frequency-dependant skin friction **Bv**(omega). Important at low speed. There is also a quadratic/nonlniear component.
* **Wave drift damping**: Added resistance for surface vessels advancing in waves. Derives from **second-order** **waves** theory. Most important for surge.
* **Damping due to vortex shedding**: ?
* **Lifting forces:** Hydrodynamic lift forces due to 2 mechanisms. 1. Linear crculation of water around the hull. 2. Non linear effect, *crossflow drag*

This contributes to linear and quadratic damping: D(vr) = D + Dn(vr)

Linear Viscous damping and non linear: pp 123 to 127. I dont get if it s related to seakeeping or also to maneuvring/DP.

Non linear equations at pp 130. Assumption (6.107) is valid?

Assumptions on hydrostatic forces should be 0?

**Chapter 7: Models for ships.**

Maneuvering models or DP models?

**Maneuvering models**

How to approximate the N(vr)vr term? 7.1.1 surge resistance and cross flow drag, 7.1.2 second order modulus functions, 7.1.3 odd functions

**OR**

go for linearized maneuvring models 7.1.4

**DP models**

DP is at low speed so everything that depends on the speed is zero. Ignore viscous damping

NO way to know added mass and b, but you can approximate with the box model (shoebox) for yaw and sway, for surge us 5% of mass of the vessel

Check the nondimensional models fossen

Essentially, DP is maneuvering (calm sea, unlike seakeeping) at zero or n speed. The added mass and B graphs are the frequency of the waves. For DP omega can be assumed 0 or close to zero anyway. Since we cannot have zero damping and the damping quadratic function, when linearized around zero, becomes zero, the linear term is added. The parameters that we know are the ones in the file that tomas sent me, and in particular the mass could vary, but it needs to be enstablished how significant is that variation (in percentae, for example). Length, instead, is assumed to be a parameter given to the controller.   
Chek out the non dimensional models of fossen, which can be just scaled up and down for various characteristics.  
Keep the code and the functions in Matlab and call them from Simulink. Try to keep everything organized. You need to make and deliver the Project plan by the deadline (roughly 10 or 13 days from today, 14/09/2023, I think.

response amplitude operators (hydrodynamics). I modelli adimensionali. Pochi parametri, semplici.

no acceleration, only speed log in 2d (x, y), gnss and gyro (rate of turn) and compass. Current speed i the delta between speed log and speed over ground

pos, speed over ground and course over ground (not indipendent, derived), speed through water log gives indep speed in x and y. High frequency.

gyro provides rate of turn

AT THE BEGINNING ASSUME ALL DATA AND SIGNALS ARE PRESENT

EMRI can be interested also in knwoing if they need an additional sensor.