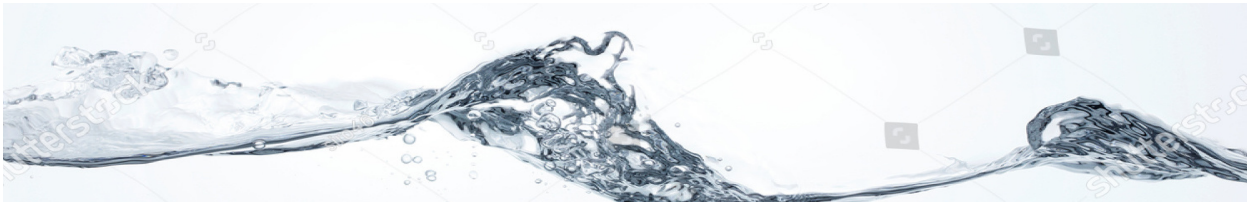

Syllabus **Feb.-12, 2020**

MAST-693 and CIEG-693: Waves in the Marine Environment

Instructor: Andreas Muenchow
Time: Monday and Wednesday 17:00-18:15
Location: 105 Robinson Hall (Newark) and 203 Cannon Lab (Lewes)

Website: http://muenchow.cms.udel.edu/classes/Waves

Goal: Provide each student with an understanding of the general principles of wave mechanics, kinematics and dynamics as well as their applications to surface gravity waves, acoustic waves, electromagnetic waves and large scale geophysical waves.

Synopsis: The class surveys a wide range of wave phenomena used to explore, understand, and sense ocean and atmosphere. While the focus is on linear ocean waves with time scales from milliseconds (compressible waves) to years (planetary waves), the class will explore, albeit briefly, nonlinear wave forms such as shock waves, solitons, and frictional damping:

- 1. Plane Waves - Unforced, acoustics
- 2. Surface Gravity Waves - Forced, homogeneous
- 3. Internal Gravity Waves - Forced, stratified
- 4. Shallow Water Waves - Boundaries
- 5. Geophysical Waves - Vorticity
- 6. Nonlinear wave forms

Grades: 40% homework problems, 40% final exam, 20% contributions to in-class discussions.

Texts:
Chapman, D.C. and P. Malanotte-Rizzoli, 1989: Wave Motions in the Ocean presented to Myrl C. Hendershott, unpublished notes, 174 pp.
http://falk.ucsd.edu/pdf/MyrlWavesNotes_ChapmanRizzoli.pdf

Gill, A.E., 1982: Atmosphere-Ocean Dynamics, Academic Press Inc., Orlando, FL, 662 pp.

Kundu, P. K., 1990: Fluid Mechanics, Academy Press, San Diego, CA, 638 pp.

Lighthill, J, 1978: Waves in Fluids, Cambridge University Press, New York, NY, 503 pp.

10^{-9} sec	Radar	Remote Sensing Weather and Ice
0.01 - 1 10^{-3} sec	Acoustics	Communication, Sensing
1 - 10 sec	Surface Gravity, no rotation	Surfing, coastal erosion, structures
0.5 day	Surface Gravity, with rotation	Tides

Radars - https://www.nssl.noaa.gov/about/challenges/
https://farside.ph.utexas.edu/teaching/336L/Fluid/Fluidhtml.html

Linear Tides in coastal embayments - North Sea, Kelvin Waves, Taylor (1921)

Nonlinear Tides in estuaries - Conway and Severn River, Muenchow and Garvine (1992)

Dam Breaking problem (nonlinear) Stoker 1947 and (linear vorticity) Gill 1982

Tidal propagation under ice sheets - propagation into icesheet