Course Number:	**MNE436/MAR599**
Course Title:	**Marine Hydrodynamics & Propulsion**
Instructors:	Prof. Geoff Cowles
Contacts:	School for Marine Science & Technology, SMAST-East 227 836 South Rodney French Boulevard New Bedford, MA 02744 U.S.A. (508) 910-6397 gcowles@umassd.edu
Class Time:	9:30 - 10:45, Tuesday/Thursday (Sci & Eng 114)
Office Hours:	10:45-12:15, Tuesday/Thursday (SENG 116C)
Website:	UMD blackboard/mycourses
Textbook:	Principles of Naval Architecture: Ship Resistance & Flow Authors: Lars Larsson & Hoyte Raven ISBN 978-0-939773-76-3 Publisher link: http://www.sname.org/pubs/books
Prerequisites:	MNE 332 (Undergrad Fluids) or Equivalent

Course Description: This course provides instruction, demonstration and exercises in the fundamentals of marine hydrodynamics. The curriculum will emphasize application of these principles through classroom examples, homework content, and computation-based projects.

Course Objectives: Students will be able to

1. Apply a fundamental understanding of the resistance components
2. Estimate the resistance components of a given ship
3. Match propulsion to the ship
4. Estimate the installed power to achieve design speed
5. Explain the relationship between ship form and purpose
6. Demonstrate their understanding of fundamental geometric tradeoffs from the point of view of hydrodynamics.
7. Employ mathematical models in support of the ship resistance problem.
8. Quantify the role of global shipping in greenhouse gas and smog-forming emissions and explain ongoing remediation efforts from a design perspective.

Grading:

Quizzes:	5%
Homework (lowest dropped):	20%
Midterm Project:	15%
Midterm Exam:	20%
Final Project:	15%
Comprehensive Final Exam:	25%

Standard grade ranges apply

Class Approach:

My approach to this course is to use, to the extent possible, Blackboard / MyCourses as an aid to providing content electronically through reading assignments, instructional

videos, and other online content. My strategy in doing this is to enable you, the student, to gain a basic level of understand of the material ***before*** you come to class so that ***during*** class we can discuss the material at a higher level and delve deeper into applications of the concepts (as opposed to introducing the information for the first time). With this model, your "homework" time outside of class will be a mix of reading and viewing online content in MyCourses, completing online quizzes in addition to traditional problem set questions.

The course is organized into nine units, each focused on a central topic. These units will span one or two weeks. Most units consist of two or three regular in-class lectures and one problem solving session. Each unit has an associated homework assignment. The written and computing problems portion of the homework will be due at the beginning of the next unit. The online quiz problems for each homework must be completed in mycourses prior to each lecture.

A typical unit will look like:

Before each Regular Lecture (2-4 lectures per unit)

- Work through the associated learning module in MyCourses, including any reading assignments and online content
- Take the associated learning assessment Quiz in MyCourses. These quizzes constitute 5% of your grade.

During Class:

- I will review the material and answer questions you may have on it and we will work through problems that put into practice the concepts discussed in the unit. These problems do not need to be turned in and do not factor into your grade.

Homework:
Each unit will have a homework that you must turn in (8 total). I will drop the lowest homework grade.

Homework Format:

- Turn in your written work on time at the beginning of class
- Write neatly and box your answers
- If you cannot attend class, have a classmate turn it in or scan/email it to me. In the event this is necessary please do not, if at all possible, take 10 pictures with your phone in alternating portrait/landscape orientation.
- I encourage you to work with others but you must write up the solutions on your own. Explanations must be in your own words.

Incomplete Policy:
Incomplete may be given only in exceptional circumstances at the instructor's discretion. The student must be passing at the time of the request or be sufficiently close to passing. If the work is not completed within one year of the recording of the incomplete grade, the grade will become an F(I). The incomplete policy for this course is that at least 70% of

the course must be already completed and an exceptional circumstance (i.e. medical issue) must exist. If you feel you require an incomplete for an exceptional reason, you need to email me and state your reasons for the incomplete in writing. We will then decide on a course of action.

Academic Integrity:
University policy applies: see link here.

Electronic Gadgets:
Usage of electronic devices for taking notes or problem solving is permitted. Any other use of devices is not permitted. Phones must be on vibrate. No texting, tweeting, surfing, etc. during class time.

Fall 2017: Tentative Schedule of Lectures and Assignments

Date	Unit	Lec	Title	SRF Chapters	Assigned [covers lectures]	Due
9/7	Background	1	Overview and Historical Context	1-4	HW1 [1,2,3]	
9/12		2	Dynamic Similarity			
9/14		3	Resistance Decomposition and Force Coefficients			
9/19	Wave Resistance	4	Surface Gravity Waves	5	HW2 [4,5]	HW1
9/21		5	Kelvin Wake			
9/26	Viscous Resistance	6	Boundary Layers	6	HW3 [6,7]	HW2
9/28		7	Frictional Drag			
10/3	Added Resistance from Lift	8	Flow over Hydrofoils	7	HW4 [8,9]	HW3
10/5		9	Flow over Finite Wings			
10/10		10	Hydrofoils and Air-Lift Vehicles		PROJ1	HW4
10/12			In Class Midterm		Covers [1-9]	
10/17	Bare Hull Resistance Computation	11	Tow Tank Testing	8	HW5 [11-14]	
10/19		12	Froude Decomposition			
10/24		13	Systematic Series	9,10		
10/26		14	Computational Ship Hydro			
10/31	Propulsion	15	Theory & Characteristics		HW6 [15-18]	HW5
11/2		16	Hull/Propulsion Interaction			
11/7		17	Systematic Series			
		18	Alternative Propulsion			
11/14	Hull Design & Powered Calculations	19	Ship Design	11.1-11.4.3.3	HW7 [19,20]	HW6,PROJ1
11/16		20	Full Powering Computation		PROJ2	
11/21		21	Detailed Hull Design	11.5.9-		HW7
11/23			Thanksgiving			
11/28	Specialty Classes	22	Planing Hydrodynamics	11.4.4	HW8 [22,23]	
11/30		23	Yacht Hydrodynamics			
12/5			Course Review			HW8
12/7			Project Presentations			PROJ2
12/12			Comprehensive Final: 8-11			