Course: EN-4151 APPLIED NAVAL ARCHITECTURE
Credits: 3   **Semester**: Fall 2012
Professor: F. Murray   Office: Room 222A Harrington

Text: Stability and Trim for the Ship's Officer

Prerequisite: EN 3112 – Strength of Materials

Office Hours:
Rm 222A Harrington, 1000 - 1050, or by appointment
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Grading: Grades will be assigned as per the Engineering Department STCW grading policy. This course is an STCW knowledge-based assessment course requiring a minimum grade of C-, or 70%, for the semester grade.

 Note: A grade lower than 70% receives an F for the course.

The semester grade will be assigned as follows:
Quizzes (5%) Exam #1 (30%), Exam #2 (30%), Final exam (35%)

Attendance: If you are going to miss a class, please advise me prior to that class. The student is responsible for catching up with the material that was missed. A student missing 12 or more classes may be dropped from the course.

Notes
1. Quizzes: There will be no makeup of quizzes. Unexcused absences will receive a grade of zero points for that quiz.
2. Cadets with disabilities**:** Students with documented disabilities may be afforded appropriate accommodations. Students requiring additional time on exams must make those arrangements with the instructor in advance.

Learning Outcomes:
Upon completion of this course, it is expected the Student:
1. Will be conversant with the basic nomenclature of ship structure and ship stability.
2. Will be able to use a ship's hydrostatic curves-of-form to calculate displacement and initial stability information.
3. Will have a working knowledge of stability basics and the effect of load changes on stability. This includes use of hydrostatic curves of form and cross curves of stability.
4. Will have a working knowledge of load changes on a ship's longitudinal trim and transverse list.
5. Will have a working knowledge of the causes and effects of stress on a ship's hull.
6. Will understand what structural hull loads are, and be able to calculate basic longitudinal hull stress for simplified loads.
7. Will understand the importance of maintaining watertight integrity.
8. Will be able to estimate a ship's power requirement based on model test data.

APPLIED NAVAL ARCHITECTURE – FALL 2012

Class #	Topic	Text
1	Administrative issues. Nomenclature, Finding Areas, Centers	
2	More nomenclature, molded form, dimensions Finding Center of Area Fundamental Ship Hull Form	Chap 2 pg 31 - 36
3	Relationships: Underwater volume, weight, specific weight Fluid weight, Archimedes Principle	
4	Properties of the waterplane, properties of the immersed hull	
5	Basic hull pressure forces, Force of Buoyancy, See top of page 72, Block coefficient ratio	See pg 72
6	Intro to Hydrostatic Curves - see Appendix A, pg 443	Appendix A
7	More Hydrostatic Curve information, Tons per inch immersion, Intro to Area Moment of Inertia	pg 443
8	Pressure forces, Introduce KGB, Parallel axis equation	
9	Flotation & Initial Transverse Stability at small angles, Intro. to Transverse Metacenter, M_T , Metacentric Height (GM_t)	Chap 2 pg 36, 37 pg 40-46 pg 89 Rolling
10	Calculating center of gravity KG, Light Ship definition, Righting Arm Positive, neutral stability Pg 42, 43 Text	Chap 3
11	Area Moment of Inertia - for rectangular shaped waterplane areas. Effective Volume - definition	middle of pg 73
12	Intro to the Trim & Stability Booklet, The effect of off-center weights Transverse Shifting of a Weight already onboard	pg 54 - 57
13	Using Hydrostatic tables More shifting of a weight Submarines - how do they work (Handout)	
Fri 5 Oct	No class (instructor away)	
Mon 9 Oct	Columbus Day - No class	
14	Adding a weight, removing a weight,	Chap 6
15	Start Free Surface, Inclining Experiment	Chap 8
16	Effect of Liquids with Free Surface. Virtual rise in G, reduction in Metacentric Height Free Surface Correction (FSC)	Chap 8
17	Free Surface Correction, example prob. Basic structural nomenclature (handout)	Chap 8
18	Flooding at sea (Car Carrier), Tonnage terms	
Mon	**EXAM #1 (approximately Mon, 22 OCT)**	

		STABILITY at LARGE ANGLES	Chap 7
	19	Return exam, Voyager of the Seas part 2	
	20	Transverse Stability at large angles of heel, Static Stability Curve	

		LONGITUDINAL HULL STRENGTH	Chap 10
	21	Ship Structure – major structural pieces, Model the ship as a Box-Beam	pg 221 - 228
	22	Structural framing systems Flexure Formula	pg 228
	23	More on Framing systems Stresses on a ship (power pt) Ship Strength - Weight curve, Buoyancy curve, Load curve	pg 229 - 238
	24	Ship Strength curves; Weight per foot W(x), B(x), L(x) Barge example	pg 229 - 238
	25	Shear Force V(x), Bending Moment Curve M(x)	
	26	STCW discussion, STCW codebook, CG exam questions	
	27	Section Modulus, Subdivision – Watertight bulkheads	Handout
	28	Drydocking	
	29	Review for exam	

	Mon	**EXAM #2 (approximately Mon., 19 Nov)**	
		THANKSGIVING BREAK	
	30	Resume classes Monday 26 Nov - Voyager of the Seas part 3	
		RESISTANCE to the SHIP – DETERMINING A SHIP'S POWER REQUIREMENTS.	
	31	Intro to Ship Resistance Resistance to the ship as it moves through the water 3 types of resistance	
	32	Towing a model, Effective Horsepower (EHP) Use of models, Law of Corresponding speeds Ship Resistance and Modeling, scale factors	
	33	Ship Propulsion, Horsepowers and basic drive trains Types of hulls	
	34	Ship propeller basics	
	35	Design project details - Friday 7 Dec	
	36	Design project	
	37	Test of your design project - Wed 12 Dec	
	38	Review for final exam	