Preliminaries

- **Instructor:** Dave Murrin  
  - Office: EN-3033  
  - Phone: 737-4058  
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- **Lectures:** Monday, Wednesday, Friday from 9:00-9:50 am  
  - There is a tutorial slot which will also be used for the design project

- **Office Hours:** To be announced
Aim: to introduce students to ship structural design, through study of the hull girder.

The course examines the elastic (intact) behaviour of ships and ship structural elements and asks two things of the student:

- To develop an understanding of the elastic behaviour of ship structures (actions/reactions within deforming bodies)
- To develop an ability to proportion a ship structure in a way that satisfies the given constraints and achieves an appropriate hierarchy of strength.
The grading system for this course is comprised of a design project, several short assignments and labs, a midterm examination, and a final examination. The relative weight of each component is as follows:

- Assignments 10%
- Design Project 15% (Due Nov. 21)
- Mid-term Examination 20% (~ Oct. 13)
- Final Examination 55%
Reference Texts

Introduction

- Ship structures have evolved
- Traditional design
  - Empirical based on experience
  - Rules based, published by classification societies
Rule-based design

Pros:
- A rulebook approach to design provides simple formulas for the structural dimensions (or ‘scantlings’) of a ship
- This saves time in the design office, and approval process.
Rule-based design

Cons:
- Formulas do not give an efficient design, and tend to have large (and sometimes unnecessary) safety factors built into them
  - Costly in terms of steel
- The formulas can only be used within limits and may be inaccurate outside of the intended range.
  - Dangerous for innovative designs
Rationally-based design is directly and entirely based on structural theory and computer-based methods of structural analysis and optimization, and which achieves an optimum structure on the basis of a designer-selected measure of merit.

- Hughes
Rationally-Based Design

- Used in aircraft, aerospace, and offshore structures.
  - High economic stakes
- Classification societies have encouraged and contributed greatly to the methods
- Requires a computer and basic knowledge of numerical methods, finite element analysis, and experience in structural design
Rational Structural Design Process

Mission → owner, needs, function

General Arrangement ← constraints, experience

Environmental Conditions

Loads

Structural Scantlings

Structural Response

Structural Response Criteria

Compare Response with Criteria

OK? → yes or no

Modify Structure

Stop