

**The University of British Columbia  
Department of Mechanical Engineering**

**MECH341  
Dynamics of Marine Vehicles**

**Monday, Wednesday and Friday: 10:00-11:00**

**Course Instructors: Mr. Jon Mikkelsen, M.A.Sc. P.Eng.**

**CEME 2052A**

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**822-2709**

**Office Hours: please contact for appointment**

**Course Objective**

Mech 341 is an introductory course in Naval Architecture. Students will be expected to develop a thorough understanding of the underlying principles related to the design of ships. Specific topics covered in this course include, ship nomenclature, prediction of vessel resistance, propulsion selection, and vessel motions in waves.

Since the enrollment in this course is normally less than 30, we strive to develop a student friendly environment where lectures are more in a tutorial format with ample opportunities for student input and questions. Students are encouraged to work cooperatively and bring to the class their specific knowledge and experiences related to the marine environment.

By the end of the course, students are expected to:

1. know all the principles terms and coefficients related to the profession of Naval Architecture.
2. be able to understand and predict a vessel's resistance based on model test data and computer modelling.
3. be familiar with propulsion selection techniques including propeller charts.
4. understand the prediction of vessel motions and means to minimize effects on crew and equipment.
5. become familiar with modern computer software techniques for vessel resistance prediction.

## Mark Distribution

Midterm	20%	(given at, or near, week 7)
Term Project	20%	(assigned late January for completion in early March)
Problem Sets	20%	(normally five problem sets)
Final Exam	40%	(scheduled during the final exam period)

Students are expected to achieve at least 50% in both the final exam and combined term work (midterm, problem sets, and term project) to pass the course. The exams are normally knowledge, skills and values based. I normally have both a closed book and open book format to the midterms and exams. The closed book sections will deal with basic knowledge and facts. These facts should be well understood by the naval architecture student and should be described in his/her own words. The open book section of the exam will test the student on skills and values. In general, this section will ask, "Are you able to apply your analytical skills to solve a particular ship problem and are you able to assess the results to provide a conclusion or recommendation for further action."

## Textbook and References

The prescribed textbook for this course is *Introduction to Naval Architecture* by T. Gillmer and B. Johnson. The text is well priced and provides a good overview of materials presented in ME340 and ME341. In addition, course material has been developed by the instructor for distribution to students. These handouts will be available at the start of each class session. The handouts will be based on the text, other reference texts, and technical papers. The reference texts include:

1. *Principles of Naval Architecture - Volume 1* (edited by E. Lewis)  
This textbook is the most used reference book in the industry. Copies can be purchased from The Society of Naval Architects and Marine Engineers (SNAME). I strongly recommend that students become members of SNAME student section at UBC. The *Principles of Naval Architecture (PNA)* is a three volume set that covers all topics related to Naval Architecture. The cost for the three volumes is approximately US\$180.00
2. *Basic Ship Theory – Volume 1* by K.J. Rawson and E.C. Tupper  
This well written textbook serves as an excellent reference for this course. Copies of the textbook have been reserved at the Koerner Library and Engineering Room. Copies of the textbook can be obtained through many of the online bookstores (amazon.com, chapters.ca, etc.) at a cost of approximately \$80.00. The main drawback with this text is that it does not contain as much additional materials compared to PNA. As such, it does make a valuable reference book, once the introductory courses are completed.

3. *Principles of Yacht Design* by Lars Larsson and Rolf Eliasson  
This text written by two famous Swedish Naval architects is written primarily for sailing enthusiasts. It covers all the basics but is written at a level for non-naval architects. However, I appreciate the practicality of this textbook. If you are considering sailboat design, I recommend you obtain this text. It is also available through the Society of Naval Architects and Marine Engineers (cost approx. US\$60).

## **Term Project**

Information on the term project will be provided on a separate handout provided to you at the end of January.

## **Topic Outline (subject to changes)**

### **Ship Resistance and Propulsion**

#### **1. Resistance**

**January**      Dimensional Analysis  
                    Froude's Law  
                    Model Testing  
                    Components of Resistance  
                    Wave Resistance  
                    Shallow Water Effects

#### **2. Propulsion**

**February**    Propeller Theory  
                    Wake Theory  
                    Propulsive Coefficient  
                    Propeller Selection  
                    Cavitation  
                    Propeller Ship Interaction

#### **3. Seakeeping**

**March**        Wave Theory  
                    Motion of Ship in Waves  
                    Added Mass  
                    Roll and Pitch  
                    Motion Effects on Ships  
                    Response Amplitude Operators  
                    Design for Motion  
                    Planing Hulls