

Fall 2015

NAME 3150

Lothar Birk
University of New Orleans

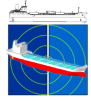
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**NAME 3150****Fall 2015**

Ship Resistance and Propulsion

Course description and objectives

Determining resistance and powering requirements is an important part of the ship design process. This course introduces students to marine flow problems and applies principles of fluid mechanics to determine resistance and propulsion characteristics of ships.

During the course we will address:

- flow patterns and resistance components
- recapture of basic fluid dynamics
- laws of similitude in resistance and propulsion
- assessment of model test results
- ship hull – propeller interaction
- ship resistance and propulsion estimates
- propeller selection
- special topics (e.g., cavitation, planing hydrodynamics)

At the end of this course you should be able to

- understand ship flow patterns and resistance components
- understand and apply laws of similitude and dimensional analysis as they relate to ship model testing
- assess ship resistance and propulsion from model test data
- estimate ship powering considering propeller selection, propeller/hull interaction, and cavitation
- apply the methods learned to solve hydrodynamic problems in ship design.

Prerequisites

Prerequisites are *Fluid Mechanics* (ENME 3720), *Calculus III* (MATH 2134), and *Form Calculations and Stability* (NAME 2160). If you have enrolled in this course without satisfying these constraints you need special permission to take this course!



Instructor

Instructor:	Lothar Birk, Associate Professor of NAME	Office hours:	Tuesday	9:00am–11:00 am
E-mail:	lbirk@uno.edu		Tuesday	2:00pm–4:00 pm
	(preferred communication)		Wednesday	10:00am–noon
Office:	911 Engineering Building		or send me an e-mail!	
Phone:	280 6183			

I'm open to meet with you outside office hours, preferably in small groups, to discuss any questions and open topics. Give me a call or send an e-mail to schedule an appointment.

Classes and attendance

Location: EN 320 and NAME computer lab EN 209
 Class hours: Monday 5:00–6:15 pm
 Wednesday 5:00–6:15 pm

Classes will be taught in an interactive manner. Therefore your attendance at every class session is important. Please initial the attendance sheet at the beginning of each class. If you are unable to attend class (illness, conflicts with other classes, etc) inform me by e-mail as soon as possible to avoid negative effects on your final grade (see Grading).

Since we use the NAME computer lab as a class room from time to time, distractions like e-mail, Facebook and YouTube are readily at hand. Please refrain from using them because it not only distracts you but your classmates and me as well.

I intend to make use of the *UNO Moodle* web-site <http://uno.mrooms3.net> for this course. Please make sure you have access and are familiar with the system. There will be a list with links to notes and pointers to additional reading and references for each class. I will make use of e-mail and your UNO e-mail addresses. Please make sure that you check your UNO e-mail regularly!

References

Summaries for (most) classes will be posted on the *UNO Moodle* web-site but you are expected to consult additional references as well. Study the summaries as soon as they are posted. Do not postpone it until you prepare for midterm or final exam. Ask questions in class!

As additional reading material I strongly recommend to get a copy of the new Principles of Naval Architecture volume on *Ship Resistance and Flow*:

L. Larsson and H.C. Raven (2010). *The Principles of Naval Architecture Series: Ship Resistance and Flow*. Society of Naval Architecture and Marine Engineers (SNAME), ISBN 978-0-939773-76-3.

There are only few reference books around covering the contents of this course. A good book is S.A. Harvald's (1983) *Ship Resistance and Propulsion*, John Wiley & Sons. Unfortunately it is out of print, however, it is available in the UNO Library. Recently a new book with similar title has come out which seems to be a reasonable and affordable replacement:



A.F. Molland, S.R. Turnock and D.A. Hudson (2011). *Ship Resistance and Propulsion: Practical Estimation of Ship Propulsive Power*. Cambridge University Press.

For your professional library of references you should also consider the new Principles of Naval Architecture volume on *Propulsion*:

J.E. Kerwin, J.B. Hadler (2010). *The Principles of Naval Architecture Series: Propulsion*. Society of Naval Architecture and Marine Engineers (SNAME), ISBN 978-0-939773-83-1.

For some basic fluid mechanics it will help to keep your textbook from Fluid Mechanics handy. In any case, you should take notes in class and/or refer to provided summaries *and* references.

Homework

Homework assignments will be given out about every two weeks. Usually they will be due two weeks later. Dates will be specified on the problem sheet. Late submission of homework will not be accepted, if it is done without my prior consent.

Some remarks on homework preparation: It is not required to use a text processor. Nevertheless your homework should be neat and well organized. Treat it as a professional preparing a report for a customer. In any case your homework has to satisfy the following standards:

- return the problem sheet with your name on it
- write neatly and orderly
- start each problem with briefly stating the problem and the given information in your own words
- describe the steps leading to the solution
- explain choices and assumptions you make
- complete the analysis algebraically before substituting numerical values
- use units wherever you introduce numerical values
- *check your results!*
 - does the result make sense?
 - are the units of the result consistent?
 - do your classmates have the same result?
- summarize and discuss results with respect to their accuracy and significance (e.g. for example by comparing it with published data).

If your homework obviously does not meet these requirements, it will be returned for rework!

Some homework may require you to get familiar with a spreadsheet program (Excel, gnumeric, etc), writing small programs, or using a commercial software packages.



Exams

There will be a midterm (75 minutes, tentatively on October 7) and a final exam. The final exam is scheduled for Wednesday December 9, 2015, 5:30pm–7:30pm according to the University course bulletin.

All exams will probably be *closed* book and only a single page summary will be allowed. Get organized before the exams!

Grading

The final course grade will be based on the total number of points scored during the term (*see the exception noted with the exams*). The contributions are weighted as follows:

homework	35 %
mid-term exam	25 %
final exam	40 %

Percentage of points P is then given by

$$P = 0.35 \cdot \frac{\text{your homework points}}{\text{total homework points}} + 0.25 \cdot \frac{\text{your midterm exam points}}{\text{total midterm exams points}} + 0.40 \cdot \frac{\text{your final exam points}}{\text{total final exam points}}.$$

I will round up every figure to one significant decimal place (e.g. 90.712 will become 90.8). *In case your final grade is close to a respective boundary (see table below) I will down-grade it, if the attendance has been low (more than one unexcused absence).*

The percentage of the scored points will define the final grades:

Percentage P [%]	Grade	Final grade
97.0 – 100	A+	A
94.0 – 96.9	A	
91.0 – 93.9	A-	
87.0 – 90.9	B+	B
83.0 – 86.9	B	
79.0 – 82.9	B-	
75.0 – 78.9	C+	C
71.0 – 74.9	C	
67.0 – 70.9	C-	

Percentage P [%]	Grade	Final grade
62.0 – 66.9	D+	D
57.0 – 61.9	D	
52.0 – 56.9	D-	
below 51.9	F	F

Anything below 67% (C–) will force you to repeat this class.

Academic integrity and other policies

Academic integrity is fundamental to the process of learning and evaluating academic performance. Academic dishonesty will not be tolerated. Academic dishonesty includes, but is not limited to, the following: cheating, plagiarism, tampering with academic records and examinations, falsifying identity, and



being an accessory to acts of academic dishonesty. Refer to the UNO Judicial Code for further information. The new policy on Academic Dishonesty and other policies are available online at <http://www.uno.edu/studentaffairs/student-policies/>.

Accommodations for students with disabilities

Students who qualify for services will receive the academic modifications for which they are legally entitled. It is the responsibility of the student to register with the Office of Disability Services each semester and follow their procedures for obtaining assistance.

Cell phones

Cell phones –as always– are switched off during class. If your cell phone rings nonetheless you will donate 5 US\$ to the SNAME student section of UNO. (Instructor donates 20 US\$ if his cell phone rings in class).