

Overview of UBC Naval Architecture & Marine Engineering Program

Jon Mikkelsen, P.Eng.

Director, UBC NAME Program


Presentation to NSRP

August 20, 2024

















NAVAL ARCHITECTURE AND MARINE ENGINEERING

MASTER OF ENGINEERING

Class of  2022

THE UNIVERSITY OF BRITISH COLUMBIA

















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JADEN LITOPOULOU
SHIV RESHMI LAKSHMINARAYANAN
MATT SHARREST
YUNDI WANG
FELIX WU
ALLEN FERNANDES
MARAS GOUTHANKAR
YI MING CHEN
YVES-ETIENNE LANDRY
GOVIND SATYA KUMAR RAJA
NICOLAS LECLERC








NOT PHOTOGRAPHED: JEFFREY PINE

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SHAN THIRUTHIRUDI ULAPPI
VISAL KATAMANENI
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NAVAL ARCHITECTURE AND MARINE ENGINEERING


MASTER OF ENGINEERING

Class of  2020

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JONATHAN BAL DUTT
FARZAN HYDER
VINCENT LOPUHA
GURPREET SINGH
KYLE NAZRAN
JASON SINGH
KETI (CHLOE) TAN
NUO BIN TRAN
PHILLIP WAINFOLD
CLAY WISKINI
JARRICA ECKARDT
GAN KANG
HARSHDEEP SINGH PEEN
ANUPAM SAHAL

PRESENTED WITH PRIDE BY *Antenna*

Mission & Vision

Teaching and research to advance the capabilities of the marine industry within a civil society, and for a sustainable future.

To this end, the program aspires to develop multidisciplinary, problem-solving engineering leaders in marine design and production.



a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

ENGINEERING

Professional NAME Degrees (30 Credits)

Developed as an original Value Proposition for the Seaspan Shipyard NSS bid. Industry advisory committee established 2011 to provide input on program needs.

M.Eng – Master of Engineering (Launched 2013)

- Designed to prepare students with existing degrees for a career in the marine sector
- Degrees include MECH, CIVL, MATR, IGEN, Combat Systems, & Marine Engineering

M.E.L. – Master of Engineering Leadership (Launched 2016)

- Combines NAME Technical Program and Sauder Business School
- Requires minimum 3-years relevant Post-Bac experience



MEng Curriculum



1. (3 cr) CIVL 437 - Ship Structures I
2. (2 cr) NAME 501 - Ship Structures II
3. (3 cr) MECH 488 – Intro. To Naval Arch. (Ship Hydrodynamics I)
4. (3 cr) NAME 502 - Ship Hydrodynamics II
5. (3 cr) NAME 566 - Ship Dynamics and Control
6. (3 cr) NAME 578 - Marine Engineering
7. (3 cr) NAME 522 - Ship Production & Industrial Engineering
8. (3 cr) NAME 524 - Shipbuilding Project Management
9. (3 cr) NAME 581 – Ship Design Process
10. (3 cr) NAME 591 - Capstone Ship Design Project
11. (2 cr) NAME 592 - Internship



NAME M. Eng. Curriculum

NAME PROGRAM SCHEDULE

FALL
SEPTEMBER - DECEMBER

MECH 488
Introduction to
Ship Hydrodynamics
(3 CR)

CIVL 437
Introduction to
Ship Structures
(3 CR)

NAME 524
Shipbuilding Project Management
(3 CR)

NAME 578
Marine Engineering
(3 CR)

NAME 581
Computer-Aided Ship Design Project
Intro. Ship Design
(2 CR)

WINTER
JANUARY - APRIL

NAME 502
Advanced Ship Hydrodynamics
(3 CR)

NAME 501
Advanced Ship Structures
(2 CR)

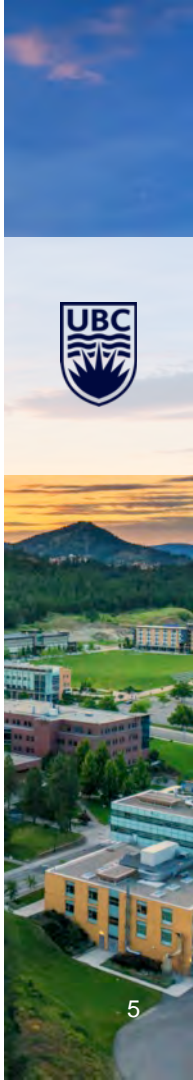
NAME 522
Ship Production and
Industrial Engineering
(3 CR)

NAME 566
Ship Dynamics and Control
(3 CR)

NAME 591
Computer-Aided Ship Design Project
(2 CR/term)

SUMMER
MAY - AUGUST

NAME 592
Shipbuilding Internship
or Project
(2 CR)



A large black ship is docked at a pier. A worker in a white hard hat and a high-visibility vest stands in the foreground. The ship is secured with ropes. In the background, there are industrial structures and a city skyline across the water.

NAVAL ARCHITECTURE & MARINE ENGINEERING

MEL | Master of
Engineering
Leadership

UBC Applied Science



NAME MEL Curriculum

COURSE OVERVIEW

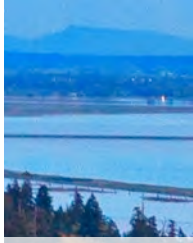
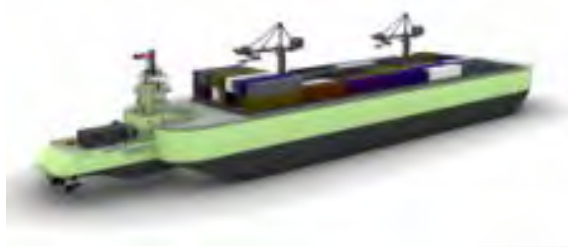
| | WINTER JANUARY—APRIL | SUMMER MAY—AUGUST | FALL SEPTEMBER—DECEMBER |
|-------------------------------|--|---|--|
| TECHNICAL COURSES (18 CR) | NAME 522: Ship Production & Industrial Engineering (3 CR) | NAME 592: Ship Building Internship | NAME 578: Marine Engineering (3 CR) |
| | NAME 566: Ship Dynamics & Control (3 CR) | | NAME 581: Ship Design (3 CR) |
| LEADERSHIP COURSES (12 CR) | APPP 503: Organizational Leadership (1.5 CR) | APPP 504: Business Acumen for Technical Leaders 4 weeks (3 CR) | MECH 488: Intro to Ship Hydrodynamics (3 CR) |
| | BAEN 540: Strategy & Innovation (1.5 CR) | | CIVIL 435: Advanced Structural Analysis (3 CR) |
| | APPP 505: Analytics & Interpretation for Applied Sciences (3 CR) | | SAUDER BUSINESS COURSE (1.5 CR) |

Schedule is subject to change - courses may be taught in different semesters.



Design Focus

- UBC NAME Program has a strong foundation on ship design
- Design program led by “Professor Practitioners” and supported by Industrial Mentors



Professional Program Impact

- Approx. 170 graduates since program inception
- Graduates employed widely throughout maritime sector
 - Design
 - Ship Building
 - Operation
 - Governance



ROBERT ALLAN LTD.
MARINE ARCHITECTS AND MARINE ENGINEERS

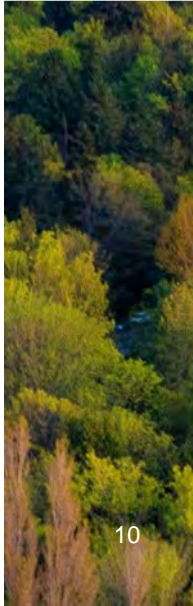


Research Program (Chairs & Professorships)

- In 2016 UBC NAME Program re-configured original Seaspan Value Proposition to expand into research-based degrees (PhD & MSc)
- July 2024 we welcome the Seaspan Chair Seaspan Chair in Robotics for Marine Vessels at UBC
- December 2024 we welcome the Rosenblatt Professorship in Marine Engineering at UBC



Researchers Jasmin Jelovica and Rajeev Jaiman are studying solutions like adding wavy and serrated edges to propellers to break up flow patterns that cause noise. Photo: Devan Power/UBC Faculty of Applied Science.



NAME Option in Mechanical Eng. Undergraduate Program

Name option website:



The screenshot shows the UBC Vancouver Campus website for the Department of Mechanical Engineering. The page features a header with the UBC logo and navigation menu. A large image of a sailboat on the water is displayed. The main content area is titled 'Undergraduate' and 'NAVAL ARCHITECTURE & MARINE ENGINEERING'. It includes a sidebar with navigation links, a main text block describing the program, and a section for 'Why Choose the Naval Architecture & Marine Engineering Option in Mechanical Engineering?'. The page also lists 'Specialized Courses', 'Unique Expertise', and 'Experiential Learning'.

THE UNIVERSITY OF BRITISH COLUMBIA
Vancouver Campus

Faculty of Applied Science
Department of Mechanical Engineering

Home Undergraduate Graduate Research Our Department News + Events Industry Contact Us

Faculty of Applied Science / Mechanical Engineering / Undergraduate / Curriculum / Program Options / Naval Architecture & Marine Engineering

Undergraduate

- Why Mech? >
- Admissions >
- MECH 2 >
- Curriculum >
- Community >
- Research Opportunities >
- Policies >

NAVAL ARCHITECTURE & MARINE ENGINEERING

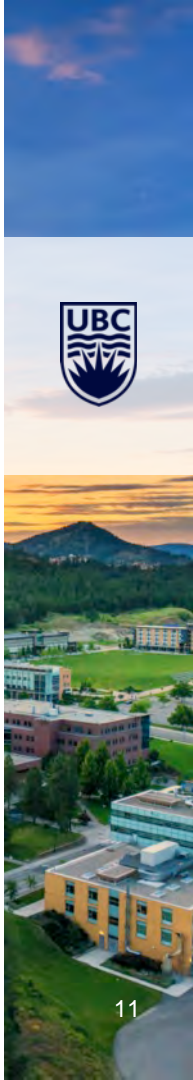
Connect the world across oceans, and create the future of one of the largest international industries through ship design.

Why Choose the Naval Architecture & Marine Engineering Option in Mechanical Engineering?

Marine transportation plays a pivotal role in facilitating intercontinental trade, ensuring the seamless flow of essential commodities, raw materials, and commercial goods across the globe. A cornerstone of international commerce and global defense, this dynamic sector requires innovation in marine transport, sustainable energy generation, and environmental stewardship. From traditional ship construction to offshore wind farms, the NAME Option allows students interested in marine systems to meet the pressing demands of this industry and drive a more sustainable marine future.

What are some unique opportunities students at UBC have?

| Specialized Courses | Unique Expertise | Experiential Learning |
|---|---|---|
| In 3rd year, students in this Option will begin taking a modified curriculum with | Our instructors have maritime industry experience, and our program has been | Our facilities include a wind tunnel, hull-testing platform, as well as a machine |



Undergraduate NAME Option

- NAME option is now available for students enrolled in the Mechanical Engineering program (first batch enrolling into third year)
- Students would be expected to complete the Option at the same time as students in the flex Mechanical Engineering BAsC stream.

| Code | Title | Credits |
|----------------------|---|-----------|
| Third Year | | |
| MECH 305 T2 | Data Analysis and Mechanical Engineering Laboratories | 6 |
| MECH 325 T1 | Machine Design | 4 |
| MECH 328 T1 | Mechanical Engineering Design Project | 3 |
| MECH 360 T2 | Mechanics of Materials | 3 |
| MECH 358 T1 | Engineering Measurements and Instrumentation | 3 |
| MECH 375 T1 | Heat Transfer | 3 |
| MECH 380 T2 | Fluid Dynamics | 3 |
| MECH 358 T2 | Engineering Analysis | 3 |
| MECH 488 T1 | Introduction to Ship Hydrodynamics | 3 |
| | Technical electives* | 3 |
| | Complementary Studies electives | 6 |
| Total Credits | | 40 |

| Code | Title | Credits |
|----------------------|--|-----------|
| Fourth Year | | |
| MECH 400 T2 | Professionalism and Ethics in Engineering | 3 |
| MECH 481 T1 | Introduction to Ship Design | 3 |
| MECH 431 T2 | Engineering Economics | 3 |
| MECH 455 T1&2 | Naval Architecture and Marine Engineering Design Project | 6 |
| MECH 463 T1 | Mechanical Vibrations | 4 |
| MECH 466 T2 | Automatic Control | 4 |
| MECH 479 T1 | Introduction to CFD | 3 |
| CIVL 435 T1 | Advanced Structural Analysis | 3 |
| | Technical electives* | 9 |
| Total Credits | | 38 |

*Students will be required to choose all 12 credits of technical electives from a constrained list of courses.

- This model can be used to develop NAME options for other disciplines such as Electrical, Civil, Materials, Integrated, Engineering Physics



Future Initiatives:

Micro-Credential: Post-Baccalaureate Certificate in Marine Vessel Design (12 Credits)

- Certificate Program complements the existing MEng and MEL program
- Similar entrance requirements as MEng and MEL
- 12 Credit certificate can be completed in as little as one term
- Options for part time available
- Program designed for industry partners and visiting students



- Foundational Core Course: NAME 591 Computer Aided Ship Design
- Two courses from restricted list in NAME (6 credits)
- One complementary course (3 credits).



Future Initiatives: Submarine Engineering

- In July 2024, the federal government announced its plans to acquire up to 12 conventionally powered under-ice submarines. There are no educational programs in Canada related to Submarine and Submersible Engineering yet the demand for engineers possessing this specialization will be critical to support this sector
- UBC NAME Program and industry are exploring opportunity to establish a complimentary submarine engineering program at UBC
- The proposed Post-Baccalaureate Certificate in Marine Vessel Design can be the foundation for the complimentary Submarine Engineering Program



Open Water Testing Facility Update

The ASSET

- Donated by Estate of Chuck Robinson – Founder MSHIPCO
 - Built ~2007
 - Used 2007-2014
 - Dormant for ~2 years
-
- Open-water / Natural Environment
 - 2 Simultaneous models
 - Tow force + 5 DOF motion



AS received

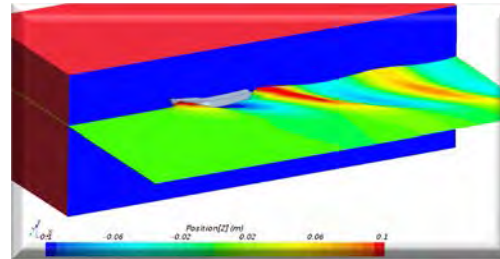


BENCHMARKING

UBC Trawler Series (1993 & 1997)

Resistance comparison:

- Original UBC Towing Tank results
- New Star-CCM+ CFD predictions
- Test Platform measurements with original model



Marine Technology, Vol. 30, No. 4, Oct. 1993, pp. 286-296

A Resistance Study on a Systematic Series of Low L/B Vessels

Sander M. Calisal¹ and Dan McGreer¹

Model resistance test results for a systematic series of low L/B displacement-type vessels are presented. The UBC Series is based on West Coast seiners and trawlers. These vessels have low L/B and L/C_{TP} values that encompass the range of existing model series data. A parent hull form was developed that has 14 percent less resistance and yet has the same displacement and deck area of a typical fishing vessel. A series of 19 models was generated by systematically varying L/B, B/T and C_{TP}. Algorithms are presented for calculation of the resistance of similar small vessels for two loading drafts. Results of side hull applications reduced the resistance of the parent hull at design speed by an additional 14.6 percent. The parent hull form is designed as a developable hull form.

| L/B | B/T | L/C _{TP} |
|----------|-------|-------------------|
| 2.4-4.0 | 2-3 | 3-4.47 |
| 4.3-3.8 | 2-3 | 4.35-3.1 |
| 3.3-1 | 1-3.2 | 3.4-4.1 |
| 3.2-3.75 | 2.3 | 3.85-3.22 |

test procedure

tests were conducted at the BC Ring Centre located adjacent to the UBC tank is 67.06 m (220 ft) long, 8.66 m (28 ft) deep. The models were constructed between 1.22 m (4 ft) and 2.13 m (7 ft) at a scale of 1:12.175. Tests at about ten speeds in the Froute 45, which corresponds to full-scale 12 knots. Two drafts were tested: one light-ship draft is defined as the one when departing for the fishing ground assumed to be empty and a full is assumed. At the loaded draft, it would be full and a half supply on board.

Fig. 6 Lines plan of UBC Series parent hull



TESTS AT SEA (FRASER RIVER)



Figure 35: Picture of a test at sea



COMPARISON

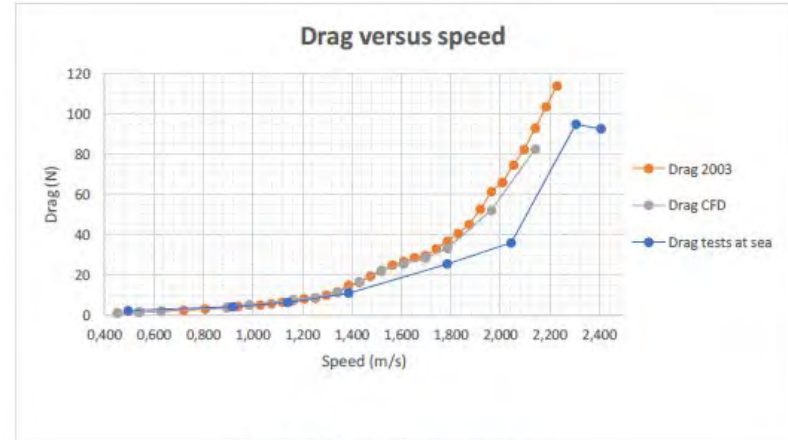


Figure 48: Three-way-comparison graph

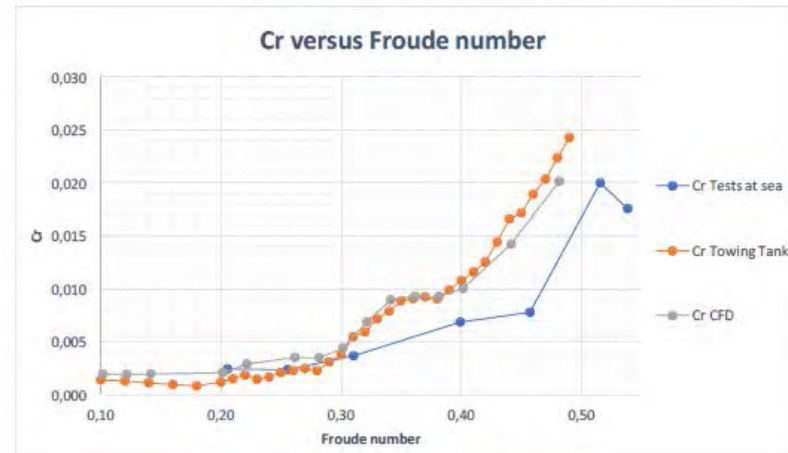


Figure 49: Dimensionless three-way-comparison graph





HULL TESTING RETURNS TO UBC AFTER 12 YEARS

October 29, 2019



CONCLUSIONS AND PLANS

Asset is “Not ready for prime time”

May be a useful at present as a visualisation tool

We believe the speed sensor is a major source of the errors

Planning a Phase II benchmarking exercise including redesign of speed sensor

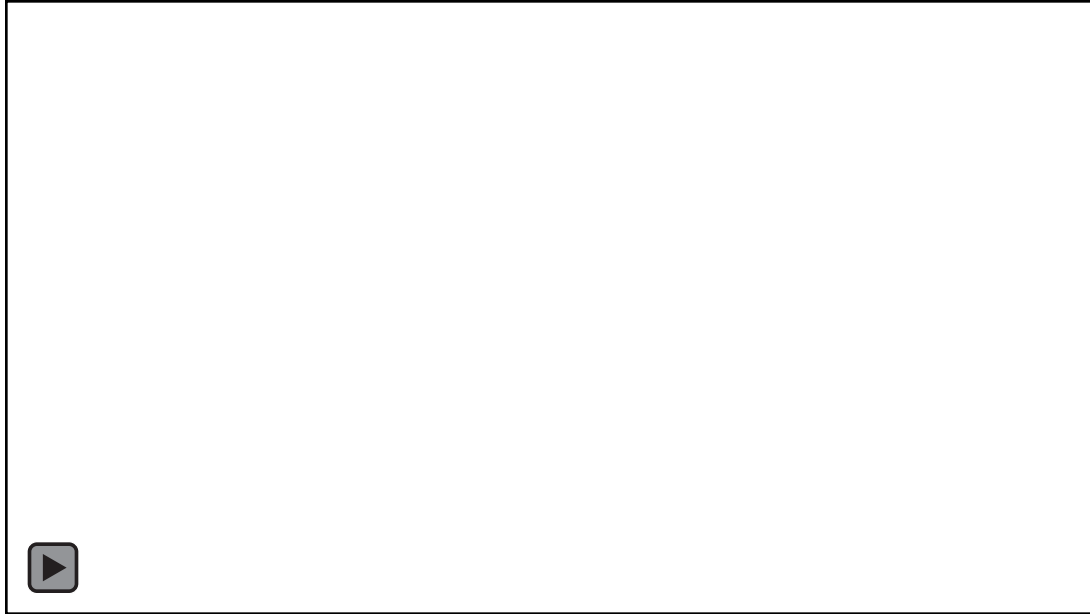
Possible MECH Capstone project

Planning to use for Visualization in NAME 502 (Hydro II)

Planning more visiting international research students



Tow Tank Development





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