Marine Technology Facilities and Research Activities at the University of Strathclyde

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VENTuRE National Networking Event Wednesday, 18 May 2022 Admiral Hall, Fort St Angelo, Birgu Waterfront



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THE UNIVERSITY OF STRATHCLYDE

- Founded in 1796
- Tradition of 'useful learning'
- Approximately 22,000 students from over 150 countries currently studying with us
- Scotland's 3rd largest University
- Five Star Overall Rating in the QS Stars University Ratings



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KEY FACTS

- Winner of eight Times Higher Education Awards
- Top 10 in fourteen subject tables Times Good University Guide 2020
- Recent winner of:
 - THE QUEEN'S ANNIVERSARY PRIZES 2019 & 2021
 For Higher and Further Education
 - UNIVERSITY OF THE YEAR 2012 & 2019
 Times Higher Education
 - SCOTTISH UNIVERSITY OF THE YEAR 2020
 The Times & The Sunday Times
- Students study withing our fours faculties: Engineering, Business, Science, Humanities & Social Sciences

NAOME - INTRODUCTION



The department of **Naval Architecture, Ocean and Marine Engineering (NAOME)** was formed in 2001 through the merger of the department of *Ship and Marine Technology* at the **University** of **Strathclyde** and the department of *Naval Architecture and Ocean Engineering* at the **University of Glasgow**, which have been involved in teaching and research in naval architecture since 1881.

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NAOME - OVERVIEW

- We have the Europe's largest Marine Technology Research Students / Staff team (Approx. 200) to sustain the production of useful and innovative ideas.
- Our academic staff (27) are internationally recognised for their expertise including international leaders with significant achievements.
- Our close links with the industry (over 300 companies) and other research institutes further strengthen our research team by the contribution of leading visiting researchers.



KEY RANKINGS

8.



WINNER UK UNIVERSITY OF THE YEAR FOR A SECOND TIME





THE QUEEN'S ANNIVERSARY PRIZES FOR HIGHER AND FURTHER EDUCATION 2019





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ENTURE

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NAOME - COMMUNITY

STAFF

- 15 Professors
- 4 Readers
- 5 Senior Lecturers
- 3 Lecturers
- 3 Technical Staff
- 10 Administrative Staff



STUDENT

- 62 Researchers and 141 PhD students
- 55 Postgraduate Students
- 205 Undergraduate Students



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NAOME - STRUCTURE

NAOME's research is organised in two Research Units:

THE OCEAN ENERGY RESEARCH UNIT

- Prof Feargal Brennan
- Prof Maurizio Collu
- Prof Sandy Day
- Dr Laibing Jia
- Prof Athanasios Kolios
- Prof Ali Mehmanparast
- Prof Erkan Oterkus
- Dr Selda Oterkus
- Dr Julia Race
- Dr Weichao Shi
- Prof Longbin Tao
- Prof Qing Xiao
- Dr Zhiming Yuan

THE MARITIME TRANSPORT RESEARCH UNIT

- Prof Evangelos Boulougouris
- Prof Mehmet Atlar
- Dr Yigit Kemal Demirel
- Dr Sefer Gunbeyaz
- Dr Byongug Jeong
- Dr Panagiotis Kaklis
- Prof Dimitrios Konovessis
- Dr Rafet Kurt
- Dr Iraklis Lazakis
- Dr Tahsin Tezdogan
- Prof Gerasimos Theotokatos
- Prof Osman Turan
- Prof Dracos Vassalos
- Prof Peilin Zhou

NAOME - RESEARCH & KE PERFORMANCE

- 63 R&KE funded projects (excluding dedicated PhD projects) are underway
- Total sum £13.5M
- £12.5M Research
- £1M KE
 - 21 funded by the EC
 - 9 are funded by EPSRC and 33 by Other sources





NAOME – RESEARCH CENTRES

NAOME also has established three Research Centres:

- The Maritime Safety Research Centre (MSRC)
- The Maritime Human Factors Centre (MHFC)
- The Peridynamics Research Centre (PDRC)







MSRC

Research areas

- Complex system safety & security
- Dynamic barrier management
- Intact & damage stability of cruise ships
- Safety culture
- Fire protection & prevention
- Blackout prevention
- LSA
- Evacuation
- Accidents
- Navigational practices

Funding

- MSRC succeeded to attract around £10M research funding from various sources, in 3 years after its establishment
- 4 H2020 Successful Applications in 2019!

Output

- 20 Journal Papers per year
- +30 Int. Conference Papers per year
- 2 PhD completions per year
- 10 UG Diploma thesis per year
- **12 Running Projects**







MHFC

Industry-focused Maritime Human factors Centre is the international home for maritime human factors to enhance the maritime safety.

The centre is supported by experimental facilities and human monitoring tools.

Full Mission Bridge Simulator



VRLab





Wireless EEG Tobii Eyetracking Glasses





PDRC

Research areas

- Composite Materials
- Corrosion Damage Modelling
- Ice-structure Interactions
- Electronic Packages
- Extreme Loading on Structures
- Structural Health Monitoring
- Structural Analysis of Renewable Energy Devices
- Fire Damage Modelling
- Underwater Acoustics
- Fatigue
- Fracture in Lithium-ion Batteries and Fuel Cells
- Fluid-structure Interaction
- Additive Manufacturing
- Nonlocal Continuum Mechanics
- Soft Materials

- Artificial Intelligence/ Machine Learning
- Structure Reliability
- Desalination
- Material Design
- Oxidation Damage in Composites
- Ships & Offshore Structures
- Subsea Structures
- Nuclear Materials
- Ship Collisions & Grounding
- Structural Control of Offshore Wind Turbines
- Nanomechanics: Greaphene Fracture & Nanoindentation
- Hydraulic Fracturing
- Vortex Particle Method



EXPERIMENTAL FACILITIES



Kelvin Hydrodynamics Laboratory

Laboratory



Fully turbulent flow channel



Full Mission Bridge Simulator



Field measurement equipment

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KHL Towing Tank

Main Features

- Tank dimensions: 76m L x 4.6m W x 2.5m D
- Maximum Carriage Speed: 4.5m/s.
- Maximum Wave Height: 0.7m (single frequency)

Balance of Work

- c30% Funded Research
- c30% Student projects
- c30% Commercial Testing

Remainder for planned maintenance, upgrades, installations, etc.





In the last 10 years, KHL has invested in:

- Carriage Drive
- Model cutting machine
- Wavemaker
- Motion Capture System
- Carriage gearboxes
- Sub-carriage system
- PIV system

Beach

- Beach & wave dampers
- Upgraded motion capture
- Underwater motion capture
- Wireless instrumentation
 Total value >£750K





Small Ocean Bassin







FTFC

Upstream Length:	2.40	m
Test Plate Length:	0.60	m
Channel Width:	0.18	m
Channel Height:	0.0225	m
Bulk Velocity Range:	~ 0.5 – 15.0	m/s
Reynolds Number Range:	~ 10.000 -	
	350.000	
Pressure taps No & range	6 taps & 20 -	mhar
	1000	mbal
Tank capacity	2.6	_m 3
LDA & PIV Access through	600 x 180 x	
Pressure drop section	22.5	mm



Dynamic Biofouling Growth Farm





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Full Mission Bridge Simulator

NTPRO-5000 Full Mission Bridge Simulator is dedicated to research to enhance maritime safety and develop solutions for Human-System Integration, system and procedure designs, Human errors, Safety Culture, Team Culture, avoidance of collision, grounding and contact while supporting research on human behavior and performance.

Simulator has capability to model safety critical situations for more than 50 different types of ships in 40 different locations and weather conditions (wind, wave, current) around the world including ice navigation.



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Marine Engineering Laboratory



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Physical Versal VENTURE

Field Measurements







Underwater and onboard noise measurements

- Onboard cavitation observations, propeller excited vibration measurements
- Onboard motion measurements

Capabilities



Yacht "Catalina"



Computational Facilities

NAOME researchers and students have access to **cutting-edge Computational Aided Engineering (CAE) software** used for Computational Fluid Dynamics (CFD) Simulations including: **ANSYS Fluent, CAESES, OpenFOAM, Shipflow, Star-CCM+**.

Time-intensive numerical simulations can be performed on the High Performance Computer (HPC) at the **regional supercomputer centre** <u>ARCHIE-WeSt</u>: 3500 cores – 38 TeraFlops – 8x512 GB RAM large memory nodes plus associated servers and storage – Located at Strathclyde University.



The broad availability of state of the art software in the NAOME department along with the **excellent industry network** allows to do research on fundamental subjects as typical **engineering projects relevant for the local and global marine industry**.



University of Strathclyde Glasgow