
University of Southampton
HARNESSING OCEAN POTENTIAL
Chair in Emerging Technologies:
Intelligent & Resilient Ocean Engineering
Harnessing benefit from our oceans more efficiently, responsibly, and sustainably, increasing capability and reducing risk.
Find out more
www.southampton.ac.uk/iroe
Royal Academy of Engineering

ROYAL ACADEMY OF ENGINEERING CHAIR IN EMERGING TECHNOLOGIES IN INTELLIGENT & RESILIENT OCEAN ENGINEERING

The Royal Academy of Engineering Chair in Emerging Technologies in Intelligent & Resilient Ocean Engineering drives activities to create a step change in ocean engineering design to support responsible, sustainable and economic use of ocean resources.

Activities address technology gaps at each stage of the engineered life cycle of ocean structures, from characterising and forecasting ocean and seafloor behaviour, to the design and operation of novel platforms for ocean facilities.

By harnessing the intelligence of robotics, autonomy, sensors and big data, next generation resilient engineered systems will unlock ocean resources for energy, food, space and transport, more efficiently, more sustainably, and with less risk to life.

The activities reach beyond engineering solutions, engaging with the public and policy makers to raise awareness of ocean engineering and guide policy for future use of our oceans.

Susan Gourvenec, Chair

Vision

My vision for this Royal Academy of Engineering Chair is for all next generation engineered ocean systems to embody intelligence, developed with new paradigms of design for greater resilience. This will be achieved through driving transformational research and embedding it in engineering practice, developing the next generation of ocean engineers and creating a community of ocean custodians.

"Oceans are a critical ecosystem for a healthy planet. Irresponsible or over utilization of the oceans would be catastrophic for humanity."

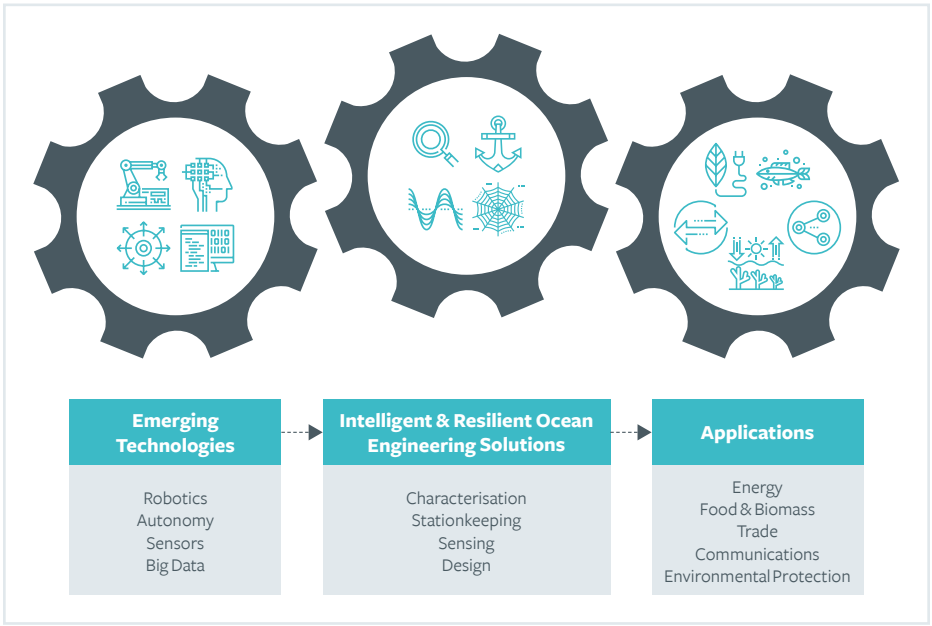
"Engineering is a humanitarian endeavour and the role of technology is to improve human life not to replace it."

Sustainability

Safety

INTELLIGENT & RESILIENT OCEAN ENGINEERING

Embedding intelligence in engineered ocean systems - whether evolved traditional systems such as vessels, platforms, subsea structures and characterisation tools, or future systems yet to be conceived - will transform our use of the oceans. Capability and resilience of engineered ocean systems will be improved, humanity's access to ocean space and resources widened, and human risk, cost and environmental footprint reduced.



The Royal Academy of Engineering Chair in Emerging Technologies in Intelligent & Resilient Ocean Engineering harnesses the intelligence of robotics, autonomy, sensors and big data to develop next generation resilient engineered ocean systems to support responsible, sustainable and economic use of ocean resources for an increasing and increasingly wealthy global population.

GOALS

The overarching goal of this Royal Academy of Engineering Chair in Emerging Technologies in Intelligent & Resilient Ocean Engineering is to develop the next generation of intelligent and resilient ocean engineering solutions to meet the growing demands of an increasing global population of increasing wealth, in a sustainable manner to protect the health of the oceans. This goal will be achieved through four key research goals alongside four key operational goals that will enable transformation of the use of our oceans within the boundaries of commercial, environmental and societal pressures.

Research Goals

Characterisation - Create intelligent site characterisation tools for autonomous deployment or operation to upscale capability without upscaling cost

Stationkeeping - Create smart mooring and anchor systems for efficient and stable platforms in increasingly harsh environments

Sensing - Create living designs by embedding intelligent sensing in engineered ocean systems that inform on system health and ultimately self-certify

Design – Create next gen concepts and methodologies, enabling modular mass produced resilient systems, performance-based design and optimal life-cycle cost

Operational Goals

Centre of Excellence - Establish a Centre of Excellence in Intelligent & Resilient Ocean Engineering

Dissemination - Research dissemination, stakeholder engagement, public engagement and outreach

Deployment - Deploy developed technologies in live offshore projects

Impact - Achieve uptake and impact from developed technologies

The goals of the this Royal Academy of Engineering Chair in Emerging Technologies in Intelligent & Resilient Ocean Engineering will deliver the next generation of engineered ocean systems, develop an enduring network between researchers and end users, support clean growth and the blue economy.

CLEAN GROWTH

Intelligent and resilient ocean engineering will make a vital contribution to clean growth through reducing greenhouse gas emissions. This will be achieved through reduced dependence on fossil fuels by unlocking ocean renewable energy resources (e.g. wind, tidal and wave); through carbon capture and storage; and through reducing dependence on traditional livestock farming through unlocking ocean biomass resources (e.g. aquaculture, seaweed, algae). Intelligent and resilient ocean engineering will reduce pressure on coastal space and the hinterland around ports by providing space to develop industrial activity and open up more versatile use of ocean space (e.g. for floating forests or floating farms). This will relieve the pressure on intensely urbanised areas, bringing food production closer to urban populations to reduce transport, and liberating coastlines for tourism and social amenity while maintaining vital activities of working ports. New technologies will enable new uses of deep ocean space, such as for open ocean energy harvesting, production and storage of zero-emission fuels, as re-fuelling stations for transocean journeys, as data collection, processing and transmission stations of oceanographic data or data generated by fleets of autonomous vehicles monitoring the health of the oceans.

[1] OECD (2016) The Ocean Economy in 2030, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264251724-en

[2] DoT (2019) Maritime 2050. https://www.gov.uk/government/publications/maritime-2050-navigating-the-future

[3] TOVG (2017) A valuation of the UK's offshore renewable energy resource. http://publicinterest.org.uk/download/archive/offshore_valuation_full.pdf

[4] BEIS (2013). Wave and tidal energy: part of the UK's energy mix. https://www.gov.uk/guidance/wave-and-tidal-energy-part-of-the-uks-energy-mix

[5] OREC (2018) Tidal stream and wave energy cost reduction and industrial benefit. https://ore.catapult.org.uk/?orecatapultreports=tidal-stream-and-wave-energy-cost-reduction-and-industrial-benefit

£2.3tn
Global ocean industry value-added by 2030[1]

£40bn
Gross value added to UK economy from maritime sector[2]

1m
Number of jobs supported by maritime sector in UK[2]

30%
Share of practicable renewable resource to harness to reduce UK CO_2 emissions by 1.1bn tonnes by 2050[3]

50%
UK's share of Europe's tidal energy resource[4]

14,500
Potential new UK jobs from tidal energy[5]

£1.4bn
Potential gross value added to UK economy from tidal energy[5]

Find out more

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Royal Academy of Engineering Chair in Emerging Technologies Scheme

The Academy's Chair in Emerging Technologies scheme aims to identify global research visionaries and provide them with long term support to lead on developing emerging technology areas with high potential to deliver economic and social benefit to the UK.

Find out more: **https://www.raeng.org.uk/grants-prizes/grants/support-for-research/chair-in-emerging-technology**