

Research and Innovation Overview 2024

Department of Electronic Engineering

The Department of Electronic Engineering at Maynooth University, within the Faculty of Science and Engineering, continues to advance its reputation for research excellence. During 2022-23, with 10 permanent academic staff and several research staff, the department made significant contributions to the university's strategic goals, particularly through its involvement in cutting-edge research and industry collaboration.

Head of Department: Professor Gerard Lacey



Research Themes and Focus Areas

The department's research covers a wide array of engineering topics, with particular focus on:

- **Control and Ocean Energy:** Developing innovative control strategies for wave energy conversion.
- **Wireless Systems and Telecommunications:** Advancing wireless communication technologies, including 5G and 6G.
- **Robotics and Intelligent Systems:** Pioneering robotics for applications in agriculture and aircraft safety.
- **Photonics:** Exploring new frontiers in optical communication and biomedical applications.



Significant Research Outputs

In 2022-23, the Department of Electronic Engineering produced a total of 42 journal articles and 29 conference papers, showcasing its commitment to impactful research. These outputs include contributions to high-impact journals and conferences in the fields of wireless systems, wave energy, and photonics.

Publications

- Ringwood, J.V., Zhan, S., and Faedo, N. (2023). Empowering wave energy with control technology: Possibilities and pitfalls. *Annual Reviews in Control*
- Kishk, M.A., Qin, Y., and Alouini, M.-S. (2022). Stochastic Geometry-based Analysis of Multi-Purpose UAVs for Package and Data Delivery. *IEEE Internet of Things Journal*

Awards

- €412,538 for the SFI/IRC Pathways Project, awarded to Dr Andrei Ermakov to develop advanced control strategies for wave energy converters.
- €1.2 million in Science Foundation Ireland funding for the COER group's ongoing contributions to wave energy and sustainable energy systems.



Collaborations and Partnerships

The department is highly engaged in national and international collaborations, with projects co-authored alongside global research institutions. Key partnerships include:

- **COER Group:** Working with top academic institutions like Virginia Tech, University of Michigan, and Danish Technological University on wave energy projects.
- **Telecommunications Research Group:** Collaborating with industry leaders such as Analog Devices and Comex McKinnon on innovations in wireless communication and agricultural robotics.

Additionally, the department is part of high-profile SFI Centres such as MaREI and CONNECT, contributing to Ireland's leadership in sustainable energy and future networks.



Research Impact and Societal Contributions

The department's research has wide-reaching societal impact, particularly in sustainable energy and technological advancements. Key projects like the Seachange and LeapHi initiatives aim to revolutionise wave energy conversion, with direct implications for reducing carbon emissions and advancing renewable energy systems. These efforts are supported by collaborations with industry, making the department a leader in applied engineering research.

In the field of robotics, the department's work on the SMART HANGAR project is set to improve safety and efficiency in aircraft operations, further demonstrating its commitment to practical, impactful research.



Future Directions

Looking ahead, the department plans to expand its research in robotics, photonics, and quantum communications, areas with significant potential for industrial applications and academic advancement. The creation of an MSc in Robotics and AI is also under consideration, which will strengthen research capabilities and foster industry collaborations.

The Department of Electronic Engineering at Maynooth University continues to thrive in its mission to push the boundaries of engineering research. Through its strong international collaborations, industry partnerships, and contributions to societal well-being, the department remains at the forefront of innovation in electronic and telecommunications engineering.