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**Presenter:** Professor Mohsen Asadnia, School of Engineering, Macquarie University

**Title:** Micro/Nano-Engineered Materials for Environmental Sensing and Energy Applications

**Biography:**

**Biography:** Mohsen Asadnia is a Full Professor at the School of Engineering, Macquarie University-Sydney, Australia, where he also directs the Master by Research program within the Faculty of Science and Engineering. He has previously been affiliated with Nanyang Technological University (NTU) in Singapore, the Massachusetts Institute of Technology (MIT) in the USA, and the University of Western Australia (UWA). He is recognised as one of the leading researchers in smart materials and sensor technologies for health and energy applications. His current research focuses on developing innovative biomedical devices, including MEMS-based sensors and microfluidic platforms, aimed at improving medical diagnostics and environmental monitoring. In addition, Prof. Asadnia is advancing the bioengineering of the inner ear, with a particular focus on developing auditory hair cells and the basilar membrane, as well as bioengineering tools for balance disorders and inner ear diseases such as Meniere’s. Prof. Asadnia has secured over $11 million in research funding from prestigious organisations such as the Australian Research Council (ARC), the National Health and Medical Research Council (NHMRC), and various industry partners in Australia. Throughout his career, he has supervised and graduated 15 PhD students, contributing significantly to the next generation of engineers and researchers. He has published more than 150 peer-reviewed papers with 9200 citations and H-index of 54, and holds eight patents.

**Abstract:** The absence of innovative micro and nano-engineering solutions in sensor technologies is hindering advancements in health diagnostics and sustainable energy solutions, with significant potential impact on both the global and local economies. In healthcare and environmental monitoring, the need for precise, robust, and reliable devices is critical. Our team is focused on developing cost-effective, easy-to-fabricate sensor technologies inspired by biological systems, such as biomimetic flow sensors, nanochannels and ion selective membranes, and hydrogel nanocomposites. These flexible, stretchable, and highly sensitive materials are poised to be game changers, providing practical, real-time solutions for industries including environmental safety, healthcare, and renewable energy. This seminar presents our recent advances in micro- and nano-engineering for sensing and clean energy. Nature-inspired sensors—such as artificial hair cells and hydrogel-based pressure sensors—are introduced for applications in health monitoring, environmental sensing, and other industrial applications. The development of electrochemical sensors for detecting ions and hazardous substances is also discussed, along with strategies to reduce signal drift and improve long-term stability. The seminar concludes with breakthroughs in blue energy, where bioinspired membranes are used to harvest power from salinity gradients.