Cross-Curricular STEM Stream

J12 Engineering and Technology Precinct

8:00AM – F23 Administration Building – *Registration*
9:00-10:30AM – Eastern Avenue Auditorium – *Official Opening, Acknowledgement of Country, and Opening Plenaries*
10:30-11:00AM – *Move to J12 Engineering and Technology Precinct*
11:10AM-1:00 PM *Master of Ceremonies* **Associate Professor Tom Goldfinch,** Engineering education specialist, The University of Sydney

11:15AM *Cross-Curricular Education Keynote Speaker 1*
Professor Stuart Khan, Head of School of Civil Engineering, The University of Sydney
Topic: Future proofing water supplies for a thirsty nation
Synopsis: Professor Stuart Khan will share his story, where STEM can take your students. **His journey from growing up in Coffs Harbour NSW, to where he is now.** He will share aspects of STEM which were influential, and the work he does. You will hear about the challenges, how teams work and what does his work mean to him.

11:40AM Professor Marjorie Valix, Head of School of Chemical and Biomolecular Engineering, The University of Sydney
Topic: Critical Minerals and reaching Net Zero
Synopsis: A foundation in chemistry and physics can lead to transformative roles in engineering, including sustainable mining. Marjorie applies her expertise to innovate metal recovery from low-grade ores and electronic waste using microorganisms. She also pioneers carbon capture techniques in mine tailings and transforms them into eco-friendly concrete, driving the shift towards a net-zero future. **Marjorie's talk will link STEM subjects in school to solving global issues**.

12:05PM *Cross-Curricular Education Keynote Speaker 3*
Dr Jeremy Qiu, Senior Lecturer, School of Electrical and Computer Engineering, University of Sydney
Topic: Sustainable energy planning and trading
Synopsis: There is no doubt that data, big data, computation and modelling are at the heart of decision making impacting society. Jeremy's research connects mathematics, comutation to engineering, and follows through to policy. **His talk will focus on STEM at the school level laying the groundwork for role of big data in policy**.

12:30PM *Cross-Curricular Education Keynote Speaker 4*
Dr Elliot Varoy, Senior Lecturer, School of Computer Science, University of Sydney
Topic: Innovative Learning with VR, AI, and Programming
Synopsis: Elliot Varoy's expertise includes developing educational tools and games, with a strong focus on object-oriented and visual programming, alongside large cohort first year experiences. He is also interested in applying these resources across a variety of contexts. **His talk will highlight this by exploring the use of VR and AI for teaching** sign language and te reo Māori, showcasing innovative approaches to enhance learning outcomes across diverse fields.

1:00 – 2:00PM Lunch J12 Wintergarden

2PM Workshop Session 1

Option 1

Professor Deanna D'Alessandro, Professor in the School of Chemical & Biomolecular Engineering and Director of Net Zero Institute (NZI), The University of Sydney

Topic: Net Zero Initiative (NZI): Enabling Rapid Change for a Thriving Planet

Synopsis: This session will provide an overview of the latest multidisciplinary flagship research institute at the University of Sydney. We span all Faculties of the University and are focusing on technologies and systems that address climate change risk, carbon removal, emissions avoidance both through zero emissions energy and demand reduction. We will outline some of the low-emission technologies our researchers are working on with partners from industry and government and the policy frameworks around existing, new and emerging technologies that are required for societal adoption. Upskilling and educating our workforce for the new and changing climate sector is key for Australia to remain globally competitive, we will provide examples of some of our recent activities.

Associate Professor Nicholas Lawson

Dr. Michael Heisel

Dr. Rod Fiford

Option 2 – J03 Engineering and Technology Precinct

Associate Professor Nicholas Lawson specializes in the development of advanced instrumentation for airborne and aerodynamic measurements, in both airborne and wind tunnels.

Dr. Michael Heisel's work aims to enhance our understanding of flow dynamics and improve their representation in models used for global weather, climate research, wind farm performance, atmospheric particle tracking, and flood prediction.

Dr. Rod Fiford teaches a range of engineering courses, including Design & Production, Industrial & Product Design Engineering, and Safety Systems & Risk Analysis with notable works on student engagement in studio teaching, the mechanical properties of rat spinal cord, and spinal cord injury models.

Topic: Engineering in Action

Synopsis: This workshop is an opportunity to explore student and research facilities while gaining insights into the practical applications of engineering principles.

Highlights:

Boundary Layer Wind Tunnel: Learn how wind influences structural engineering, powers wind turbines, aids in pollution modelling and the critical role of wind in various engineering projects.

Fluids Laboratory: Observe the large wave flume in motion, demonstrating the impact of surface waves on structures and gain an understanding of fluid dynamics and its applications.

Explorer Space: Visit the area where students engage in prototyping, design, and testing. See projects in development and the creative process behind engineering solutions.

Eight360 NOVA flight simulator-a 360-degree virtual reality cockpit that replicates piloting any aircraft, from an A380 to a spaceship. With unlimited rotational axes, it permits complex movements like spinning and inverted flight to create an environment that links to the 'cause and effect' of aircraft design.

3:15PM Workshop Session 2

Option 1 – J03 Engineering and Technology Precinct

Professor Gwenaelle Proust, Professor of Materials Engineering and Director of Sydney Manufacturing Hub (SMH), The University of Sydney

Bruce McLean is the chief engineer of the Sydney Manufacturing Hub. He is a professional engineer with more than 30 years of experience in the aerospace and aviation industry. He has diverse experience in technical operations, maintenance, manufacturing, technology development and Additive Manufacturing (AM). For the past 15 years, Bruce has focused on Additive Manufacturing, specifically metal powder bed AM.

Topic: Sydney Manufacturing Hub (SMH)

Synopsis: Explore a world of advanced manufacturing and cutting-edge technology. Witness firsthand modern production processes, such as a range of 3D printing technologies. During the visit, you will tour the state-of-the-art facility and see components made from metal, ceramic, plastic and composite showcasing the latest in manufacturing innovation. This experience aims to inspire and educate the next generation about the diverse career opportunities within the manufacturing sector, emphasizing the importance of STEM education in shaping the future of the Australian manufacturing industry.

Option 2 – Sydney Quantum Academy

Rebecca Halligan is the Chief Operating Officer at the Sydney Quantum Academy and a Superstar of STEM championing diversity and careers in quantum.

Simon Devitt is an Associate Professor at the University of Technology Sydney, Director of the Australian Quantum Software Network and Managing Director of the quantum technology firm h-bar.

Topic: How quantum literacy will be as important as digital literacy is now

Synopsis: We are at the beginning of a new technological revolution, one where information processing systems begin to incorporate the rules of nature at its most fundamental level, quantum. Not only will this usher in a new set of computational, communications and sensing technologies but it will also bring a whole new set of educational challenges. While quantum mechanics has proven itself to be the most successful theory that human beings have ever conceived, it carries conceptual baggage - so much so that the general public considers it to be accessible only to experts. This needs to change. We will discuss opportunities in Australia and efforts to build this new type of literacy, not just at the university level, but also with younger and younger students, using new tools, techniques and lessons that could serve as a re-imagining of how we teach large swaths of STEM in the future.

4:30 – 6:00 Social and networking activities (included in registration – please **select** which option you will attend on conference app)
4:30 – 5:30 PM Engineering Tour (limited numbers) - meet at Engineering J03
4:30 – 6:00 PM STEM Festival Networking Event – TAG Family Foundation Grandstand

6:00 – 10:00 PM Dinner – The Refectory Banquet Hall, The University of Sydney (additional registration required)

THE UNIVERSITY OF SYDNEY