



Short Bio of Prof. **Sivakumar Nadarajan**

Sivakumar Nadarajan (S'12–M'16–SM'24) received the B.Tech. degree in electrical and electronics engineering and the M.Tech. degree in electrical drives and controls from Pondicherry Engineering College, Pondicherry, India, and the Ph.D. degree in electrical engineering from the National University of Singapore, Singapore. He has accumulated around 19 years of industrial experiences from aerospace, marine, automotive, and other industrial sectors. From 2009 to 2024, he was with Rolls-Royce Singapore Pte. Ltd., Singapore, as a technical manager and Head of CoE – Electrical equipment health monitoring. Since July 2024, he has been working as an Associate Professor in the engineering cluster supporting electrical engineering and naval architect programmes at Singapore Institute of Technology, Singapore.

Dr. Nadarajan has filed 40 patents in USA and Europe and published over 50 research papers in international journals and conferences. He is a certified chartered engineer by Institute of Engineering and Technology (IET), UK, and also a certified Project Management Professional (PMP) from Project Management Institute, USA. He also recognized with various awards for his innovation and technology development, including the 2023 ASEAN outstanding engineering achievement award from AFEO, the 2023 IES prestigious engineering award from IES, Singapore, and also received the Sir Henry Royce awards for innovation and engineering excellence from Rolls-Royce Plc. He is currently involved in applied research projects with strategic industrial partners to address their challenges on adopting electrification and health monitoring solutions in industrial and marine platforms. His current research interests include condition monitoring, marine EV charging, failure prognosis, electrical machine, electric drives, power electronics, and machines modelling. Dr. Nadarajan has supported various IEEE activities, he is currently serving as a local arrangement chair for IEEE ITEC-AP, Associate Editor for IEEE IAS transactions, Guest editor for IEEE transaction on consumer electronics, IEEE standards working group chair for MSDAD.

Topic and abstracts of your distinguished lectures

Topic1: Aircraft electrification and challenges

Abstract: The aviation industry makes up around 2% of global greenhouse gas emissions, and the industry grows at an average of around 4% every year for next 20 year, hence it important to look at various avenues to reduce emission from the industry for the journey towards NetZero. Aircraft electrification has emerged as a promising solution, offering the potential for improved energy efficiency, reduced operating costs, and emission. However, achieving meaningful electrification in aviation poses significant technical and operational challenges. This lecture provides an in-depth exploration of aircraft electrification, covering key electrification strategies for various aviation market segments. The lectures in this topic highlight critical barriers including power-to-weight ratio constraints, battery energy density, safety and certification issues, and integration into existing aircraft architectures. The lectures conclude with a review of current research trends, industry initiatives, and the roadmap towards sustainable aviation industry. Attendees will gain a comprehensive understanding of the technological, regulatory, and practical challenges that must be overcome to make electric aviation a viable reality.

Topic2: Electrical equipment health monitoring for safety critical applications

Abstract: Electrification is a key strategy to reduce emission from transportation sector, the operational reliability of aircraft and marine vessels heavily depends on critical electrical equipment used for power and propulsion applications such as motors, generators, power converters, and switchboards. The undetected faults in the electrical equipment manifest into failure quickly and may lead to blackout or expensive catastrophic events. The lecture provides overview of aircraft and marine electrification strategies, importance of Equipment Health Monitoring (EHM) of electrical equipment to improve reliability and availability, technology requirements for the electrical EHM, value added services enabled by EHM. The lectures in this topic, highlight various novel technologies proposed for monitoring critical onboard electrical equipment in marine and aerospace industrial sectors, as well as the commercial health monitoring solutions for electrical equipment. Attendees will gain a comprehensive understanding of the EHM framework, technological requirements, technical gaps, practical challenges and value proposition offered by the equipment health monitoring.

Topic3: NetZero and transport electrification

Abstract: Governments, industries, and institutions worldwide are setting ambitious NetZero targets to halt the progression of climate change thru driving rapid innovation

across industrial sectors. Transportation sector contributes around 15% of global greenhouse gas emission, electrification of transportation assists to reduce the emissions. The land transport sector shows significant progress in adopting electrification to reduce emission. However, the aviation and marine sectors are at an early stage of electrifying aircraft and marine vessels. The lectures in this topic, provide concept of NetZero, NetZero goal and targets, status of NetZero targets, electrification strategies for marine and aerospace applications, and challenges. Attendees will gain a comprehensive understanding of NetZero, NetZero initiatives, electrification of aviation and marine sector, industries initiatives, and technical challenges.

Topic4: e-mobility charging

Abstract: Given that the transportation sector contributes around 15% of global greenhouse gas emissions, electrification across land, sea, and air sectors is essential for achieving the sustainability targets. The land transport sector has shown substantial progress, whereas aviation and marine applications are still at early stages of electrification. Though the automotive industry has made significant progress in deploying standardized AC and DC charging solutions, the marine sector still remains in its infancy. Currently, marine electrification largely depends on customized or adapted automotive charging systems, as no universally accepted standards for marine charging exist. The emerging Megawatt Charging System (MCS) standard aims to address these challenges, but global implementation will take time. The lectures in this topic provide overview of various AC and DC charging options, standards for DC fast charging, challenges in charging marine full electric vessels, Megawatt charging system, V2G and renewable energy integration in e-mobility charging. Attendees will gain a comprehensive understanding of e-mobility charging including slow and fast charging for automotive and marine applications, existing standards for charging and technical challenges.