SPACE 2025

(SPace, Aerospace and defenCE Workshop)

July 20, 2025

Sheraton Grand Bengaluru Whitefield Hotel & Convention Center

SPACE WORKSHOP SCHEDULE

July 20, 2025

	Zinnia	Amarylis	Petunia	Poinsettia 1	Poinsettia 2	Heliconia 1
08:30-10:30	WS1: Distributed Sensor Technology and Education Initiative (DSTEI)	WS2: MOONSHOT	WS4: Passive Radar for Space, Aerospace and Defence Applications	WS7: Next-Gen Verification Strategies for Complex SoCs: AI-Driven, Scalable, and Future-Ready	WS10: Digital Twin for Uncrewed Air Transportation	WS14: Spacecraft Power System
10:30-11:00	TCN1: Tea/Coffee/Networking					
11:00-13:00	WS1: Distributed Sensor Technology and Education Initiative	WS2: MOONSHOT	WS5: Active Device Measurements using VNA	WS8: Robust Engineering Systems Control Systems and Signal Processing (RES CSSP) Toolbox	WS11: From Threat Detection to Test Automation: A Unified NI Technology Workshop	WS15: Designing Smart Satellite Missions : MBSE Meets AI
13:00-14:00	LB1: Lunch Break/Networking					
14:00-16:00	WS1: Distributed Sensor Technology and Education Initiative	WS3: Simulation-Driven Lunar Orbit Planning and Optimization	WS6: MIMO Radar Technology: From Fundamentals to Applications	WS9: Optimal Computational Guidance for Challenging Aerospace Missions	WS12: Microwave Integrated Circuit Components Design Essentials	
16:00-16:30	TCN2: Tea/Coffee/Networking					
16:30-18:00	WS1: Distributed Sensor Technology and Education Initiative	WS3: Simulation-Driven Lunar Orbit Planning and Optimization	WS6: MIMO Radar Technology: From Fundamentals to Applications	WS9: Optimal Computational Guidance for Challenging Aerospace Missions	WS13: Performance of Spacecrafts and its Payloads in Space Weather	

WS1: Distributed Sensor Technology and Education Initiative (DSTEI) Tutorial

Room: Zinnia Time: 8.30AM-5.00 PM

EO/IR Distributed Sensor: Dr. Mark E Davis

Abstract: The Distributed Sensor Technology and Education Initiative (DSTEI) tutorial is motivated for small sensors on Drones. This Lecture is divided into five parts.

- DSTEI Project Objectives: A distributed grouping of Drones is considered for AESS Student Branch Chapters as a project design.
- EO/IR Sensor System: The design of an electro-optic/infrared (EO/IR) sensor on small Drones is detailed. A concept of these devices on a Drone are presented for area coverage for crops and fire surveillance.
- Planck's Law The requirements for sensing by the direct solar illumination and indirect irradiance of the target is considered. The day/night sensing is presented based on the sensor design.
- Focal Plane Array Design: A focal plane array (FPA) is defined for the lens, imaging sensor and distance resolution. The impact of FPA characteristics for EO and IR designs are provided in several flight geometries.
- Sensor/System Interfaces: The last section of the lecture will illustrate materials design, area coverage rate of the data collection and interface to the navigation and datalink during a project collection.

Multi-Target Tracking: Stefano Coraluppi

Abstract: We start with general comments on the multi-target tracking (MTT) problem and some mathematical preliminaries. Multiple-hypothesis tracking (MHT) is a leading paradigm for MTT. We describe the target and sensor mathematical modeling assumptions that enable track-oriented MHT. Next, we derive the MHT recursion and illustrate its use with illustrative examples. We provide broader context by describing connections between MHT and the overall taxonomy of MTT methodologies. We discuss recent advances in cutting-edge MHT processing and their relevance to operational surveillance applications.

Despite the proven success of MHT as a methodology for MTT, computational constraints and other fundamental performance limitations may lead to unacceptable performance in some settings. We discuss the benefits that can be achieved with multi-stage MHT processing. In many settings, judicious distributed MHT processing enables improved performance over (necessarily suboptimal) centralized MHT. We provide illustrative examples from several domains. Additionally, we describe recent advances in graph-based tracking, a fast (approximate) approach to MHT that provides improved results in certain applications.

Satellites, Smart Payloads: Exploring Satellite Applications through Pico-satellites: Giovanna E. Ramirez

Abstract: This lecture introduces the foundational concepts of artificial satellites, with a specific focus on payloads and sensor applications in pico-satellites and CanSats. Starting with a historical overview of spaceflight from the launch of Sputnik-1 in 1957, the session transitions to the modern use of small satellites as platforms for innovation, education, and research.

- Satellite Applications: Earth observation, meteorology, disaster management, communications, and navigation.
- Payload & Sensor Integration: How compact payloads (e.g. atmospheric sensors, GPS, imaging systems) are selected and implemented.
- CanSat Projects: Hands-on educational platforms that simulate real satellite missions with sensor data and telemetry.
- From Learning to Launching: How CanSat experience leads to CubeSat and pico-satellite development, including examples from Latin America.

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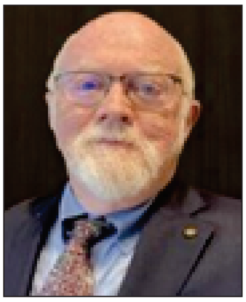
An Introduction to UAV Technology, Applications and Regulationslites : Dr. Vincent Socci

Abstract: Drone operations are becoming more commonplace in society. Any adult may purchase a drone for hobby operation and may choose to pursue licensing for commercial operation. A new pilot may become more effective by understanding drone technology. A new business operator can be more profitable by understanding relevant drone applications. The FAA has recently issued updated rules for drone registration, pilot licensure, and operation. The purpose of this lecture is to prepare the public to be knowledgeable users of drone technology, effective strategists in drone business applications, and good citizens of drone operator regulations and policies. An orientation of UAV technology, operating regulations, and business applications is provided.

Bio-Sketch for speakers:

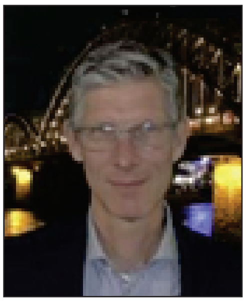
Dr. Mark E Davis, 2022-2023 IEEE AESS President



Dr. Mark E. Davis has over 50 years' experience in Radar technology and systems development. He has held senior management positions in the U.S. Defense Advanced Research Projects Agency (DARPA), Air Force Research Laboratory, and General Electric Aerospace. At DARPA, he was the program manager on both the foliage penetration (FOPEN) radar advanced development program and the GeoSAR foliage penetration mapping radar. Dr Davis has written a new text on Ultra-Wide Band Surveillance Radar, published by IET in January 2021. He has been the DSTEI Project leader for the AESS system design of distributed EO/IR sensors.

His education includes a PhD in Physics from The Ohio State University, and Bachelor and Master's Degrees in Electrical Engineering from Syracuse University. He is a Life Fellow of both the IEEE and Military Sensing Symposia, and Past-President of IEEE Aerospace Electronics Systems Society (AESS). He is the 2011 recipient of the AESS Warren D White Award for Excellence in Radar Engineering, and the 2018 IEEE Dennis J. Pickard Medal for Radar Technologies and Applications.

Stefano Coraluppi: Chief Scientist at Systems & Technology Research (STR)



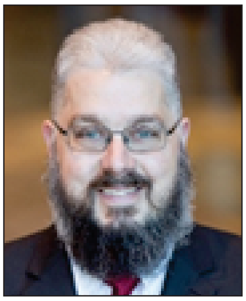
Stefano Coraluppi is a Chief Scientist at Systems & Technology Research (STR), an IEEE Fellow, and an IEEE AESS Distinguished Lecturer. He received the BS in Electrical Engineering and Mathematics from Carnegie Mellon University (1990), the MS in Electrical Engineering from the University of Maryland (1992), and the PhD in Electrical Engineering from the University of Maryland (1997). He has held research staff positions at ALPHATECH (now BAE Systems, 1997-2002), the NATO Undersea Research Centre (now NATO CMRE, 2002-2010), Compunetix (2010-2014), and STR (since 2014). His research interests include multi-target tracking, multi-sensor data fusion, distributed detection and estimation, nonlinear filtering, and optimal and stochastic control. He serves on the IEEE AESS Board of Governors and the ISIF Board of Directors. His past service includes Associate Editor-in-Chief for the IEEE Transactions on Aerospace and Electronic Systems, Editor-in-Chief for the ISIF Journal of Advances in Information Fusion, General Co-Chair (with Peter Willett) for FUSION 2006 in Florence, Italy, General Co-Chair (with Lauro Snidaro) for FUSION 2024 in Venice, Italy, and NATO STO

Giovanna E. Ramirez, Analog Astronaut, Colombia

Giovanna E. Ramirez received her professional degree in Electronic Engineering, as well as a Master's Degree in Development and Integral Project Management. She is also a certified aviation pilot and analog astronaut recognized by training and research centers in Poland. She has completed numerous aerospace training programs in various countries. Currently, she leads STEM projects at the Scientific Corporation of the Aerospace Sector (COCSA) and has served as a mentor for the

Space4Women program, an initiative by the United Nations. She was also a professor in the master's program in aerospace engineering at San Buenaventura University and the Colombian School of Engineering Julio Garavito. Past president of the professional chapter Aerospace & Electronic Systems Society- AESS Colombia section (2019-2021); Former fellow of the Japan Global Space consortium, Researcher and developer of a space mission through a HeptaSat-satellite. She has worked in the Directorate of Science, Technology and Innovation and in the Postgraduate School of the Colombian Air Force. She has been involved in several national and international research projects in cooperation with IEEE (Institute of Electrical and Electronics Engineers), UNISEC (University Space Engineering) and the Colombian Air Force. She has recognitions such as: the International "Ten Outstanding Young People" JCI Award 2024; "Successful Women Award Colombia 2020" in the Science and Technology category, Best Young professional IEEE 2019. Entrepreneur of the year 2018 'with the JULIO GARAVITO award', and Author of the "Genius Pamper" invention. Recognized as Young Promise Under 30 by COLPARMEX, and selected as Recipient of the International Galileo Chair by COLPARMEX.

Dr. Vincent Socci: CTO, Target Motion



Vincent Socci is the CTO of On Target Motion, where he provides engineering, program management and business development services for aerospace, automotive, rail, marine, and other safety-critical applications. Previously, as Product Cost Director at Blue Origin, he managed the product engineering, production, and operation cost of rocket engines. Prior to that, he led National Instruments transportation business development throughout the Americas and provided business and technical support for customers in vehicular applications, with emphasis in propulsion and autonomous systems. With 35 years of experience in aerospace, automotive, rail, power electronics, and medical systems, he has engineered systems in the most complex applications. His specialized areas of interest are embedded controls, real-time test, and systems engineering for vehicle-based applications. In the early 90's, Socci patented the first electronics for the Cummins B-series diesel engine, which are still in use today. In the mid-90's, he developed power controllers for GE locomotives. Late-90's into 2000's, he led the development of the HybriDrive HEV powertrain, which was used on various platforms from commercial buses and taxis to military trucks. Through the 2000's into 2010's, he led the development of aerospace and automotive vehicle control systems for power, communications, fueling, radar, motor controls, and unmanned systems. He was the Director of Large Transport Fuel Systems for Parker Aerospace, leading the development of the A350XWB aircraft to first flight. Socci then developed advanced validation systems for propulsion and autonomous applications, using simulation/emulation architectures, products, and workflows to solve transportation product development challenges. Currently, he is focused on aerospace innovation including commercial space transportation and UAV development. He is a Ph.D. candidate and holds a BS in electrical engineering, MS in electrical engineering and MBA in technology management. Socci has served on the Board of Directors and governing boards of several professional societies, including IEEE, SAE, and PMI. He also serves as an expert witness in aerospace, automotive, and medical device litigation.

WS 2: MOONSHOT: Cislunar Transport, Guidance, Navigation, and Space Domain Awareness

Room: Amarylis Time: 8.30AM-1.00 PM

Overview: The Global Exploration Roadmap has inspired international interest in a new era of human exploration of the solar system. Recent years have seen exponential growth in the launch of space objects and there is an increased interest in having a permanent cislunar presence through the Artemis program and various other governmental and private-sector efforts. A sophisticated understanding of motion of a spacecraft in multi-body environments such as the cislunar space is essential to transit across various regions in the cislunar space and to forecast and track objects for mission safety and collision avoidance. Over the past several decades, the perturbed two-body restrictive framework has been the foundational backbone for providing extensive modeling, analysis, and analytical solutions to study spacecraft motion in orbits around the Earth. However, beyond GEO (XGEO) the dynamical environment shifts, and the structure of fundamental behaviors can be radically different. The primary challenge that limits the transferability of tools and techniques from the LEO/GEO to XGEO regions is non-Keplerian dynamics, data sparsity from limited coverage and availability of sensors. In a large part, periodic orbits and their associated invariant manifolds dictate the design of transfer trajectories between the neighborhoods of the Earth and Moon. This tutotial session will provide a primer on the methods and mathematics for cislunar astrodynamics methods with a focus on state-of-the-art tools and techniques developed to investigate the behavior of transport mechanisms across this region. The design of transport highways connecting different cislunar regimes will be discussed. The talks will also provide details of transitioning low-fidelity solutions to higher-fidelity. Novel tools to propagate state uncertainty, search and track spacecraft in cislunar space will be discussed. How the navigation error grows in different cislunar regimes and the performance of different state estimation algorithms in providing a statistically consistent estimate of spacecraft position and velocity will be discussed. At the end of the tutorial session, participants will be able to:

1. Explore the dynamical environment of cislunar space under multiple fidelities: equilibrium points, periodic orbits, quasi-periodic orbits using tools such as chaos indicators, invariant manifolds, and Poincare sections.
2. Learn to apply uncertainty propagation and filtering techniques to cislunar trajectories.
3. Develop methods for trajectory design and performing Guidance, Navigation, and Control for inside the cislunar environment.
4. Be exposed to implementation challenges such as computational complexity, non-Gaussian uncertainty, reduction of filter dimension, colored noise, and discretization.

Cislunar space is drawing increasingly sharp interest from the international space community warranting attention. This tutorial session will cater to both professionals from the defense community who develop plans, capabilities, expertise, and operational concepts for enhanced space domain awareness beyond GEO realm and commercial space players necessary for a sustainable human presence as part of the “Moon-to-Mars" paradigm. It will address challenges in spacecraft operations such as staying in a trajectory, transfers between different trajectories, Earth and Moon, different orbit types and their utility for exploration v/s surveillance and present the state-of-the-art in their development.

Abstract:

Understanding Transport Mechanisms in Cislunar Space: Roshan Eapen: Transport mechanisms in the restricted three-body problem rely on the topology of dynamical structures created by gravitational interactions between a particle and the planets' governing its motion. In a large part, periodic orbits and their associated invariant manifolds dictate the design of transfer trajectories between the neighborhoods of the two primaries. In this talk, the behavior of such dynamical structures is investigated using dynamical systems theory. This talk will identify transport opportunities to planar libration point orbits and promote the development of a catalog of transfers in cislunar space. A special focus on dynamical modeling of high-fidelity motion will also be discussed.

Chaoticity in Cislunar Space: Prof. Puneet Singla: This talk examines navigation error growth in cislunar space and evaluates the consistency of various linear and nonlinear uncertainty propagation algorithms. Error growth is quantified using the nonlinearity index and finite-time Lyapunov exponent, while consistency is assessed by comparing state probability density approximations. Insights will be provided on the long-term propagation of state errors and effects of measurement sparsityon the performance of precise orbit determination.

Navigating Cislunar Space: Prof. Maruthi Akella – This talk will leverage the advances in optimal control theory and numerical methods to design ballistic trajectories and periodic orbits in the cislunar space. The process of exporting these trajectories and orbits to high-fidelity motion models will be discussed. Insights into designing feedback control laws to ensure safe operations with performance guarantees will be provided.

Orbit Element Equivalents for Cislunar Space: Prof. Roshan Eapen, Prof. Puneet Singla & Prof. Maruthi Akella: This talk will introduce recent advances in multi-body dynamics to define local features to characterize trajectories in the neighborhood of a Lagrange points. These dynamical features though local in nature are equivalent to orbit elements in the Keplerian dynamics. The utility of these local elements in station-keeping, trajectory design and tracking space traffic in the cislunar space will be discussed. Semi-analytical means to predict spacecraft behavior will be also discussed.

Bio-sketches for Speakers:

Dr. Maruthi Akella is a professor in Aerospace Engineering and Engineering Mechanics at UT Austin where he holds the Cockrell Family Endowed Chair in Engineering. He is founding director for the Center for Autonomous Air Mobility and faculty lead coordinator for the controls, autonomy, and robotics area at UT Austin. His research encompasses coordinated systems, learning, adaptation, and vision-based sensing. His research group contributed for the onboard guidance algorithm for the Intuitive Machines IM-1 mission – the first U.S. moon landing in more than 50 years since the Apollo era. The major impacts of Dr. Akella's work have been recognized through the AIAA Mechanics and Control of Flight Award, the AAS Dirk Brouwer Award, the IEEE-CSS Award for Excellence in Aerospace Control, and the Judith Resnik Space Award from the IEEE Aerospace and Electronic Systems Society. Dr. Akella is Editor-in-Chief for the Journal of the

Astronautical Sciences and a Fellow of the AIAA, IEEE, and AAS. In October 2024, the International Astronomical Union designated asteroid number 5376 – a nearly 5-mile diameter-sized minor planet from the main asteroid belt – as “Maruthiakella” honoring Dr. Akella's contributions to “many successful applications in astrodynamics.”

Dr. Roshan Eapen is an assistant Professor of Aerospace Engineering at the Pennsylvania State University. His research interest lies at the intersection of Dynamical Systems Theory, Astrodynamics, and Computational Vision with specific focus on semi-analytic satellite orbit and attitude theories, optimal control of spacecraft, sensor modeling, light-matter interaction, and vision-based navigation. He runs the Computational Astrodynamics Research and Experiments (CARE) lab which host the Penn State University Dynamial observatory (PSUDO), a 0.6m telescope observatory and ground station. He is a JN Tata scholar (2015) and the recipient of the Heep Graduate Fellowship from the Hagler Institute of Advanced Studies.

Dr. Puneet Singla is the Harry and Arlene Schell Professor of the Aerospace engineering at the Pennsylvania State University (PSU). Dr. Singla's research interface nonlinear dynamics with approximation theory, sensing, uncertainty analysis, and optimal control. He significantly advanced data-driven approaches for a diverse range of highly complex problems such as space domain awareness (SDA), guidance navigation and control (GNC) of hypersonic vehicles, and accurate prediction of toxic plume dispersions. His research related honors include the IEEE AESS's Judith A. Resnik Award, NSF CAREER award, the AFOSR Young Investigator award, the University at Buffalo's “Exceptional Scholar” Young Investigator Award and the Texas A&M University's Young Aerospace Engineering Distinguished Alumni Award in recognition of his scholarly activities. He is IEEE AESS's distinguished lecturer since 2024. He is a fellow of American Astronautical Society (AAS) and an associate fellow of American Institute of Aeronautics and Astronautics (AIAA).

WS3: Simulation Driven Lunar Orbit Planning and Optimization

Room: Amarylis Time: 2.00 PM-6.00 PM

Leverage high-fidelity simulation environments and integrated modelling platforms to design, analyse, and optimize lunar trajectories that meet mission and payload requirements. This workshop explores advanced techniques in multi-body dynamics, system-level design, and constellation planning for mission development in the Earth–Moon system.

Abstract:

The renewed global interest in lunar exploration has accelerated the need for robust trajectory design and optimization capabilities that operate within the complex gravitational environment of the Earth–Moon system. Recent advancements in high-fidelity simulation tools and integrated modelling platforms have made it possible to evaluate mission concepts under multi-body dynamics with unprecedented precision.

This workshop focuses on applying such tools—especially Ansys Systems Tool Kit (STK) Astrogator and Cislunar Orbit Designer (CODE)—to develop end-to-end simulations that support system-level mission design, constellation architecture, and payload optimization for lunar and Cislunar missions. Through a combination of technical talks, live demonstrations, and real-world case studies, participants will gain exposure to simulation-based workflows that incorporate lunar orbit propagation, stability assessments, and trajectory optimization in three-body and multi-body regimes. These techniques are instrumental in designing mission scenarios that are compliant with international safety standards and are adaptable to evolving payload and launch requirements. This workshop also emphasizes supporting mission extension to Sun–Earth Lagrange points and Martian orbits. The final sessions will include real-world insights into mission operations and ground control from Indian space industry experts, extending the applicability of these techniques to broader interplanetary contexts.

Objectives

- Model lunar and Cislunar missions using high-fidelity simulation environments incorporating multi-body dynamics and orbit propagation tools.
- Design and evaluate constellation architectures for lunar observation and communication, optimized across performance metrics such as coverage, latency, and revisit time.
- Understand stability regimes around Libration points and how these influence mission design, insertion strategies, and station-keeping maneuvers.
- Extend simulation-driven design practices from lunar scenarios to interplanetary missions with a focus on Mars orbit design and ground segment operations.

Abstracts:

Intro to High-Fidelity Trajectory Design: Dr. Sarthak Srivastava

This session introduces participants to STK Astrogator and its role in trajectory planning for lunar missions. Attendees will learn how to set up a mission profile, perform orbit propagation using high-fidelity integrators, and design maneuvers under lunar gravity influences. Use cases will demonstrate initial orbit selection, transfer planning, and insertion strategies.

Three-Body Dynamics for Lunar Orbit Simulation: Dr. Maruthi Akella

Based on the MOONSHOT morning session, this talk will delve into the restricted three-body problem and its application to lunar trajectories. It will cover periodic and quasi-periodic orbits, halo orbits, and the dynamic behavior of Cislunar transfer paths. Emphasis will be on simulation models that capture non-linear dynamics relevant to Earth–Moon missions.

Cislunar Dynamics & Constellation Design: Giuseppe Corrao

These two sessions explore trajectory and constellation planning using STK and CODE. The first session focuses on Earth–Moon trajectory propagation using STK's three-body capabilities, while the second emphasizes optimization of Cislunar constellations using simulation-based design space exploration. Topics include coverage metrics, inter-satellite spacing, latency optimization, and trade studies.

Sun–Earth Libration Points: Stability and Mission Design: Dr. Sarthak Srivastava

This session examines trajectory design near Sun–Earth Libration points, with discussion on stability zones, insertion strategies, and orbit maintenance. Applications in communications, observation, and deep-space gateway missions will be discussed using simulation case studies.

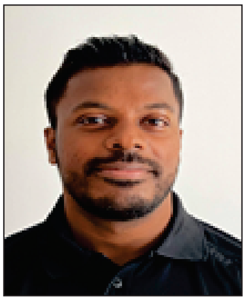
Mars Orbit Design and Analysis

An in-depth discussion on Mars mission planning using Indian Space Research Organization (ISRO) methodologies. Topics include interplanetary trajectory design, Mars orbit capture, and orbital stability under the influence of solar perturbations and Martian gravity.

Ground Station Control for Interplanetary Missions

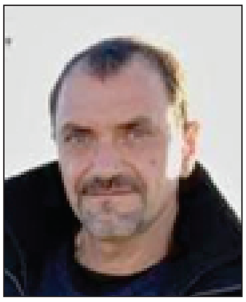
An operational overview of ground segment requirements for lunar and deep-space missions. Discussion points include telemetry, tracking, command scheduling, and integration of ground assets for Cislunar and Mars mission support.

Dr. Sarthak Srivastava



Sarthak holds a Ph.D. in Planetary Science and a B.Eng. in Aerospace Engineering, both from Nanyang Technological University (NTU), Singapore. He has ten years of diverse experience in Aerospace and Defence, specializing in aircraft design, spacecraft design, and mission-level modeling, simulation, and analysis. Sarthak currently leads the Ansys Mission Engineering capability in APAC region. His current areas of interest include Space Mission Design, C4ISR and Hypersonics.

Dr. Ing. Giuseppe Corrao:



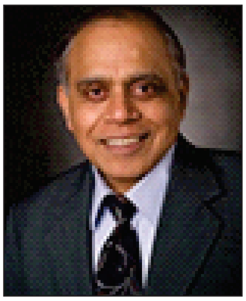
Dr. Ing. Giuseppe Corrao is an expert in astrodynamics with nearly 25 years of experience in the Aerospace & Defense sector. Since earning his Master's in Aerospace Engineering in 2000, Dr. Corrao has specialized in the Modelling & Simulation of spacecraft trajectories.His key areas of work include: Developing custom applications for Space Surveillance Awareness & Tracking (SSA/SST) using System ToolKit (STK). Conducting Space Mission Analysis & Design across all orbit regimes (LEO, MEO, GEO, Interplanetary). Designing Mission Planning Systems and optimization algorithms for Earth Observation satellites. Advancing Orbit Determination techniques for LEO, GEO, and Lunar missions. Contributing to Ballistic Missile Defense and Cislunar Domain Awareness.

WS 4: PASSIVE RADAR FOR SPACE APPLICATIONS

Room: Petunia Time: 8.30 AM-10.30 PM

Abstract: Passive radar technology is revolutionizing modern defense and space surveillance and transforming security and navigation by enabling covert, cost-effective, and resilient detection capabilities as a viable alternative to traditional active radar systems. Unlike traditional radar systems, passive radar relies on ambient radio frequency signals from "illuminators of opportunity"—such as commercial broadcasts, e.g., FM radio and digital television, cell tower signals, and satellite transmissions—to detect, track, and classify objects without emitting its own signals. This unique approach offers significant advantages, including low probability of detection, reduced electromagnetic interference, and enhanced operational sustainability. Additionally, it enhances security by offering low probability of interception and resistance to jamming, making it ideal for surveillance, border monitoring, and urban security operations. In this talk, we will explore the principles of passive radar and its growing role in applications such as defense, space applications, security and navigation. We will address how passive radar enhances situational awareness in contested environments, supports stealth detection, and enables persistent monitoring of air and space domains. We will also discuss how it enhances perimeter protection, maritime surveillance, and urban traffic monitoring while also supporting alternative navigation solutions in GPS-denied environments. Additionally, we will examine its challenges, including signal processing complexities, integration with existing defense networks, interference mitigation, and the impact of evolving signal environments. Recent advancements in machine learning and sensor fusion for passive radar will also be highlighted as enablers for improved detection accuracy and navigation reliability. With increasing threats in modern warfare and the space domain, passive radar presents a critical frontier in surveillance and reconnaissance. As the need for robust, non-emissive sensing grows, passive radar is also emerging as a critical tool for security and navigation. This talk will provide insight into its current capabilities, ongoing research, and future potential in defense, security, space situational awareness, and positioning systems.

Bio: Prof. Ram Narayanan The Pennsylvania State University, USA



Professor Ram Narayanan received the B.Tech. degree in electrical engineering from IIT Madras in 1976, and the Ph.D. degree in electrical engineering from the University of Massachusetts in 1988. During 1976–1983, he was a Research and Development Engineer with Bharat Electronics Ltd., India, where he developed microwave subsystems and communications equipment. During 1983–1988, he was a Graduate Research Assistant at the University of Massachusetts where he designed and built a 215-GHz radar to study the millimeter-wave radar reflectivity of vegetation and ground snow. In 1988, he joined the Electrical Engineering Department, University of Nebraska–Lincoln, where he last served as the Blackman and Lederer Professor. Since 2003, he has been a Professor of electrical engineering at The Pennsylvania State University. He has coauthored over 12 book chapters, 180 journal articles, and 450 conference publications. His current research interests include radar information characterization and processing, cognitive radar, adaptive radar, passive radar, radar networks, and multifunctional RF systems. He is a Fellow of the IEEE, the IETE, and the SPIE. He currently serves as a member of the IEEE Committee on Ultrawideband Radar Standards Development. He received the 2017 IEEE Warren White Award for Excellence in Radar Engineering, the 2017 IETE Journal of Education Paper Award, and the 2023 Distinguished Alumnus Award from IIT Madras.

WS 5: Active Device Measurements using VNA

Room: Petunia Time: 11.00 AM-1.00 PM

Abstract:

Session will explore the comprehensive use of Vector Network Analysers (VNAs) for characterizing active RF and microwave devices. It begins with an introduction to VNAs, detailing their role in measuring S-parameters and other critical metrics for both passive and active components. The session emphasizes the importance ofcalibration and error correction, explaining various models and techniques such as SOLT, LRL, and Auto-Cal for ensuring measuremet accuracy.

The core of the Session focuses on active device fundamentals, including amplifiers, mixers, and transceivers. It covers key performance parameters like gain, linearity, intermodulation distortion (IMD), third-order intercept points (TOI), and noise figure. Advanced topics such as Multi-Frequency Gain Compression (MFGC) and AM/AM and AM/PM distortion are discussed in the context of modern communication systems like 5G and 6G.

This session will also introduce pulsed measurement techniques, highlighting Anritsu's PulseView™ technology for high-resolution pulse analysis, and explores optical VNA measurements for E/O and O/E devices using specialized calibration modules. Finally, the session concludes with practical guidance on amplifier and mixer testing setups, emphasizing automation, software integration, and measurement confidence. Also, how VNA can be used in broadband, millimeter-wave, and optoelectronic testing environments.

Speaker : Mr. Sadanand Bhatt - Associate Director - Solution Engineering – Anritsu India Pvt ltd.

Mr. Sadanand Bhatt, has been an integral part of Anritsu for over 11 years, bringing with him a wealth of knowledge and experience that spans more than three decades in the test and measurement industry.

Mr. Bhatt with his deep technical expertise has been playing a very crucial role in supporting customers from Aerospace and defence segment across the country.

WS 6: MIMO Radar Technology: From Fundamentals to Applications

Room: Petunia Time: 2.00 PM-6.00 PM

Abstract: Radiolocation systems known as Radar (Radio Detection and Ranging, coined by the US Navy) were developed secretly for military use by several countries in the period before and during World War II. Later in the civilian application space, co-located MIMO (Multiple-Input Multiple-Output) Radar emerged as a key component in ADAS (Advanced Driver Assistance Systems), where FMCW (frequency modulated continuous wave) operation is preferred for its hardware simplicity, low-power and three-dimensional (range, velocity, and direction of arrival) detection ability. This presentation would focus on the signal processing as well as electromagnetic aspects of TDM (time-division multiplexed) FMCW MIMO Radar. Broadly, the following areas would be covered:

- Signal and System Models of MIMO Radar: Range, Doppler and Angle Processing
- Improvement of Angular Resolution using TDM MIMO Radar
- Antenna Design and Placement in mm-wave MIMO Radar
- Computational Electromagnetic Analysis of MIMO Radar in presence of Radome

Besides the use in ADAS, the usage of MIMO Radar technology in space-surveillance (detection and tracking of small objects in low altitude orbits) as well as efficient detection of Drones and UAVs (Unmanned Aerial Vehicles) would be elaborated upon. Finally, a rudimentary live demo would be provided on the localization and classification of single and multiple Low RCS Objects using mm-wave MIMO Radar using a TI (Texas Instruments) Radar Module and Computer.

Biography:

Dr. Debdeep Sarkar obtained his B.E. (Bachelor of Engineering) in ETCE (Electronics and Telecommunication Engineering) from Jadavpur University, Kolkata, India in 2011, and his M. Tech. (Master of Technology) and Ph.D. in EE (Electrical Engineering) from Indian Institute of Technology, Kanpur, in 2013 and 2018, respectively. He worked as a Visiting Researcher (May 2017-Aug 2017) and Post-doctoral Fellow (Nov 2018-Feb 2020) in the Department of Electrical and Computer Engineering, Royal Military College, Kingston, Ontario, Canada.

Dr. Debdeep has authored 1 book, 3 contributed book chapters, 4 Filed Indian Patents (two Granted), 55 peer-reviewed Journals, and 100+ reputed conference papers to his credit. He regularly peer-reviews in multiple IEEE Transactions and Letters and serves as Associate Editor in IET Microwaves, Antennas and Propagation, IEEE Access and Scientific Reports. He has received Academic Excellence Award (M. Tech.) from IIT Kanpur (2012), URSI (International Union of Radio Sciences) Young Scientist Award (2019 and 2020), Outstanding YP (Young Professional) Volunteer Award from IEEE Bangalore Section (2021), Infosys Young Investigator award (2020-2022), IETE Sri C Viswanatha Reddy Memorial Award (2022), Outstanding Antennas/Microwave Technologist Award from IEEE AP/MTT Chapter, Bangalore Section (2023), Young Professionals Excellence Award from WAMS Society (2024), INAE (Indian National Academy of Engineers) Young Associate Award (2024), and several best paper awards and international travel grants. He further represents as a member in IEEE AP-S YP (Young Professionals) Global Committee.

WS 7: Next-Gen Verification Strategies for Complex SoCs: AI-Driven, Scalable, and Future-Ready

Room: Poinsettia 1 Time: 8.30 AM-10.30 AM

Abstract:

The complexity of today's SoCs is unprecedented multi-core architectures, AI/ML accelerators, safety-critical functionality, and tightly integrated heterogeneous blocks have pushed traditional verification methodologies to their limits. With verification now consuming over 70% of the design lifecycle, the industry is at an inflection point: we must move beyond legacy flows and adopt intelligent, scalable

strategies that deliver both speed and confidence. This Presentation is a forward-looking view of next-generation verification strategies, rooted in real-world challenges and practical innovation. We'll explore how to shift verification earlier in the lifecycle with robust pre-silicon planning, drive coverage closure across fragmented domains, and ensure readiness for power, performance, and safety compliance. A strong emphasis will be placed on how AI and ML are transforming the verification landscape from smarter test generation and regression analytics to predictive debug and automated root-cause analysis.

Key Topics Covered:

- The Urgency for Next-Gen Verification
- Shifting Verification Left
- Coverage Closure in the Modern Era
- Hybrid Verification Approaches
- AI & ML in Verification Workflows
- Future-Forward Verification Trends
- Evolving the Verification Ecosystem

Despite the proven success of MHT as a methodology for MTT, computational constraints and other fundamental performance limitations may lead to unacceptable performance in some settings. We discuss the benefits that can be achieved with multi-stage MHT processing. In many settings, judicious distributed MHT processing enables improved performance over (necessarily suboptimal) centralized MHT. We provide illustrative examples from several domains. Additionally, we describe recent advances in graph-based tracking, a fast (approximate) approach to MHT that provides improved results in certain applications.

Bio-sketch for Speaker:

Sumit Kumar, Senior Engineering Manager, Analog Devices India

Sumit Kumar is a Senior Engineering Manager at Analog Devices India with over 1.4 decades of expertise in VLSI design verification and AI-driven methodologies. He holds a B.E from D.S.C.E and M.Tech from BITS Pilani and an Executive Management from IIM Bangalore.He lead the entire front-end design and design verification for System-on-Chip (SoC) solutions, ensuring robust design verification methodologies and execution. Previously, he worked with Cadence and Broadcom, where he was responsible for handling front end activity and COE's for complex SoCs and IPs, gaining hands-on experience with high-performance silicon environments. In addition to his professional role, he am actively involved in technical conferences , Panel discussions , speaker on semiconductor topics like SOC & IP design , Design verification, both functional & formal verification & validation , functional safety and Over all semiconductor domains . Also mentor in the semiconductor field for Btech/Mtech and Experienced folks. Serving as Advisory Board , Advisory Panel Offering career guidance to students for many institutes in India. he am a recognized mentor, speaker, and panelist in the semiconductor domain. he was panel chair of VLSID 2025 conference too, he actively contribute to industry conferences and academic outreach programs, and am passionate about driving the next wave of innovation in design verification through intelligent methodologies and scalable architectures.

Sumit currently leads the front-end design and design verification for System-on-Chip (SoC) solutions, ensuring the implementation of robust verification methodologies and seamless execution. Prior to Analog Devices, Sumit worked at Cadence and Broadcom, where he played a key role in handling front-end activities and Centers of Excellence (COEs) for complex SoCs and IPs, gaining hands-on experience with high-performance silicon environments.

Sumit has led several initiatives focused on AI-powered verification, guiding large-scale SoC projects to successful first-pass silicon validation. His extensive experience spans across pre-silicon verification, post-silicon validation, emulation, and hardware/software co-verification for complex multi-core systems.

In addition to his technical expertise, Sumit is an active speaker at industry conferences, panel discussions, and academic events, covering topics like SoC & IP design, design verification (functional and formal), validation, functional safety, and various aspects of the semiconductor domain. He also serves as a mentor to BTech/MTech students and industry professionals, offering career guidance through being part of Advisory Board , Advisory Panel Offering career guidance to students. With a passion for shaping the future of the semiconductor field Sumit actively contributes to the education and mentoring of the next generation of engineers.

WS 8: Robust Engineering Systems Control Systems and Signal Processing (RES CSSP) Toolbox

Room: Poinsettia 1   Time: 11.00 AM-1.00 PM

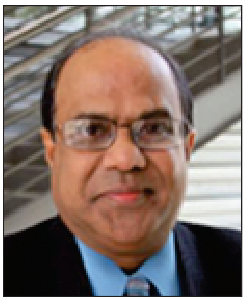
Abstract:

This Tutorial presentation first gives an overview of the research carried out by Prof. Yedavalli and his group on stability and robustness of dynamic systems described by linear state space models with applications in aerospace, mechanical and electrical systems using both eigenvalue based stability assessment via Transformation Compliant (TC) methods such as the Routh-Hurwitz Criterion, Cayley-Hamilton Theorem, and Lyapunov Matrix Equation methods (which are all equivalent to each other) as well as sign pattern based Qualitative Sign Stability (QLSS) approach being used by ecology researchers. Then, by juxtaposing these two extreme viewpoints, namely TC and QLSS methods, his startup firm RES proposes a new method without using eigenvalues at all so that we achieve not only significant computational savings but also many other superior and powerful features. This new Convex Stability concept (as opposed to Hurwitz stability (for continuous time systems) and Schur stability (for discrete time and sampled data systems) is a completely different and innovative concept, essentially positively disrupting the current control systems and signal processing design algorithms, as evidenced by the issuance of an already awarded US Patent (and another potential patent to be awarded soon by the India patent office). The novel Transformation Allergic (TA) Approach and the associated Convex Stability concept invented by our firm's RES CSSP Toolbox has emphatically proved

that the current literature eigenvalue based control and signal processing methods being followed by the TC methods (mentioned above) have significant flaws and thus are leading to misleading conclusions about the actual stability of a dynamic system in all the real world applications, especially in the Defense (robotics and autonomous flight vehicle) applications and Space (satellite attitude, orbit, docking and formation flying) applications. In addition, this new concept of Convex Stability is valid equally well for not only time-invariant dynamic systems but also for Time Varying and a few mild Non-Linear dynamic systems as well. This Tutorial will discuss these concepts with concrete real life application examples. This patented Convex Stability concept does not endorse the transfer function approach and proves that the currently popular PID controller philosophy is insufficient for guaranteed safe fight in any real-life flight control/robotics/satellite control applications. Finally, RES CSSP Toolbox algorithms can stabilize and control any dynamic system declared by the current literature methods as un-controllable, un-stabilizable, un-observable and un-detectable.

Because of the issuance of two patents (one an already awarded US patent # No. 11,815,862, and another India patent under review), the contents of this tutorial presentation are IP protected and can be used only with a technology licensing agreement with the firm Robust Engineering Systems, LLC or permission from it.

Bio-sketch for Speaker:



Dr. Rama K. Yedavalli, Founder, President, CEO and CTO of Robust Engineering Systems, LLC

Dr. Rama K. Yedavalli received his Ph.D degree from the School of Aeronautics and Astronautics of Purdue University in the Dynamics and Control area in 1981. His Bachelor's and Master's degree were both from the Indian Institute of Science (IISc), Bangalore, India. He spent his sabbatical at IISc as the “Satish Dhawan Chaired Professor” in 2017-18. He received the `Distinguished Alumnus Award' in 2009 and the “Platinum Jubilee Award” and the “Satish Dhawan (Visiting) Chaired Professorship” in 2017-18, all, from the AE department of IISc.

Dr. Yedavalli is a (Life) Fellow of IEEE, a Fellow of ASME, a Fellow of AAAS and an Associate Fellow of AIAA. He received the O.Hugo Schuck Best Paper award from the American Automatic Control Council in 2001. In 2002, he also received the `Lumley Research Award' by the Ohio State University's College of Engineering. He published a graduate level text book with Springer in Jan 2014 titled: “Robust Control of Uncertain Dynamic Systems: A Linear State Space Approach” and an Undergraduate level textbook titled: “Flight Dynamics and Control of Aero and Space Vehicles” published by Wiley in 2020. A third book is under contract to be delivered to AIAA Education Series in 2025 in which he plans to discuss the Convex Stability Approach. He published in excess of 200 Journal, Book chapters and Conference papers and presented invited seminars on these topics. He holds the title of Academy Professor from the Ohio State University and currently serves as the Founder, President, CEO and CTO of the startup firm Robust Engineering Systems, LLC, which holds the patent for the contents of this tutorial presentation.

WS 9: Optimal Computational Guidance for Challenging Aerospace Missions

Room: Poinsettia 1 Time: 2.00 PM-6.00 PM

Abstract:

Aerospace missions are becoming increasingly complex and challenging. All stage recovery of launch vehicles for repetitive usage, planetary entry/re-entry, high-precision vertical soft-landing, station-keeping in unstable Halo orbits, in-orbit rendezvous and docking are a few examples of such missions. Similarly pin-point accuracy, angle constraint, look-angle constraint etc. are becoming an absolute must in missile guidance. Ideally, trajectory generation of such missions (and the associated guidance) require formulating a constrained nonlinear optimal control problem. Conventional techniques to solve such problems are known to suffer from severe computational difficulties in general, and hence, are ill-suited for onboard computers. Fortunately, recent advancements in innovative solution algorithms in addition to improved computational speed of onboard processors have come together to provide powerful computational guidance solutions. In fact, computational guidance has come a long way in the past two decades, and is now being confidently used.

In this tutorial, after giving the necessary background and motivation, three different computational guidance philosophies that are relevant to a variety of aerospace missions will be discussed in fair detail. These include (i) real-time optimal trajectory generation through lossless convexification, (ii) Pseudo-spectral optimal guidance, and (iii) a predictor-corrector scheme called MPSP (Model Predictive Static Programming), and its several variants. Several application problems will also be discussed to convey the significant advantage of this computational guidance approach.

Bio-sketch for Speaker:

Prof. Radhakant Padhi, IISc, Bangalore

Prof. Radhakant Padhi, received a Ph.D. from the Missouri University of Science and Technology, Rolla, USA, is currently the HAL Chair Professor at the Department of Aerospace engineering in the Indian Institute of Science, Bangalore; and also an Associate Faculty at its Centre for Cyber-Physical Systems. He is a Fellow of Indian National Academy of Engineering, Astronautical Society of India, Aeronautical Society of India, Institution of Electronics and Telecommunication Engineers (IETE), and Institute of Engineers (India). He is an Associate Fellow of AIAA and a Senior Member of Institute of IEEE. He is the Director of Operations of the Automatic Control and Dynamic Optimization Society, which is the national member organization of the International Federation of Automatic Control (IFAC) in India. He is an Associate Editor of Unmanned Systems journal, and has been an associated editor of two more journals in the past in the control and automation field.

Prof. Padhi's research interest is on optimal and nonlinear control synthesis algorithms and their applications to challenging practical problems in aerospace, biomedical and mechanical engineering, as well as other application areas such as process control and laser beam pointing control. He has co-authored over 292 publications in international journals and conferences and also a book on Satellite Formation Flying. He is currently finalizing two more book manuscripts.

Prof. Padhi is a member of technical review committees for several missions of ISRO and DRDO of India, including the performance analysis committee, which analyzed the reasons for partial failure of Chandrayaan-2 mission and suggested the necessary improvements for the Chandrayaan 3 mission. Recently, Prof. Padhi has floated two deep-tech start-ups incubated in IISc (vtpl.tech and vapl.tech), through which he intends to utilize his research output for the benefit of society.

WS 10: Tutorial on Digital Twin for Uncrewed Air Transportation

Room: Poinsettia 2 Time: 8.30 AM-10.30 AM

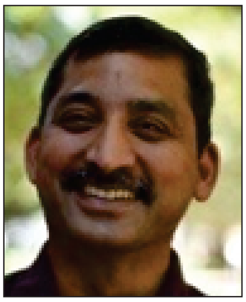
Abstract:

Digital twins—dynamic, data-driven virtual representations of physical systems—are revolutionizing how the uncrewed aviation industry monitors the flights from taking off to landing. By integrating real-time data, advanced analytics, and domain expertise, digital twins enabling decision-making, and operational efficiency. This tutorial will introduce the digital twin concept, with a focus on its application to uncrewed aircraft systems (UAS), supporting infrastructure, and airspace management. It explores the potential of digital twin technology in the rapidly evolving domain of uncrewed air transportation. The tutorial will begin with an overview of digital twin technology, highlighting its core principles and technological foundations. Participants will learn how digital twins are being leveraged in uncrewed air transportation.

1. Digital Twin for the UAS Platform: The session will delve into the creation and deployment of digital twins for the UAS platform. Attendees will explore modeling techniques, real-time sensor integration, and the use of tools (MATLAB and Unreal Engine) for development and experimentation. The discussion will focus on how digital twins enable real-time vehicle health monitoring, and adaptive flight control.
2. Digital Twin for Communication, Navigation, and Surveillance (CNS): This session will cover the extension of digital twin technology to the CNS infrastructure essential for UAS operations. The tutorial will address how digital twins can simulate and monitor CNS network performance using real-time data from satellites, ground stations, and airborne assets.
3. Digital Twin for Airspace Management: The final session will focus on the application of digital twins for airspace management. The discussion includes urban and national airspaces, incorporating live traffic, demonstrating how digital twins support conflict detection, capacity optimization, and the safe, scalable integration of UAS into complex airspace environments.

Bio-Sketch for speakers:

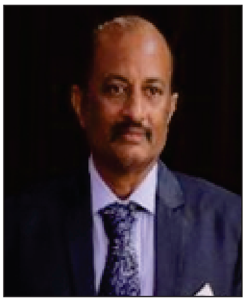
Kamesh Namuduri, University of North Texas, Denton, USA



Kamesh Namuduri, is an Electrical Engineering Professor at the University of North Texas (UNT), Denton, TX 76203, USA. He has done his B. Tech in Electronics and Communications, Osmania University, Hyderabad, India, August 1984, M.S. in Computer Science, Central University, Hyderabad, India, August 1986 and Doctor of Philosophy in Computer Science and Engineering, University of South Florida, Tampa, December 1992. Currently, he is serving as the Director for Autonomous Systems Laboratory at UNT. His research interests are Emergency

Communications, Airborne Networks, and Image and Video Communications. He has authored a book "UAV Networks and Communications" by the Cambridge University Press and 6 book chapters. He has 38 journal articles and 72 conference papers to his credit.

K. L. V. Sai Prakash Sakru, National Institute of Technology, Warangal



K. L. V. Sai Prakash Sakuru, Associate Professor, Department of ECE, National Institute of Technology, Warangal since 1992. Earlier to this, he worked at Indian Institute of Technology, Kharagpur as Junior Scientific Officer. He has done his B. Tech from SRKR Engineering College (Andhra University), Bhimavaram, M. Tech from Regional Engineering College (Kakatiya University), Warangal, and Ph.D. from National Institute of Technology, Warangal. His research interests include IoT & CPS, Machine Learning and Smart System Design, ML/DL-based Resource Allocation in Space-Air-Ground Communication Networks, Adhoc and Sensor Networks. He has 35 journal and conference papers to his credit and three best paper awards.

Arunkumar Sampath, Principal Consultant and Global Head, Software-Defined Vehicles (SDVs) and eVTOL Aircraft/Urban Air Mobility (UAM), TCS

Arunkumar Sampath is currently employed in Tata Consultancy Services (TCS) as a Principal Consultant and Global Head, Software-Defined Vehicles (SDVs) and eVTOL Aircraft/Urban Air Mobility (UAM) in the Manufacturing Business Group. He has 28 years of experience in the gamut of automotive and aerospace/defense fields including Sustainable Mobility, 5G Networks, AI & Edge Computing. He has written 35 technical articles on advanced technologies including 5G networks, Fuel Cells, Cybersecurity, Urban Air Mobility, Drive by Wire Electric Vehicles, Edge Computing, AI/ML, Gen AI, and Next Gen Computing.

WS 11: From Threat Detection to Test Automation: A Unified NI Technology Workshop

Room: Poinsettia 2 Time: 11.00 AM-1.00 PM

Anti-drone Monitoring System: Abhishek Tiwari

The session will focus on emerging challenges in developing communications technology for contested environments, highlighting solutions from NI users for SDR Rapid Deployment, EW, Counter UAS and More.

A Model-based workflow for Automated Test System (ATS) Digital Transformation: Karthik SP

Digital engineering predominantly has focussed on systems engineering and design, often overlooking the integral role of test. Spanning the entire lifecycle from concept through sustainment, test too often remains siloed and underutilized. This session explores the feasibility of bridging systems engineering and test workflows using MBSE concepts. Join us to discover how a holistic approach to digital engineering can revolutionize both the test landscape and its synergy with systems engineering.

Mr. Abhishek Tiwari is a seasoned professional with over 15 years of experience in the Aerospace and Defence sector. As a Principal Business Manager at National Instruments (NI), he drives strategic growth across Radar, Electronic Warfare (EW), Communications, Navigation, Surveillance, and RF Test applications for Aerospace and Defence customers throughout the APAC region. In his role, Abhishek focuses on expanding NI's market presence by cultivating key partnerships—both directly and through system integrators and distributors—identifying emerging business opportunities, and aligning advanced test and measurement solutions with evolving industry demands. Prior to NI, Abhishek served as a Product Manager at MathWorks, where he led strategy and product development for Antenna, RF, Radar, and Sensor Fusion products. He worked closely with engineers across 5G, radar, and EW domains to optimize workflows and enable efficient system design. Earlier in his career, Abhishek contributed to the development of radar hardware and software systems at Bharat Electronics Limited (BEL) and the Electronics and Radar Development Establishment (LRDE), DRDO, specializing in mission-critical radar and radio systems for Indian defence programs. Abhishek holds a bachelor's degree in Electronics and Telecommunication from NIT Raipur and an MBA in Leadership and Strategy from the Indian School of Business (ISB), Hyderabad.

Karthik SP is a professional with over 18 years of experience in the Aerospace & Defense sector. As a Senior Group Manager at NI, Karthik plays a pivotal role in driving business growth by leading technical teams, strategizing with sales units, and collaborating with global partners to ensure customer success and foster innovation in system designs. Throughout his career, he has worked with major industry leaders such as Moog, Honeywell, and AMETEK, contributing significantly to overcoming complex challenges and advancing technological solutions. Karthik's contributions extend beyond technical expertise; his leadership and strategic vision have enabled his teams to consistently deliver high-quality solutions that meet rigorous industry standards. His proficiency in NI LabVIEW and systems engineering, combined with his experience in data acquisition and testing, make him a valuable asset to any project. Additionally, Karthik has published several papers, showcasing his profound technical leadership and deep industry knowledge. These publications have addressed key topics in aerospace actuator systems, virtual instrumentation, and automated testing methodologies. Karthik remains committed to advancing the aerospace and defence field by leveraging cutting-edge technologies and fostering a culture of innovation and collaboration. His dedication to excellence and continuous improvement has not only contributed to the success of the organizations he has worked with but has also helped shape the industry's future direction. Karthik SP stands out as a leading figure in his field, continually pushing the boundaries of what is possible in aerospace engineering.

WS 12: Microwave Integrated Circuit Components Design Essentials

Room: Poinsettia 2 Time: 2.00 PM-4.00 PM

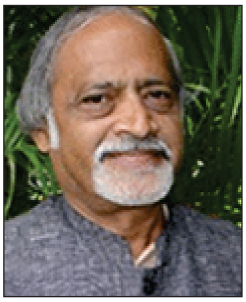
Abstract:

Our Country's Technological developments and achievements in Space Engineering, Defence frontiers, Biomedical Engineering are Phenomenal and stand tall in the International arena. 'Miniaturization' is the common Mantra for all the above. Microwave Integrated Circuits (M.I.C) Technology is the backbone for it. The huge Microwave system is the combination of M.I.C. components. The workshop involves the Design Essentials, mainly the lay out design from the fundamentals of M.I.C. Theory, coupled mode theory, S parameters, Even mode, Odd mode analysis, Nomograms, CAD technique .Discontinuity analysis , over view of planar transmission lines and their variants also will be touched upon.

From different mathematical functions, method of obtaining 'g' values for different filters, Transformations, Realizations in M.I.C. forms and Implementations will be discussed. Necessary Microwave Circuit theory and Nomograms to obtain the design parameters will be discussed. The complete lay out and the fabrication too will be taken up. The standard heritage books , classic papers I.R.E. of inventors ,application notes of Agilent, Radiation laboratory series and Philips -manuals too will be discussed. The introduction to Frequency Selective Surfaces also will be dealt with. The importance of fundamental coding will be made visible through Computer Aided Design of Microwave Integrated Circuits.

Bio-sketch for Speaker:

Dr. S. Raghavan, NIT Trichy



Dr. S. Raghavan , Professor (H.A.G.) Retd. Electronics and Communication Engineering Department, National Institute of Technology (N.I.T.), Trichy has about 44 years of teaching and research experience. His interest includes Microwave Integrated Circuits, BioMedical Engineering, RF MEMS, BioMEMS, Metamaterial, Frequency Selective Surfaces FSS. Established State of the art massive Library in N.I.T. Converted N.I.T. medical dispensary into a full fleged hospital. A proud research scholar of Prof. Bharathi Bhat and Prof. S K Koul, CARE, IIT Delhi, has established state of the art Microwave Integrated Circuit Lab (unique in South India) in N.I.T., Trichy with the help of Govt. of India funding. Won Best Teacher award twice and conferred with Honorary Fellowship of Ancient Sciences and Archaeological Society of India, Was a Senate member and B.O.S. member of National Institutes foe many years. Short time visiting Fellow in California State University, North Ridge, (CSUN) USA. Awarded to conduct Tutorial in APEMC 2010, Beijing, China Chair of two sessions in an International conference Hangzhou, China. Organizing Chair of 'Indian Antenna Week 2014', Chandigarh. Invited to be a session chair in PIERS 2013 symposium Taipei, Taiwan. Actively participated in APMC Japan, EuMW Poland and France. Visited Singapore ((NTU) and Malasia. Chair in InCAP 21 and conducted in workshop on FSS FILTERS. Highestr Google Scholar count among circuit branch faculty members of 31 N.I.T.s of the country Fellow/Senior Member in more than 40 international (including 9 IEEE Societies viz. MTT, APS, EMBS , WIE, Photonics, AESS, SIT,IMS, IETE, IEI, CSI, TSI, InRaSS) and national Professional Societies Life time achievement (Microwaves) award by then Chairman ISRO Dr Kiran Kumar. Patron of the first ever international IEEE conference IMICPW 2019 in NIT Trichy and IEEE Antenna and Propagation Society (APS) Madras Chapter. Life time achievement Award winner. He was an Executive Member in Telemedicine Society of India. (Both International and National). Earned Smt. Ranjana Pal award of IETE for the contribution in the field of M.I.C. Member of. Also, the founding faculty advisor of IEEE MTT and APS student branch Chapters NIT Trichy. S. Raghavan is the author of Microwave Integrated Circuit (M.I.C.) Components Design through MATLAB CRC Press. Author of Three chapters on 'Metamaterial-FSS Based Radome using SIW Technology', 'Metamaterials in Medicine ' and 'Application of Frequency Selective Surfaces in the Medical Field' in CRC and Springer Publications. Made an impact in MICROWAVE ENGINEERING EDUCATION among the student community at large. Popularized CAD of Microwave Integrated Circuits and fitting examples can be seen in “Microwave 101.National Institute of Technology

WS 13: Performance of Spacecrafts and its Payloads in Space Weather

Room: Poinsettia 2 Time: 4.00 PM-6.00 PM

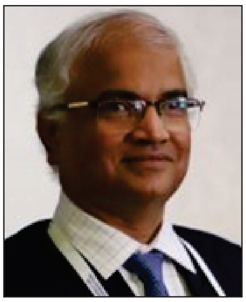
Abstract:

Space weather, the encompassing phenomena such as solar flares, coronal mass ejections (CMEs), solar energetic particle events, suprathermal energetic particle radiation from galactic cosmic rays and geomagnetic storms—poses significant challenges to the performance and longevity of spacecraft and their onboard payloads. These events can lead to increased radiation levels, highly energetic plasma particles causing spacecraft charging, single-event upsets (SEUs) and long-term degradation in electronic components. Additionally, geomagnetic storms can enhance atmospheric drag on low Earth orbit (LEO) satellites, leading to orbital decay and potential mission disruptions. By understanding and addressing the effects of space weather, we can enhance the resilience and reliability of spacecraft, ensuring the success of current and future missions in increasingly congested and dynamic space environments.

This workshop delves into the multifaceted impacts of space weather on spacecraft systems. We shall explore case studies highlighting anomalies and failures attributed to space weather events, such as the increased thermospheric density leading to the loss of multiple Starlink satellites in February 2022. Furthermore, we will discuss the implications of spacecraft charging, where differential surface charging, internal charging can result in electrostatic discharges, affecting spacecraft operations.

Bio-sketch for Speaker:

Dr. Soumyabrata Chakrabarty, IIT Kanpu



Dr. Soumyabrata Chakrabarty obtained his B. E. (Hons) degree from NIT (Previously REC) Silchar in 1988, M. E. from Jadavpur University in the year 1992 both in Electronics and Telecommunication Engineering and Ph. D. degree in Engineering from Indian Institute of Technology, Kharagpur in the year 1996. He served NIT, Silchar as lecturer in the Department of Electronics and Telecommunication Engineering during 1995-1996. He is currently working as Professor of Practice Department of Space, Planetary & Astronomical Sciences & Engineering (SPASE)

Indian Institute of Technology, Kanpur. He served the Department of Electrical Engineering, IIT Gandhinagar as visiting professor during July 21-June 2024.

He served the Antenna Systems Group, Space Applications Centre, Ahmedabad as scientist/Engineer during September 1996 – June, 2021 and was involved in the development of a variety of state-of-the-art antenna systems related to Microwave Remote sensing payloads. He served the German Aerospace Centre (DLR) during 1999-2000 as guest scientist deputed from ISRO. His area of research is Space Weather interaction of Spacecrafts, Computational Electromagnetics, Design and development of Antennas for Radio Telescopes and Microwave Sensors. He has authored and co-authored more than 80 papers published in IEEE transactions on EMC, MTT and IET Journals, International journal of Electronics etc. He received INSA visiting fellowship 1996 and was short-listed for INSA young Scientist award 1997. He received ISRO team excellence award for the successful development of Scatterometer and RISAT payload. He is a professional violinist and graded artist of All India Radio. He participated in many classical music concerts in West Bengal, Assam, Gujarat and Delhi for the last 30 years.

WS 14: Spacecraft Power System

Room: Helconia 1 Time: 8.30 AM-10.30 AM

Abstract: A spacecraft needs electrical power for its operation. For a successful mission the power availability should be continuous and reliable. Power systems consists of three major constituients viz., Power Generation, Energy Storage and Power Conditioning and Distribution. The design considerations of these parts vary depending on the orbit and mission requirements. This talk explains the details of consideerations and schemes for Power System Design and Realisation in various types of spacecrafts

Bio-sketch for Speaker:

Ranganath S Ekkndi

Ranganath S Ekkundi graduated in Engineering B.E. (E) with Electronics as specialization in 1976 and joined ISRO Satellite Centre ISAC (now renamed as U R Rao Satellite Centre), Bangalore in 1977. He made significant contributions in the area of Spacecraft Power Systems and played a key role in the development of Power Systems for the first Indian telecommunication satellite APPLE and first Indian remote sensing satellite IRS 1A. His major contribution is in the evolution of Power System Configuration for INSATs and GSATs which are Indian Geostationary Communication Satellites and had a lead role in concept through successful in orbit performance of Power Systems of CHANDRAYAAN & MARS ORBITER MISSION.

Rnganath S Ekkundi held various positions as Project Manager, Deputy Project Director and Associate Project Director for various projects of ISRO and served as Group Director (Power Systems Group) and as Outstanding Scientist and Deputy Director (Communications & Power Area) in ISAC. Further on also functioned as Prof Satish Dhawan Scientist at ISAC. He was conferred with ASI (Astronautical Society of India) Award for Spacecraft and Related Technologies for the year 2008 and ISRO MERIT AWARD for the year 2012. He has published 12 technical papers on the topics of power systems and power electronics.

WS 15: Designing Smart Satellite Missions: MBSE Meets AI

Room: Helconia 1 Time: 11.00 AM-1.00 PM

Abstract: This session explores the convergence of Model-Based Systems Engineering (MBSE) and Artificial Intelligence (AI) to streamline satellite mission analysis, spacecraft dynamics modeling, and advanced data-driven applications in space missions. The session will highlight methodologies to simulate, visualize, and optimize satellite operations—from orbital mechanics to hyperspectral data processing—using modern tools, such as MATLAB, and integrated workflows. Topics covered:

- Satellite Mission Analysis and Scenario Simulation
- CubeSat Mission Modelling with MBSE Framework
- Field of View & Ground Access Analysis for Constellations
- Spacecraft Dynamics Modelling: HPOP, Attitude Dynamics & Profiles
- Perturbation Effects: Atmospheric Drag, Third-Body Gravity, and Solar Radiation Pressure
- Guidance, Navigation, and Control (GNC) Integration
- Hyperspectral Imaging Workflow & Big Image Processing
- Scalable Data Handling & Labelling for Satellite Imagery
- Deep Neural Network Training and Hyperparameter Tuning

Peeyush Pankaj | Sr. Application Engineer | MathWorks

Peeyush is a senior application engineer at MathWorks, where he promotes MATLAB products for data science. He works closely with customers in the areas of predictive maintenance, digital twins, enterprise integration, and big data. Peeyush has over 11 years of industry experience with a strong background in aviation. Prior to joining MathWorks, he worked on aircraft engine design, testing, and certification. Peeyush holds a master's degree in advanced mechanical engineering from the University of Sussex, UK. He has filed 25 patents on advanced jet engine technologies and prognostic health monitoring of aircraft engines.

Mukesh Prasad | Principal Application Engineer | MathWorks

Mukesh Prasad is a Principal Application Engineer in MathWorks India and enables engineers & scientists to adopt Model-based Design workflows. Mukesh has over 17 years of experience in jet engine control and flight control systems. Prior to joining MathWorks, Mukesh worked as Systems Specialist with Moog India, where he gained hands-on experience in Model-Based Systems Engineering (MBSE) and Test Equipment Design for aircraft applications. He started his career as Scientist at Gas Turbine Research Establishment (GTRE), one of the labs of DRDO, and worked on aircraft engine control design, testing, and certification using model-based design workflows. Mukesh holds a master's degree in mechatronics engineering from NIT Surathkal while bachelor's degree in mechanical engineering from NIT Kurukshetra

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