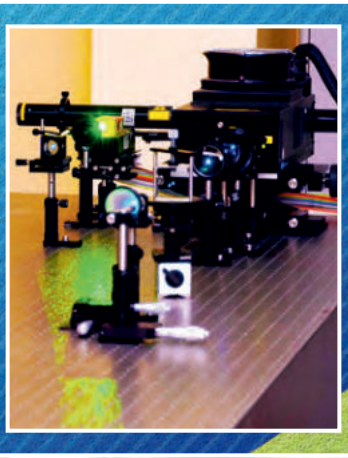


Indian Institute of Space Science and Technology

Thiruvananthapuram

Annual Report 2022-23

Annual Report *2022-23*

Indian Institute of Space Science and Technology

Declared as Deemed to be University under Section 3 of the UGC Act, 1956
An autonomous institute under Department of Space, Govt. of India
Valiamala P O, Thiruvananthapuram - 695 547, Kerala

www.iist.ac.in

Our Inspiration

Dr. A. P. J. Abdul Kalam

Founder Chancellor, IIST

(2008 - 2015)

Vision & Mission

Vision

To be a world class educational and research institution contributing significantly to the Space endeavours.

Mission

- Create a unique learning environment enriched by the challenges of the Space Programme.
- Nurture the spirit of innovation and creativity.
- Establish Centres of Excellence in niche areas.
- Provide ethical and value based education.
- Promote activities to address societal needs.
- Network with national and international institutions of repute.

Key Functionaries

Chancellor

Dr. B. N. Suresh

President, IIST Governing Body
Chairman, IIST Governing Council
Secretary, DoS/ Chairman, ISRO

Shri. S. Somanath

Director, IIST
Chairman, Board of Management

Dr. D. Sam Dayala Dev
(20.01.2022 - 20.09.2022)

Dr. S. Unnikrishnan Nair
(from 20.09.2022)

Registrar

Dr. Y. V. N. Krishna Murthy

Deans

Dr. A. Chandrasekar
(Academic and Continuing Education)

Dr. Raju K. George
(Research & Development and Intellectual Property Rights)

Dr. Kuruvilla Joseph
(Student Activities, Student Welfare and Outreach)

Contents

From Director's Desk

FOREWORD

Emerging from the lull that Covid 19 lockdowns created, IIST has keenly planned and executed its academic programs back into full functioning in 2022. The year, which has also been the 15th year of IIST's derivation, the institute engaged with multiple measures to expand and transmute its course curriculums, research, collaborations, student activities as well as its physical infrastructure. Though it is beyond the scope of this foreword to capture all the processes that were executed and planned for the enrichment of IIST, I would like to share a few salient ones.

IIST is taking sure and deliberated steps to adopt National Education Policy (NEP), which we plan to implement in phases starting with the new academic year. Department of Physics renamed M.Tech. Solid State Technology programme to Quantum Technology which is expected to be an oasis for students who are keen to explore the highly advanced level of physics praxis. Furthermore, the M.Tech. seats in 10 different programs have been increased from 18 to 20 which will cater to a wider student community. To boost the doctoral research program in the institute, 94 Ph.D. students were admitted in the year 2022-23. The addition of these scholars brings the total number of research students in the campus to 265.

In the 10th convocation of IIST, B.Tech. degree were conferred on 112 students and M.Tech. degrees were awarded to 104 students and to 20 students from the dual degree programme. Ph.D. degrees were awarded to 28 students across all seven departments. A large number of them have joined various centres of ISRO. A total of 1234 graduates from the institute have joined ISRO so far. The impact and the appreciation for this legacy is reflected in the recognition IIST continues to receive. IIST has been ranked 48th in National Institute Ranking Framework (NIRF) and initiatives are planned to further improve the ranking. The institute has initiated actions for INI status and is getting ready for NAAC and NBA accreditation.

The academic year 2022-23 was a fruitful one with regards to research activities also. Currently, 45 Externally funded / Extramural Research projects are being undertaken by the

faculty members of IIST. An Advanced Space Research Group, (ASRG) was constituted in IIST for streamlining space research ventures, which has approved 32 projects in collaboration with the different ISRO/ DoS centres. The PSLV-In-orbitaL Obc and Thermals (PILOT) payload and the second hardware of the ARIS-2 payload are ready and awaiting for launch opportunity. Activities for RPA-V payload for the Venus mission, engagement with ISRO's TDS-01 satellite mission are two other very notable projects in progress. Some of these ventures are unique in the way they elicit student collaboration. The Hybrid Rocket Experiments (IHRX) which is a student-driven program mentored by the faculty members from the institute and various scientist from ISRO/ DoS centres is one among them.

IIST has also made a strong footprint in collaborative ventures other than research. The research work in collaboration with national and international institutes were and are in full swing. In the context of the new space reforms, IIST has signed MoUs with L&T and Quazer Tech Pvt. Ltd. with an aim to develop newer technologies associated with satellite and launch vehicle systems. Five companies have been incubated and functioning actively under STIIC with many more in the pipeline. A tally of 6 patent applicants filed, 212 articles published in reputed journals and 5 books published by faculty and students show the significant academic and research footprint the institute has. Recognizing the imperative of further strengthening the academic and research environment of the institute and to catch up with the advances in the Indian space ecosystem, concerted efforts are being made to extend the research of IIST beyond its campus into ISRO centers, to enhance the institute's ranking and research outcomes, and recommend tailored academic programs to align with the new National Education Policy (NEP).

IIST experienced an influx of expertise through the visits of renowned scientists, academicians and various eminent personalities, including foreign delegations. These interactions not only enriched the academic landscape of the institute, but also helped in fostering an environment of innovation and collaboration.

Beyond the confines of classrooms, the students of IIST found time in organizing several outreach programs, trying to make a change in the lives of the less advantaged sections of the society. The institute came alive with vibrant celebrations and fests which included Dhanak, the cultural fest; Conscientia, the Tech fest; the sports day, MUN and other such events which infused the campus with a kaleidoscope of colors, adding dynamism and energy to the academic environment.

With pride and gratitude, I have pleasure in submitting the Annual Report of IIST for the period 2022-2023. We express deep gratitude to Secretary DoS / President, Governing body of IIST for taking keen and involved interest in the functioning of IIST and the continued support and guidance extended to IIST.

S. Unnikrishnan Nair
Director, IIST

The Institute

1. The Institute

Established in 2007 in Thiruvananthapuram, Kerala, the Indian Institute of Space Science and Technology (IIST) was founded with the aim of exploring new frontiers in science and technology while nurturing a skilled workforce to support these endeavors. Designated as a Deemed University under Section 3 of the UGC Act 1956 by the Department of Space, IIST proudly holds the distinction of Asia's first Space University. Over its 16 years of operation, the institute has dynamically grown into a hub for multidisciplinary learning and research, spanning fields such as Aerospace, Avionics, Chemistry, Earth and Space Sciences, Humanities, Mathematics, and Physics. Offering undergraduate courses across three branches and postgraduate programs across 15 branches in Science, Technology, and Engineering, IIST places a synergistic emphasis on Space Science and Technology applications. Today, IIST stands as India's premier science and technology institute, fostering a rigorous, multidisciplinary approach to knowledge, encompassing concepts, models, and applications in science and technology. It has evolved into a center for learning and problem-solving, addressing both local and global needs, and bridging the realms of technology and society.

The institute exists as a symbiotic counterpart of ISRO, injecting innovative ideas and cutting-edge technology into ISRO's operational domains. Students at IIST have numerous opportunities to contribute as interns and employees to various ISRO centers, establishing a valuable human resource pool. IIST's Doctoral and Post-Doctoral research programs encourage students to actively participate in groundbreaking and interdisciplinary research, addressing critical needs in the country. The advanced facilities across departments, coupled with a culture of robust interdisciplinary collaboration and support from ISRO centers, empower students and research scholars in their pursuits. Beyond advancing science and technology, scholars and students enthusiastically contribute to scholarship in social science, management, economics, and cultural

studies. In this manner, the institute embodies the essence of the National Education Policy (NEP), giving due credit to science, engineering, humanities, and management alike.

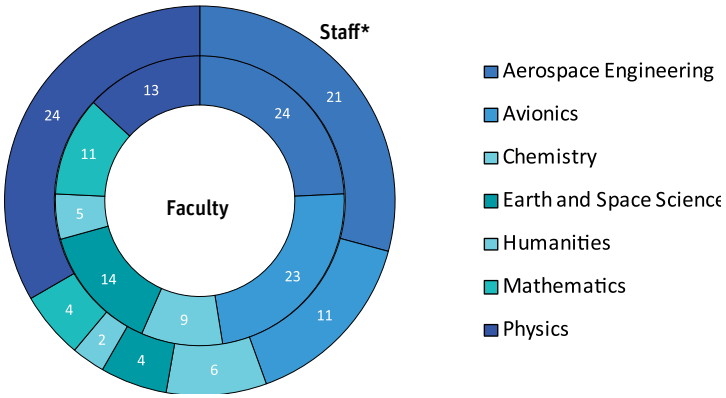
IIST is actively engaged in diverse space projects, showcasing its prowess in cutting-edge technologies. IIST also fosters student involvement through various projects. These initiatives, led by students and guided by both institute faculty and ISRO scientists, exemplify IIST's commitment to nurturing the next generation of space innovators.

IIST has been striving to build a strong research tradition, the impressive statistics can show in terms of various research indicators, including active collaboration with other universities/institutes at the national and international levels, publications, patents etc. Driven by visionary initiatives, precise actions, decisive choices and effective leadership, IIST aspires to evolve into a worldwide hub for research, education, and initiatives in space-related disciplines in the forthcoming years.

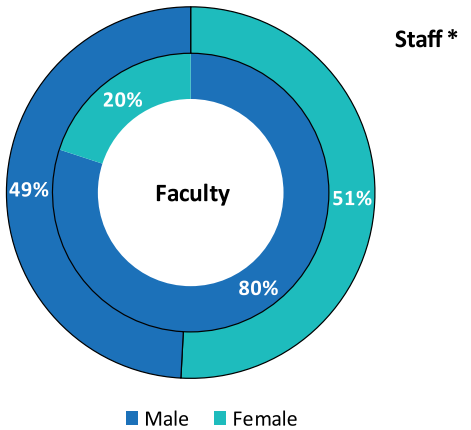
1.1 IIST at a Glance 2022-23

Departments and its strength

Faculty & staff strength in various department



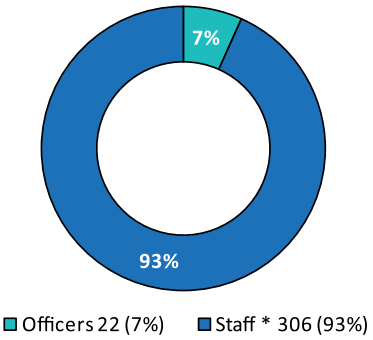
Gender wise distribution of faculty & staff in various departments



** Staff - Technical, scientific and hired man power*

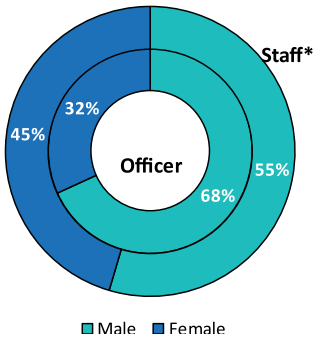
Administration and other Essential Services

Administrative Strength



**Staff includes hired man power*

Gender Statistics - Administrative and other Essential Services



**Staff includes hired man power*

Students Strength *(as on 31-03-2023)*	
B.Tech. students enrolled in 2022	144
B.Tech. students in campus	579
Dual Degree students enrolled in 2022	24
Dual Degree students in campus	40
M.Tech students enrolled in 2022	133
M.Tech students in campus	218
Doctoral students enrolled in 2022	94
Doctoral students in campus	265
Post Doctoral Scholars in campus	05

Projects and Collaborations	
ASRG Projects approved	32
ASRG Projects under review	09
Externally funded / Extramural Research Projects	45
MoUs signed (till date)	25

Research Outcome	
Book / Book chapters	25
Journal Papers	212
Conference Proceedings	117
PhD Thesis Defended	28
Patents Granted *(till date)*	9
Patent application submitted *(till date)*	18

Centres of Excellence	
Centres of Excellence	4

Awards and Achievements	
Awards and Recognitions	48

Research Resources	
New Books/ E-books/ Reports added in the library	2680

Startups	
Incubated	1
Pre-incubated	3
Admission offered	1

Placements	
Placement (B.Tech./ Dual Degree- ISRO)	103
Placement (B.Tech./ Dual Degree- Placement cell)	26
Placement (M.Tech. - Placement cell)	66

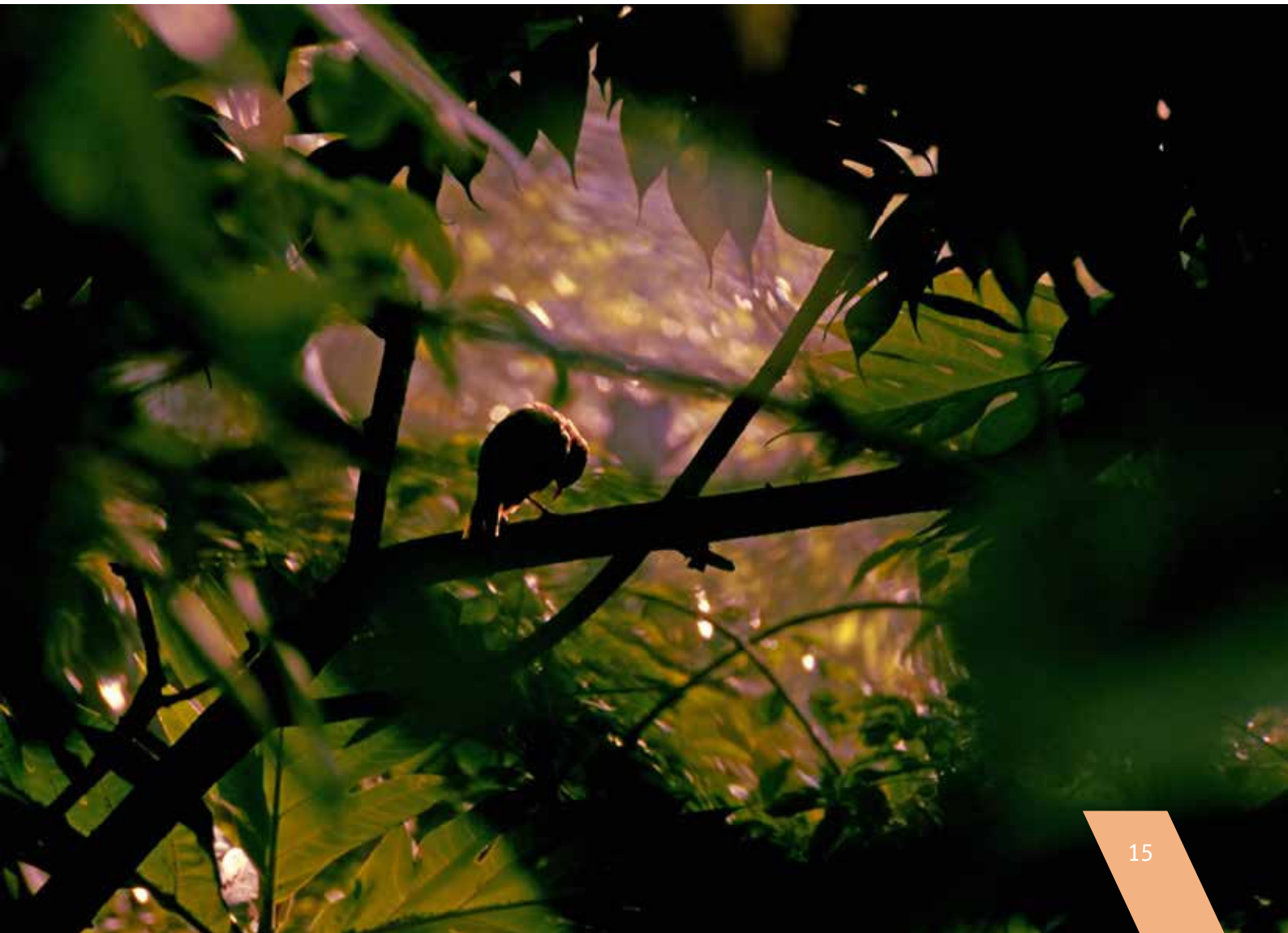
RTI Status

From April, 2022 to March, 2023 (Decentralised the processing of applications under RTI and CPIO, IIST has been disseminating the information directly to the applicants).

Application Received	Information given	Appeal Received	Appeal Settled	CIC Hearing
44	34	2	0	Nil

Vigilance Status

Number of Vigilance Cases: NIL



1.2 Statutory Bodies

1.2.1 IIST Governing Body

S. Somanath	Secretary, DoS/ Chairman, ISRO **President**
M. Maheshwar Rao	Additional Secretary & FA, DoS
Shantanu Bhatawdekar	Scientific Secretary, ISRO Headquarters
S. Unnikrishnan Nair	Director, VSSC
V. Narayanan	Director, LPSC
Nilesh M. Desai	Director, SAC
Prakash Chauhan	Director, NRSC
S. Unnikrishnan Nair *(from 20.09.2022)* **D. Sam Dayala Dev** *(till 20.09.2022)*	Director, IIST **Secretary**

1.2.2 IIST Governing Council

S. Somanath	Secretary, DoS/ Chairman, ISRO **Chairperson**
M. Maheshwar Rao	Additional Secretary & FA, DoS
G. Jayanthi	Joint Secretary (Finance), DoS
Shantanu Bhatawdekar	Scientific Secretary, ISRO Headquarters
D. Sam Dayala Dev *(till 20.09.2022)* **S. Unnikrishnan Nair** *(from 20.09.2022)*	Director, IIST **Secretary**

1.2.3 IIST Board of Management

D. Sam Dayala Dev *(till 20.09.2022)* **S. Unnikrishnan Nair** *(from 20.09.2022)*	Director, IIST **Chairman**
M. Maheshwar Rao	Additional Secretary & FA, DoS
Shantanu Bhatawdekar	Scientific Secretary, ISRO Headquarters
V. Narayanan	Director, LPSC
Prakash Chauhan	Director, NRSC
Virendra Kumar Tewari	Director, IIT Kharagpur
V. Kamakoti	Director, IIT Madras

C. Anandharamakrishnan *(from 11.11.2022)* **A. Ajayaghosh**	Director, NIIST
Anil Bharadwaj	Director, PRL
A. Chandrasekar	Dean (Academics and Continuing Education), IIST
Raju K. George	Dean (Research & Development and Intellectual Property Rights), IIST
Kuruvilla Joseph	Dean (Student Activities, Student Welfare and Outreach), IIST
N. Sabu	Professor, Department of Mathematics, IIST
Vani Devi M.	Assistant Professor, Department of Avionics, IIST
Y. V. N. Krishna Murthy	Registrar, IIST **Secretary**

1.2.4 IIST Finance Committee

D. Sam Dayala Dev *(till 20.09.2022)* **S. Unnikrishnan Nair** *(from 20.09.2022)*	Director, IIST **Chairman**
M. Maheshwar Rao	Additional Secretary & FA, DoS
Bijay Kumar Behera	Associate Director, BEA ISRO Headquarters
A. Chandrasekar	Dean (Academics and Continuing Education), IIST
Raju K. George	Dean (Research & Development and Intellectual Property Rights), IIST
Y. V. N. Krishna Murthy	Registrar, IIST
Sivanandan G.	Sr. Head Accounts/ IFA LPSC, Valiamala
R. Hari Prasad	Deputy Registrar, Grade II (Finance)/ Finance Officer **Secretary**

1.2.5 IIST Academic Council

D. Sam Dayala Dev *(till 20.09.2022)* **S. Unnikrishnan Nair** *(from 20.09.2022)*	Director, IIST **Chairman**
A. Chandrasekar	Dean (Academic & Continuing Education), IIST
Raju K. George	Dean (Research & Development and Intellectual Property Rights), IIST
Kuruvilla Joseph	Dean (Student Activities, Student Welfare & Outreach), IIST
K. Sudhakar	Former Professor, IIT Bombay
K. R. Ramakrishnan	Former Professor, IISc Bangalore
C. Anandharamakrishnan *(from 11.11.2022)* **A. Ajayaghosh**	Director, NIIST, Thiruvananthapuram
K. Kurien Issac	Senior Professor, Department of Aerospace Engineering
C. S. Narayanamurthy	Senior Professor, Department of Physics
Aravind V.	Professor and Head, Department of Aerospace Engineering
A. Salih	Professor, Department of Aerospace Engineering
Manoj T. Nair	Professor, Department of Aerospace Engineering
Deepu M.	Professor, Department of Aerospace Engineering
Anup S.	Professor, Department of Aerospace Engineering
Chakravarthy P.	Professor, Department of Aerospace Engineering
Deepak Mishra	Professor and Head *(till 03.01.2023)*, Department of Avionics
N. Selvaganesan	Professor and Head *(from 04.01.2023)*, Department of Avionics
B. S. Manoj	Professor, Department of Avionics
Priyadarshnam	Professor, Department of Avionics
Sandhya K. Y.	Professor and Head, Department of Chemistry

Nirmala Rachel James	Professor, Department of Chemistry
K. Prabhakaran	Professor, Department of Chemistry
Rama Rao Nidamanuri	Professor and Head, Department of Earth and Space Sciences
Anandmayee Tej	Professor, Department of Earth and Space Sciences
Samir Mandal	Professor, Department of Earth and Space Sciences
Sarita Vig	Professor, Department of Earth and Space Sciences
Anand N.	Professor, Department of Earth and Space Sciences
Shaijumon C. S.	Associate Professor and Head, Department of Humanities
V. Ravi	Professor, Department of Humanities
Lekshmi V. Nair	Professor, Department of Humanities
C. V. Anil Kumar	Professor and Head, Department of Mathematics
K. S. S. Moosath	Professor, Department of Mathematics
N. Sabu	Professor, Department of Mathematics
Deepak T. G.	Professor, Department of Mathematics
Sudheesh Chethil	Professor and Head, Department of Physics
S. Murugesh	Professor, Department of Physics
Umesh R. Kadhane	Professor, Department of Physics
Anindya Dasgupta	Associate Professor, Department of Avionics
Gigy J. Alex	Associate Professor, Department of Humanities
Y. V. N. Krishna Murthy	Registrar **Secretary**

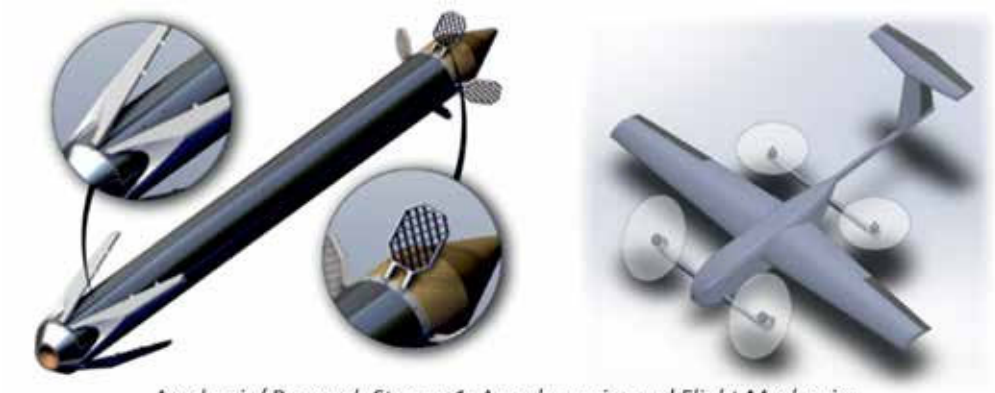
1.3 Functionaries in Academics, Administration and Other Units

Director		
D. Sam Dayala Dev *(till 20.09.2022)* **S. Unnikrishnan Nair** *(from 20.09.2022)*		
Registrar		
Y. V. N. Krishna Murthy	Sr. Professor	
Deans		
A. Chandrasekar	Academics & Continuing Education	
Raju K. George	Research and Development & IPR	
Kuruvilla Joseph	Students Activities, Student Welfare & Outreach	
Department Heads		
Aravind Vaidyanathan	Professor	Aerospace Engineering
Deepak Mishra *(till 03.01.2023)* **N. Selvaganesan** *(from 04.01.2023)*	Professor	Avionics
K. Y. Sandhya	Professor	Chemistry
Rama Rao Nidamanuri	Professor	Earth and Space Sciences
C. S. Shaijumon	Associate Professor	Humanities
C. V. Anil Kumar	Professor	Mathematics
Sudheesh Chethil	Professor	Physics
Officers		
C.V.H.S.S. Mallikarjuna Rao *(till 30.11.2022)* **S.N. Chandrasekaran** *(from 05.12.2022)*	Head Civil and Maintenance Division	
V. Sennaraj	Deputy Registrar, Grade II (Academics)	
R. Hari Prasad	Deputy Registrar Grade II (Finance)	
Mohan Sukumar	Scientist/ Engineer 'SG' (Computer System Group)	
Bindya K. R.	Deputy Registrar, Grade I (General Administration, Student Activities and Welfare)	
Ramanathan S.	Deputy Registrar, Grade I (Recruitment and Review)	

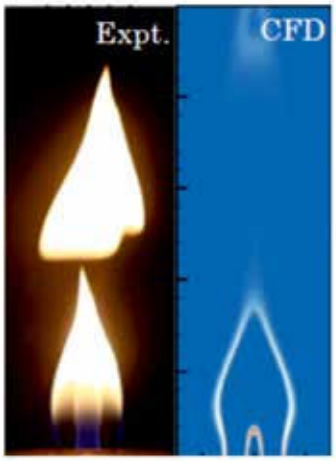
Subash Chandran M. B. **Rakesh R. Menon**	Deputy Registrar, Grade I (Purchase) Deputy Registrar, Grade I (Stores)
Abdunnasar A.	Library Officer-E
Vinod Kaimal K. P.	Head - Canteen Services
Rajeena Beegam S. **Reny Thomas**	Deputy Registrar, Grade I (Finance)
Pradeep Kumar K. R.	Senior Administrative Officer & PRO (Establishment and Transport)
Cimy Asaf	Assistant Director (Official Language)

Academic Departments

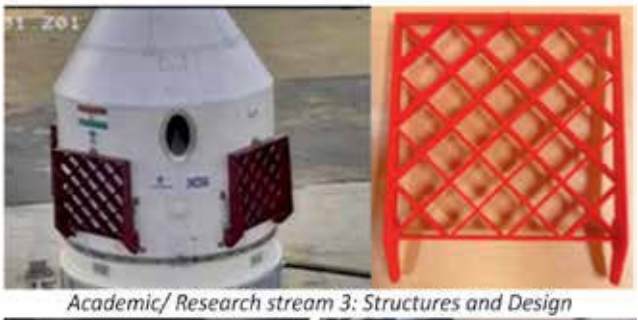
Department of Aerospace Engineering



Academic/ Research Stream 1: Aerodynamics and Flight Mechanics



Academic/ Research stream 2: Thermal and Propulsion



Academic/ Research stream 3: Structures and Design

Academic/ Research stream 4: Materials, manufacturing and Management

2.1 Department of Aerospace Engineering

Vision

To be a centre for learning and innovation in Aerospace Engineering, igniting in students the spark to explore the unknown and contributing at national and global level.

Mission

- provide excellent teaching and research environment for undergraduate, postgraduate and doctoral students conducive for critical thinking in the areas of aerospace engineering.
- Equip the students with the capacity to acquire integrated systems engineering approach, leading to innovative thinking for smart solutions in the areas of aerospace technology.
- Strive to create a longstanding synergy between the society, industry and other peer institutions to collectively address the nation's technological needs
- Instill a deep sense of commitment to accept and overcome technological challenges, thereby nurturing future leaders of tomorrow.

Core Research Focus

(a) Aerodynamics and Flight Mechanics

(b) Thermal and Propulsion

(c) Structures and Design and

(d) Materials, Manufacturing and Industrial Engineering

Fact File

Number of faculty	:	23
Technical Staff	:	06
Tutors/ Technicians	:	12*
Non-teaching staff	:	03*
Research Scholars	:	70
Number of PhDs conferred	:	03

**(hired Manpower)*

Laboratory / Research Facilities

Department of Aerospace, IIST owns 22 instructional labs and 10 research labs, which include

- Advanced Propulsion and Laser Diagnostic Facility
- High Pressure Shock tube facility
- Flame diagnostic lab facility
- Flow Engineering lab facility
- Structural Health Monitoring Lab
- Experimental Composite Micromechanics lab/ Micro Raman Spectrometer Facility
- Temp/ pressure Calibration Facility
- Cryogenics Lab
- Aerodynamics Lab
- Flight Mechanics Lab
- Thermal and Propulsion Lab
- Heat Transfer and Fluid flow lab
- Strength of Materials Lab
- Aerospace Structures lab and Laser Doppler Vibrometer Facility
- Material Characterization/ Physical Metallurgy Lab
- Manufacturing and Metrology lab
- Computational fluid Mechanics facility
- Computer Aided Design and Analysis facility
- Engineering Drawing Lab
- Basic Engineering lab/ Workshop

Research and Developments

- Faculty members from department have been contributing actively to Advanced Space Research Group (ASRG) activities. Typical areas of research include
  - Development of Mathematical Human Thermal Behaviour Model for a Reference Indian Subject.
  - Additive manufacturing – Directed Energy Deposition for space applications.
  - Supersonic combustion of isrosene behind two strut configuration.
  - Analysis of Thruster Plume Behaviour in Vacuum using DSMC Method.
  - Cold flow characterization of a Dual Throat Nozzle (DTN) based Tri-propellant Engine Propulsion System.
- Human physiology laboratory with the necessary tools and technologies to conduct research in terrestrial and microgravity environments has been proposed from department.
- Department has initiated MoUs with various Industries/ R&D organizations including Larson & Tubro, Sree Chitra Tirunal Institute of Medical Sciences and

Technology (SCIMST), Technion - Israel institute of technology, Isae-Supaero Toulouse, France.

- Faculty members from Department holds various externally funded projects, funded by DRDO, DST-DAAD, Indian Oil Ltd etc.
- Various awards/ recognitions have been received by faculty and students, which include INAE innovative student project award (in Doctoral Category), Best M.Tech Thesis awards, and Best paper awards in various conferences.
- Proposed new initiatives/ upgradation of academic/ research labs like Cold gas thruster facility, Combustion Research Facility, Reacting flow/ Flow Instability/ Two phase flow characterization facilities, Sub-zero engineering and analysis lab, Mechanism and Robotics Demonstration Facility.

Research outcomes - Fact File

International Journal	:	33
Conferences	:	19
Book chapters	:	7
Patents	:	2 (Under review)

Contributions to Institute Level Space Missions

Department of Aerospace Engineering is actively contributing to various space missions undertaken by Institute under SSPACE. Recently accomplished missions include ARIS, PILOT etc.

- Development of Hybrid Propulsion Experimental Rocket - Demonstrator (HyPER-D) has been initiated, in which the proposed experiments include a series of sub-orbital flights with innovations related to re-usable launch vehicle technologies.
- Faculty from department is full involved in IIST Ground Station Development.
- Initiatives in cold gas propulsion system development.
- Initiated CubeSat Development activities in association with L&T.

Outreach Activities

- More than 12 conferences/ workshops/ seminars/ FDPs, participated by faculty members.
- Reviews/ Technical discussions at ISRO/ other organizations/ Institutes.
- Contributed to various outreach activities for school/ college students initiated by Student Activity Board at IIST.

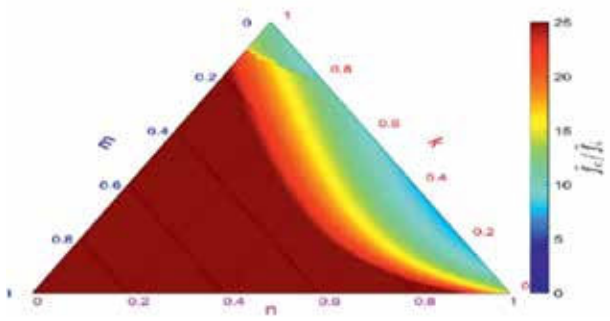
Startup activities

Currently following three Start-ups are mentored by faculty members of Department

- M/s Vashishtha Research Pvt. Ltd., focusing on robotic systems/ robotic measurements etc.
- M/s InterCosmos Space Exploration Technologies Pvt. Ltd, focusing on the development of a proof-of-concept for HyperX (satellite propulsion) with 10 N bi-propellant thruster with a hypergolic, storable and highly throttleable fuel.
- M/s Specrule scientific focusing on In-house development of laser-based optical sensor systems for aerospace and combustion research.

Faculty Profile

Anup S., Ph.D., Professor



Research Interest

- Mechanics of Bio-inspired composites
- Micromechanics
- MD simulations of nanocomposites

Research Highlights

- Biological composites such as nacre and bone which consist of hard platelets embedded in a soft matrix, has excellent mechanical properties which can be mimicked to form bio-inspired composites.
- The hierarchical arrangement and the staggering pattern of the platelets inside the matrix are major factors affecting the final properties of such composite materials.
- A new generalized model for a stair wise staggered two hierarchical bio-inspired composite was formulated. This was optimized using ternary diagrams for stiffness, strength, and toughness.

Reference:https://www.iist.ac.in/aerospace/anup

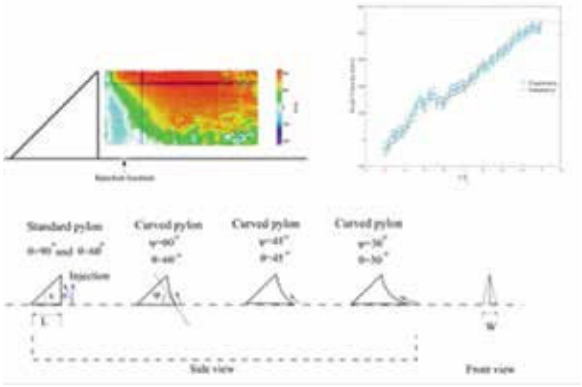
Aravind Vaidyanathan, Ph.D., Professor

Research Interest

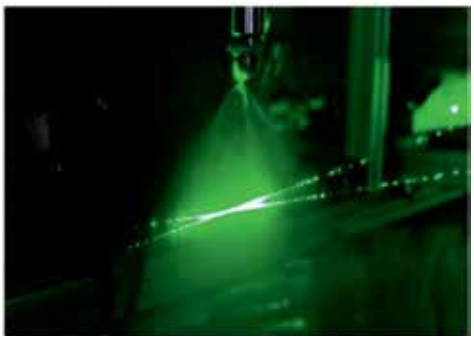
- Outer Space: Integrated Launch Vehicle Design and Analysis, Small Satellite Launch Vehicle Development- 50 kg @ 500 km orbit, Sounding Rockets, Small Satellite and Payload Development
- Inner Space: Exploring the Human Consciousness and Potential through Ancient Indian Wisdom

Research Highlights

Experimental studies on mixing enhancement of secondary jet (gaseous, liquid, and aerated jet) in supersonic cross-flow using curved pylons, ramps, and cavities with pressure measurements, particle image velocimetry (PIV), high-speed Schlieren, and planar laser-induced fluorescence (PLIF) are used for the validation of numerical results of gaseous secondary injection. Cold flow injector characterization of flight model and scaled models of ISRO's Scramjet Strut Injector was done to investigate the droplet size, droplet velocity and spray structure. Cold flow characterization of the Quartet Impinging Injector for Hybrid rocket propulsion keeping the pressure differential for actual case was studied. The driving and coupling mechanisms that contribute to onset of combustion instability are experimentally investigated using a sub-scale modular combustion chamber by dynamic pressure measurement and simultaneous high speed OH* chemiluminescence imaging. The flame response function method is employed in a FEM based Helmholtz equation solver to predict the stability of the configuration. A start-up company Specrule Scientific Pvt Ltd. incubated at the Space Technology Innovation and Incubation Centre (STIIC) in IIST is developing their products based on laser diagnostic techniques in collaboration with the APLD lab. The techniques developed include tunable diode laser absorption spectroscopy (TDLAS), Interferometric Rayleigh Scattering (IRS), Digital Two-Color Ratio Pyrometry (TCRP) etc.



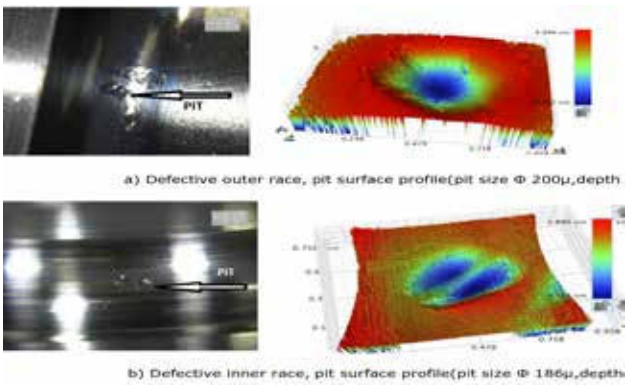
Pylon Configurations, Validation Results using PIV.



LDV conducted on a standard spray nozzle.

Reference: https://www.iist.ac.in/aerospace/aravind7

Bijudas C.R., Ph.D., Associate Professor



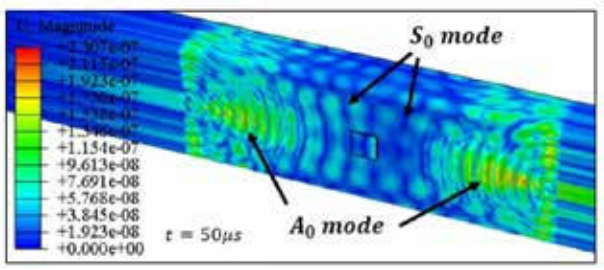
Bearing element surface defect and the pit surface profile

Research Interest

- Structural Health Monitoring
- Wave propagation in thin walled Structures
- Energy Harvesting

Research Highlights

- Health monitoring of rolling element bearings using improved wavelet cross spectrum technique and support vector machines



Simulation of guided waves propagating in a chanel

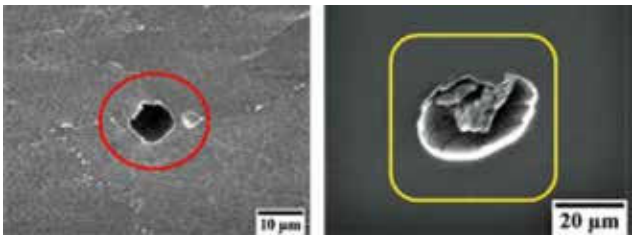
- Numerical and experimental investigation of nonlinear Lamb wave mixing at low frequency

Reference: https://www.iist.ac.in/aerospace/biju

Chakravarthy P., Ph.D., Professor

Research Interest

- Weldability of Aerospace Materials
- Deformation processing of Light alloys



Defects in additively manufactured components.

Research Highlights

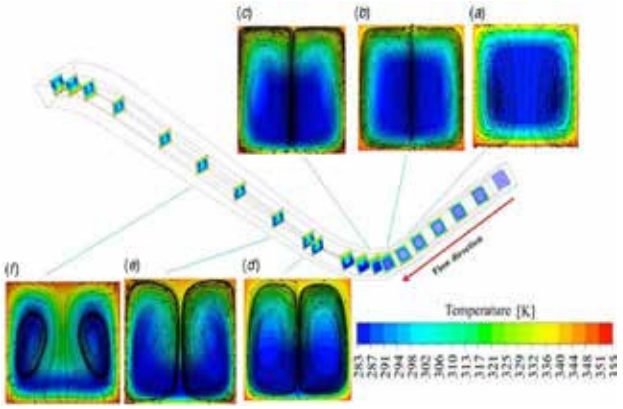
- Defect analysis in additive manufactured components
- Welding of aerospace materials
- Deformation studies/ Hot working of metallic materials

Reference: https://www.iist.ac.in/aerospace/chakravarthy

Deepu M., Ph.D., Professor

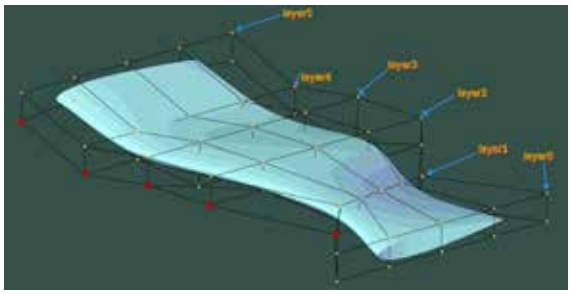
Research Interest

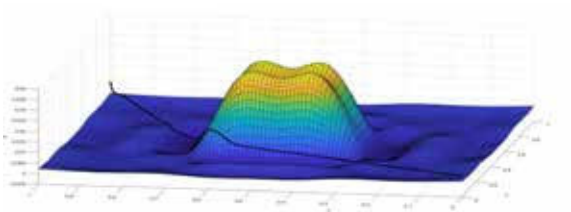
- Modeling of turbulent, compressible, reacting flows in propulsion systems
- Heat & mass transfer enhancement
- Heat transfer in microchannels
- Heat transfer in reactive materials



Reference: https://www.iist.ac.in/aerospace/deepu

Devendra Prakash Ghate, Ph.D., Assistant Professor





Research Interest

- Trajectory Optimization, Multi-disciplinary Optimization, Adjoint Methods

Research Highlights

- RBF surrogate model based trajectory optimisation for electric taxi
- Satellite scheduling algorithms
- Adaptive trajectory design for launch vehicle stage recovery

Reference: https://www.iist.ac.in/aerospace/devendra.ghate

Dhayalan R., Ph.D., Assistant Professor

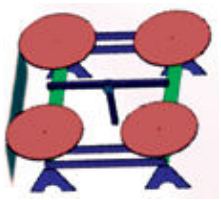
Research Interest

- System Identification of Aerial Vehicles
- Design and Development of Unmanned Aerial Vehicles
- Automatic control of UAVs

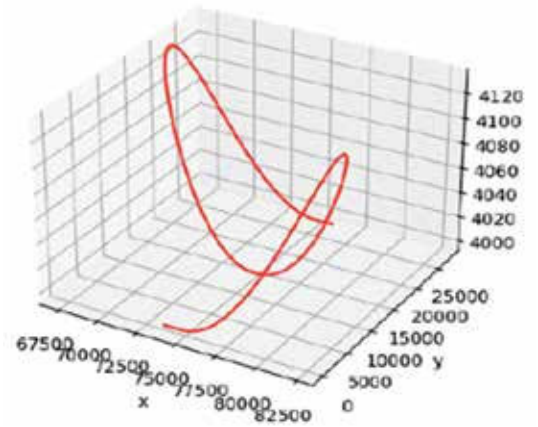
Research Highlights

- System Identification of Aerial Vehicles
- Aerodynamic models
- Parameter Estimation Methods
- Design and Development of Unmanned Aerial Vehicles
- Fixed Wing UAVs
- Multirotor UAVs
- VTOL UAVs
- Automatic control of UAVs

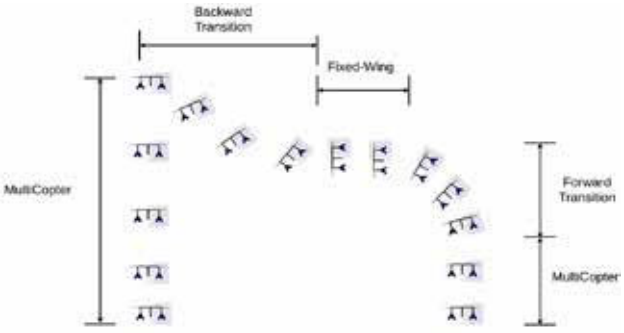
Tail Sitter UAV



Fixed Wing VTOL UA

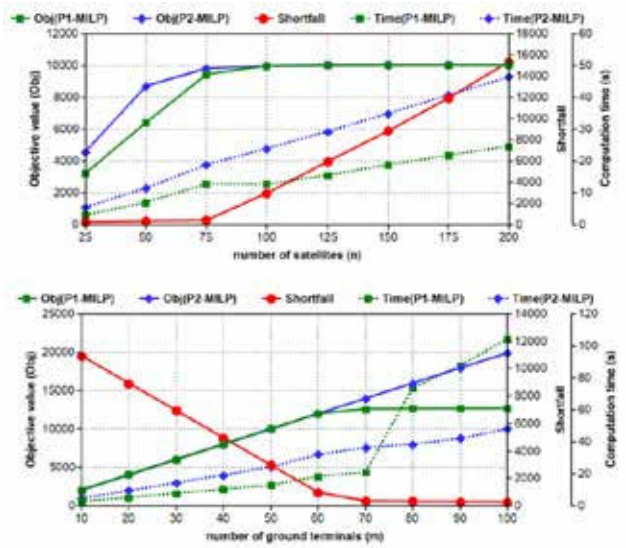


Crazy 8 using LQR control



Reference: https://www.iist.ac.in/aerospace/dhayalan.r

Girish B.S., Ph.D., Associate Professor



Research Interest

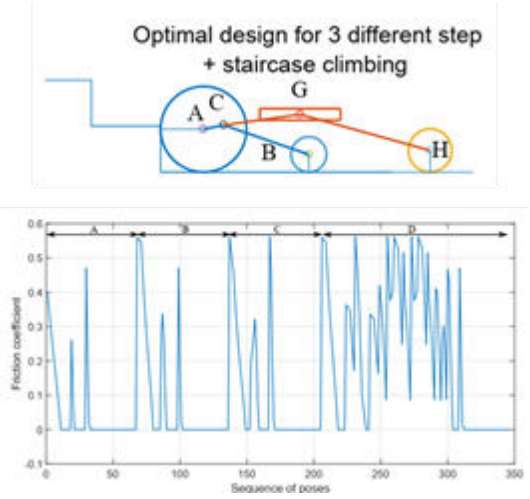
- Operations research applications in manufacturing and space systems
- Operations management

Research Highlights

- Exact algorithms for scheduling job shops in JIT manufacturing
- Efficient MILP formulations for satellite broadcast scheduling problem

Reference: https://www.iist.ac.in/aerospace/girish

Kurien Issac K., Ph.D., Senior Professor



Research Interest

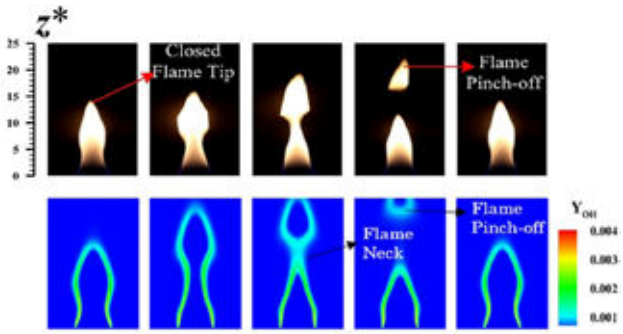
- Kinematics of Mechanisms
- Dynamics of Rigid Body Systems
- Optimal Design
- Automatic Control
- Robotics
- Aids for Rehabilitation

Research Highlights

- Optimal design of wheeled rover for uneven hard terrain
- Performance optimization of wheeled rover on uneven hard terrain

Reference: https://www.iist.ac.in/aerospace/kurien

Mahesh S., Ph.D., Assistant Professor



Research Interest

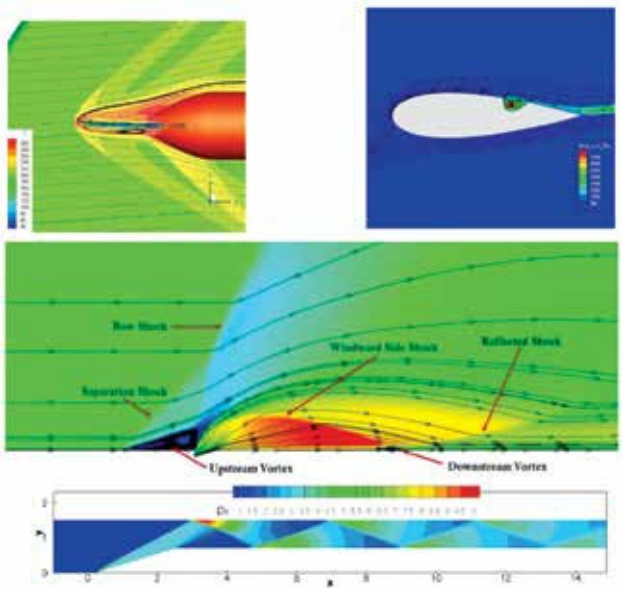
- Jet Diffusion Flame Characterization
- Microgravity Combustion
- Sub-atmospheric Combustion
- Ultra-Low Emission Burners

Research Highlights

- Design and Development of Annular Swirl Burner
- Characterization of Buoyant Swirl Inverse Diffusion Flames (IDF)

Reference: https://www.iist.ac.in/aerospace/maheshsubbiah

Manoj T. Nair, Ph.D., Professor



Research Interest

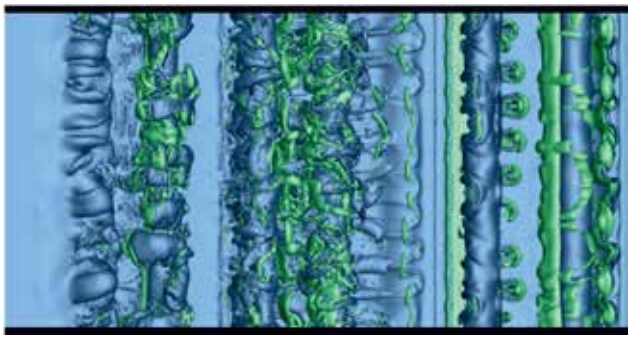
- Computational Fluid Mechanics
- Hypersonic Aerothermodynamics
- Aerodynamic Shape Optimization
- Compressible & Incompressible Flow
- Unsteady Flows
- Large Eddy Simulation

Research Highlights

- Combination of counterflow jet and cavity for heat flux and drag reduction
- Optimisation of Trapped Vortex Cavity for Airfoil
- Study of scarfed nozzle
- Higher-order slope limiters

Reference: https://www.iist.ac.in/aerospace/manojtnair

Manu K. Vasudevan, Ph.D., Associate Professor



Research Interest

- Flow instability and transition
- Heat transfer in phase change material
- Direct contact condensation

Research Highlights

- Direct numerical simulation of flow transition in adverse and zero pressure gradient flows
- Conducted experiments and simulation of PCM melting
- Performed numerical simulation of direct contact condensation

Reference: https://www.iist.ac.in/aerospace/manukv

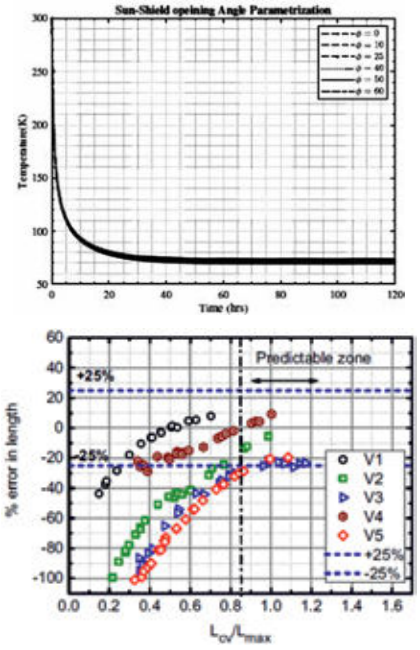
Pradeep Kumar P., Ph.D., Associate Professor

Research Interest

- Two-phase flows, Electronic cooling, Radiation heat transfer in high temperature insulation, micro-scale flows and heat transfer.

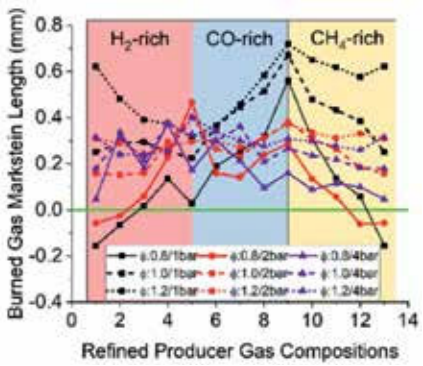
Research Highlights

- Cavitation zone characterisation of planar cavitating venturis
- In-orbit thermal performance evaluation of multi-stage radiant cooler with varying sunshield opening [jointly with URSC-Bangalore]

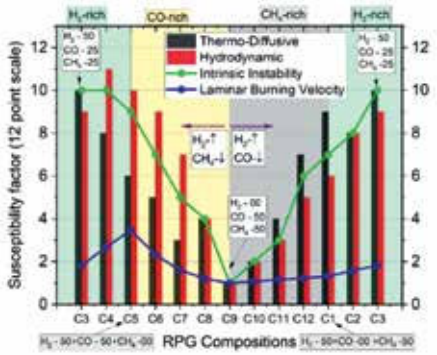


Reference: https://www.iist.ac.in/aerospace/pradeepkumarp

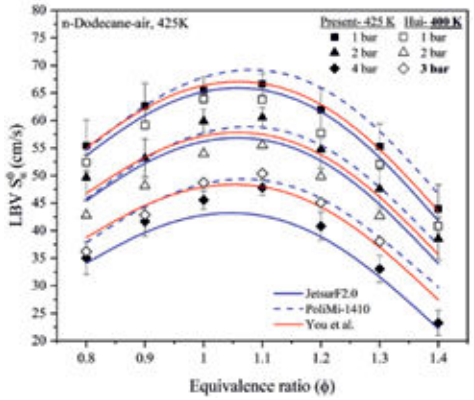
Prathap C., Ph.D., Associate Professor



Burned gas Markstein length variation with different refined producer gas composition at 1 bar, 300K



A comprehensive analysis to display the effect of thermo-diffusive, and hydrodynamic effects on laminar burning velocity



Laminar burning velocity of n-dodecane-air mixture at 425K and 1-3 bar

Research Interest

- Burning Velocity, hypergolic combustion, Low calorific value fuels, reaction mechanisms, Swirl flames, catalytic combustion, carbon fiber formation, biomass gasifier, IC engines, microgravity combustion, laser ignition, hybrid rocket propulsion, Direct Contact Condensation

Research Highlights

- An innovative ranking system to address comprehensive stability of laminar burning velocity of low calorific value fuels such as producer gas towards thermo-diffusive and hydrodynamic instabilities
- Premixed n-dodecane-air was studied using a heated cuboidal combustion chamber. The measured laminar burning velocity was used to test the existing detailed and skeletal reaction mechanisms

Reference:https://www.iist.ac.in/aerospace/prathapc

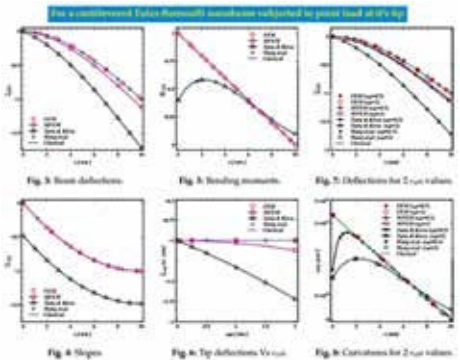
Praveen Krishna I.R., Ph.D., Associate Professor

Research Interest

- Nonlinear Dynamics
- Vibration
- Acoustics
- Nonlocal mechanics

Research Highlights

- Static bending behaviour of nanobeams utilizing size-dependant continuum theories.
- Highlight flaws in various techniques adopted by researchers investigating nanobeam bending problems.
- Develop consistent analytical and semianalytical solution methodologies concerning nanobeam elastostatics.



Reference:https://www.iist.ac.in/aerospace/praveenkrishna

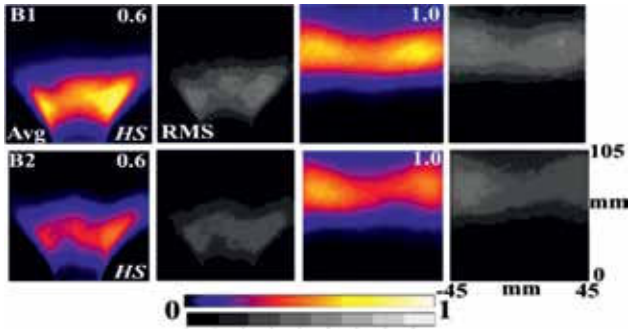
Rajesh Sadanandan, Ph.D., Associate Professor

Research Interest

- Aerospace Propulsion
- Clean Combustion
- Optical and Laser-based Diagnostics

Research Highlights

- The Influence of Varying Fuel Composition and Flowfield on Turbulent Biogas-Like Flame Characteristics
- Renewable energy sources like biogas have complex chemical compositions where the percentage of its constituents (CH_4,CO_2, and minor constituents like N_2 & H_2) can vary depending on their source. This causes difficulties in practical applications as it affects the combustion efficiency, flame stability, and pollutant emissions. The influence is experimentally investigated in an in-house developed non-premixed variable swirl burner using optical & laser diagnostic methods.



Time-averaged OH chemiluminescence distribution, and RMS fluctuation under high swirl (HS) flow conditions showing the variations in heat release characteristics with changes in fuel composition (B1: CH_4:CO_2 =80%:20%, B2: CH_4 :CO_2 = 60%:40%)*

Reference:https://www.iist.ac.in/aerospace/rajeshsadanandan

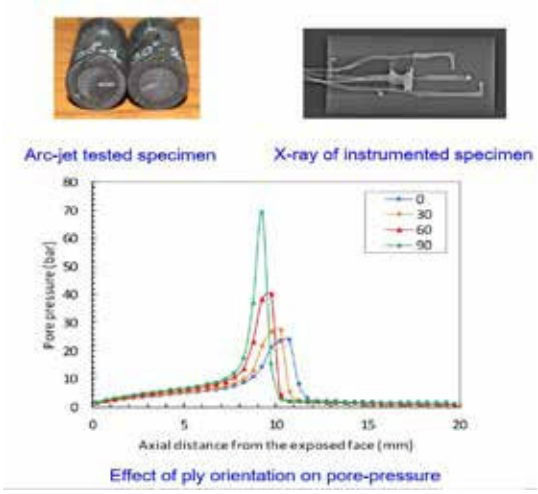
Raveendranath P., Ph.D., Adjunct Professor

Research Interest

- Efficient and locking free Finite Element Methods
- Modelling and analysis of nano-beam structures
- Coupled numerical simulation of Ablative composites

Research Highlights

- Developed a two-dimensional axisymmetric, unstructured Finite volume model for thermochemical response of Carbon-Phenolic ablative composite.
- Decomposition kinetics model developed for Carbon-Phenolic material using thermogravimetry tests
- Arc jet tests conducted on Carbon-Phenolic material prepared at different ply orientations.

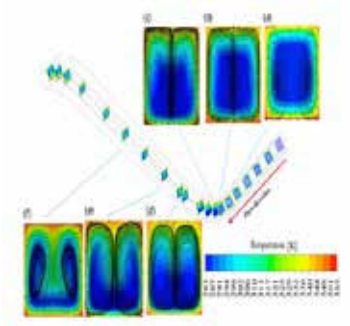


Reference: https://www.iist.ac.in/aerospace/raveendranath

Salih A., Ph.D., Professor

Research Interest

- Computational Fluid Dynamics
- Simulation of Multiphase Flows



Research Highlights

- Development and investigation of an equation of state (EOS) for compressible water for the application over a wide range of pressure.
- Numerical investigation of isothermal flow problem of an instantaneous valve closure in an irrigation pipe and the associated flow transients.
- Development of an analytical solution to a shock tube problem with compressible liquid as working fluid.
- Development of a mathematical model that incorporates an adaptive damping technique for the accurate prediction of hydraulic surges in compressible liquids.
- Development of a hierarchical Cu-ZSM-5 catalyst coated on α-alumina foam support for NH_3 Selective Catalytic Reduction (SCR).
- Numerical studies on the flow and heat transfer characteristics of rectangular regenerative cooling passages with lateral curvature for a high-area-ratio nozzle.
- Chill-down of Cryogenic feed lines - An insight into the influence of feed line orientation and mass flux on heat flux at inner wall.

Reference: https://www.iist.ac.in/aerospace/salih

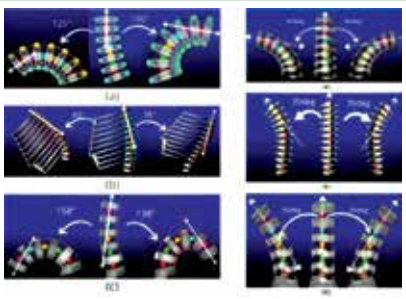
Sam Noble, Ph.D., Reader

Research Interest

- Design and synthesis of mechanisms
- Robotics/ assitive mechanisms
- Optimal design

Research Highlights

- Bio-inspired Skeletal Model and Kinematics of Humanoid Spine and Ribs
- Deployment mechanism for multifold mirror/ reflectors



Reference: https://www.iist.ac.in/aerospace/samnoble

Satheesh K., Ph.D., Associate Professor

Research Interest

- High temperature gas dynamics, Experimental aerodynamics, Laser absorption spectroscopy applications

Research Highlights

- Development of a TDLAS sensor in collaboration with Rajesh S.
- Uses H_2O as the absorbing species
- Simultaneous measurement of temperature and concentration
- Validation under progress by applying to standard McKenna flame

Reference: https://www.iist.ac.in/aerospace/satheeshk

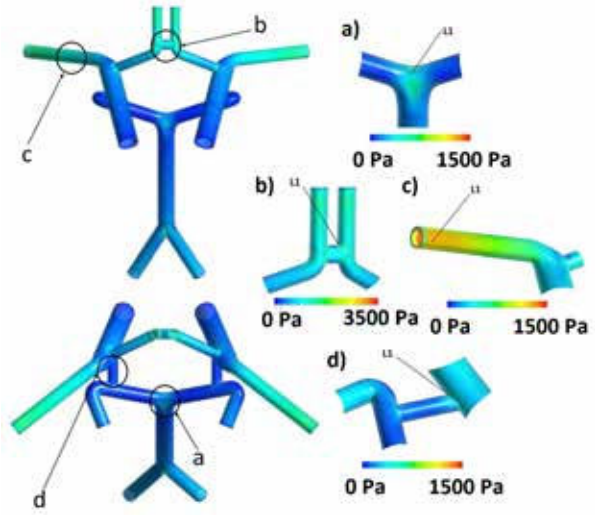
Shine S.R., Ph.D., Associate Professor

Research Interest

- Heat transfer in space applications
- Bio-fluid mechanics
- Bio-heat transfer
- Computational hemodynamics

Research Highlights

- Fluid–Structure Interaction Model for Assessing Aneurysm Initiation at the Circle of Willis



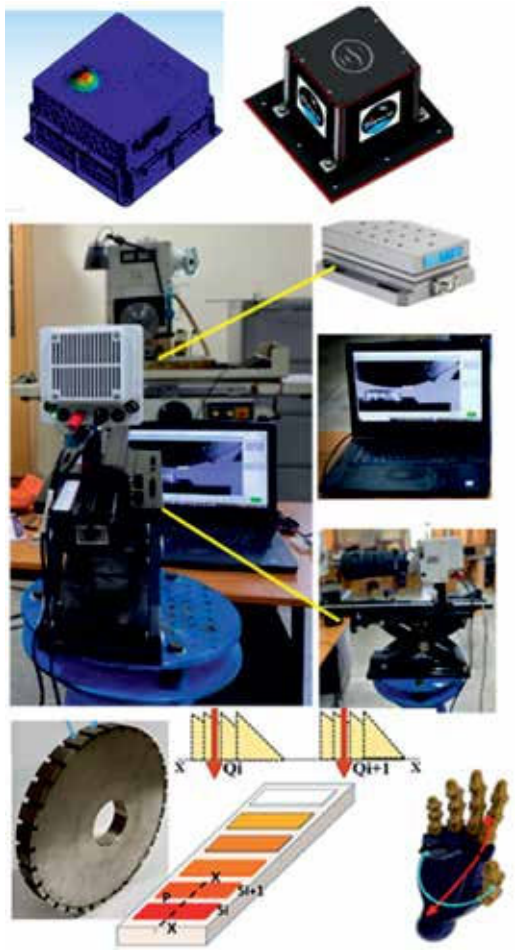
Hemodynamics associated with the arteries of the circle of Willis (CoW) is analysed to identify possible cerebral aneurysm initiation sites using computational methods. The wall shear stress (WSS) distribution and localized Von Mises stress (VMS) in Anterior Communicating Artery (ACoA) junction is the highest of all, indicating the risk of aneurysm initiation and rupture. Flow patterns due to geometrical features of CoW influence the distribution of WSS.

Analysis of human thermoregulatory mechanisms

IIST's mathematical model assesses thermoregulatory mechanisms in hot and cold environments. Results indicates that shivering and sweating are effective defenses for cold and hot conditions, respectively. Suppressing shivering is more effective than stopping vasoconstriction for inducing therapeutic hypothermia. The result may be helpful for hot/cold stress management and design of drug protocols.

Reference: https://www.iist.ac.in/aerospace/shine

V.S. Sooraj, Ph.D., Associate Professor



Machining and Precision manufacturing

Research Interests

- Machining and Precision Manufacturing
- Subtractive and Additive Manufacturing
- Machining of Composites/ difficult-to-cut Aerospace Materials
- Green practices in Machining
- Abrasive Processing and fine finishing
- Design for manufacturing, applied to satellite/payload systems and bio-medical instrumentation

Research Highlights

- Design and Development of reconfigurable grinding wheel system with self-generated cold air cooling system and self-adaptable (sweating type) lubrication system, with the aid of additive manufacturing.
- Design and Development of Intermittent - Progressive Machining Strategy for Fibre Reinforced Polymer Composites.
- Studies on Bio-inspired Human Skeleton modelling for humanoids.
- Design and Development of mechanical package (Additive as well as subtractive manufacturing) for payloads and sensors for IIST (SSPACE) space Missions.
- Modelling and experimental studies on abrasive processing (Surface generation, thermal and related aspects).

Reference: https://www.iist.ac.in/aerospace/sooraj

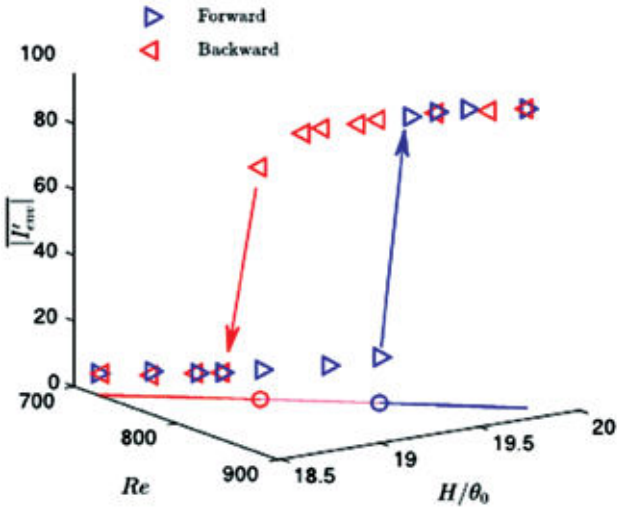
Vinoth B.R., Ph.D., Associate Professor

Research Interest

- Flow instability
- Aerodynamcis and Aeroacoustics
- Unsteady flows

Research Highlights

- New calibration procedure is proposed to improve the accuracy of Hot-wire anemometer.
- Experimentally demonstrated that rectangular low-density jet can become unstable through sub-critical Hopf bifurcation.
- Spatiotemporal stability studies demonstrate that the base flows from the Navier–Stokes equations are required to predict the critical conditions in low-density jets.



Reference: https://www.iist.ac.in/aerospace/vinothbr

Department of Avionics

2.2 Department of Avionics

Vision

To be globally recognized for being at the forefront of innovation in higher education and research for empowering students in Avionics and allied areas to contribute significantly to the benefit of the society at large and Indian space science and technology.

Mission

- Inspire and educate our undergraduate, postgraduate and doctoral students and impart deep understanding of Electrical, Electronics and Communication, Computing and related areas.
- Nurture the spirit of innovation and creativity among students and contribute to the growth of the nation through excellence in teaching, research and development following ethical practices.
- Develop skills in design and building of systems that impact society and space technology.
- Continue to collaborate and establish a peer-to-peer network with institutions and industries of national and international repute.

Core Research Focus

(a) Computer vision
(b) Intelligent robotics and Machine learning with applications
(c) Control systems
(d) Digital Signal Processing and Communication Systems
(e) Microwave and RF design
(f) Power electronics
(g) VLSI and Microsystems

Fact File

Number of faculty	:	23
Technical Staff	:	12
Tutors/ Technicians	:	02
Research Scholars	:	86
Ph.Ds conferred	:	09

Laboratory/Research Facilities

Department of Avionics, IIST has 14 instructional labs and 16 research labs; which include

- Analog Electronics Lab
- Basic Electrical Lab
- Basic Electronics Lab
- Computer Networks Lab
- Control System Lab
- Digital Communication Lab
- Digital Electronics Lab
- Digital Signal Processing Lab
- ECAD Lab
- Instrumentation and Measurement Lab
- Microprocessor and Microcontroller Lab
- Navigation Systems and Sensor Lab
- Power Electronics Lab (UG)
- RF and Microwave Lab (UG)
- SSPACE Satellite ground station
- Small Spacecraft Systems & Payload Centre (Electronics Fabrication & Research Lab)
- Advanced Antenna Fabrication and Characterization Lab
- Advanced Microwave Lab
- Advanced Wireless Communication Research Lab
- VLSI & Microsystems Lab
- Micro/ Nanosystem characterization Lab
- MEMS and Nano FAB Phase-1
- NEM Sensor Systems Lab
- Chemi Sens Lab
- Internet of Things Lab
- Virtual Reality Lab
- Image Processing and Computer Vision Lab
- Communication Networks Lab
- Power Electronics in Electrical Distribution System Lab
- Power Electronics Research Lab

Research and Developments

- The RF and Microwave research facility is augmented with an anechoic chamber to measure the far field radiation pattern of antennas. This facility has the capability to work from 1GHz to 18 GHz.
- Faculty members from the department have been contributing actively to Advanced Space Research Group (ASRG) activities. The Department has 6 ASRG projects and few more under discussion. [https://www.iist.ac.in/departments/projects/46].
- Department has initiated MoUs with various Industries / R&D organizations including

- TU-Delft
- IEEE, New Jersey
  - Iowa State University, Ames, IA, USA.
  - IIIT Kottayam
  - CDAC Trivandrum
  - Regional Cancer Center (Trivandrum), NIIST, and RGCB.
  - CeNSE, IISc, Bangalore (Meity INUP)
- Faculty members from the Department hold various externally funded projects, funded by DST-SERB, DBT, DRDO, KSCSTE/ETPetc. [https://www.iist.ac.in/departments/projects/46]

Research Outcomes/ Publications

International Journal	:	52
Conferences	:	48
Books	:	01
Book chapters	:	02
Patents	:	03 (Under review)

Contributions to Institute Level Space Missions

- Department of Avionics is actively involved in development of Small Satellites and Payload development (SSPACE) activities at IIST, with focus on Systems Engineering, Onboard Computer System, Electrical Power Systems, Communication System, Attitude determination and control systems, Payload electronics, and interface electronics for other subsystems.
- Faculties from Avionics department is also involved in IIST Ground Station Development, maintanence and regular operations of spacecraft
- The Department is involved in ISRO space missions for developing Advanced Retarding Potential Analyzer for Venus and Mars Mission (ARIS-Venus/Mars)

Outreach Activities

- More than 16 conferences/ workshops/ seminars/ FDPs, participated by faculty members
- Reviews /Technical discussions at ISRO /other organizations/Institutes
- Contributed to various outreach activities for school/ college students initiated by Student Activity Board at IIST
- IEEE student chapter has been operational and active since 2011. 5 student branch chapters are operational as of today under this. Various workshops and seminars were organised by these branch chapters. The department of Avionics in collaboration with the student branch chapters has organised 17 expert lectures and hands on workshops.

Startup activities

- Dr. B. S. Manoj is an advisory board member and mentor for the non-profit startup Zeroing in Association.
- Dr. Sudharshan Kaarthik is a mentor for a start-up company FluxxEV incubated at STIIC in IIST.
- Dr. Priyadarshnam is an advisory board member and mentor for LT Defense, Coimbatore for jointly developing LISAT satellite.

Faculty Profile

Anindya Dasgupta, Ph.D., Associate Professor

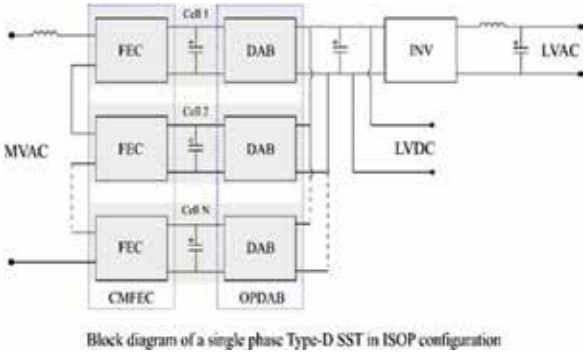
Research interests

- Control scheme development for modular solid state transformers
- Current sensor less control of high frequency link converters

Research highlights

Development of control schemes of utility interfacing solid state transformers for

- Input parallel output parallel configurations
- Controlled phase-shedding / phase-addition capabilities



Block diagram of a single phase Type-D SST in ISOP configuration

Reference: https://www.iist.ac.in/avionics/anindyadgupta

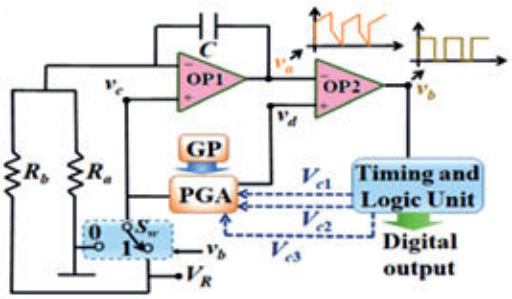
Anoop C. S., Ph.D., Associate Professor

Research Interest

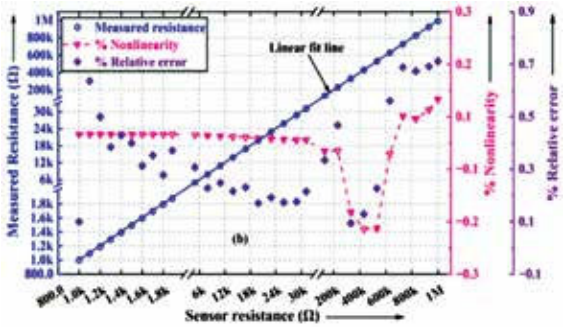
- Sensor Electronics
- Direct-Digital Converters
- Analog Signal Processing

Research Highlights

- Design and Development of a GP-assisted multi-regiming digitizer for wide-span resistive sensors
- Development of a novel through-shaft angle transduction scheme and associated electronics for full-circle range.
- Improved digitizer Schemes suitable for interfacing with a wide-range current-output sensors



Geometric Programming (GP)-assisted MDR circuit for wide-span resistive sensors.



Experimental results demonstrating accurate operation of MDR over wide-span

Reference: https://www.iist.ac.in/avionics/anoop.cs

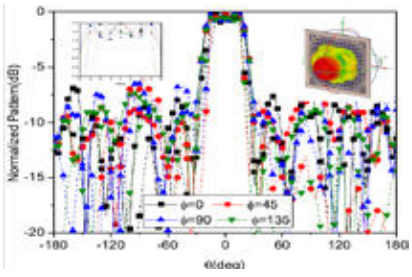
Basudeb Ghosh, Ph.D., Professor

Research Interest

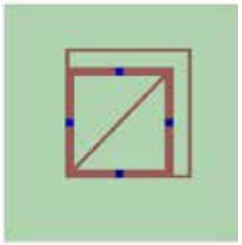
- Design and analysis of active and passive metasurface antennas
- Computational electromagnetics
- Synthetic aperture radar and microwave imaging

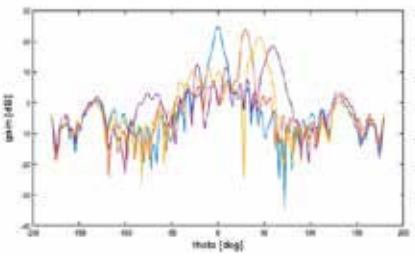
Research Highlights

- Research on Metasurface antenna



Dual band beam shaping





Active Metasurface

Reference: https://www.iist.ac.in/avionics/basudebghosh

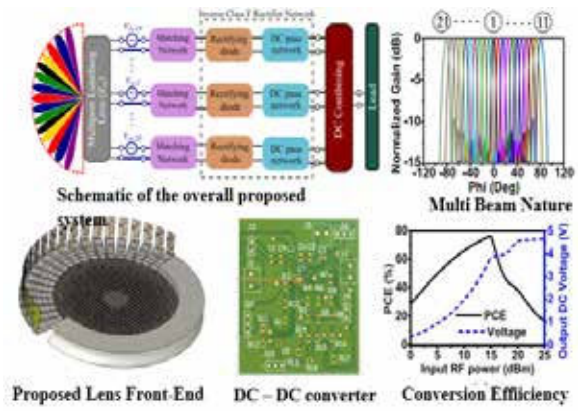
Basudev Majumder, Ph.D., Associate Professor

Research Interests

- Application of Periodic structures in RF and Microwave active and passive system design.
- Wireless Sensing and RF product design like Radar and Imaging devices.
- MMIC based devices for Space Applications

Research Highlights

- Design, study and numerical demonstration of a 5G wireless power transfer system as part of DST Inspire Faculty Project.
- Designing different future phase shifter less one-dimensional frequency scanned array antennas.



Reference: https://www.iist.ac.in/avionics/basudevmajumder

Chinmoy Saha, Ph.D., Professor

Research Interest

- Time Modulated Antenna Array (TMAA) for far-field wireless power transfer application
- Metasurface Based Antennas for Microwave Wireless Power Transfer and Energy Harvesting
- Design and Development of Antenna Systems for 5G and cognitive radio applications
- Ground Station Antenna Design for Satellite Tracking Applications

Research Highlights

- Design of dual- and tri-band ground station antennas for X-, S-X, and S-Ka band
- Channelling network integrated dual-band metasurface energy harvester
- Multifunctional UWB Antennas for various CR applications

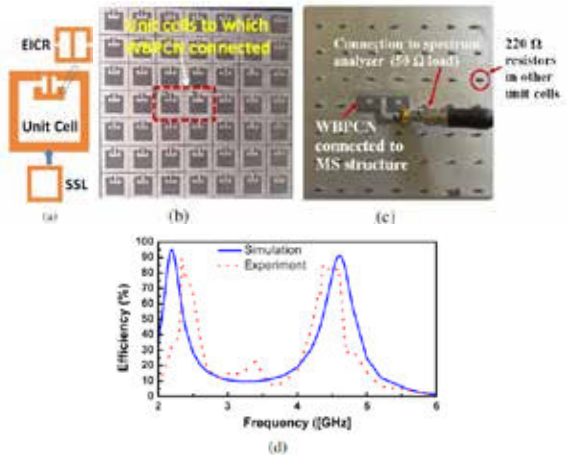


Fig. (a) Evolution of unit cell structure from SSL and EICR, (b) Fabricated metasurface structure - Front View
(c) Fabricated metasurface structure – BackView, (d) The efficiency plot of metasurface structure with WBPCN.

Reference: https://www.iist.ac.in/avionics/chinmoysaha

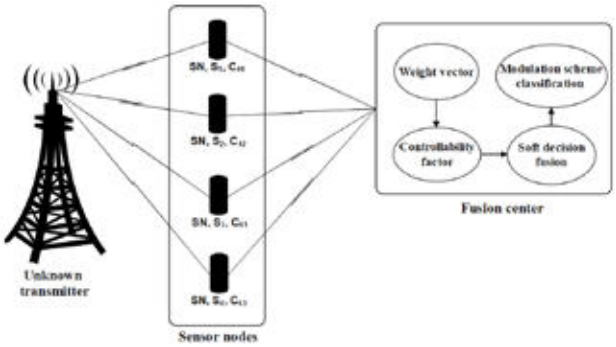
Chris Prema S., Ph.D., Associate Professor

Research Interest

- Efficient utilization of Spectrum, Cognitive radio based Intelligent communication.
- Localization and sensing in B5G/6G communication, Spectrum Mapping
- AMC, Sparse signal processing.

Research Highlights

- Co-operative positioning and localization in D2D communication using tenzorization.
- Automatic modulation and classification using cumulants.
- Design of low complexity sub-Nyquist wideband receiver.



Reference: https://www.iist.ac.in/avionics/chrisprema

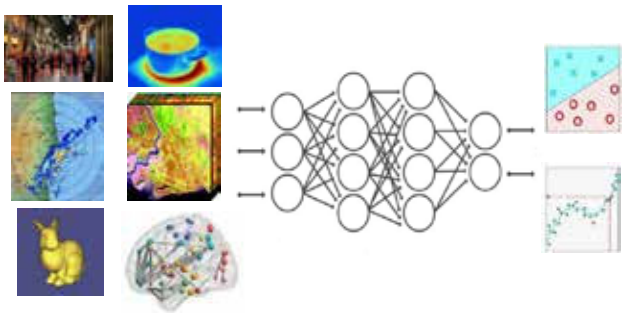
Deepak Mishra, Ph.D., Professor

Research Interest

- Deep learning architectures for space applications and societal usage
- Representation learning and computer vision
- Mobile robot navigation algorithms
- Point cloud processing
- Augmented reality

Research Highlights

- Person re-identification and tracking using optimal transport theory
- Geometric deep learning for time series analysis of multivariate bio signals
- Machine learning driven augmented reality-based campus walkthrough
- Tracking and now casting of convective storms



Reference: https://www.iist.ac.in/avionics/deepak.mishra

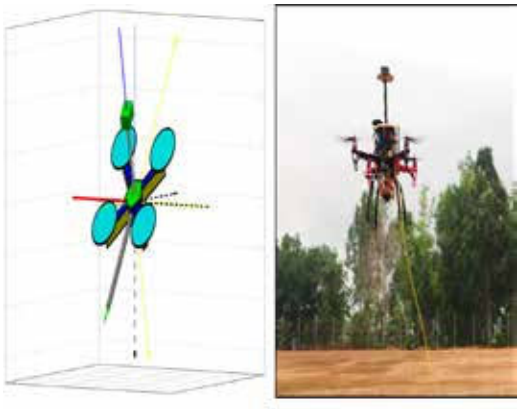
Harsha Simha M.S., Ph.D., Associate Professor

Research Interest

- Spacecraft Attitude Dynamics., Control and Estimation
- Cooperative control, Control of Unmanned Aerial vehicle

Research Highlight

- Modelling and Control of port dynamics of a quadcopter
- Lie-group variational integrator based Sensor Fusion Algorithm using uncertainty ellipsoid for Spacecraft Attitude Estimation
- Attitude control of satellite using single Gimbal control moment gyroscope
- 6D trajectory, guidance and control development for air-breathing phase of reusable launch vehicle



Reference: https://www.iist.ac.in/avionics/harshasimhams

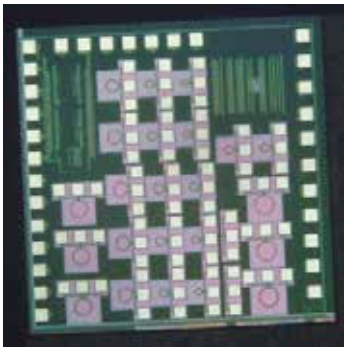
Immanuel Raja, Ph.D., Assistant Professor

Research Interest

- Analog, mixed-signal, RF IC design
- Payload electronics design
- RF subsystems for small satellites and payloads

Research Highlights

- Tape-out in 180nm – Programmable instrumentation amplifier, test inductors, physically-unclonable function.
- Tape-out in 65nm – full transmitter at 28 GHz for 5G applications, injection-locked oscillators at 28 GHz, 105-110 GHz fundamental oscillator with on-chip antenna, injection-locked dividers, Class-G PA at 28 GHz



Reference: https://www.iist.ac.in/avionics/immanuelraja

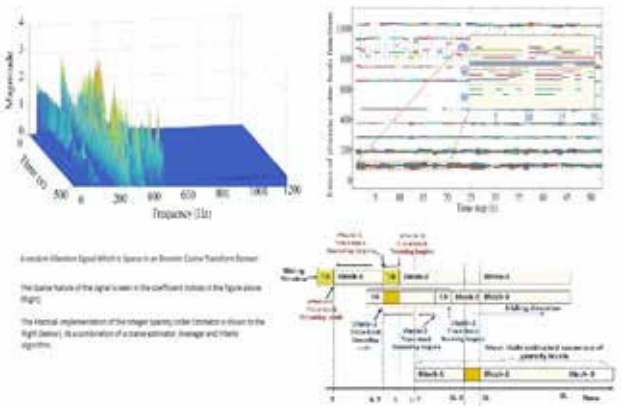
Lakshminarayanan R., Ph.D., Associate Professor

Research Interest

- Statistical Learning Theory (Machine Learning) and Its Applications to Communications Systems and Image Processing.
- Dynamic Compressed Sensing.

Research Highlights

- Phase prediction for Compensation in Free Space Optical Communication.
- Robust Detection of Mini and Micro Drones using Mutiple Signatures.
- Estimation and Prediction of Amplitudes of the Sparse Coefficients of Time varying Signals.



Reference: https://www.iist.ac.in/avionics/lakshminarayanan

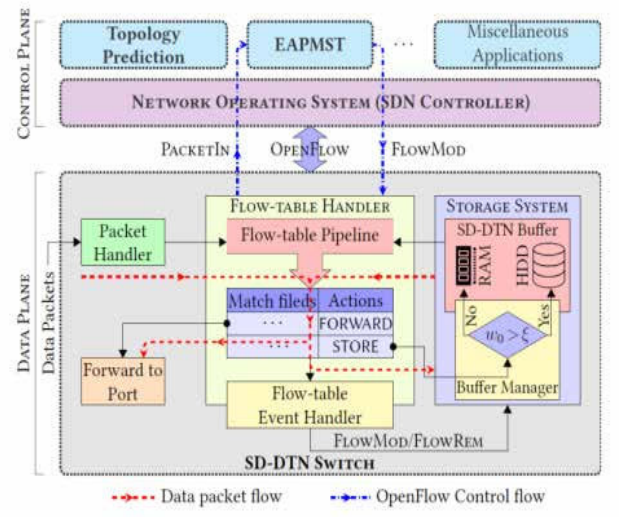
Manoj B.S., Ph.D., Professor

Research Interest

- Artificial Intelligence for Computer Networks, Advanced Satellite Networks, 6G Networks, Software Defined Wireless Networks, Complex Networks, Cyber security, Quantum Big Data Analytics
- Research-oriented Teaching and Learning

Research Highlights

- Development of a Software-Defined Disruption Tolerant Network (SD-DTN) switch for the purpose of enabling disruption tolerant SDNs
- Development of prototype systems, experimental platforms, protocols, and algorithms for Space and High-Altitude Platform based IoT (SHAPE-IoT)
- Development of several advanced quantum-classical computer architectures for Big Data Analysis.



Reference: https://www.iist.ac.in/avionics/bsmanoj

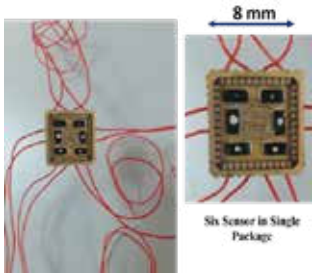
Palash Kumar Basu, Ph.D., Associate Professor

Research Interest

- Gas sensors: Development of Reliable gas sensors for domestic and space applications.
- Biosensor: Liquid Biopsy of cancer and early detection of cancers

Research Highlights

- The group is aimed to develop miniaturize gas sensors to monitor the emissions from soil for precession agriculture. This Gas sensor technology will provide new dimensions in the field of precision agriculture, Air pollution monitoring system, Coal mines and man hole gas detection system in low cost.
- The group is conducting research to develop Biosensor for Liquid biopsy of cancer. The protocol is optimised. The necessary approval to conduct a clinical trial with the Regional Cancer Centre is under process.



Optically Activated CO, CH4, NH3, and CO2 sensors (Version: 2) for various applications, including an environment monitoring system, manholes, and coal mines applications. The same concept has been extended to develop gas sensors for Environmental Control and Life Support System (ECLSS) in thev

Reference: https://www.iist.ac.in/avionics/palashkumarbasu

Priyadarshnam, Ph.D., Professor

Research Interest

- Control Systems, State transfer and Parameterisation in dynamical systems, mission design for small satellites, systems engineering of small satellites, design development of spacecraft subsystems, onboard computer, flight software, electrical power systems, communication systems, attitude determination and control systems, structures
- The interdisciplinary centre Small-spacecraft Systems and PAyload CEntre (SSPACE) aims to develop spacecraft and sub-systems and futuristic missions using student small satellites and payloads for ISRO and IIST missions.

Research Highlights

- Designed and developed onboard computer and electrical power systems (TRL 9) for InspireSat1
- Designed and developed onboard computer and interface card for the POEM platfrom (TRL 9) for the PILOT mission.
- Successfully realised the PILOT mission on the POEM platform.

Reference: https://www.iist.ac.in/avionics/priyadarshnam

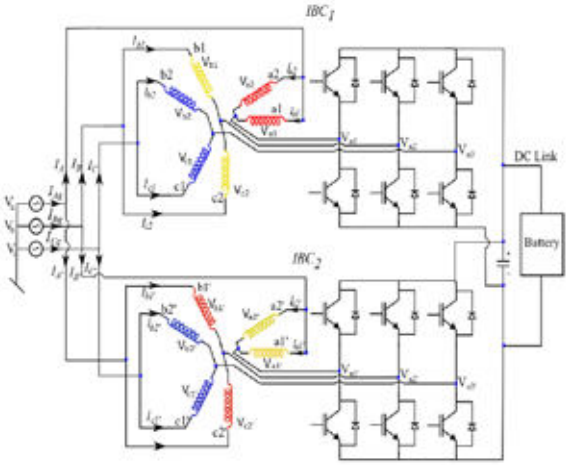
R. Sudharshan Kaarthik, Ph.D., Associate Professor

Research Interest

- Power Electronics and Electric Drives
- Electric Vehicle Technology
- Multi-motor drives
- Electrical systems for small satellites and payloads

Research Highlights

- Parallel operation of Integrated Battery Chargers is demonstrated with Split-phase machines for AWD vehicles
- Model Predictive Control for single phase IBC with active power decoupling is developed
- Control system for using an Induction generator for APU systems in Aircraft



Reference: https://www.iist.ac.in/avionics/sudharshan.kaarthik

Rajeevan P.P., Ph.D., Professor

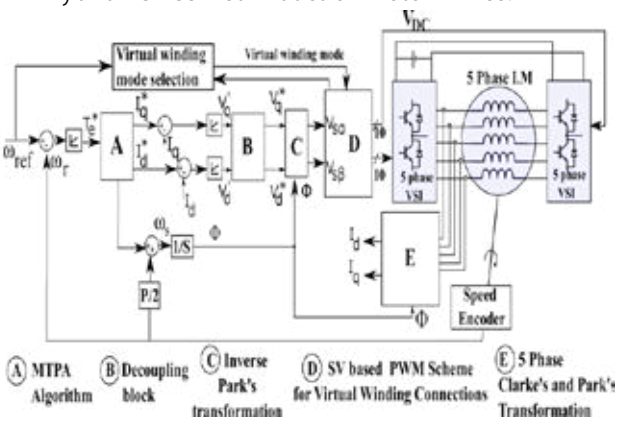
Research Interest

Control of Electric drives: Multiphase Drives – with focus on five phase Induction Motor Drives, Current Source Inverter fed Induction Motor Drives, Speed Range Extension Schemes

- Pulse Width Modulation Techniques for VSIs and CSIs
- New configurations of Induction Generator System
- Applications of Power Electronics in Power systems

Research Highlights

- Virtual Voltage Vector based Control Schemes for Five-phase Induction Motor Drives.
- Fault Tolerant Control Schemes for BLDC Motor Drives with Open-end Windings.
- Speed Range Extension Schemes for Direct Torque Controlled PMSM Drives.
- Hybrid VSI-CSI fed Induction Motor Drives.



Reference: https://www.iist.ac.in/avionics/%20rajeevanpp

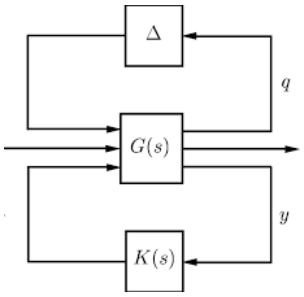
Rajesh Joseph Abraham, Ph.D., Associate Professor

Research Interest

- Robust Control
- Control System and applications
- Power System Control

Research Highlights

- Control Systems and Applications
- Guidance and Navigational Control
- Robust Control and Applications



Reference: https://www.iist.ac.in/avionics/rja

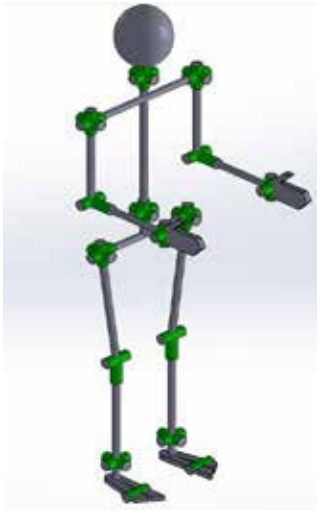
Sam K. Zachariah, Ph.D., Adjunct Professor

Research Interest

- Mathematical Modelling and Control of Under Actuated Robots
- Stability analysis of hybrid dynamic periodic systems
- Control design for hybrid dynamic periodic systems based on Dynamic Behaviour Primitives

Research Highlights

- Mathematical modelling and Control design for NASA's Valkyrie Humanoid Robot on simulation platform
- Mathematical Modelling and Control design for MIT's Mini Cheetah Quadruped Robot on simulation platform
- Mathematical modeling and Simulation of Above-the- knee Amputee with prosthetic leg being developed by VSSC.
- Mathematical modelling and Controller design for biped and quadruped robots being developed in DRDO as a part of STAR project.



Reference: https://www.iist.ac.in/avionics/samzac

Seena V., Ph.D., Associate Professor

Research Interest

- CMOS-MEMS Sensor ASICs
- NEMS Nanomechanical Sensors-Polymer MEMS and Silicon MEMS sensor architectures and fabrication technologies
- Micro Electro Mechanical Systems (MEMS) based inertial sensors
- MEMS Energy harvesters- Piezoelectric and Thermoelectric based for self-powered sensors

Research Highlights

- CMOS MEMS Sensor ASICs with SGFET based Transduction for open loop and closed loop micro accelerometer, nano-N Force sensing, Ultra sensitivities Gas Sensors
- Ring-Flexure Membrane SGFET Gas sensor device and technology
- Silicon MEMS Nanomechanical Membrane Flexure sensor device and technology demonstration. Laboratory prototype for hydrogen gas sensing application

Reference: https://www.iist.ac.in/avionics/seena.v

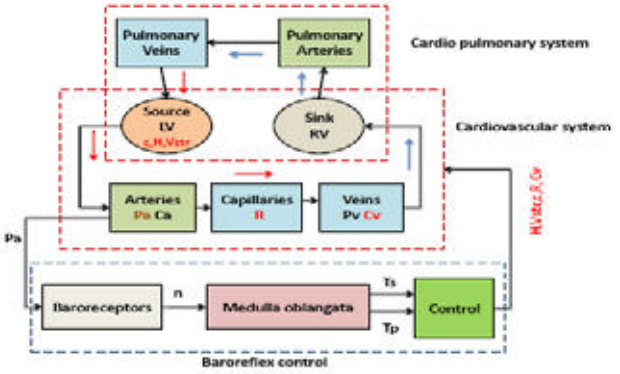
N. Selvaganesan, Ph.D., Professor & Head of Department

Research Interest

Control system design, Estimation theory, Biological modelling, Fault diagnosis and Fractional order control.

Research Highlights

- Fractional order integer/complex coefficient PID controller design for complex coefficient systems to meet the various specifications along with stability in positive and negative frequencies
- Fractional Order Model for Cardiovascular Systems (CVS) with Baroreflex Control (including postural changes under normal and orthostatic conditions)
- Encryption/Decryption Algorithms for Secure Communication using fractional order Chaotic based Hashed Key
- Development of more efficient algorithms for human health monitoring using analytical model and deep learning methods



Block diagram representation for baroreflex control

Reference: https://www.iist.ac.in/avionics/n_selvag

Sheeba Rani J., Ph.D., Associate Professor

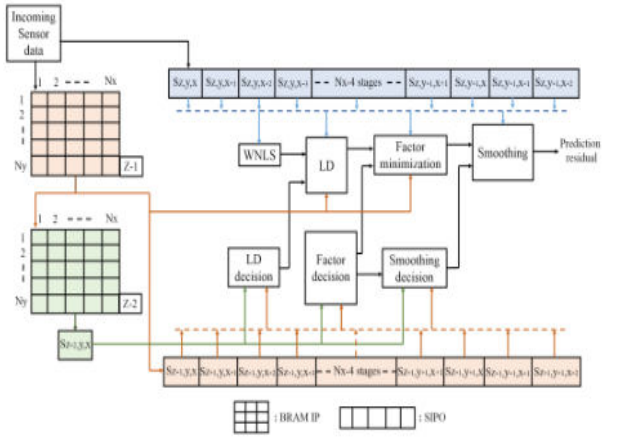
Research Interest

On board algorithms for Satellite Image processing/ Image compression

- Hardware architectures for Signa/imagel processing, Machine Learning and AI applications
- Digital VLSI architectures for GNSS base band receivers, low power circuits, Hardware security

Research Highlights

- Developed Hardware architecture for onboard Satellite image compression.
- Developed VLSI architectures for Compressive Sensing Sparsity Independent reconstruction.



Hardware architectures for onboard satellite image compression.

Reference: https://www.iist.ac.in/avionics/sheeba

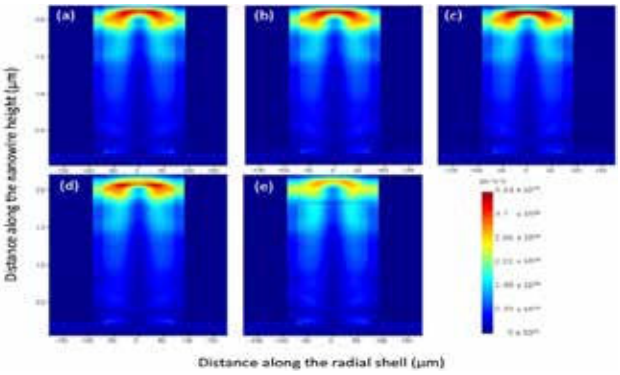
Sooraj R., Ph.D., Associate Professor

Research Interest

- Micro ring resonator switches, logic gates and modulators
- Semiconductor nanowire solar cells
- Optical beam steering

Research Highlights

- Micro ring off-axis based logic gates [NOT, AND and OR]
- Design of GaAs based nanowire solar cells



Cross-sectional view of the photo generation profile across the nanowire solarcell for various nanowire thicknesses

Reference: https://www.iist.ac.in/avionics/sooraj.r

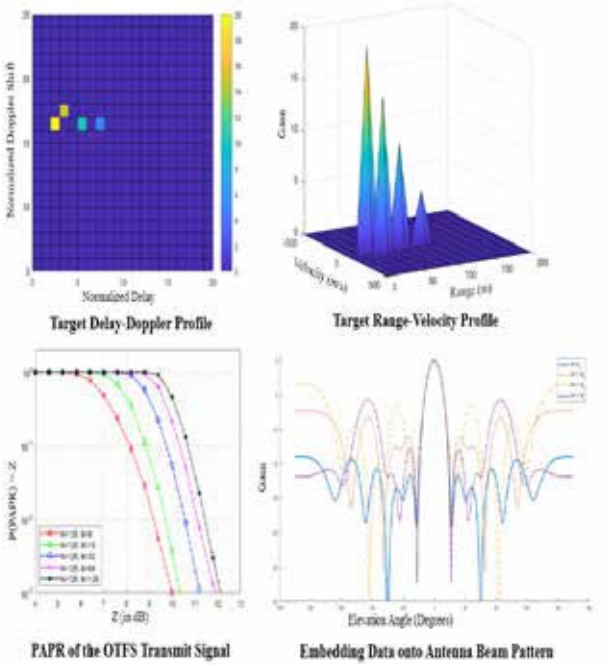
Vanidevi M., Ph.D., Assistant Professor

Research Interest

- RIS based wireless communication
- OTFS based ISAC systems
- Embedding Communication data on radar signal for ISAC systems

Research Highlights

- Target parameter estimation for OTFS radar using sparse signal processing
- Fractional Delay Doppler Estimation for OTFS based ISAC systems
- Near field beamforming for RIS based communication
- Target localization for bistatic OTFS radar



Reference: https://www.iist.ac.in/avionics/vani

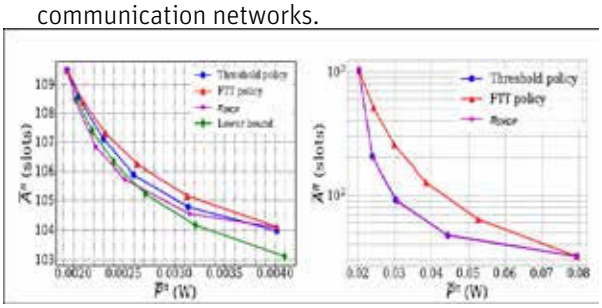
Vineeth B.S., Ph.D., Assistant Professor

Research Interest

- Sequetntial decision making under uncertainty,
- Performance analysis and Optimization,
- Markov decision processes, Reinforcement learning,
- Communication Networks

Research Highlights

- Characterization of age of information for multiple access protocols and deterministic scheduling protocols and its relationship to transmit power in communication links.
- Performance analysis of control algorithms over communication networks.



Reference: https://www.iist.ac.in/avionics/vineethbs

Department of Chemistry

2.3 Department of Chemistry

Vision

To be a center of symbiosis of different branches of science, ultimately leading to novel material development, their testing and applications in diverse areas of Materials Science and Technology including future space programs of the nation.

Mission

- To provide excellent teaching and research environment for undergraduate, postgraduate and doctoral students in diverse areas of Material Science & Technology
- To facilitate the design and development of novel materials and processes to meet future technological challenges
- To achieve the goal of contributing to India's future space missions including the Human in Space Program

Core Research Focus

(a) Composite Materials
(b) Chemical/ Electrochemical Sensors
(c) Electrochemical Energy Storage
(d) Organic Functional Materials
(e) Materials for Sustainable Applications
(f) High Temperature Materials
(g) Biology Payload for Human Space Program

Fact File

Number of faculty	:	09*
Technical Staff	:	02
Tutors/Technicians	:	02
Non-teaching Staff	:	02
Research Scholars	:	40
Ph.Ds conferred	:	03

**(including one DBT faculty)*

Laboratory / Research Facilities

The department of chemistry has one BTech/MTech instructional lab and following 9 research labs:

- Materials characterization lab
- Nanoscience lab
- Inorganic lab
- Organic lab
- Polymer processing lab
- Chemistry engineering lab
- Physical chemistry lab
- OLED Lab
- Battery fabrication lab

Research and Developments

- Faculty members from the department have been contributing actively to Advanced Space Research Group (ASRG) activities. So far, five projects have been approved under the ASRG scheme.
- Faculty members from the department hold various externally funded projects, funded by DRDO, DBT, HSFC-Gaganyaan and ISRO.

Research Outcomes/ Publications

International journals	:	42
Conference papers	:	12
Book	:	01
Book chapters	:	06
Patents	:	1 (submitted)
Projects	:	05

Contributions to Institute-Level Space Missions

- The Department of chemistry is actively involved in the design and development of novel materials and processes to meet future technological challenges including human in space program.
- The Human Spaceflight Centre funded Space Biology payload for the developmental flights of the Gaganyaan Mission (PIs: Dr. K. G. Sreejalekshmi and Dr. Ravi Kumar Hosamani, Dharwad, Karnataka) had cleared the System Concept Review and the prototype for test purposes was developed. TIFR Mumbai had entered an MoU with IIST for sharing the hardware developed by IIST for conducting their planned spaceflight research.
- Faculty members from the department undertake interdisciplinary research projects funded by IIST and projects in areas of high relevance to the space program in collaboration with ISRO.

Outreach Activities

- More than 25 conferences/ workshops/ seminars, participated by faculty members
- Reviews/Technical discussions at ISRO/other organizations/ Institutes
- Contributed to various outreach activities for school/ college students initiated by the Student Activity Board at IIST

Startup activities

1. **SPACETIME 4D Printing Solutions LLP** is a startup initiative by one of the alumni from the Department of Chemistry is focused on the development of customized 3D printers for Materials Research. Currently, Spacetime is developing a new type of 3D printer called MAREP300. It is a 3D Printer dedicated to material research and composite development through direct extrusion additive manufacturing technology. Raw materials can be directly used as input, an exquisite feature, in sharp contrast to filament feeding in conventional 3D printers.
2. **INTERCOSMOS Pvt Ltd**: Incubated within the Department of Aerospace Engineering, this startup, focusing on the development of green propellants is supported for their chemistry-related experiments by the laboratories of Department of Chemistry.

Faculty Profile

Gomathi N., Ph.D., Associate Professor

Research Interest

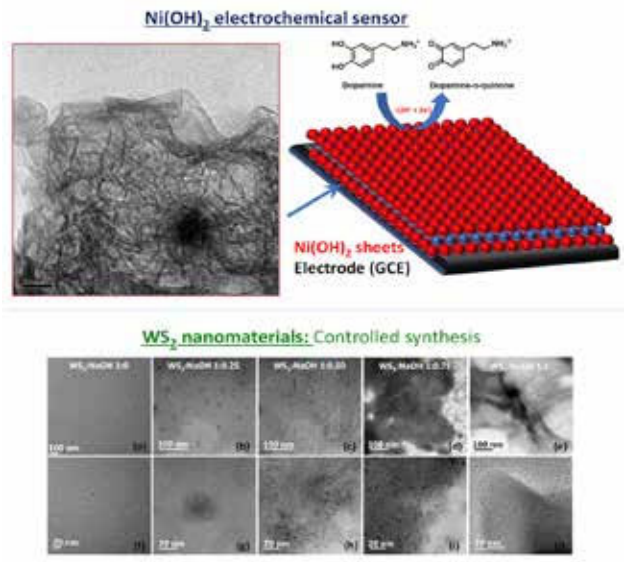
- Metal-organic framework (MOF)
- Electrochemical sensing
- Membrane-based water purification
- Nanomaterials for carbon capture

Research Highlights

- Developed bimetallic MOF-activated carbon-based composite material for enhanced carbon capture
- Removal of emerging contaminants achieved by using mixed matrix membrane with bi-metallic MOF
- Developed bimetallic MOF-based electrode for electrochemical sensing of antibiotic

Reference:https://www.iist.ac.in/chemistry/gomathi

Jobin Cyriac, Ph.D., Associate Professor



Research Interest

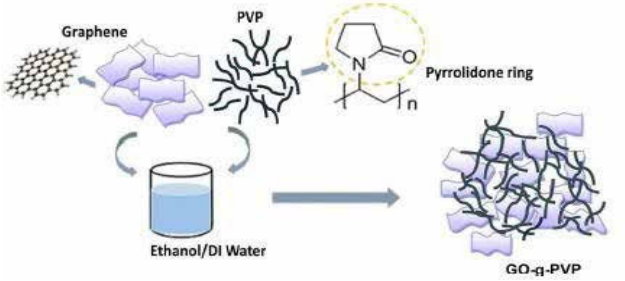
- Nanomaterials-based fluorescence chemical sensors, Surface-enhanced Raman spectroscopy (SERS), Mass spectrometry

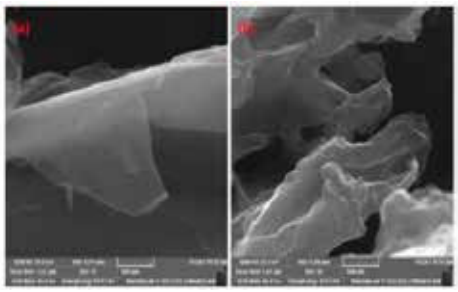
Research Highlights

- Demonstrated $Ni(OH)_2$ nanosheets-based electrochemical sensors for selective detection of dopamine, uric acid and α-Lipoic acid.
- A green hydrothermal route for the selective synthesis of various morphologies of WS_2 nanomaterials, viz. quantum dots (QDs), nanosheets and hybrid QDs-nanosheets was established.

Reference: https://www.iist.ac.in/chemistry/jobincyriac

Kuruvilla Joseph, Ph.D., Outstanding Professor and Dean (SA, SW & Outreach)

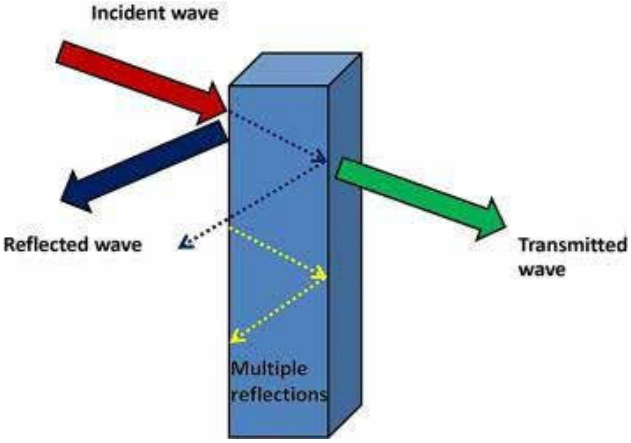


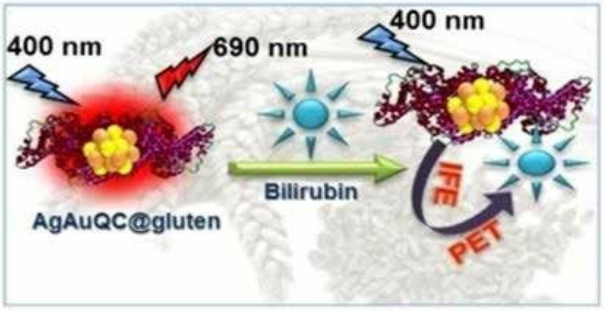


SEM image of GO and GO-g-PVP

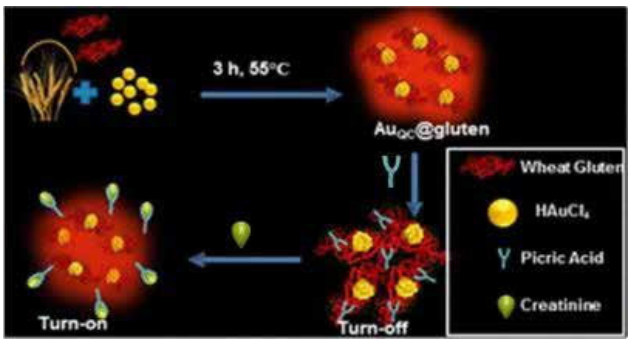
Research Interest

- Epoxy Toughening using novel toughening agents
- Materials for EMI shielding
- Carbon fibers from lost cost precursors
- Biosensors
- Advanced polymer composites for multi-functional applications





Schematic of GO-g-PVP



Research Highlights

- Development of flexible and efficient materials for EMI shielding
- Preparation of low-cost carbon fibers

Reference:https://www.iist.ac.in/chemistry/kuruvilla

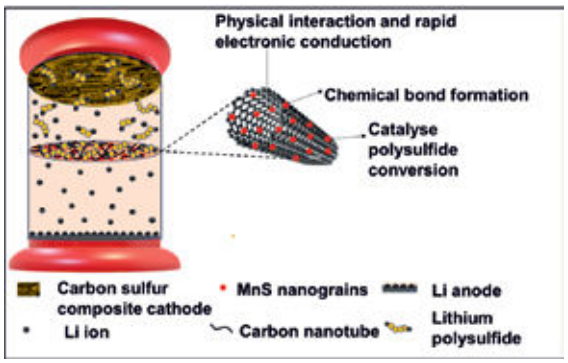
Mary Gladis J., Ph.D., Associate Professor

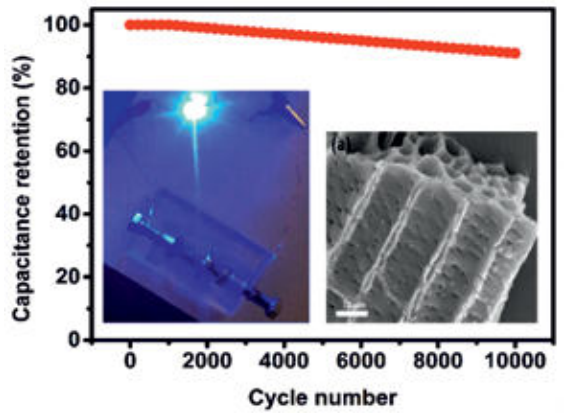
Research interest

- Li-ion/ Metal-sulphur batteries
- Supercapacitors
- Corrosion & coatings

Research Highlights

- Developed a carbon nanotube/ manganese sulfide composite-based separator coating for Li-S batteries which delivered a superior electrochemical performance (discharge capacity of 876 mAh g^{-1} at 0.5 C) with controlled self -discharge properties.
- Developed a biomass-derived porous carbon-based supercapacitor (coin cell) that exhibited a maximum energy density of 67.8 W h kg^{-1} and power density of 15,000 W kg^{-1} with ~88% capacitance retention after 10,000 cycles.





Reference: https://www.iist.ac.in/chemistry/marygladis

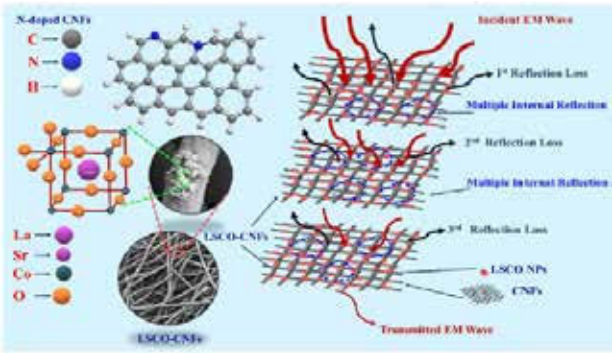
Nirmala Rachel James, Ph.D., Professor

Research Interest

- Polymer composites for EMI shielding applications

Research Highlights

- Developed Flexible N-Doped Carbon Nanofiber-Polydimethylsiloxane Composite Containing La0.85Sr0.15CoO3−δ Nanoparticles for Green EMI Shielding
- Dveloped Highly flexible, PEDOT:PSS-Polyvinylpyrrolidone Coated Carbon Nanofiber-Polydimethylsiloxane Composite for Electromagnetic Interference Shielding
- Developed Carbon black incorporated carbon nanofiber based polydimethylsiloxane composite for electromagnetic interference shielding



EMI shielding by $La_{0.85}Sr_{0.15}CoO_{3-\delta}$ Nanoparticles incorporated carbon nanofiber

Reference: https://www.iist.ac.in/chemistry/nirmala

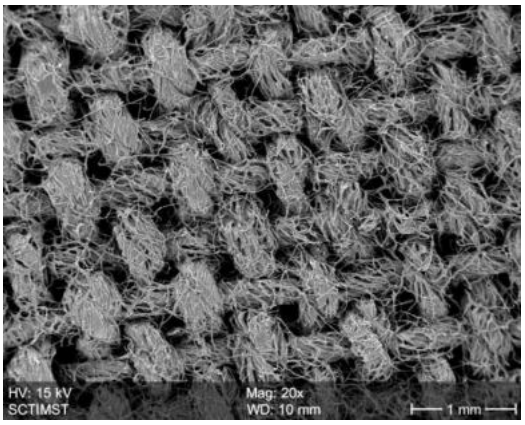
Prabhakaran K., Ph.D., Professor

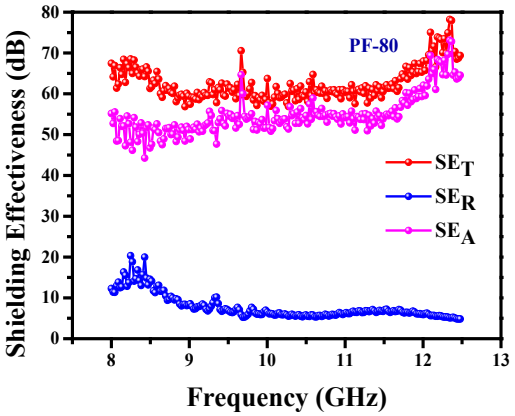
Research Interest

Ceramic processing using natural binders, SiBOC foams for thermal protection, Materials for microwave dielectric and EMI Shielding applications

Research highlights

- Thin carbon grids are developed from used cotton cloth
- The carbon grids of thickness nearly 0.6 mm shows adequate tensile strength
- The carbon grids exhibit reflection dominated EMI shielding with total shielding effectiveness as high as X dB
- The shielding effectiveness increases with an increase in carbon grid width and decrease in empty grid size





SEM microstructure (L) and EMI shielding effectiveness in the X-band region (R) of the carbon grid produced from used cotton grid

Reference: https://www.iist.ac.in/chemistry/prabhakaran

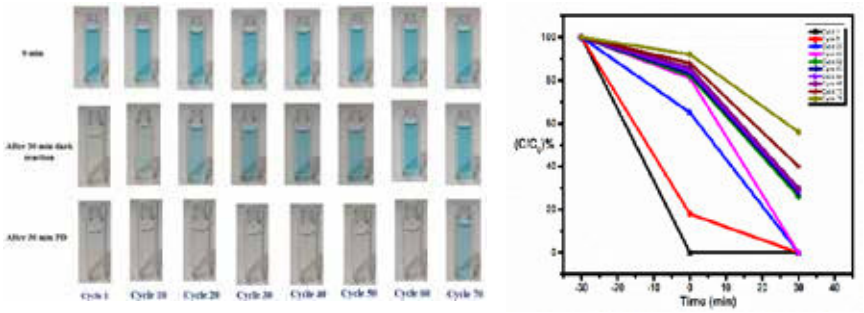
Sandhya K.Y., Ph.D., Professor & Head

Research Interest

- Green synthetic strategies for nanomaterials for electrochemical sensors, water remediation, energy storage and environmental applications. Upcycling of plastic wastes to activated carbon.

Research Highlights

- Plastic derived carbon based TiO2 composite as a novel photocatalyst with remarkable recyclability for the degradation of organic dyes in water.
- The catalyst shows 100% recyclability for 50+ cycles for different organic dyes.



(L). Digital images showing the recyclability; (R). Photocatalytic efficiency of the photocatalyst for the photodegradation of methylene blue dye

Reference: https://www.iist.ac.in/chemistry/sandhya

Sreejalekshmi K.G., Ph.D., Professor

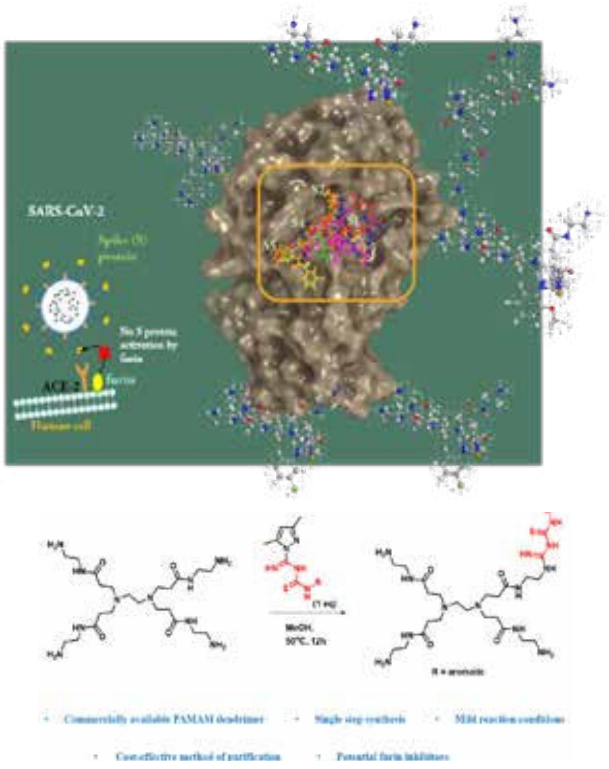
Research Interest

- Smart and functional Materials
- Space life sciences
- Bioastronautics

Research Highlights

- Combinatorial library of potential furin inhibitors
- Molecular docking and molecular dynamic simulations
- Key interactions with furin's catalytic triad

Reference: https://www.iist.ac.in/chemistry/sreeja



Department of Earth and Space Sciences

2.4 Department of Earth and Space Sciences

Vision

To be a department trusted for scientific excellence where learning and research contribute to the advancement of science and society, bridging the gap between technology and its application to fundamental research in the space sciences.

Mission

- To offer postgraduate and doctoral programs in interdisciplinary and emerging areas associated with Earth and space sciences.
- To provide innovative and sustainable solutions for space missions through cutting-edge research.
- To be an intellectual ecosystem by establishing collaboration between academia and industry.

Core Research Focus

(a) Astronomy and Astrophysics

(b) Atmospheric and Ocean Sciences

(c) Remote Sensing

(d) Planetary Geosciences

Fact File

Number of faculty	:	14
Tutors/ Technicians	:	03
Non-teaching staff	:	01
Research Scholars	:	49
Ph.Ds conferred	:	03

Laboratory/ Research Facilities

The Department owns 4 instructional labs and 8 research labs, which include;

- Astronomy Lab
- Atmospheric and Ocean Sciences Lab
- Remote Sensing Lab
- Geology/Planetary Geosciences Lab
- National facility for Hyperspectral Analyses
- Regional Centre for Geodesy
- Areal Lidar Survey
- Climate Observatory, Ponmudi
- Aerosol Research
- IIST Balloon Launch Facility
- Automatic Weather Station
- Planetary Analogue Research Facility

Research and Developments

The department's research activities are interdisciplinary in nature, they aim to bridge the gap between technological advancement and its application to fundamental research areas in Earth and Space sciences. The research activities focus on diverse fields of Earth System Science, Astronomy & Astrophysics and Geoinformatics.

Faculty members of the department have been actively involved in the Advanced Space Research Group (ASRG) activities. Three projects have been approved till date under the ASRG scheme.

- The Ponmudi Climate Observatory has facilities for high-end research on aerosol-cloud interactions studies. A Regional Centre for Geodesy is established in IIST with funding from DST. Aerial LiDAR data and an orthophoto of Thiruvananthapuram city were obtained by Aerial Lidar Survey with funding from DST.
- The Department has initiated MoUs with various R&D organizations and national and international universities, including IIT Kharagpur, Mangrove Foundation Maharashtra and Niigata University, Japan.
- Faculty members of the Department hold various externally funded projects. The funding agencies include DRDO, DST-SERB, MoES, DBT, Mangrove Foundation Maharashtra, and Max-Planck Society, Germany.

Research outcomes - Fact File

International Journals	:	41
Conferences	:	23
Books	:	01

Contributions to Institute Level

Space Missions

- Faculty members of the department are contributing to the Small Satellite Payload development (SSPACE) activities, Balloon launch facility for the measurement of the vertical profile of ozone with meteorological parameters, Student Satellite Programme (SSP), ExoWorld and so on.
- Faculty members are involved in payload development, science formulation, and data processing of ISRO missions to the Moon, Mars, Venus and Sun.

Outreach Activities

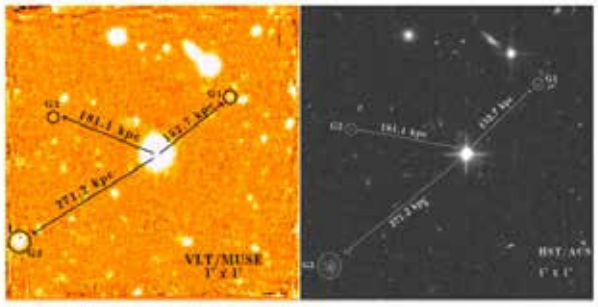
- Conducted various outreach / training programmes for school and college students such as Geoconnect, Astronomy School, STORM etc. Contributed actively to various outreach activities for school/college students initiated by Student Activity Board of IIST.
- Students and faculty members of the department actively participated various conferences, workshops, seminars, FDPs and so on.
- Actively involved in Reviews/ Technical discussions of ISRO and many national and international research organizations/ Institutes.

Start-up activities

Bhuh Pramaan is a Bengaluru based start-up company being incubated under the Space Technology Innovation and Incubation Centre, IIST. Being mentored by the Remote Sensing Faculties of the Department of Earth and Space Sciences, Bhuh Pramaan is dedicated to developing innovative solutions in the satellite image and geospatial data processing. Bhuh Pramaan juxtaposes satellite data with machine learning algorithms to process petabytes of data in near real-time scenarios. The services include analyze, visualise data, and generate tangible insights to act on key pointers and provide customized solutions. Our predictive analytics simplifies complex information into comprehensible, actionable deliverables that ensure timely decisions. Capitalizing on the democratization of earth observation data through satellite constellations, satellite data analytics has catapulted into the most sought-after market and is growing. The demand for easy-to-use, reliable, and robust analytics solutions in a market that is currently controlled by complex and costly solutions, Bhuh Pramaan is positioned to become a leading solution provider in the satellite data analytics domain.

Faculty Profile

Anand Narayanan, Ph.D., Professor



Research Interest

- Understanding the physical and chemical evolution of galaxies and intergalactic medium
- Studying large scale outflows from Active Galactic Nuclei
- Understanding the role of environment in regulating galaxy properties

Research Highlights

- Reported the presence of multiphase gas and metals in intra-group environments and in the outskirts of galaxy clusters.
- Completed one of the largest surveys to date of ionized carbon in diffuse form in the low redshift universe, which resulted in the estimates of their contributions to cosmic baryon density, and in the metallicity of the intergalactic medium.

Reference: https://www.iist.ac.in/ess/anand

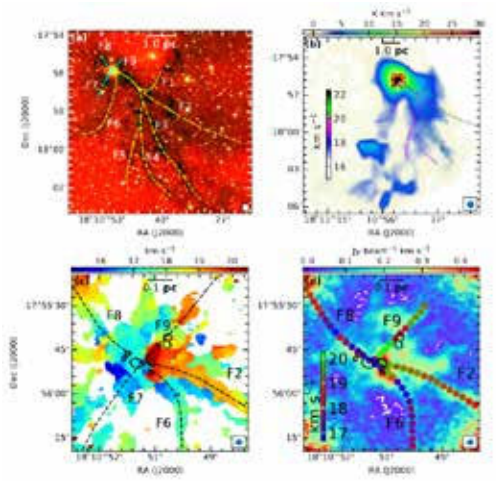
Anandmayee Tej, Ph.D., Professor

Research Interest

- High-mass star formation
- Particle acceleration in stellar systems
- Probing atmospheres of solar system objects from stellar occultation events

Research Highlights

- Using new continuum and molecular line data from the ALMA Three-millimeter Observations of Massive Star-forming regions (ATOMS) survey, we have revealed Fragmentation and multi-scale gas kinematics in the globally contracting protoclusters G12.42+0.50 and G19.88-0.53. From the large-scale converging filaments to the collapsing cores, the gas dynamics in these protoclusters show scale-dependent dominance of turbulence and gravity. The combination of these two driving mechanisms needs to be invoked to explain massive star formation in the protoclusters.



Plots showing the gas kinematics in G12.42+0.50 protocluster. (a) Skeletons of the identified filaments are overlaid on the colour composite image of the region around G12.42 using Spitzer 3.6 μm (blue), 4.5μm (green) and 8.0μm (red) bands. (b) Velocity integrated intensity map of the ^{13}CO (3 - 2) molecular line transition is shown in colour scale. The velocity peaks of ^{12}CO (3-2) are overlaid on it. Dashed square box represents the region of the ATOMS maps shown in panel (c) and (d). (c) Peak velocity map of $H^{13}CO^{+}$ (1 - 0) overlaid with filaments F2, F6, F7, F8, and F9. (d) The velocity peaks of $H^{13}CO(1\text{-}0)$ extracted along the filaments (F2, F6, F8, and F9) are overlaid on the moment zero map of $H^{13}CO$ (1 – 0) for the region associated with G12.42+0.50 shown in colour scale. The identified 3 mm cores are shown as black ellipses. The beam sizes are shown at the bottom right of each figure

Reference: https://www.iist.ac.in/ess/tej

Chandrasekar A., Ph.D., Outstanding Professor & Dean (Academics)

Research Interest

- Land-Atmosphere Interaction Process
- Data Assimilation

Research Highlights

- Investigated the impact on enhanced forest conditions on the land surface characteristics over Central India using LIS.
- Analysed soil moisture estimates from regional and global datasets over the Indian region.
- Assessed impact of EnKF data assimilation of satellite derived soil moisture over the Indian region using LIS.
- Investigated the impact of enhanced forest condition on the regional weather over Central India using NU-WRF.
- Investigated the impact of different rainfall forcings on the soil moisture distribution over India using LIS.

Reference: https://www.iist.ac.in/ess/chandra

Rama Rao Nidamanuri, Ph.D. Professor & Head

Research Interest

- Remote sensing
- Methods and algorithms for processing and analysis
- Hyperspectral image processing: acquisition methods, automatic analysis processes
- 3D modelling of landscapes using LiDAR point clouds
- Real time image analysis approaches
- Remote sensing sensors development: imaging spectrograph
- Spectral mixture modelling and trace material detection in ultra high resolution imagery
- Atmospheric and radiative transfer modelling: region sensitive atmospheric correction modelling for multispectral and hyperspectral sensors

Research Highlights

- Developed a transferable technology for fractional material detection for agriculture and environmental monitoring applications.
- Proposed and experimentally demonstrated microplastics mapping technology.
- Developed and demonstrated site independent machine learning based technology for soil parameters retrieval using remote sensing data.
- Developed a design prototype for hyperspectral imaging sensor.
- Developed an automatic drone image analysis framework for crop mapping on the go.

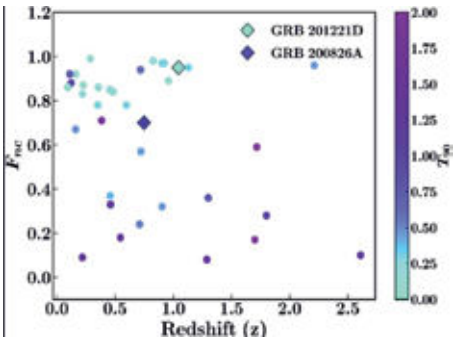
Resmi Lekshmi, Ph.D. Associate Professor

Research Interest

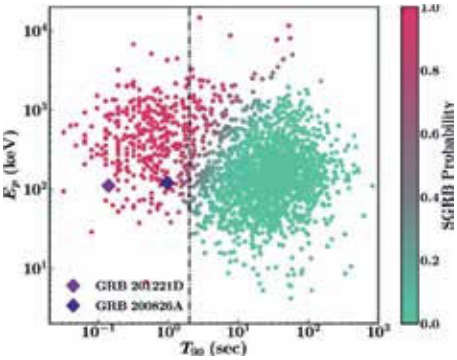
- Gamma-Ray Bursts
- Electromagnetic counterparts of gravitational wave events
- Fast Radio Bursts
- Time domain astronomy

Research Highlights

- Studied the properties of the high redshift short GRB 200826A.
- Compared this source with GRBs of other short and long GRBs (though to be of collapsar origin).
- Found that GRB200826A has properties similar to long GRBs.
- Noticed that this is true abouthigh-z short GRBs in general, which means they can likely be ofcollapsar origin.



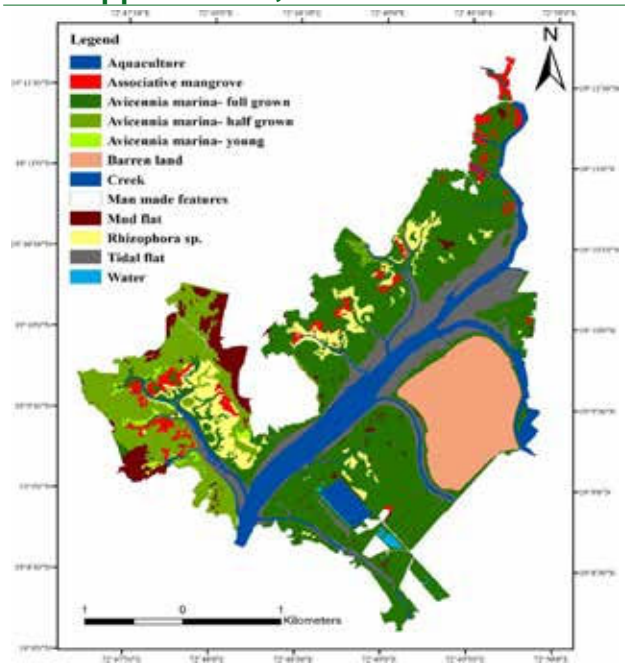
Non-collapsar probability of short GRBs vs their redshifts, color coded by the burst duration.



GRBs in the duration - spectral peak plane. Color coded by the probability for them to be of being a short GRB.

Reference: https://www.iist.ac.in/ess/l.resmi

Gnanappazham L., Ph.D., Professor



Mapping the mangrove species, Malad Creek, Mumbai

Research Interest

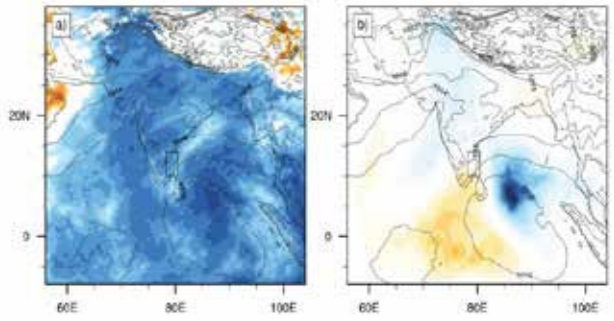
- Harnessing the potential of Geospatial tools for species level mapping of Indian mangroves and understand tidal dynamics

Research Highlights

- Explored the potential of open Google Earth images for mapping mangrove species
- Multi source remote sensing for improving the biomass estimation of mangroves.
- Understanding the influence of tidal dynamics on mangroves

Reference: https://www.iist.ac.in/ess/gnanam

Govindan Kutty M., Ph.D., Associate Professor



Sensitivity of forecast metric 24-h accumulated area-averaged precipitation valid at 72-h lead time to analysis sea level pressure for (a) univariate and (b) multivariate.

Research Interest

- Data Assimilation and Predictability
- Ensemble methods
- Extreme Weather events modelling
- Numerical Weather Prediction

Research Highlights

- Developed a multivariate approach to understand the key synoptic features for extreme rainfall

Reference: https://www.iist.ac.in/ess/govind

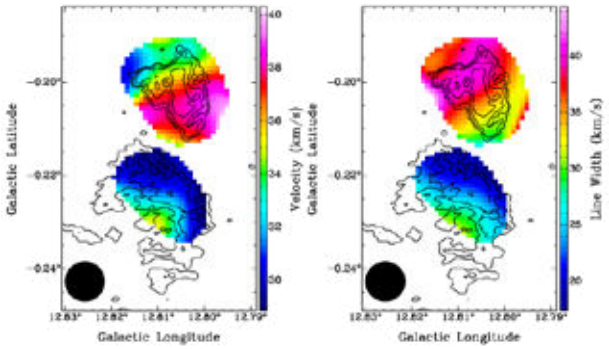
Jagadheep D., Ph.D., Professor

Research Interest

- High-mass star formation
- Galactic Structure
- Astronomical masers

Research Highlights

- A multi-wavelength study of the W33 Main region
- The dynamics of the ionized gas around the W33 Main ultracompact HII region have been studies using radio recombination lines using the Giant Metre Wave Radio Telecope (GMRT) and data from the international GLOSTAR survey. The observations detected prominent emission from W33 main and also detected another HII region south-east of W33 Main. The recombination line data show a clear velocity gradient across W33 Main highlighting interactions between multiple molecular clouds. The data also reveal that the second HII region south-east of W33 Main is in the process of expansion due to pressure difference between the HII region and the ambient interstellar medium.



The figure shows the velocity field (left panel) and the velocity dispersion (right panel) of the W33 Main region. W33 Main is the source to the north while the second source to the south-east is another older HII region that is in the process of expansion. The dark circle shows the resolution of the map.

Reference: https://www.iist.ac.in/ess/jagadheep

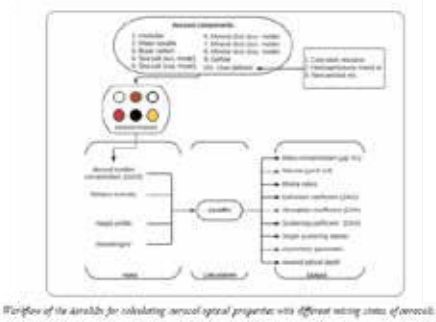
P.R. Sinha, Ph.D., Assistant Professor

Research Interest

- Mixing state of aerosols
- Aerosol-cloud interaction

Research Highlights

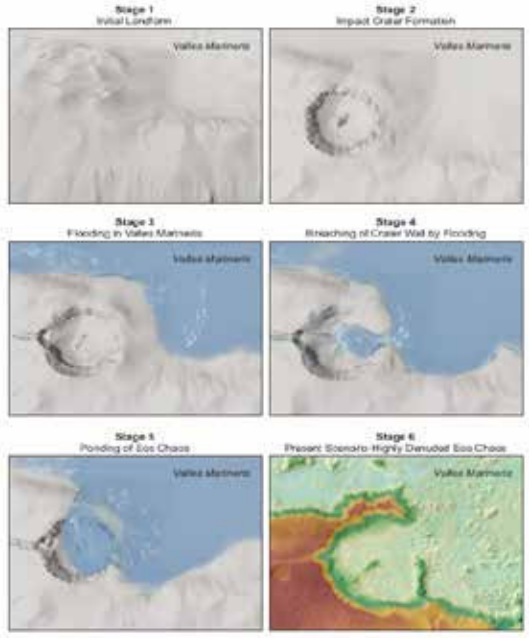
- Established elevated aerosol layer in the free troposphere over the Indian region using space-borne Lidar observation and proposed formation mechanisms of the elevated aerosol layers.
- Developed a Python package named “AeroMix” to provide an open-source tool for aerosol studies and to derive the possible mixing state from the ground- and satellite-based observations of aerosol optical properties.



- Workflow of the AeroMix for calculating aerosol optical properties with different mixing states of aerosols.

Reference: https://www.iist.ac.in/ess/prs

Rajesh V.J., Ph.D., Professor



Stages of evolution of an impact-like structure in western Eos Chaos, Mars.

Research Interests

- Planetary Geosciences
- Terrestrial Analogues for Planetary Exploration
- Astrobiology
- Mineralogy and Petrology

Research Highlights

- Geomorphology and mineralogy of Eos chaos on Mars
- Understanding glacial processes and related features on the low latitudinal Mars.
- Spectrochemical characterization and isotopic investigation of ultramafic-hosted magnesites and associated rocks from southern peninsular India.
- Serpentine-magnesite Association of Salem Ultramafic Complex, Southern India: A Potential Analogue for Mars.

Reference : https://www.iist.ac.in/ess/rajeshvj, Stages of evolution of Eos Chaos, Mars

Ramiya A.M., Ph.D., Associate Professor

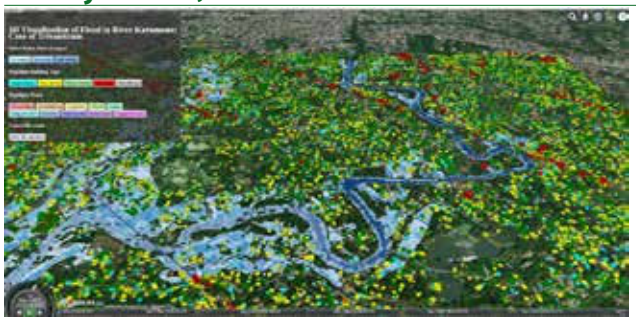


Fig: Web application for visualising flooding scenario over Karamana basin with 3D buildings and DEM derived from Aerial LiDAR data

Research interest

- Processing of very high resolution remote sensing data from UAV, airborne, satellite data
- 3D Point cloud data processing
- Spatial Database management

Research Highlights

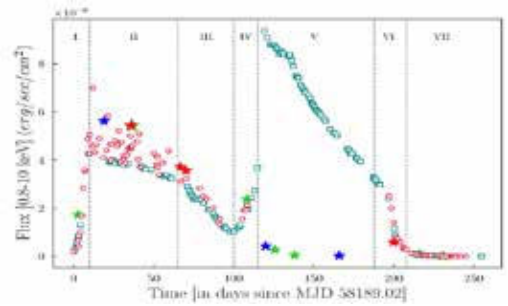
- Developed a methodological workflow to create 3D building models in CityGML standard from airborne LiDAR point cloud.
- Demonstrated the applicability of the proposed 3D CityGML models for flood simulation/modelling. The output from the model can be used by the decision makers to prioritize flood evacuation measures and flood risk management.
- Developed a novel methodological approach for creation of information extraction system for urban planning and governance using airborne LiDAR point clouds in ontological data management layout and 3D data Repository.

Reference: https://www.iist.ac.in/ess/ramiya

Samir Mandal, Ph.D., Professor

Research Interest

- Accretion physics and radiation processes around compact objects
- Spectral and temporal variability of X-ray binaries, AGNs
- Multi-wavelength study of Tidal Disruption Events



Research Highlight

- We performed spectral and timing studies of the dynamically confirmed black hole MAXI J1820+070 during the 2018 outburst. The outburst profile (evolution of flux with time) is shown in the figure. Swift/XRT (red circle) and NICER (green square) have good coverage over the entire event in the 0.8-10 keV band. We also use AstroSat (blue star), NICER-NuStar (green star) and XRT-NuStar (red star) data in 10-60 keV. The first outburst (phase I-III) is a failed one, while the second (phase IV-VIII) is a successful outburst. The source shows spectral state transitions and the evolution of quasi-periodic oscillations frequency, RMS during outbursts.

Reference: https://www.iist.ac.in/ess/samir

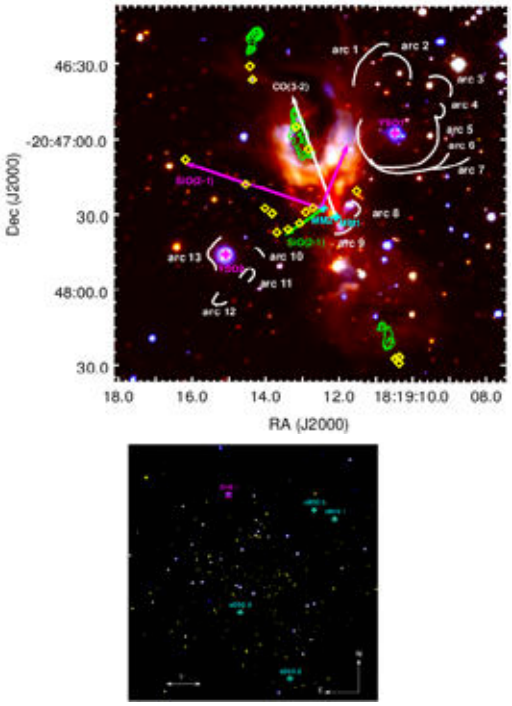
Sarita Vig, Ph.D., Professor

Research Interests

- Protostellar Jets
- Massive Star forming Regions
- Globular Clusters
- Classification of YSOs with ML and AI techniques

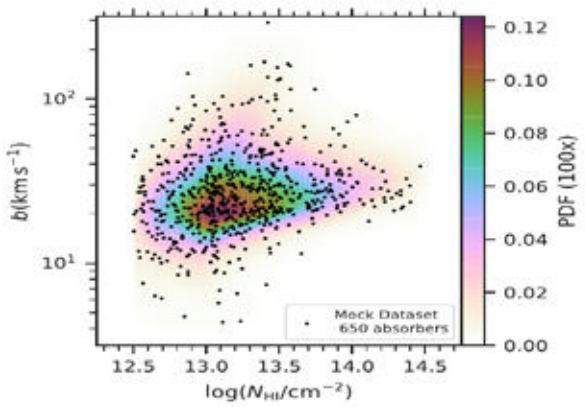
Research Highlights

- Study of HH80-81 jet in near-infrared shock tracers of H_2 and [FeII] lines
- Developed Numerical model of radio jets with thermal and non-thermal continuum emission
- Formation scenario of blue stragglers in Globular Cluster NGC5053 with AstroSat UVIT data
- Star-formation activity towards RCW42 using radio and infrared



Reference: https://www.iist.ac.in/ess/sarita

Vikram Khaire, Ph.D., Inspire Faculty



The color map is the full Doppler width (b in km/s) and column density of neutral hydrogen (N_{HI})distribution recovered from the NyX simulations of the mock Lyman-α forest, which is emulated by our new emulator based on machine learning. The black dots are the mock data sets we used in the inference to estimate the temperature of the intergalactic medium. Taken from paper Hu, Khaire, Hennawi et al 2022, (MNRAS, 515, 2188).

Research Interest

- Intergalactic medium
- Galaxy formation
- Machine learning applications to Astronomy

Research Highlights

- We presented a new approach to measuring the power-law temperature density relationship and the photoionization rate of hydrogen gas in the intergalactic medium based on the Voigt profile decomposition of the Lyman-α forest into a set of discrete absorption lines with Doppler parameter b and the neutral hydrogen column density.

Reference: https://www.iist.ac.in/ess/vikramkhaire

Department of Humanities

2.5 Department of Humanities

Vision

To attain excellence in Research, Teaching, and Learning with Social Sensitivity.

Mission

- To mould scientists and engineers with humanitarian concern, management skills, and sensitivity towards the socio-economic reality of society.
- To support the vision of the institute in providing a holistic education including ethical education, soft skills, entrepreneurial ability, and the spirit of innovation.
- To bridge the gap between space technology and the socio-economic, cultural & managerial development of the country.

Core Research Focus

(a) Space Economics

(b) Technology Diffusion and Economic Development

(c) Cultural studies

(d) Gender Studies

(e) Supply chain Management

(f) Space Technology and Society

(g) Study of the Marginalized Communities

Fact File

Number of faculty	:	05
Technical Staff	:	01
Tutors / Technicians	:	01
Non-teaching staff	:	01
Research Scholars	:	23
Ph.Ds conferred	:	02
Post-Doctoral students	:	01
Senior Research Associate	:	01

Laboratory / Research Facilities

Department of Humanities, IIST owns one instructional lab and one research lab

- Language Lab

For imparting practical sessions on communication skills, including presentation skills, role playing, group discussions, and also to give special sessions on listening and speaking skills.

- Audio Visual Lab

The Audio Visual lab has offered help in the form of Content creation for in house activities, creation of hard spots graphics / animation and other videos, recording of Interviews, talks of dignitaries, expert lectures etc and documentation and archival of every important activity of IIST.

Research and Developments

- The backbone of the departmental research activities is a vibrant PhD Programme. The faculty members in the department maintains an impressive number of extramural and IIST- ISRO projects.
- Department has initiated MoUs with Centre for Development Studies (CDS) and the US Consulate.
- The faculty members contribute not only to the disciplines as traditionally constituted, but also to new and emerging fields that cut across disciplinary lines. Studies are undertaken on diverse areas such as Tribal Cuisines, Muzuris Heritage, Supply Chain Management and the Impact of Tele-medicine on the Rural areas of the country. These projects are being funded by ISRO, ICSSR, DECU and Government of Kerala.

Research outcomes -Fact File

Journals published	:	15
Conferences Attended	:	2
Plenary Sessions	:	26
Book chapters	:	1
Books	:	1

Contribution to Indian Space Research

- A collaborative work of the department with CDS has shed interesting light on India's "space economy". Applying an eclectic framework, the study has tried to analyse the size and structure of India's space economy and the role of the state in shaping it. It also tries to provide some estimate of the productivity of the public investment in creating a space economy. In a first-of-its kind in the country, the study arrived at a figure of ₹.36,794 crore (approximately $5 billion) for the 2020-21 fiscal. They also found that the estimated size of India's space economy, as a percentage of the GDP, has slipped from 0.26% in 2011-12 to 0.19% in 2020-21. In relation to GDP, India's spending is more than that of China, Germany, Italy and Japan, but less than the U.S. and Russia.
- A major project on the impact of telemedicine is being currently undertaken by the department sponsored by ICSSR. It tries to analyse the extend of utilization of telemedicine services in the country, the extend it

has diffused among the people and the barriers and accelerators of diffusion.

- The department has also proposed a project in collaboration with VSSC on Indian Space Research Programme and its impact on the Indian Industries.

Outreach Activities

- Faculty members have delivered quite a good number of talks in the form of keynote addresses and had handled plenary sessions for conferences/ workshops/ seminars/ webinars and FDPs.
- The social outreach club of IIST - Nirmaan is being manned by the faculty members of the department. Nirmaan organized camps for the students of the tribal settlement of Thenmala, Njaruneeli and Athirapalli forest division.
- Department coordinated Episteme 2022, a two week residential science camp for 36 highly abled children between the age group of 9-14 years, selected from all over the country. It was organised by IIST in collaboration with Pravaha Foundation and Agastya International Foundation, AP.
- Reviewers of various technical forums of ISRO, State Govt. and Central Govt., and various national level universities and institutes, and also editors / subeditors of reputed academic journals.
- Contributed genuinely as motivational speakers in various forums at schools, colleges and universities.
- Actively engaged in the print, visual and social media panel discussions on international and socioeconomic and cultural topics.

Contributions to Institute Level Activities

- Department has initiated activities for including IIST under Unnat Bharath Abhiyan Programme coming under Government of India.
- A six week English Language Support Programme was offered by the Regional English Language Office of the US Embassy. The programme coordinated by Dr. Bristow from the University of Emory consisted of modules in Technical Writing for B.Tech. First Semester students and Research Writing programme for M.Tech. and Ph.D. scholars.
- Department of Humanities is actively involved in many institute-level programs and committees. Various institute level clubs like Nirmaan, Quiz club, MUN Club, Drama Club, Dance Club, and Movie Club are manned by the them.

Faculty Profile

Babitha Justin, Ph.D., Associate Professor

Research Interest

- Cultural Studies
- Gender studies
- Pandemic Visual Cultures

Research Highlights

- Pandemic art and other visual cultures and especially on Covid art
- Working on Gender and History in the Muziris Heritage Project

Reference: https://www.iist.ac.in/humanities/babitha

Gigy J. Alex, Ph.D., Associate Professor

Research Interest

- Food and Cultural Studies
- Tribal Culinary Studies
- Food Representations in Cinema

Research Highlights

- Engaged in the project on Mapping of Tribal Cuisines
- Understanding Modernity and Sociocultural Significance of Cookbooks

Reference: https://www.iist.ac.in/humanities/gigy

Lekshmi V. Nair, Ph.D., Professor

Research Interest

- Science, Technology & Society
- Study of Marginalized Communities
- Social Research

Research Highlights

- Impact of Mass Media on life and culture of Adivasi Communities in Kerala
- Impact of Telemedicine in the Remote Areas of India
- Indian Space Program and its impact on the industrial sector of the country.

Reference: https://www.iist.ac.in/humanities/ lvnair

V. Ravi, Ph.D., Professor

Research Interest

- Supply Chain Management
- Digital Supply Chain
- Sustainable Supply Chain

Research Highlights

- A combined AHP-TOPSIS multiple criteria decision-making approach to evaluate the quantitative and qualitative data of sustainable supplier is proposed.
- In this research, ethics is taken as the fourth dimension of sustainability along with Triple Bottom Line, considering that it plays a crucial role in purchasing activity and supplier selection.
- The results indicate that economic factors still dominate during sustainable supplier selection in Indian context.

Reference: https://www.iist.ac.in/humanities/ravi

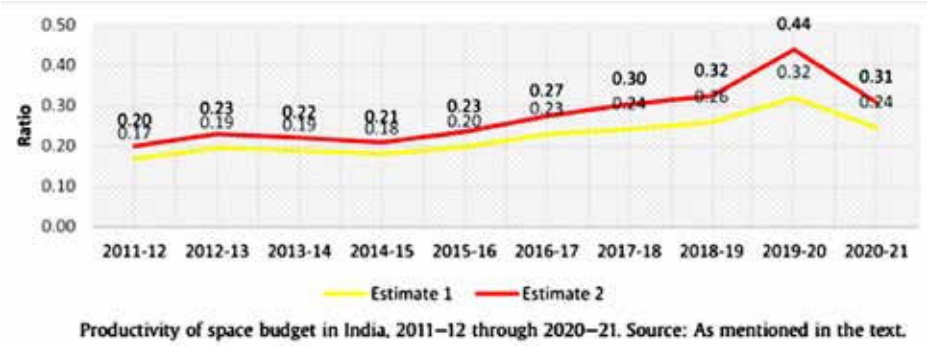
Shaijumon C.S., Ph.D., Associate Professor & Head

Research Interest

- Space Economics
- Development Economics
- Agricultural Economics
- Indian Macroeconomy
- Neuro Economics

Research Highlights

- Estimation of indirect economic impacts of space technology in India
- Indian Space Program and its Impacts on Industrial sector
- Telemedicine and its impacts



Productivity of space budget in India, 2011–12 through 2020–21. Source: As mentioned in the text.

Reference: https://www.iist.ac.in/humanities/shaiju

Department of Mathematics

2.6 Department of Mathematics

Vision

To be a distinguished centre for research and education in Mathematics and its applications, recognised nationally and internationally for its high-quality research and teaching.

Mission:

- Provide an excellent teaching and research environment for undergraduate, postgraduate, and doctoral students for critical and innovative thinking in different areas of Mathematics and its societal applications.
- Foster research collaborations at the national and international levels to cultivate a dynamic and active research ecosystem.
- Establish IIST as a prominent national-level knowledge center for a wide spectrum of mathematical activities.

Core Research Focus

(a) Commutative Algebra
(b) Control Theory
(c) Differential Geometry
(d) Machine Learning
(e) Numerical analysis
(f) Partial Differential Equations
(g) Queuing Theory and Time Series Analysis
(h) Stochastic Modelling & Analysis

Fact File

Faculty	:	11
Tutors/ Technicians	:	03
Non-teaching staff	:	01
Research Scholars	:	26
Post-doctoral fellows	:	01
Research Associates	:	03
Ph.Ds conferred	:	04

Laboratory/ Research Facilities

Department of Mathematics, IIST owns

- One Programming lab
- One M.Tech Machine Learning instructional lab
- One Mathematics Research lab/ Conference room
- One mini Research lab

Seminar/ Conference/ Workshop arranged

- March 16-17, 2023, workshop on "Theory and Numerics of Differential Equations", sponsored by SERB Project No. CRG/2021/002410 organized by the Department of Mathematics, IIST.
- March 13, 2023 (as part of international Womens' day and Pi day): "Women in Applied Mathematics", Prof. Aekta Aggarwal, IIM Indore, MP.
- March 8-10, 2023, "National Conference on Applied Mathematics and Numerics" (NCAMN 2022), jointly with the Department of Mathematics, Mar Ivanios College, Trivandrum.
- December 23, 2022, (as part of National Mathematics day): "Ramanujan's life and some of his impactful mathematical discoveries.", Prof. Kalyan Chakraborty, Director, KSOM, Kozhikode, Kerala.

Mathematics Club talks

1. 01-06-2022 James T Kurian The Poincaré-Bendixson Theorem
2. 24-08-2022 Jogender Singh Fractal Geometry - an Introduction to Julia and Fatou Sets.
3. 07-10-2022 Sidhartha Patnaik Control Theory: History, Perspectives, Achievements, and Approaches
4. 09-11-2022 Janakiraman B Ring theoretic properties of C[0,1]
5. 14-12-2022 Sonu Bose Efficient Numerical Methods for Singularly Perturbed Differential Equations
6. 11-01-2023 Anjuna Dileep On unique determination of unknown spatial load in a damped Euler Bernoulli Beam
7. 08-02-2023 Utkarsh Rajput Formal systems and their applications
8. 22-02-2023 Subrahamanian Moosath K.S Some Basic Geometrical Concepts for Partial Differential Equations
9. 29-03-2023 Sudheer Mishra Groups and their conjugacy

Post-graduate course

The department offers an M.Tech. in Machine Learning and Computing.

Research and Developments

Faculty members collaborate actively with various national and international institutions and are having three externally funded projects from funding agencies like DST-SERB, NBHM etc.

Research outcomes - Fact File

Journal articles	:	12
Conferences proc.	:	02
Book chapters	:	01
Extramural projects	:	06

Faculty Profile

C.V. Anil Kumar, Ph.D., Professor & Head

Research Interest

- Nonlinear Dynamics and Chaos in suspension rheology
- Time Series Analysis of naturally occurring data

Research Highlights

- We developed governing equations describing the migration of an arbitrary forced spheroid in an oscillating-shear flow at low Reynolds number, assuming a sufficiently diluted suspension to neglect the particle-particle interactions. The steady state solutions are found and analyzed in detail. We find the periodic solutions, analytically and the quasi-periodic solution, numerically. We analyse the stability of both for the first time at least in periodically forced suspensions. We study the dependence of the size and shape of the attractor on the controlling parameters such as aspect-ratio, Reynolds-number, amplitude and frequency of the external force and initial orientations or positions of the suspension.

Reference: https://www.iist.ac.in/mathematics/anil

Deepak T.G., Ph.D., Professor

Research Interest

- Applied Probability, Stochastic Processes, Queueing Theory

Research Highlights

- Developed a general class of probability distributions and point processes by using phase type distribution as the mixing distribution. The point processes like Poisson-Lindley processes, Poisson-Gamma processes etc can be considered as particular cases of our processes, called Poisson-Phase type processes. This process can be used as a tool for modelling many random point processes appearing in practical life.
- Presently working on the modelling and analysis of some fluid queue problems, which can be considered as mathematical models of electric vehicle charging stations.

Reference: https://www.iist.ac.in/mathematics/Deepak

E. Natarajan, Ph.D., Associate Professor

Research Interest

Virtual element method for linear and nonlinear problems with specific focus on convection dominated diffusion reaction problems. Algebraic multigrid method for sparse linear systems arising from the polygonal/polyhedral discretization.

Research Highlights

- Virtual element method for time-dependent convection diffusion models with nonlinear reaction term. Theoretical error analysis is performed, importantly an interesting lemma for the approximation error is proved in the hp version.
- Stabilization of the convection-diffusion system is studied using the VEM formulation. The branch solution technique is studied using the tools from theory of partial differential equations. Existence and stability of the discrete solution is discussed and the optimal rate of convergence is derived.
- Quasilinear PDEs over the polygonal discretization involve modern tools of numerical analysis. In this the theoretical analysis is much involved as the convection term is nonlinear. Rate of convergence is shown to be optimal in L^2 and H^1 norms followed by numerical experiments.

Reference: https:// www. iist.ac.in/mathematics/thanndavam

Kaushik Mukherjee, Ph.D., Associate Professor

Research Interest

- Fitted-Mesh methods (FDM/FEM) for singularly perturbed PDEs/ODEs; Fractional-step methods for multi-dimensional PDEs; Computational methods for PDEs with non-smooth data; Computational methods for Delay Differential Equations; Numerical Analysis of nonlinear singular perturbation problems.

Research Highlights

- Numerical approximation of coupled system of differential equations has always been a subject of interest to many researchers due to application of

these types of differential equations in modelling various physical problems that arise in biology, epidemiology and ecology, and nuclear engineering etc.

- Due to the presence of small diffusion parameters, the system of differential equations reduces to a system of singularly perturbed differential equations. Solutions of such systems generally possess overlapping boundary layers. Due to this characteristic, it becomes computationally challenging to design parameter-uniform numerical methods, which can capture the solution accurately independent of the perturbation parameter.
- We investigate efficient numerical approximation to the scaled solution derivative along with the solution of a weakly coupled system of singularly perturbed convection-diffusion problems having diffusion parameters of different orders of magnitude.
- To achieve the goal, we construct a new layer-adapted mesh, called generalized S-mesh that is appropriately adapted to the overlapping boundary layers. The specialty of using the generalized S-mesh is that it does not require increment of mesh-intervals N to enhance the accuracy of the numerical method; and henceforth, it enables to design cost-effective numerical technique.
- The current algorithm on the generalized S-mesh provides a robust numerical approximation in comparison with the standard Shishkin mesh and the Vulanovic L-mesh.

Reference: https://www.iist.ac.in/mathematics/Kaushik

Nicholas Sabu, Ph.D., Professor

Research Interest

- Mathematical Elasticity, Homogenization

Research Highlights

- Lower dimensional approximations of thin elastic and piezoelectric shells are studied. We have derived two dimensional models for various three dimensional elastic and piezoelectric structures with uniform and variable thickness. We have also studied the corresponding eigenvalue problems.

Reference: https://www.iist.ac.in/mathematics/sabu

Prosenjit Das, Ph.D., Associate Professor

Research Interest

- Polynomial automorphisms, Affine fibrations, Affine forms, Cancellation problems, Epimorphism problems, locally nilpotent derivations and allied areas.

Research Highlights

- Discovered the exhaustive class of locally nilpotent derivations of stably polynomial affine 2-fibrations having polynomial kernels.
- Discovered the exhaustive class of locally nilpotent derivations of affine 2-fibrations having affine 1-fibration kernels.
- Discovered a criterion for an element of an affine 2-fibration to be a residual coordinate.

Reference: https://www.iist.ac.in/mathematics/prosenjit.das

Raju K. George, Ph.D., Outstanding Professor, Dean (R&D, IPR)

Research Interest

Mathematical Theory of Control, Machine Learning

Research Highlights

- Controllability Analysis of Networked Systems. We investigate controllability properties of networked systems characterized by heterogeneous nodes as well as homogeneous nodes. The analysis is via spectral properties of the associated operators. We also analyze controllability of networked nonlinear systems by using Fixed point Theory.
- Machine Learning Algorithms are developed for finding steering controllers for various types of systems with different effects such as delays and impulses.
- Modeling and Simulation of real life systems.

Reference: https:// www. iist.ac.in/mathematics/george

S. Sumitra, Ph.D., Associate Professor

Research Interest

- Brain Computer Interface. Machine Learning, Data Mining

Research Highlights

- Self-supervised Enhancement of Latent Discovery in GANs
- Brain Computer Interface
- Information Diffusion Models for Social Media Text
- Spectral Graph Convolutional Neural Networks in the Context of Regularization Theory
- Graph Kernels based on Optimal Node Assignment
- Neighborhood Preserving Kernels for Attributed Graphs

Reference: https://www.iist.ac.in/mathematics/sumitra

Sakthivel K., Ph.D., Associate Professor

Research Interest

- Optimal Control Problems of Fluid Flow Models and Magnetization Dynamics, Inverse Problems of Beam and Plate Models, and Dynamic Programming of Stochastic Fluid Dynamic Models.

Research Highlights

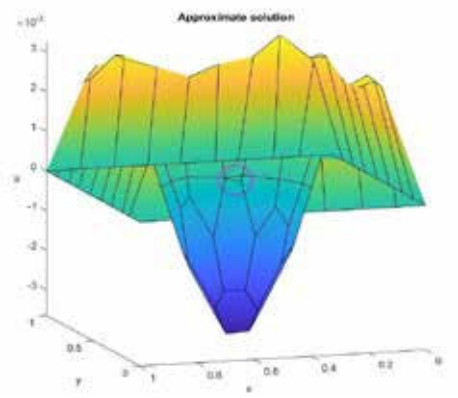
- Optimal control of magnetization dynamics in a ferromagnetic sample at a microscopic scale is studied. The existence of optimal control and a first-order necessary optimality condition is obtained.
- Studied the inverse problem of determining the unknown shear force acting on the inaccessible tip of a microcantilever beam, which is a key component of Transverse Dynamic Force Microscopy (TDFM). An optimization method based on weak solution theory for PDEs is employed in proving the existence of solutions for the inverse problems. The finite element method combined with conjugate gradient algorithms is used for the numerical reconstruction of the shear force.

Reference: https://www.iist.ac.in/mathematics/sakthivel

Sarvesh Kumar, Ph.D., Professor

Research Interest

- Computational Partial Differential Equations, Finite volume methods, Finite element methods, Virtual element methods, Discontinuous Galerkin Methods, Fluid flow Problems



Research Highlights

- A conforming Virtual Element Method (VEM) is employed to approximate general linear elliptic problems with discontinuous diffusivity constant across the interface.
- The significant challenges in solving such a problem include the low global regularity of the solutions and suitable mesh generation near the interface. In the proposed discretization, it is easy to generate background-fitted meshes independent of the location of the interface.
- In our mesh generation, we allow arbitrary small edges (naturally occurred in fitted mesh) and develop the stable virtual element scheme by using boundary stabilization
- Sophisticated analysis is carried out to show the well-posedness of the discrete problem and prove nearly optimal rate of convergence with minimum regularity on the continuous solution.
- Several numerical experiments are conducted to compare the classical and proposed boundary stabilization behaviour on different interfaces to show the flexibility and robustness of the method.
- The scheme's performance is illustrated with large magnitudes of discontinuities across the interface, which confirms the accuracy and theoretical rates of convergence.

Reference: https://www.iist.ac.in/mathematics/sarvesh

Subrahamanian Moosath K.S., Ph.D., Professor

Research Interest

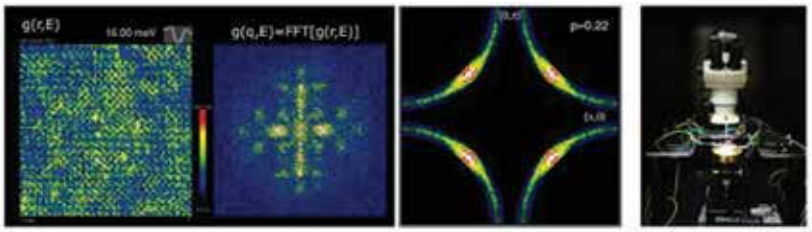
- Information Geometry
- Applications of Information Geometry to Machine Learning

Research Highlights

- We would like to explore the geometric aspects of non-parametric statistical models and the geometry of estimation. We have completed the study of the topology of Orlicz spaces which are the model spaces in the manifold structure of non-parametric statistical models.Geometry of non-parametric statistical models and the estimation theory are under study.
- The statistical manifold structure of the point cloud data is considered and see how it can be used for classifying the data. The theory is based on the Gromov-Hausdorff distances using Fisher information metric or geodesic distance, leading to isometry invariant geometric comparisons. Also, we are looking at the smooth deformation of one object into another by interpolation between two point cloud data sets.

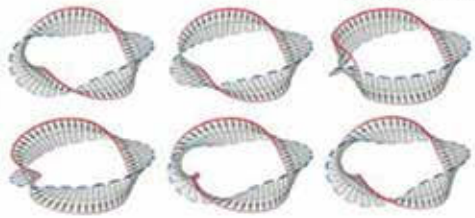
Reference: https://www.iist.ac.in/mathematics/smoosath

Department of Physics



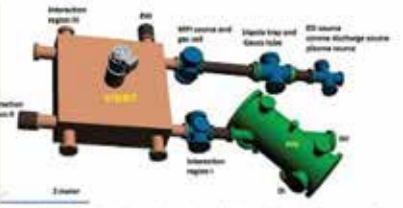
Visualizing electronic structure in both real and momentum space with Spectroscopic Imaging STM(SI-STM)

Micro-probe station



Rogue breathers in a spin chain : Special Spin chain modes, associated with changing linking number by '2' 'continuously'

ARIS Payload - Advanced Retarding Potential Analyser for Ionospheric Studies - Successful execution of first space mission by IIST



"VISHIT", Preliminary design of Versatile Ion Storage Ring at IIST

Home-built Plasma Atomic Layer Deposition (ALD) system

Design of Surface Discharge Sparkplugs Operates at 1 kV instead of 6 kV

2.7 Department of Physics

Vision

To be a vibrant centre for research and learning in pure and applied physics.

Mission

- To pursue excellence in our current subjects of expertise, and to diversify further into newer areas of research.
- To prepare students to be at the forefront of research in contemporary and emerging technologies, and for a leadership role as technology entrepreneurs in the near future, by laying a strong foundation in core areas of physics and engineering.
- To enable students to apply their knowledge to tackle foundational challenges in basic sciences.
- To engage with the community at large, emphasizing the importance of scientific pursuit and its relevance to society, while encouraging a scientific mindset.

Core Research Focus

Applied and Adaptive Optics, Quantum Technologies, Quantum Optics and Quantum Information

- Atomic and Molecular Physics
- Solid State Physics (Device Physics, Nuclear Magnetic Resonance, Scanning Tunneling Microscope), Theoretical Condensed Matter Physics
- Statistical Physics, Integrable systems, Nonlinear Dynamics

Fact File

Number of faculty	:	13
Sr. Scientific Assistant	:	01
Tutors /Technicians/Technical Assist.	:	08
Non-teaching staff	:	02
Research Scholars	:	44
Ph.Ds conferred	:	01
Post doctoral fellows	:	01
DST Woman Scientist	:	01

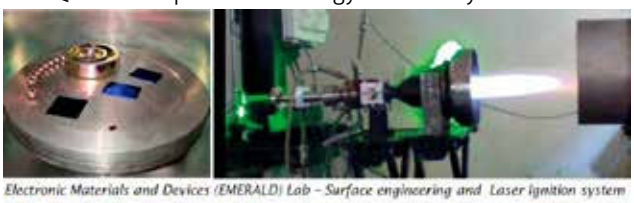
Laboratory / Research Facilities

Department of Physics, IIST owns eight instructional labs, which include

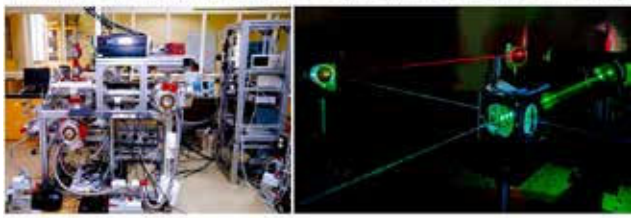
- General Physics Laboratory
- Modern Physics Laboratory
- Solid State Physics Laboratory
- Applied and Adaptive Optics Laboratory (PG)
- Optics Laboratory (UG)
- Quantum Technology Laboratory
- Computational Physics Laboratory

In addition, there are the following dedicated research laboratories.

- Atomic and Molecular Physics Laboratory
- Applied and Adaptive Optics Laboratory
- Electronic Materials and Devices (EMERALD) Laboratory
- Space Technology Innovations and Characterizations (STIC) Laboratory
- Electric Propulsion Laboratory
- Sensor and Payload Laboratory
- Quantum Optical Technology Laboratory



Electronic Materials and Devices (EMERALD) Lab – Surface engineering and Laser ignition system



Atomic and Molecular Physics Laboratory *Applied and Adaptive Optics Laboratory*

Research and Developments

- Faculty members from the department have been contributing actively to the development of space science and technology by actively being involved in research projects in collaboration with other ISRO and DOS centers through Advanced Space Research Group (ASRG) activities.
- Active collaboration for achieving larger scientific goals with other national and international research groups, such as

- Physical Research Laboratory, Ahmedabad, India
  - Space Applications Center, Ahmedabad, India
  - National Chemicals Laboratory (NCL Pune)
  - Tata Institute of Fundamental Research (TIFR) Hyderabad.
  - SRM University, Andhra Pradesh, India.
  - School of Physics, University of Hyderabad, India.
  - Weizmann Institute of Science – Israel.
  - Technion Institute of Technology – Haifa – Israel.
  - Extreme Light Infrastructure – Nuclear Physics – Magurelle
  - Center for Quantum Research and Technology, University of Oklahoma, USA.
  - University of Electro-Communications, Tokyo– Japan.
  - Technical University of Denmark – Denmark.
- Faculty members from Department hold various externally funded projects funded by DST-SERB, UGC-DAE-CSR, etc.

Research outcomes - Fact File

International Journal	:	19
Conferences	:	13
Book Published	:	01
Book Chapter	:	01

Contributions to Institute Level Space Missions

- Department of Physics is actively involved in Small Satellite and Payload development (SSPACE) activities at IIST, with a core focus on sensors and payload design and development.
- Faculty from the department undertake consultancy projects (ISRO) on emerging technologies such as Diagnostics for Stationary Plasma Thrusters.
- Department is involved in ISRO collaborative missions, including Advanced Retarding Potential Analyzer for Venus Mission (ARIS-Venus), Integrated Diagnostic Module for Electric Propulsion Technology Demonstration Satellite (TDS-01), etc.
- Faculty from the department is involved in the Quantum Technology initiative of the Government of India, currently working towards the realization of quantum communication and quantum sensing for space applications.
- Department is involved in ISRO collaborative missions including Advanced Retarding Potential Analyser for Venus Mission (ARIS-Venus), Integrated Diagnostic Module for Electric Propulsion Technology Demonstration Satellite (TDS-01), etc.

Outreach Activities

- IIST, with initiation from the department of Physics, hosted 23rd National Conference on Atomic and Molecular Physics (NCAMP23) from 20th to 23rd February 2023. NCAMP is a very prestigious biennial conference conducted by Indian Society of Atomic and Molecular Physics (ISAMP). ISAMP is an organization founded in the year 1975 and is the single largest society of Indian researchers working in the field of atomic and molecular physics. More than 250 participants from all across the country and a few from outside the country participated in the conference. The program was conducted with 60 seminars/presentations and 151 poster presentations.
- As part of the conference "NCAMP 23" a unique "Brainstorming session on organics in space: new frontiers" was conducted. The two hour session was attended by all the NCAMP23 participants, special invitees from international laboratories and the Directors of PRL, Ahmedabad, ARIES, Nainital, IISER, Kolkata and IIA, Bengaluru. The session was chaired by Chairman, ISRO/Secretary DoS. The session deliberated on the challenges and opportunities in the domain of organic molecular research in space.
- About 20 conferences / workshops / seminars / FDPs, participated by faculty members
- Reviews / Technical discussions at ISRO / other organizations / Institutes
- Contributed to various outreach activities for school / college students initiated by student chapters of SPIE, the International Society for Optics and Photonics as well as of Optica, the optical society.

Awards and recognitions

- Dr. C.S. Narayanamurthy, Outstanding Professor, Department of Physics has been awarded for ICO Galileo Galilei Award for 2022 (September 2022).
- Dr. C.S. Narayanamurthy, Outstanding Professor, Department of Physics has been elected to SPIE Fellowship (December 2022).

Faculty Profile

Apoorva Nagar, Ph.D., Associate Professor

Research Interest

- Steady states and phase transitions in nonequilibrium systems, Biological Physics

Research Highlights

- Study on the effect of long hops on a lattice model with open and closed boundaries
- Study on the effect of resetting dynamics on the totally asymmetric exclusion process (TASEP).
- The Ising model with stochastic returns to initial state at power-law intervals

Reference: https://www.iist.ac.in/physics/apoorva.nagar

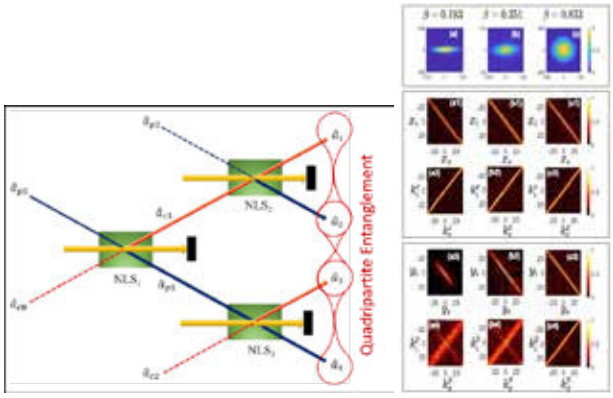
Ashok Kumar, Ph.D., Associate Professor

Research Interest

- Generation and Characterization of Quantum Entangled Light, Quantum Sensing and Quantum Imaging, Quantum Communication

Research Highlights

- Investigated anisotropic spatial entanglement in photon-pairs generated from nonlinear opticalt interactions.
- Investigated Continuous variable multipartite entanglement in cascaded nonlinearities



Right Side: Intensity distribution of the pump laser beam (a-c), Joint detection probability of position [(a1-c1) and (a3-c3)] and momentum [(a2-c2) and (a4-c4)] of photon pairs.

Reference: https://www.iist.ac.in/physics/ashokkumar

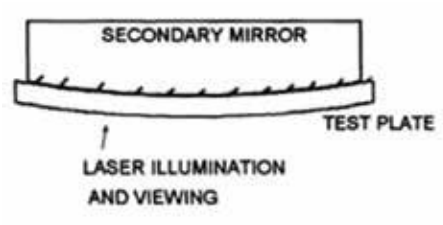
C.S. Narayanamurthy, Ph.D., Outstanding Professor

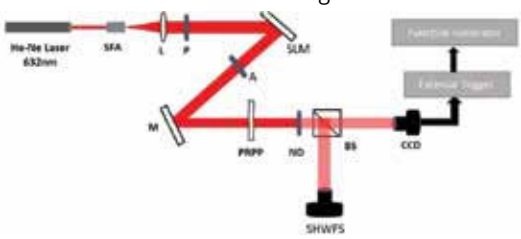
Research Interest

- Classical Optics (Wave propagation through turbulence, Digital holography and its applications, Wavefront Sensors, Adaptive Optics for wavefront Corrections, freeform optics, Classical Interferometry etc.)

Research Highlights

- Investigations on wave propagation through atmospheric turbulence using structured laser beams for free space communications
- Freeform optical design for R C Telescopes
- Digital holographic methods for non-destructive testing and measurements





Reference: https://www.iist.ac.in/physics/murthy

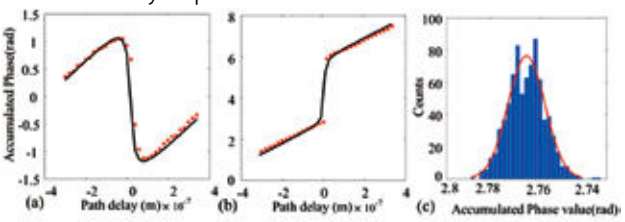
Dinesh N. Naik, Ph.D., Associate Professor

Research Interest

- Coherent & Incoherent Optics, Guided Wave Optics, Singular Optics, Adaptive Optics, Signal & Image Processing.

Research Highlights

- Sensitivity Enhancement in Low Coherence Fourier Transform Spectral Interferometry
- Through the interference with additional reference beam maintained at out-of-phase condition near zero optical path delay with respect to the sample probe beam, it is shown to introduce nonlinearity in phase change measured. In the experimental demonstration, the classic low coherence spectral interferometry is used. The three-beam interference is achieved by a modified Michelson interferometer. According to the setting of initial path delay and amplitude ratio of the interfering fields, the intensity of superposed field shows spectral modulations. Spectral phase is measured from the modulations in the recorded spectral interference using Fourier transform method of fringe analysis. The proposed method maps the linear path delay to highly nonlinear phase accumulation and has the potential to enhance sensitivity of phase measurements.



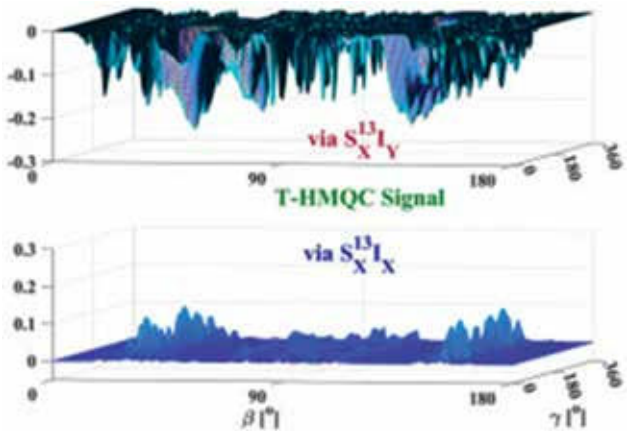
The variation of phase accumulated by the superposed field with path delay for central wavelength for(a) $\alpha = 0.88$ and (b) for $\alpha = 1.05$(c) the histogram showing the distribution of phase values obtained using repeated spectral measurements with unchanged experimental settings.

Reference: https://www.iist.ac.in/physics/dineshnnaik

S. Jayanthi, Ph.D., Associate Professor

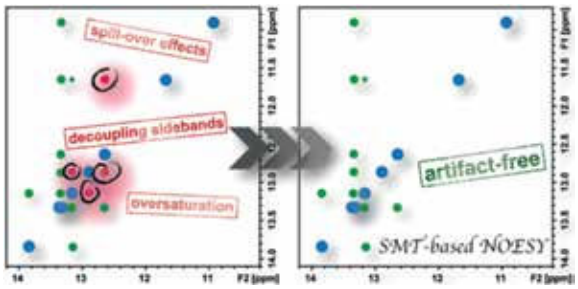
Research Interest

- Solution and solid state Nuclear Magnetic Resonance [NMR], Pulse sequence development, Solving time dependent Hamiltonians, Study of dynamics of molecules, Molecular dynamic simulations



Research Highlights

- Constructed an effective Hamiltonian to provide a theoretical and numerical description of spin dynamics associated with TRAPDOR-HMQC experiment involving 1H and 35Cl under fast MAS.



- Saturation magnetization transfer, routinely used for site specific information in solution NMR are not free from artifacts. A theoretical and experimental study is provided in identifying the artifactst

Reference: https://www.iist.ac.in/physics/jayanthi.s

K.B. Jinesh, Ph.D., Associate Professor

Research Interest

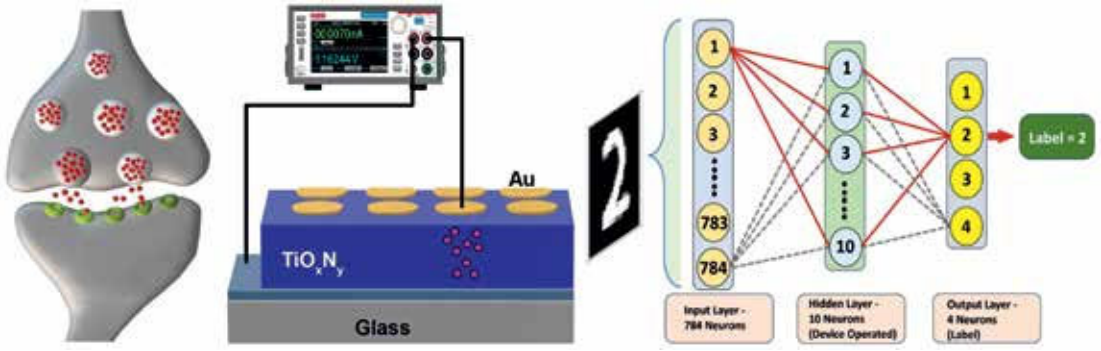
Neuromorphic Technology for future Artificial Intelligence, Future memory devices for data storage and computation, Inelastic Electron Tunneling Spectroscopy of single molecules.

Research Highlights

In-charge of the Research labs:

- Electronic Materials and Devices (EMERALD) lab and
- Space Technology Innovations and Characterization (STIC) lab.
- We have developed neuromorphic systems with giant synaptic responses, using BiFeO3 thin films deposited using Pulsed Laser Deposition (PLD) technique. The paper published in American Chemical Society journal Applied Electronic Materials, we reported

highly linear and large synaptic response of these devices. We were able to train the devices for pattern recognition applications with a prediction accuracy larger than 95%.



(left) a biological synapse works with the exchange of neurotransmitters across the synaptic junctions. (Middle) A neuromorphic devices work with the ionics in the active medium; (Right) the device can be trained for pattern recognition using Complementary Neural Network (CNN) models to identify hand-written images.

Reference: https://www.iist.ac.in/physics/kbjinesh

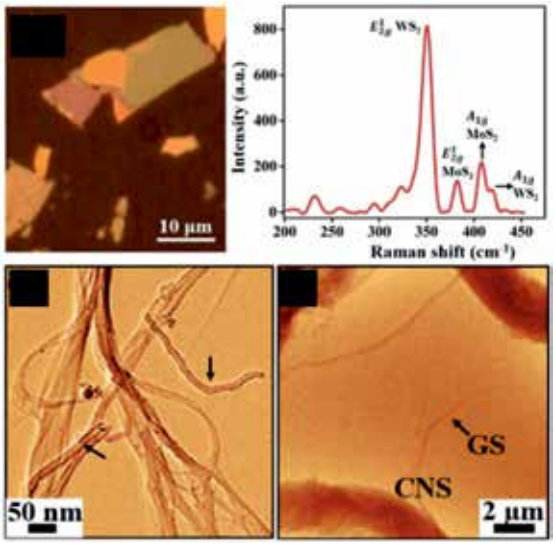
Kuntala Bhattacharjee, Ph.D., Associate Professor

Research Interest

- Quantum Materials
- van der Waal's Heterostructure
- Band Engineering
- Carbon Nanotubes and Space Applications

Research Highlights

- Scanning tunneling microscopy and spectroscopy studies and first principles density functional theory (DFT) calculations to understand structure and local electronic properties.
- CNT based thin filmsfor spaceapplications.
- Quantum 2D materials and investigation of electronic and electricalproperties,catalytic activities of TMD Janus like structures, quantum heterostructures based wide spectral range detectors for space related applications.



Reference: https://www.iist.ac.in/physics/kuntala.b

Naveen Surendran, Ph.D., Associate Professor

Research Interests

- Condensed matter theory, Topological order, Periodically driven systems

Research Highlights

- Investigation of topological phase transitions and dynamical freezing in periodically driven systems such as the three-dimensional Kitaev spin-model, bilayer graphene and Su-Schriefffer-Heeger model.

Reference: https://www.iist.ac.in/physics/naveen.surendran

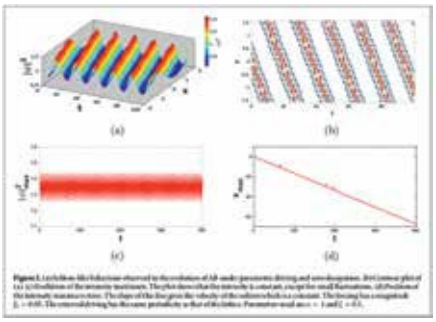
S. Murugesh, Ph.D., Professor

Research Interests

- Inverse scattering transforms, solitons and breather excitations in spin systems and applications.

Research Highlights

- Emergent soliton-like solutions in the parametrically driven 1-D nonlinear Schrödinger equation



- We have investigated the long time dynamics of spatially periodic breather solutions of the 1-D nonlinear Schrödinger equation under parametric forcing along with dissipation.
- In the absence of dissipation, robust soliton-like excitations are observed that travel with constant amplitude and velocity.
- With dissipation, these solitons lose energy (and amplitude) yet gain speed – a characteristic not observed in an ordinary soliton. Moreover, these novel solitons are found to be stable against random perturbations.

Reference: https://www.iist.ac.in/physics/murugesh

Solomon Ivan, Ph.D., Associate Professor

Research Interest

- Classical Optics, Quantum Optics, Quantum Information.

Research Highlights

- Outlined a new method to detect entanglement of mixed states in 2 times N dimensions, directly from experimentally measured intensities. Gives an alternate to Bell's inequality in detecting entanglement. The method was demonstrated through an experiment performed at IIST on partially coherent polarization entangled states. This resulted in a publication in JOSA A 2022.

Reference: https://www.iist.ac.in/physics/solomonivan

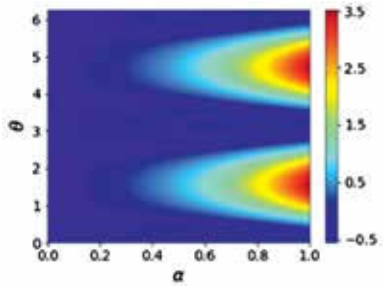
Sudheesh Chethil, Ph.D., Professor & Head

Research Interest

- Quantum Information and Quantum Computing, Nonlinear Dynamics and Quantum Chaos, Quantum Optics

Research Highlights

- The disappearance of squeezing in superposition states and its manifestation in the energy density
- Construction of quantum target space from world-sheet states using quantum state tomography
- Nonlinear dynamics of superposition of wavepackets
- Homodyne nonclassical area as a nonclassicality indicator



Reference: https://www.iist.ac.in/physics/sudheesh

Umesh R. Kadhane, Ph.D., Professor

Research Interest

- Molecular physics, high energy radiation interaction with organic molecules, the origin of prebiotic molecules in space

Research Highlights

- Development of energy correlated time of flight mass spectrometer
- EUV radiation interaction with PANH molecules
- Planetary ionosphere plasma simulation facility: Titan reactor
- Electrospray ion source with 14 pole ion trap facility

Reference: https://www.iist.ac.in/physics/umeshk

Academic Programmes

3. Academic Programmes

IIST offers a range of undergraduate and postgraduate programs that lead to degrees in B.Tech., Dual Degree, M.Tech., M.S., and Ph.D. across various fields encompassing Science, Engineering, and Humanities. In addition to these, the institute also provides certificate courses and short-term programs. Our teaching methodology is designed to integrate insights from fundamental areas into interdisciplinary challenges. We employ diverse teaching techniques, ranging from traditional classroom lectures to virtual classrooms. Students actively engage in internships, projects, assignments, fieldwork, presentations, debates, and seminars. They are also encouraged to establish connections with industry professionals whenever possible.

In our commitment to provide high-quality education to a broader student base and staying abreast of the latest scientific, technological, and socio-economic developments in the country, we ensure that the curriculum for all programs is updated every three years. To this end, a dedicated task force was established to study and implement the National Education Policy-2020 (NEP-2020) at IIST. Following the NEP guidelines, we have introduced new elective courses and recommend the inclusion of multidisciplinary programs, minor specializations, skill enhancement courses, and value-added offerings in the coming years. This approach allows us to continuously evolve and enhance the educational experience we offer to our students.

During the reporting period, the institute offered two undergraduate programmes, a dual degree programme, fifteen post-graduate programmes and full-time/part-time Ph.D. programmes.

3.1 Undergraduate Programmes

In the academic year 2022-23, IIST has offered B.Tech. in Aerospace Engineering and B.Tech. in Electronics and Communication Engineering (Avionics), with 72 seats each, 3 seats in each reserved for PMSSS and a Dual Degree programme with B.Tech. in Engineering Physics with 24 seats. Students of the Dual Degree programme will spend an additional fifth year to pursue either a Master of Technology degree in Optical Engineering or Earth System Science or a Master of Science in Astronomy or Astrophysics or Solid State Physics.

Undergraduate programme enrollment for the academic year 2022-23

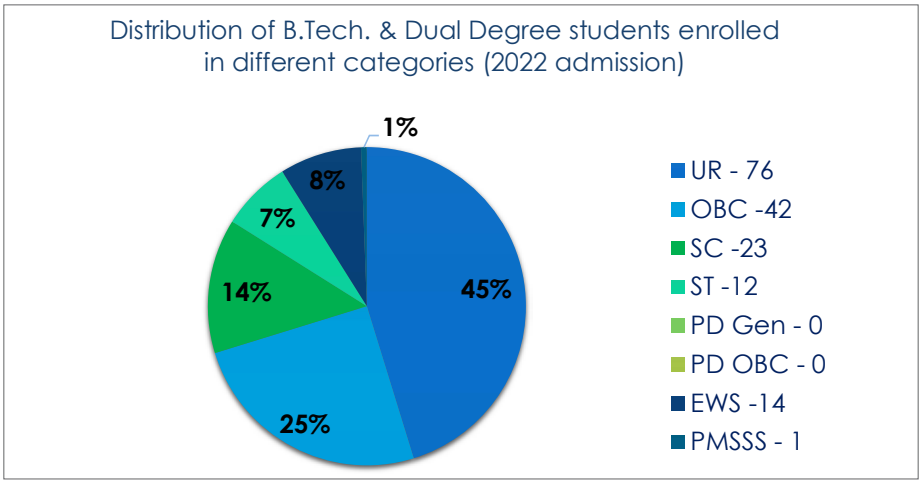
UG Programme	Gen	OBC	SC	ST	PD* Gen	PD* OBC	EWS**	PMS SS***	Total
Aerospace Engineering	33	18	9	6	0	0	6	0	72
Electronics & Communication Engineering (Avionics)	32	18	10	5	0	0	6	1	72
Dual Degree (Engineering Physics)	11	6	4	1	0	0	2	0	24
Total	**76**	**42**	**23**	**12**	**0**	**0**	**14**	**1**	**168**

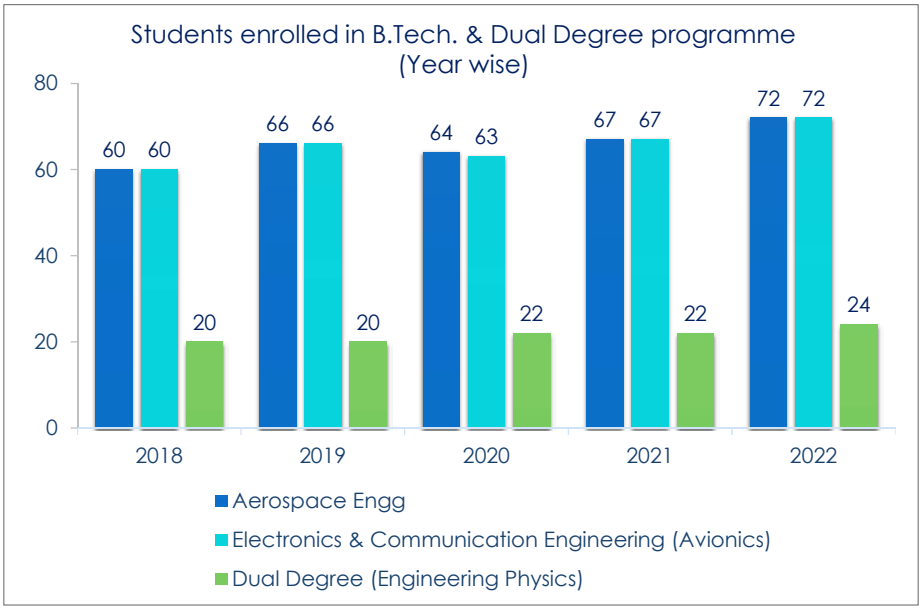
* *Persons with disabilities (PD)*

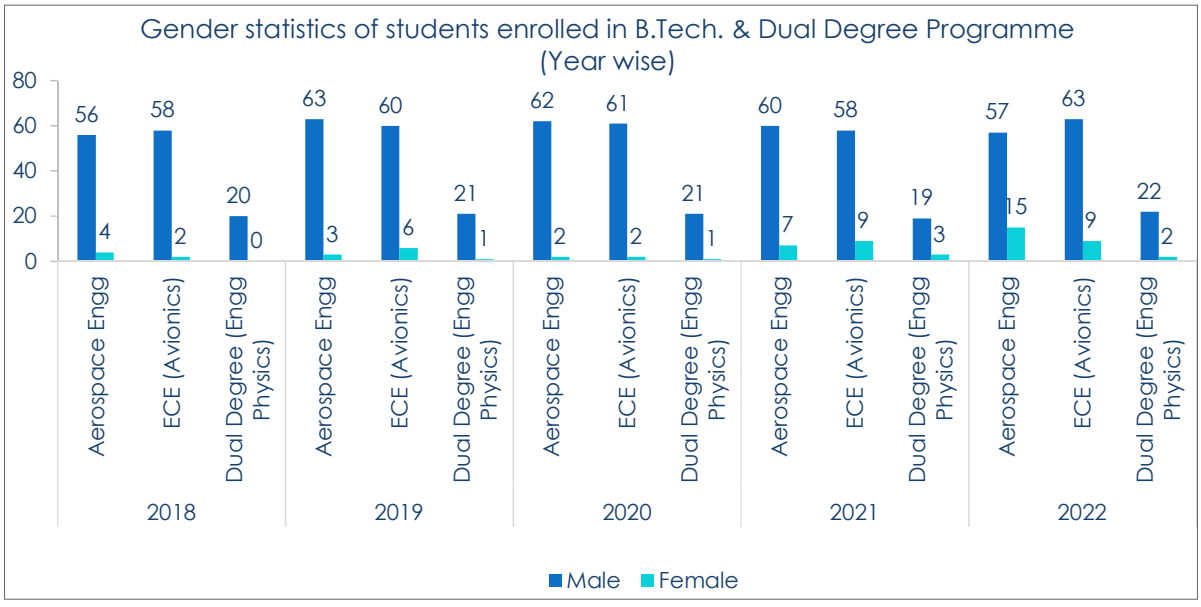
** *Economically weaker sections (EWS). As per government directive, the reservation for the EWS has been started from the academic year 2019-2020*

*** *Prime Minister's Special Scholarship Scheme (PMSSS)*

Distribution of B.Tech. & Dual Degree students enrolled in different categories (2022 admission)







IIST Admission at a glance: State wise Distribution

SI.No.	State	Count
1	Andhra Pradesh	15
2	Assam	01
3	Bihar	15
4	Chandigarh	01
5	Chhattisgarh	05
6	Delhi	01
7	Gujarat	10
8	Haryana	08
9	Jharkhand	02
10	Karnataka	04
11	Kerala	06
12	Ladakh	01
13	Madhya Pradesh	10
14	Maharashtra	19
15	Orissa	04
16	Punjab	02
17	Rajasthan	08
18	Tamil Nadu	12
19	Telangana	12
20	Uttar Pradesh	21
21	Uttarakhand	02
22	West Bengal	11
	TOTAL	**168**

Gender	Count
Female	25
Male	143

3.2 Postgraduate Programmes

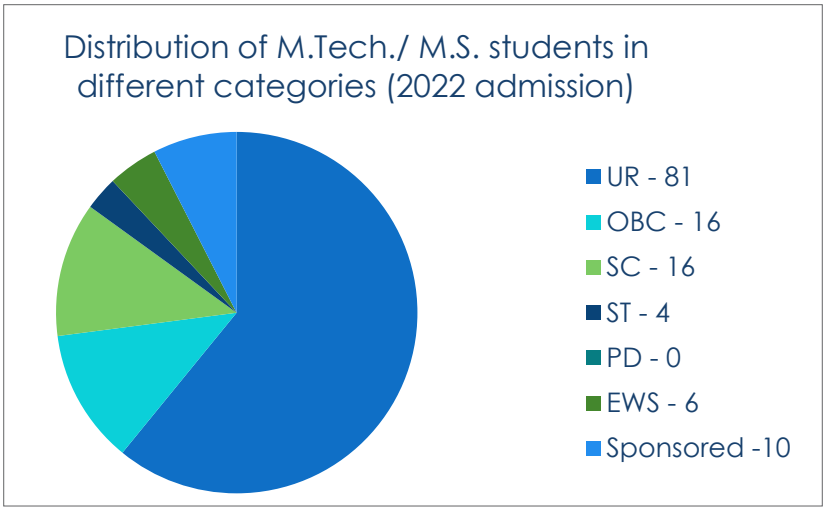
During the 2022-23 academic year, the institute offered 15 Master of Technology/ Master of Science programmes.

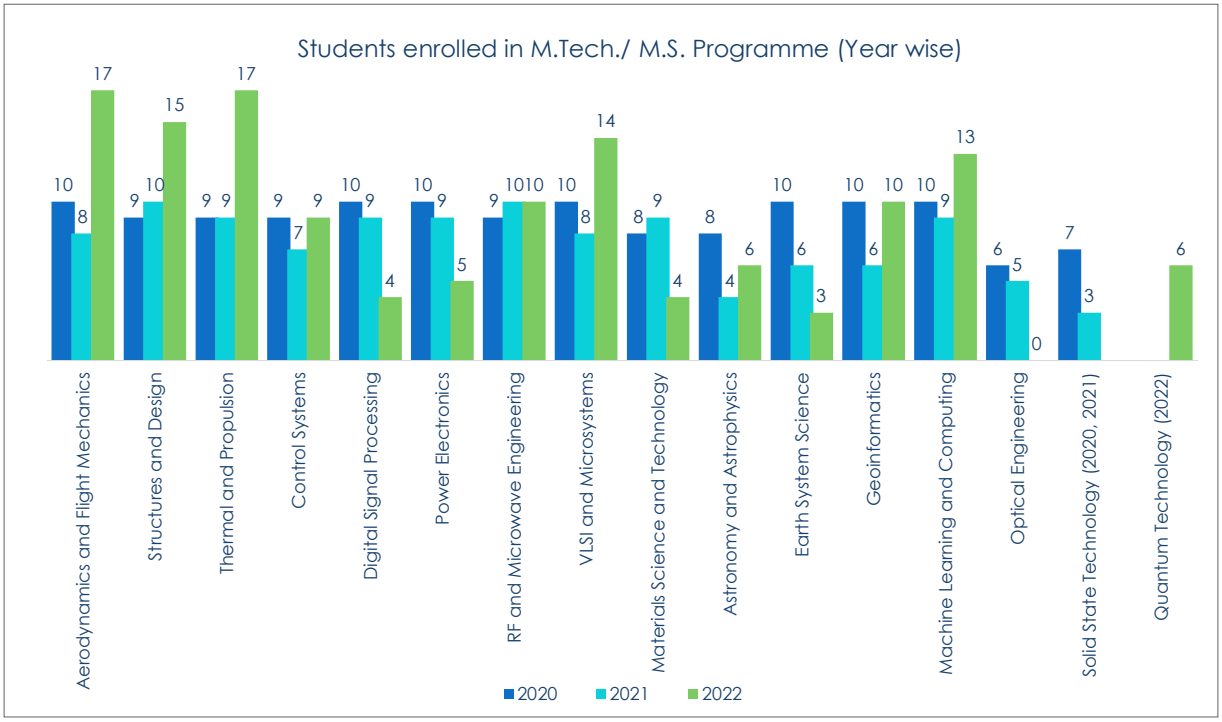
Admission to these programmes were based on national-level exams like GATE or JEST, followed by an interview. The following are the category-specific details of students admitted in the reporting period.

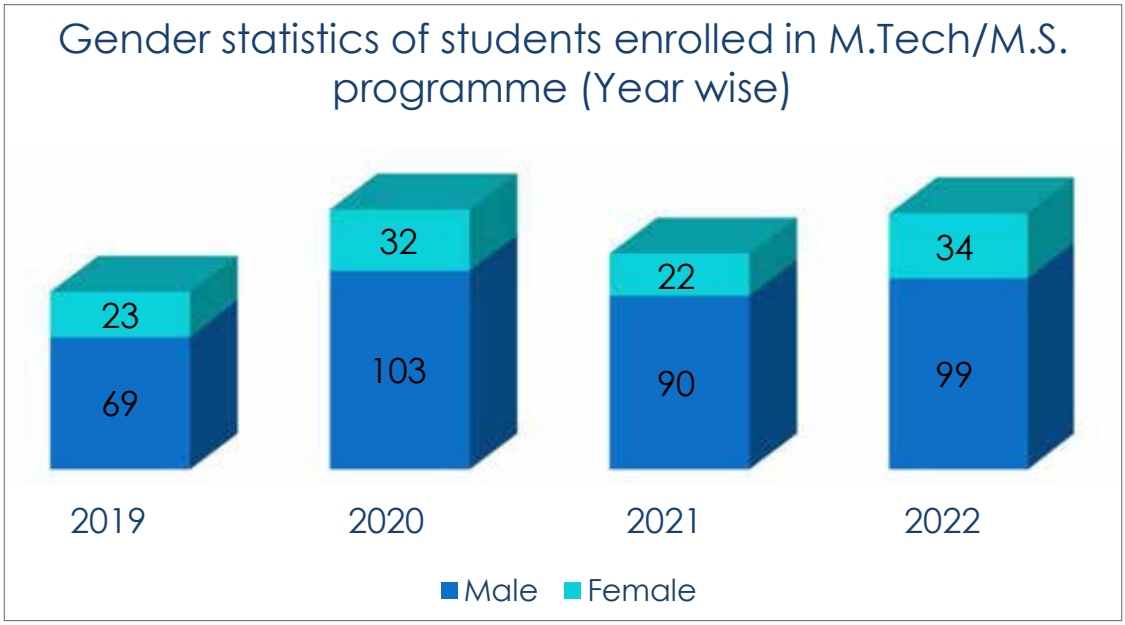
PG Programmes	2022 Enrollment							Total
	UR	OBC	SC	ST	PD*	EWS**	Sponsored	
Aerodynamics and Flight Mechanics	6	4	4	0	0	2	1	17
Structures and Design	7	4	3	0	0	1	0	15
Thermal and Propulsion	7	4	0	1	0	2	3	17
Control Systems	5	2	2	0	0	0	0	9
Digital Signal Processing	4	0	0	0	0	0	0	4
Power Electronics	5	0	0	0	0	0	0	5
RF and Microwave Engineering	9	0	0	0	0	1	0	10
VLSI and Microsystems	11	0	1	2	0	0	0	14
Materials Science and Technology	4	0	0	0	0	0	0	4
Astronomy and Astrophysics	4	0	2	0	0	0	0	6
Earth System Science	1	1	0	0	0	0	1	3
Geoinformatics	4	1	1	1	0	0	3	10
Machine Learning and Computing	8	0	3	0	0	0	2	13
Optical Engineering	0	0	0	0	0	0	0	0
Quantum Technology	6	0	0	0	0	0	0	6
Total	**81**	**16**	**16**	**4**	**0**	**6**	**10**	**133**

* *Persons with disabilities (PD)*

** *Economically weaker sections (EWS). As per government directive, the reservation for the EWS has been started from the academic year 2019-2020.*





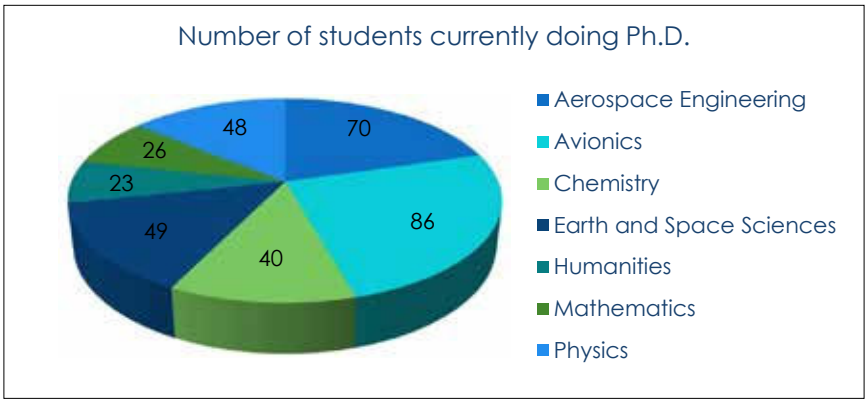


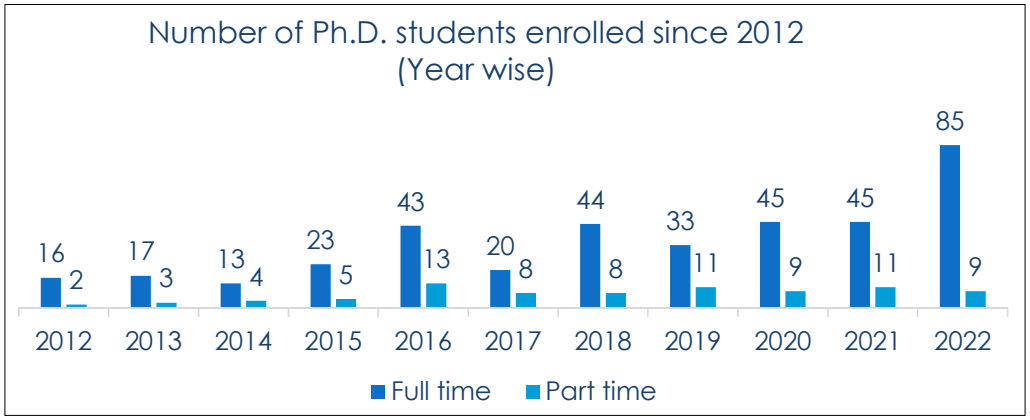
3.3 Doctoral Programmes

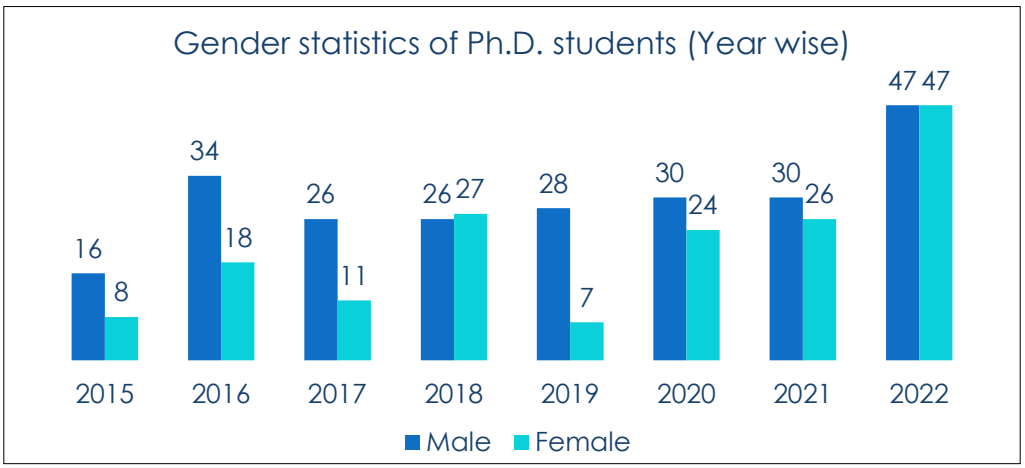
IIST is known for the quality and diversity of its research and fosters research through Ph.D. and Post-doctoral programmes administered by all seven departments. The faculty in the departments of engineering, science, and humanities conducts active research in frontier areas including space-related fields, resulting in highly renowned international and national journals and patents. The faculty and students participate in international and national conferences. IIST provided Ph.D. programmes in all seven departments in 2022-23. This year, admissions to Ph.D. programmes were held in July 2022 and January 2023, with a basic qualification of GATE/UGC/CSIR NET-JRF/JEST or equivalent exams. During the report period, 94 students registered for Ph.D. programmes, the details of which are provided below:

Ph.D. Enrollment 2022-23

Department	Full Time	Part Time	Total
Aerospace Engineering	14	3	17
Avionics	19	2	21
Chemistry	11	0	11
Earth and Space Sciences	14	0	14
Humanities	7	2	9
Mathematics	7	1	8
Physics	13	1	14
Total	**85**	**9**	**94**







3.4 Convocation

The 10th convocation of IIST was held on 17th December 2022 at the Pearl Jubilee auditorium LPSC campus, Valiamala. Shri. G. Madhavan Nair, former Secretary, DOS/ Chairman, ISRO was the chief guest of the day. The programme was also graced by the presence of Dr. B. N. Suresh, Chancellor, IIST , Shri. S. Somanath, Secretary DOS and President-GB, IIST and Dr. S. Unnikrishnan Nair, Director and Chairman, BoM, IIST. Dr. V. Narayanan Director, LPSC, was the Guest of Honour of the day. A total of 112 undergraduate degrees, 20 dual degrees, 104 postgraduate degrees and 28 Ph.D. degrees were awarded during the convocation.

Dr. S. Unnikrishnan Nair, the Director of IIST, welcomed the distinguished dignitaries and other guests on and off the dias, parents, graduating students, faculty members and the staff. During his address, he presented a comprehensive report highlighting the notable achievements of the institute over the past year. Dr. B.N. Suresh, the Chancellor, underscored the rapid advancements and cutting-edge technologies emerging in the space sector, both nationally and globally. He emphasized the increasing demand for highly educated engineers and the pivotal role that IIST can play in this evolving landscape. Shri. S. Somanath, the President of the Governing Body, offered his heartfelt congratulations to the graduating students. He emphasized the significance of collaborative learning and the value of interdisciplinary interactions within our academic environment. Dr. V. Narayanan, the esteemed Guest of Honour, elaborated on the numerous space programs and topics that graduating students can explore in the days ahead, inspiring them to embark on exciting journeys in their careers. The convocation address was delivered by Shri. G. Madhavan Nair, who congratulated the graduating students and offered valuable advice. He encouraged them to observe their surroundings, identify pertinent societal issues, determine where to focus their efforts, and utilize their knowledge to address the day-to-day challenges faced by society.

Along with the degrees, certificates and medals of excellence to the top scorers recognizing their outstanding accomplishments were also presented.

3.5 Degrees Conferred

In the 10th convocation of IIST, B.Tech. degrees were conferred on 112 students, 51 students graduating in Aerospace Engineering and 61 in Electronics and Communication Engineering. 20 Students of the Dual Degree programme received their B.Tech. degree in Engineering Physics and M.Tech./MS with specializations in - Optical Engineering, Solid State Physics, Earth Systems Science and Astronomy & Astrophysics. M.Tech. degrees were conferred on 97 students (Department of Aerospace - 19, Department of Avionics - 36 , Department of Chemistry - 6, Department of Earth and Space Science - 16, Department of Mathematics - 9, Department of Physics - 11) and Master of Science degree was received by 7 students from the Department of Earth and Space Science. Ph.D. degrees were awarded to 28 students across all the seven departments. After degree were conferred in the 10th convocation, the total degrees awarded by the institute are 1491 B.Tech., 86 dual degree, 687 M.Tech. and 130 Ph.D. degrees.

Degree Awarded - 10th Convocation

Degree	Discipline	No. of Students
Bachelor of Technology	Aerospace Engineering	51
	Electronics & Communication Engineering (Avionics)	61
Dual Degree	B.Tech. in Engineerng Physics + M.Tech. in Earth System Science	4
	B.Tech. in Engineerng Physics + Master of Science in Astronomy & Astrophysics	4
	B.Tech. in Engineerng Physics + M.Tech. in Optical Engineering	7
	B.Tech. in Engineerng Physics + Master of Science in Solid State Physics	5
Master of Technology	Aerodynamics and Flight Mechanics	8
	Structures and Design	4
	Thermal and Propulsion	7
	Control Systems	7
	Digital Signal Processing	8
	Power Electronics	7
	RF and Microwave Engineering	8
	VLSI and Microsystems	6
	Materials Science and Technology	6
	Earth System Science	8
	Geoinformatics	8
	Machine Learning and Computing	9
	Optical Engineering	6
	Solid State Technology	5
Master of Science	Astronomy and Astrophysics	7
Ph.D.	All disciplines	28
Total		**264**

3.6 Ph.D. thesis and the degree awarded

Twenty-eight students had successfully defended their Ph.D. theses and awarded degrees. Following List is given in the order: Student name, Thesis title, Guide(s) name, Department, Date of defence.

1) Sonu Tabitha Paulson (SC15D009) - 6.7 GHz methanol masers and the early phases of massive star formation - D Jagadheep / Earth and Space Sciences / April 05, 2022.
2) Vinod Kumar P (SC16D042) - Analysis and Design of Metasurface Antennas - Basudeb Ghosh / Avionics / April 13, 2022.
3) Pavithra Celeste (SC17D005) - Some Classes of Probability Distributions Constructed from Phase Type Random Variables - Deepak T G / Mathematics / May 12, 2022.
4) Sandip Sankar Roy (SC15D028) - Design and Realization of Single and Multi-band Monopulse Feed using Horn and Dielectric Rod for LEO Satellite Tracking Application - Chinmoy Saha / Avionics / May 19, 2022.
5) Prabith K (SC16D021) - Dynamic Analysis of a Two-spool Aero-engine Model Undergoing Multi-disk Rub-impact using a Semi-analytical Method - Praveen Krishna I R / Aerospace Engineering / May 27, 2022.
6) Narendra Singh Yadav (SC16D015) - Study of Higher - Order Fitted Mesh Methods for Singularly Perturbed Parabolic PDEs with Smooth and Nonsmooth Data - Kaushik Mukherjee / Mathematics / May 27, 2022.
7) Dhanesh A (SC16D032) - Study of Liquid Jets at Transcritical to Super critical Conditions in Single and Multicomponent Systems - Aravind V / Aerospace Engineering / May 30, 2022.
8) Fayza K A (SC16D012) - Design and Optimization Studies of Electroabsorptive and Carrier Injective Microring Resonators for Optical Switching and Logic Gate Applications Sooraj Raveendran / Avionics / - June 14, 2022.
9) Neha Gupta (SC18D021) - A Study on Spatial and Temporal Variabilities in the Martian Thermosphere - Umesh R Kadhane, IIST and Narukull Venkateswara Rao, NARL / Physics / July 13, 2022.
10) Arpita Munsi (SC18D020) - Understanding the helical evolution of tropical cyclone and their interaction with the upper ocean - Govindan Kutty M, IIST and Amit P Kesarkar, NARL / Earth and Space Sciences / August 18, 2022
11) Arya Nair J S (SC16D033) - Graphene and Molybdenum Disulphide Based Nano-Structures for Toxic Metal ion Removal from Water and Electrochemical Sensing Applications - K. Y. Sandhya / Chemistry / September 30, 2022.
12) Elangovan K (SC18D002) - Efficient Digitizing Interface Circuits for Various Resistive Sensor Configurations with Considerations on Wide-span and Remote Measurements - Anoop C S / Avionics / October 7, 2022.
13) Rakesh R Menon (SC15D018) - Study of select issues of sustainable supply chain management in Indian Electronics industry - Ravi V / Humanities / October 13, 2022.
14) Chalumuri Avinash (SC18D045) - Quantum Machine Learning for Big Data Analytics - Manoj B S, IIST and K Raghavendra, ADRIN / Avionics / October 27, 2022.
15) Tina B S (SC16D009) - MEMS Nanomechanical Membrane-Flexure Sensors with Integrated Electromechanical Transduction: Design, Fabrication, and Application Development - Seena V / Avionics / November 21, 2022.
16) Gopika Gupta (SC18D017) - Changing patterns in Aerosol Optical, Physical and Chemical Properties across the globe - C S Narayanamurthy, IIST and M Venkata Ratnam, NARL / Physics / November 21, 2022.
17) Battula Durga Siva Deeraj (SC16D035) - Studies on Mechanical Performance and Electromagnetic Shielding Effectiveness of Electrospun Fiber /Epoxy Composites - Kuruvilla Joseph / Chemistry / November 22, 2022.
18) Surya Kumar Gautam (SC16D048) - Complex object reconstruction from far-field intensity and its application - Dinesh N Naik / Physics / November 22, 2022.
19) Surya Mani Tripathi (SC11D024) - Numerical and experimental investigation of buckling behaviour of metallic dished shallow shells under uniform external

pressure - Anup S / Aerospace Engineering / November 28, 2022.

20) Thomas James Thomas (SC16D019) - Efficient algorithm and VLSI architectures for compressed sensing signal recovery - Sheeba Rani J / Avionics / November 29, 2022.

21) Jogender Singh (SC16D039) - On the dynamics of a periodically driven spheroid in a variety of flows at low Reynolds numbers - Anil Kumar C V / Mathematics / December 7, 2022.

22) Asha P Nair (SC14D010) - Lyapunov Based Stable and Robust Adaptive Control Design for a Class of Space Transportation Systems - N Selvaganesan / Avionics / January 23, 2023.

23) Asif Salim (SC16D020) - Formulation of Learning Algorithms for Graph Data Classification - S Sumitra / Mathematics, January 31, 2023.

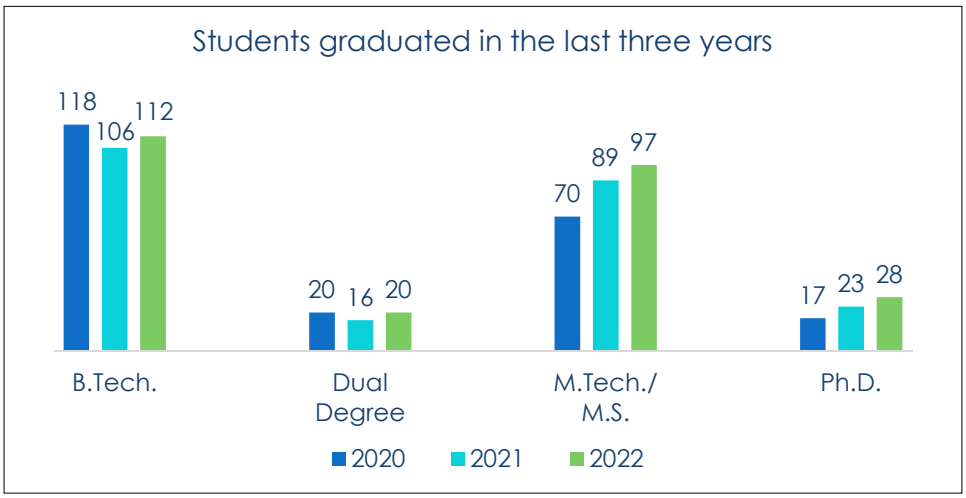
24) Reji J (SC17D029) - 3D Lidar Point Cloud Processing using Statistical and Machine Learning Methods for Precision Agriculture - Rama Rao N / Earth and Space Sciences / February 27, 2023.

25) Saisree S (SC16D029) - Graphene Quantum Dot and Metal Nanocluster-based Nano Functional Materials for Electrochemical Sensing Applications - K Y Sandhya / Chemistry / February 28, 2023.

26) Rakeshkumar K. Kaneriya (SC16D050) - Design, Development and Fabrication of Gallium Nitride (GaN) High Electron Mobility Transistor (HEMT) based terahertz devices for Space Applications - Solomon Ivan / Physics / March 01, 2023.

27) Muhammed Sihas K M (SC16D031) - Socio-Cultural Transition of Adivasis in Wayanad - Role of Mass Media - Lekshmi V Nair / Humanities/ March 06, 2023.

28) Priya Mariam Raju (SC16D051) - Generic Approaches to Enhanced Correlation Filter Tracking - Deepak Mishra / Avionics / March 31, 2023.



3.7 Academic Honours

Sri Aditya Deevi (SC18B080) of B.Tech., Electronics and Communication Engineering (Avionics) received the prestigious Gold Medal for being the best academic performer across all B.Tech. branches and Kiran L. (SC17B150) of Master of Science in Astronomy and Astrophysics (Dual Degree) received the Gold Medal for topping all M. Tech. programmes. Subrahmanya V Bhide (SC18B030) received an excellence certificate and a cash prize for having the highest academic score in Aerospace Engineering, while Abhishek A (SC17B141) Dual Degree (M.Tech. in Optical Engineering) was selected as the best all-rounder and outgoing student.

Subrahmanya V Bhide (SC18B030) of Aerospace Engineering and Sri Aditya Deevi (SC18B080) and Kothadiya Princekumar Balkrushna (SC18B078) of Electronics and Communication Engineering are pursuing Masters degrees at California Institute of Technology (Caltech), USA, before joining ISRO. The 9-month programme is financially supported under the DoS-Caltech Professor Satish Dhawan Endowment Fellowship.

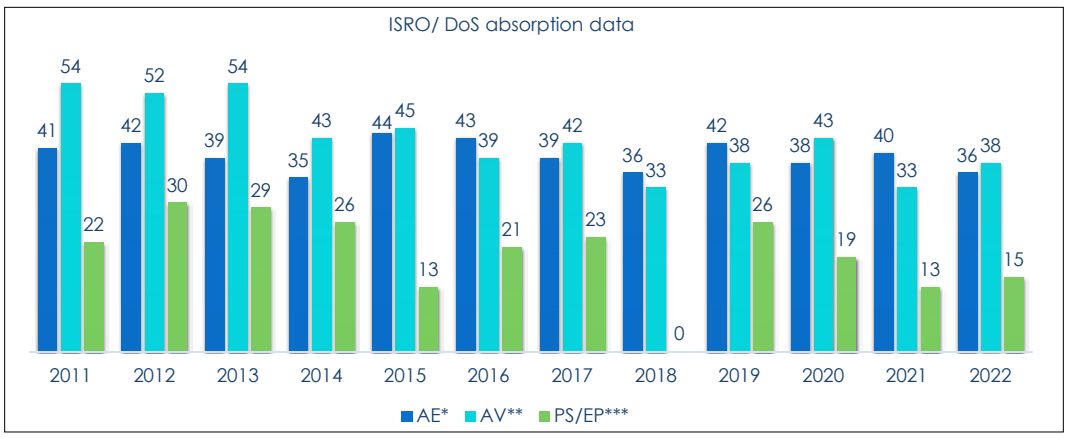
Gold medal for the topper of all B.Tech. Branches	Gold medal for the topper of all PG specializations	Best academic score in Aerospace Engineering	Best all-rounder and the best outgoing student
			
Sri Aditya Deevi (SC18B080) *B.Tech. in Electronics and Communication Engineering (Avionics)*	Kiran L (SC17B150) *Dual Degree (M.S. in Astronomy and Astrophysics)*	Subrahmanya V Bhide (SC18B030) *B.Tech. in Aerospace Engineering*	Abhishek A (SC17B141) *Dual Degree (M.Tech. in Optical Engineering)*

Masters Programme at California Institute of Technology (CalTech), USA		
		
Subrahmanya V Bhide (SC18B030) *Aerospace Engineering*	Sri Aditya Deevi (SC18B080) *Electronics and Communication Engineering (Avionics)*	Kothadiya Princekumar Balkrushna (SC18B078) *Electronics and Communication Engineering (Avionics)*

3.8 Placement

ISRO Placement for B.Tech. Students

In 2022-23, the placement process in IIST was carried out in a hybrid mode. B.Tech. and Dual Degree graduates who secure a CGPA of 7.5 and above are absorbed into the different centres of ISRO/ DOS. In 2022, 89 students, were offered placement in ISRO. A total of 1231 graduates from the institute have joined ISRO so far.



AE: B.Tech. Aerospace Engineering.

AV: B.Tech. Avionics or B.Tech. Electronics and Communication Engineering (Avionics).

PS/EP: B.Tech. Physical Science, later changed to Dual degree programme with B.Tech. in Engineering physics and M.Tech. / M.S.

Centre for Career Guidance and Placements (CCGP)

On 20th March 2023, the 'Placement Cell' was reconstituted with a different title as "Centre for Career Guidance and Placements" (CCGP). The CCGP steering committee is constituted with members from various academic departments. The CCGP steering committee was formed with an objective of training students and facilitating student in internships and placements in industries and R&D organizations. In view of the new space reforms and to further enhance the skill development programmes and placements, the scope and objective of the CCGP shall be augmented to encompass wider area of student training, career guidance and ensure placement in top rated companies.

The CCGP fosters regular interactions with industry, R&D organisations, and management institutions to provide Training, Career Guidance, Internship/ Project and Campus Placements to our postgraduate and undergraduate students. The CCGP functions in accordance with the Institute's standards, attempting to connect students' interests with relevant career profiles. It is constantly working to protect the interests of students and strives to be a part of their safe and secure future.

The CCGP steering committee has met a few times to discuss the following activities:

1. Training students on computer coding skills, soft skills, communication skills and related workshops.
2. Constituting student volunteers and batch representative's groups from all the programs.
3. Creating awareness about IIST to the top recruiting companies and delegation from IIST to the top companies in India.
4. Improve the infrastructure of the CCGP.

In 2022-2023, a total 91 Companies visited IIST for Placements. For M. Tech about 56 companies have visited which includes M/s Schneider Electric, M/s Daimler Truck, M/s TCS, M/s Robert Bosch, M/s Agnikul Cosmos, M/s Global Foundries, M/s ST Microelectronics, M/s Intel Technology, M/s Mercedes Benz, M/s Mathworks, M/s TATA Advanced Systems, M/s Siemens Gamesa, M/s Continental Automotive, M/s Infosys, M/s SquareYard, M/s BYJU's, M/s TATA Elxsi, M/s Delta Electronics, M/s C-DAC. The maximum package was 28 Lakh per annum (LPA) for M.Tech. students, For B.Tech. programme, 40 companies have visited IIST. The maximum package [CTC] was 13.5 LPA. The average package for M.Tech. students is 15 LPA and 13.5 LPA for B.Tech. students.

Internship Details

B.Tech. (2019-2023) and M.Tech. (2021-2023)

Sl No.	Name of the student	Course	Company
		B.Tech.	
1	Oddi Nikhil Sanjiv	ECE (Avionics)	M/s CDAC, BLR
2	Shriram TG	ECE (Avionics)	M/s CDAC, BLR
3	Pratyaksh Maru	Aerospace Engineering	M/s Textron India
		M.Tech.	
1	Yathish P Karkera	Structure & Design	M/s Centum Electronics
2	Revathi Gunasekaran	RF & Microwave Engineering	M/s Centum Electronics
3	Mukul Kumar Jobra	Digital Signal Processing	M/s Centum Electronics
4	Rudranath Palit	Digital Signal Processing	M/s Centum Electronics
5	Prakhar Patel	Machine Learning & Computing	M/s INTEL

Sl No.	Name of the student	Course	Company
6	Dilip M	Machine Learning & Computing	M/s INTEL
7	Kola Keerthana	Machine Learning & Computing	M/s INTEL
8	Aruna Shaju Kollannur	Digital Signal Processing	M/s INTEL
9	Priyank Zaveri	Digital Signal Processing	M/s INTEL
10	Rudranath Palit	Digital Signal Processing	M/s INTEL
11	Aruna Shaju Kollannur	Digital Signal Processing	M/s C DAC
12	Shyam Kumar Singh	RF & Microwave Engineering	M/s Mercedes Benz
13	Rushikesh Patil	VLSI & Microsystems	M/s Mercedes Benz
14	Jaya Sridhar NK	VLSI & Microsystems	M/s Mercedes Benz
15	Chirag Agarwal	VLSI & Microsystems	M/s C-DAC, HYD
16	Prashant Shashikant Pandey	VLSI & Microsystems	M/s C-DAC, BLR
17	Parvathy M R	Machine Learning & Computing	M/s Continental
18	Saurabh Verma	Machine Learning & Computing	M/s Continental
19	Prashant Shashikant Pandey	VLSI & Microsystems	M/s Global Foundries
20	Salini M S	Geoinformatics	M/s Robert Bosch
21	Chirag Agarwal	VLSI & Microsystems	M/s ST Microelectronics
22	Saurabh Verma	Machine Learning & Computing	M/s TCS
23	Samridh Patial	Aerodynamics & Flight Mechanics	M/s L&T
24	Aman Kumar Rai	Aerodynamics & Flight Mechanics	M/s L&T
25	Kshitij S Raut	Structure & Design	M/s Vashishtha Research
26	Yathish P Karkera	Structure & Design	M/s Centum Electronics
27	Revathi S	Control Systems	M/s Aadyah Aerospace
28	Amal S Thomas	Power Electronics	M/s Robert Bosch
29	Sidharth Shivdas	Power Electronics	M/s Robert Bosch
30	Santhosh Kumar	Thermal & Propulsion	M/s Mercedes Benz
31	Ajinkya Ashok Jagtap	Machine Learning & Computing	M/s Robert Bosch
32	Shaantanu Tayade	VLSI & Microsystems	M/s C-DAC, HYD
33	Jinesh Bhikamchand Lunia	Structure & Design	M/s Veneklasen Asst.
34	Ashley Kevin Dsouza	Thermal & Propulsion	M/s Mercedes Benz
35	Keerthana Raghu	Thermal & Propulsion	M/s Mercedes Benz
36	Jitendra Kumar	VLSI & Microsystems	M/s SM Technology
37	Sivaganesh	Geoinformatics	M/s Pixxel India

Placement Details

B.Tech. (2019-2023) and M.Tech. (2021-2023)

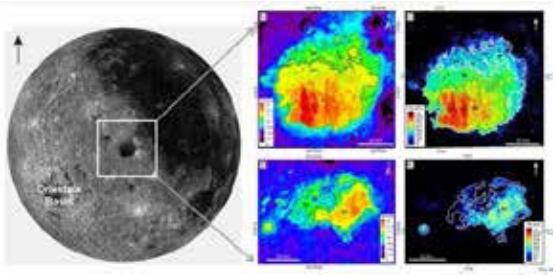
Sl No.	Name of the student	Course	Company
		B.Tech.	
1	Praveen Kannaa Ba	ECE (Avionics)	M/s Publicis Sapient
2	Shivansh Tripathi	ECE (Avionics)	M/s Agnikul Cosmos
3	Nageli Purushotham	ECE (Avionics)	M/s Agnikul Cosmos
4	Parth Gaikwad	Aerospace Engineering	M/s Agnikul Cosmos
5	Sri Krishna Chanakya P	ECE (Avionics)	M/s Agnikul Cosmos
6	Yash Bharti	Aerospace Engineering	M/s Agnikul Cosmos
7	Bijoy Mondal	ECE (Avionics)	M/s Agnikul Cosmos
8	Shashi Kumar	ECE (Avionics)	M/s Agnikul Cosmos
9	Madhav Yerram	Aerospace Engineering	M/s Agnikul Cosmos
10	Simhadri Nani	ECE (Avionics)	M/s Agnikul Cosmos
11	Pratyaksh Maru	Aerospace Engineering	M/s Agnikul Cosmos
12	Aakash Preetham V	Aerospace Engineering	M/s Agnikul Cosmos
13	J Sai Vikas	Aerospace Engineering	M/s Agnikul Cosmos
14	Oddi Nikhil Sanjiv	ECE (Avionics)	M/s Agnikul Cosmos
15	Tanuboddi Jevanth	Aerospace Engineering	M/s Agnikul Cosmos
16	Aravind Potluri	ECE (Avionics)	M/s Agnikul Cosmos
17	Murtaza Hamid	ECE (Avionics)	M/s Agnikul Cosmos
18	Ujjawal	Aerospace Engineering	M/s Agnikul Cosmos
19	Kshirsagar Chaitanya Arjun	Aerospace Engineering	M/s Agnikul Cosmos
20	Chitikela Neeraj Kumar	ECE (Avionics)	M/s Cyient Technology
21	Ejaz Pathan Khan	ECE (Avionics)	M/s Aadyah Aerospace
22	Seera Venu Gopal	ECE (Avionics)	M/s Aadyah Aerospace
23	Ajaya Kumar Patel	Aerospace Engineering	M/s Qspider
24	Pankaj Singh	Aerospace Engineering	M/s Qspider
25	Daksh Kumar	Aerospace Engineering	M/s Qspider
26	Nageli Purushotham Naidu	ECE (Avionics)	M/s Qspider
27	Srikant Venkatraman	Aerospace Engineering	M/s Qspider
28	Hanjari Ram	ECE (Avionics)	M/s Qspider
29	Vistesh	Aerospace Engineering	M/s Qspider
30	Yash bharti	Aerospace Engineering	M/s Qspider
31	Aakash Preetham V	Aerospace Engineering	M/s Qspider
32	Karun Mathews Manoj	ECE (Avionics)	M/s TATA Elxsi
33	Simhadri Nani	ECE (Avionics)	M/s TATA Elxsi

Sl No.	Name of the student	Course	Company
34	Venkata S Subhash Geddam	Aerospace Engineering	M/s L&T
35	Archit Yadav	Aerospace Engineering	M/s L&T
36	Kadiyam Hari Venkat	ECE (Avionics)	M/s Artificial Brain
37	Ajay Kumar Patel	Aerospace Engineering	M/s Agnikul Cosmos
38	Daksh Kumar	Aerospace Engineering	M/s Qspider
	M.Tech.		
1	Dilip M	Machine learning & Computing	M/s Schneider Electric
2	Saurabh Verma	Machine learning & Computing	M/s Schneider Electric
3	Prakhar Patel	Machine learning & Computing	M/s INTEL
4	Sudarsanan AK	Digital Signal Processing	M/s Mathworks India
5	Saurabh Verma	Machine learning & Computing	M/s TCS
6	Rudra Nath Palit	Digital Signal Processing	M/s TCS
7	Parvathy M R	Machine learning & Computing	M/s Robert Bosch
8	Kshitij Raut	Structures & Design	M/s Quest Global
9	Daniel Edwin Paul P	Structures & Design	M/s Quest Global
10	Borra Mahesh Reddy	Aerodynamics & Flight Mechanics	M/s Quest Global
11	Ch Santhosh Kumar	Thermal & Propulsion	M/s Quest Global
12	Revathi S	Control Systems	M/s Daimler Truck Inn
13	Rashmitha Binde	RF & Microwave Engineering	M/s Daimler Truck Inn
14	Gonna Gowthami	Power Electronics	M/s Daimler Truck Inn
15	Sidharth Shivdas	Power Electronics	M/s Daimler Truck Inn
16	Rohini Satpute	Power Electronics	M/s TATA Advanced Sys
17	Tejas Joshi	Power Electronics	M/s TATA Advanced Sys
18	Kartikey Sharma	Material Science & Technology	M/s TATA Advanced Sys
19	Yathish Karkera	Structures & Design	M/s Agnikul Cosmos
20	Yagneshwari R	Structures & Design	M/s Agnikul Cosmos
21	Sailesh Kamath	Material Science & Technology	M/s Agnikul Cosmos
22	Soumyajyoti Dey	Material Science & Technology	M/s Agnikul Cosmos
23	Purohit Kiran	Thermal & Propulsion	M/s Agnikul Cosmos
24	Aman kumar Rai	Aerodynamics & Flight Mechanics	M/s Agnikul Cosmos
25	Santhosh Kumar	Thermal & Propulsion	M/s Agnikul Cosmos
26	Ashley Kevin Dsouza	Thermal & Propulsion	M/s Agnikul Cosmos
27	Ayan Sarkar	Thermal & Propulsion	M/s Agnikul Cosmos
28	Samridh patial	Aerodynamics & Flight Mechanics	M/s Agnikul Cosmos
29	Jayakrishnan K	RF & Microwave Engineering	M/s Agnikul Cosmos
30	Daniel Edwin Paul P	Structures & Design	M/s Cyient Technology

Sl No.	Name of the student	Course	Company
31	M Shashank Rao	Material Science & Technology	M/s Cyient Technology
32	Sourabh Suryawanshi	Material Science & Technology	M/s Cyient Technology
33	ARPIT SHRIVASTAVA	Thermal & Propulsion	M/s Cyient Technology
34	Nakka Jithendra	Thermal & Propulsion	M/s Cyient Technology
35	Aruna Shaju Kollannur	Digital Signal Processing	M/s C-DAC, Bangalore
36	Sivaganesh	Geoinformatics	M/s C-DAC, Bangalore
37	James.P.A.	Optical Engineering	M/s C-DAC, Bangalore
38	Ajayakrishnan R	Control Systems	M/s Siemens Gamesa
39	Prahannathan V	RF & Microwave Engineering	M/s Siemens Gamesa
40	Amal S Thomas	Power Electronics	M/s Delta Electronics
41	Ajay Kumar	Machine learning & Computing	M/s Qspider
42	Prashant Shashikant Pandey	VLSI & Microsystems	M/s Global Foundries
43	Sivaganesh	Geoinformatics	M/s TATA Elxsi
44	Jayakrishnan K	RF & Microwave Engineering	M/s TATA Elxsi
45	Avaneesh Kumar Singh	Digital Signal Processing	M/s TATA Elxsi
46	M Shashank Rao	Material Science & Technology	M/s Cyient Technology
47	Sourabh Suryawanshi	Material Science & Technology	M/s TATA Elxsi
48	Daniel Edwin Paul P	Structures & Design	M/s L&T Ltd
49	Salini M S	Geoinformatics	M/s Robert Bosch
50	Amal S Thomas	Power Electronics	M/s Robert Bosch
51	Harshita Gaur	Control Systems	M/s LTTS
52	Avaneesh Kumar Singh	Digital Signal Processing	M/s LTTS
53	Shubham Anil Thorat	Control Systems	M/s LTTS
54	Shashank Shekhar	Thermal & Propulsion	M/s LTTS
55	Shubham Anil Thorat	Control Systems	M/s Agnikul Cosmos
56	Borra Mahesh Reddy	Aerodynamics & Flight Mechanics	M/s L&T Ltd
57	Jitendra Kumar	VLSI & Microsystems	M/s Microelectronics (Germany)
58	Shyam Kumar Singh	RF & Microwave Engineering	M/s Marcedes Benz
59	Rushikesh Patil	VLSI & Microsystems	M/s Marcedes Benz
60	Jaya Sridhar NK	VLSI & Microsystems	M/s Marcedes Benz
61	Sidharth Shivdas	Power Electronics	M/s Robert Bosch
62	Shaantanu Tayade	VLSI & Microsystems	M/s C DAC
63	Yadvendra Singh Yadav	Power Electronics	M/s L&T Ltd
64	Deepak Raj	Optical Engineering	M/s Paras Defence
65	Priyank Zaveri	Digital Signal Processing	M/s Edveon Technology
66	Tushar Saxena	Optical Engineering	M/s Bellatrix

Research & Development

4. Research and Development



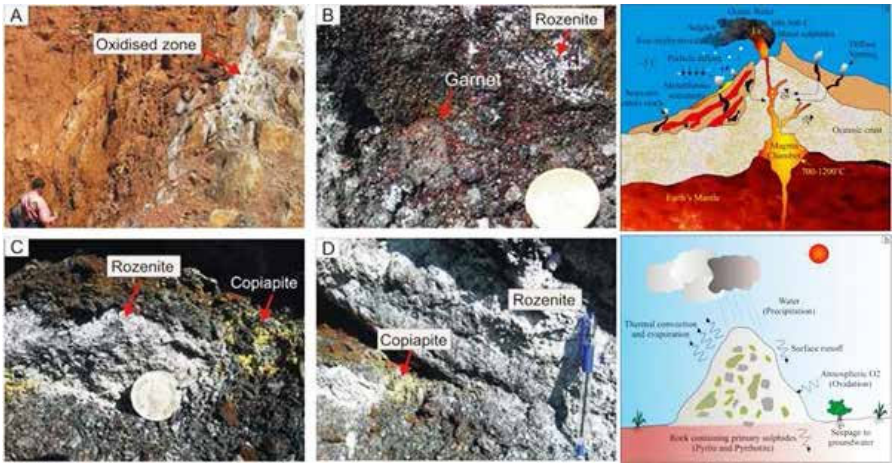
The research at IIST is carried out in the spheres of theory and experiments. The institute is setting up state-of-the-art facilities in all departments to bolster the cutting-edge research activities. The focus of the Institute is on strong interdisciplinary and collaborative work within the departments as well as in collaboration with various ISRO centres and the generation of technologies by responding to the needs of local, national and global interest. IIST has also been instrumental in exploring research collaborations and exchange of scientific ideas with international academic and research organizations. This includes international collaborations, both as Memorandum-of-Understanding (MoU) at the Institute-level as well as at an individual level of faculty-to-faculty collaboration. IIST also aims to catalyze innovation driven entrepreneurship, thereby addressing strategic goals of the nation and the needs of global society.

4.1 Thrust Areas of Research @ IIST

Aerodynamics and Flight Mechanics	Thermal, Fluid Flow and Propulsion	Structures, Design and Robotics	Materials Science and Engineering	Manufacturing and Management
Control Systems	RF and Micro Wave Engineering	Electronics and Navigation Systems	Signal Processing and Communication	Semi-Conductors and IC design
Power Electronics	Nano Technology, Nano Electronics, and MEMS	Computer Vision & Virtual Reality	High Temperature and Energy Storage Materials	Bio-Materials and Nano – Composites
Synthetic Organic Chemistry	Nano Science, Nano Materials and Sensors	Astronomy & Astrophysics	Atmospheric Science and Climate Studies	Planetary Geoscience And Solid Earth
Remote Sensing and Geospatial Technologies	Atomic and Molecular Physics	Condensed Matter Physics	Applied and Adaptive Optics	Quantum Information and Computing
Machine Learning and Data Mining	Industrial Mathematics and soft computing	Artificial Intelligence and Data Analytics	Nonlinear Dynamics and Chaos	Stochastic Modelling and Analysis
Queuing Theory and Network Models	Differential Geometry and Applications	Mathematical Elasticity, Homogenization	Commutative Algebra and Applications	Applied Numerical Analysis
Space Economics and Policy	Science Technology and Society	Literature and Communications	Culture and Gender Studies	Technology / Supply chain Management
Optical and Laser Based Combustion Diagnostics	Composites and Structural Health Monitoring	Design and Analysis for Additive Manufacturing	Networking and Cyber-Physical Systems	Thermoregulation studies for Bio-medical and Space
Payloads and Satellite Development	Sensors for Space Application/ Crew module	Mechanisms for Space Applications	Space Biology and Microgravity Experiments	Electric Propulsion and Diagnostics

Research in Materials, Manufacturing and Space Technology

Research in Space Exploration/ Satellite Technology/ Communication



Research in Planetary Geosciences / Earth and Space Sciences

4.2. Space Technology Research @ IIST

4.2.1 Interdisciplinary Research in SSPACE

The emerging and fast growing trend in the usage of small satellites and its constellations in the global scenario demand an urgent need of capacity building in the areas of theoretical design, system engineering and realisation of small and high performance satellite systems. The unique opportunity of POEM (PSLV Orbital Experimental Module) in 4th stage (PS4) of PSLV offered by Indian Space Research Organization (ISRO) and Indian National Space Promotion and Authorization Center (IN-SPACe) also opened great avenues for microgravity experiments from academic institutions/ research communities.

Small-spacecraft **S**ystems and **PA**yload **CE**ntre (SSPACE) was established in 2018 as an **interdisciplinary** research and development centre. SSAPCE is set with an objective of conceptualisation, design, development and qualification of small spacecraft systems & payloads, and also focused to establish required equipment and facilities. A number of small satellite projects have been initiated at SSPACE, with the core objective of design and realisation of a space-borne hardware. Within this span of operation, SSPACE could set a culture of knowledge sharing among the faculty members, students, research schol-

ars and project fellows, through boundary less collaborations with various ISRO centres. The involvement of IIST's own alumni, who is working as middle and lower level scientists/engineers in ISRO centres, as mentors and reviewers in this journey makes IIST more proud.

Interdisciplinary efforts of team SSPACE in collaboration with ISRO

4.2.2 Space Missions undertaken at SSPACE

Mission Title	Objective	Launch Details/ Remarks
Advanced Retarding Potential Analyser-Version 1 (ARIS 101F) for PSLV-C45	A technology demonstration mission consisting of a Retarding Potential Analyser (RPA) capable of measuring ion velocity, temperature and velocity as a PS4 orbital stage payload.	Successfully launched in PSLV C45
InspireSat1	Jointly developed between IIST, University of Colorado, Boulder, USA, NCU, Taiwan, and NTU, Singapore. The mission consists of two payloads, Compact Ionospheric Payload (CIP) and Dual Axis X-ray Solar Spectrometer (DAXSS). Science data has been made public to Inspire Partners.	Successfully launched as a secondary payload on PSLV C52
PSLV In-orbitaL OBC and Thermals (PILOT)	To demonstrate (a) 3D printed metal structure performance for satellite related applications, (b) to demonstrate the thermal simulation model with flight data acquired through sensors placed at strategic locations, (c) to demonstrate the performance of the indigenously designed OBC along with the flight software developed for the mission. This OBC is expected to be used in the future missions from IIST and (d) to demonstrate the indigenously developed RS485 telemetry communication with POEM.	Getting ready to be launched in PSLV C55
Advanced Retarding Potential Analyser-Version 2 (ARIS 102F) for PSLV-C55	Upgraded version of ARIS-1 with in-house-built sensors with high sensitivity, high energy resolution and optimised operating parameters for structural and compositional studies of ionosphere.	Getting ready to be launched in PSLV C55
AHAN	Spacecraft with Geiger Muller Counter (GMC) as main payload to study the radiation counts at LEO.	Research and development in progress
ISAT2	Spacecraft with Magnetic Gradiometry as main payload.	Research and development in progress
XNAV	Spacecraft to demonstrate navigation using pulsar stars in the X-ray band.	Research and development in progress
IDM	Integrated diagnostic module for Electric propulsion technology demonstration satellite.	Research and development in progress
Space Biology Payload	Spaceflight induced changes in kidney stone formation in Drosophila fly. The payload proposed in first GAGANYAAN flight	Research and development in progress

4.2.3 Systems and Sub-Systems developed at SSPACE

The prime focus of SSPACE is capacity building in the area of spacecraft engineering, and enable the students of IIST industry ready. Towards this, undergraduate, post graduate and doctoral level students of IIST have been given opportunities to work with interdisciplinary faculty-research team of SSPACE. As an outcome of this research, many subsystems of spacecraft are being indigenously developed at SSPACE and related labs, and they have been listed below.

- ARIS sensor: Advanced Retarding Potential Analyser has been developed indigenously for the ARIS missions.
- OBC for small satellites: The onboard computer developed for the InspireSat mission can be used in future small satellite space missions. This system is qualified with TRL 9.
- EPS for small satellites: The Electrical Power System developed for the InspireSat1 mission can be used in future small satellite space missions. This system is qualified with TRL 9.
- Integrated Diagnostics Module (IDM) for onboard diagnostics of an electric propulsion system to be installed on a Technology demonstration satellite (TDS-1).
- Analog/ Digital electronic Systems for ARIS and PILOT payload.
- The communication board, ADCS and the cold gas thrusters are in the process of development.
- Indigenous monolithic 1U satellite structure designed for subtractive manufacturing and its development using machining route.
- Indigenous monolithic 3U Satellite structure designed for subtractive manufacturing and its development using machining route.
- Indigenous monolithic 1U satellite structure designed for additive manufacturing and its development using laser based- powder bed additive manufacturing.
- Design of mechanical hardware for ARIS and IDM missions, via subtractive manufacturing route.
- Design, Development and testing of Random Positioning Machine for microgravity science experiments.
- Spaceflight hardware design for Space Biology Payload.
- Development of indigenized gas sensors for crew cabin.

4.2.4 Collaboration under SSPACE

SSPACE could establish official technical collaborations with many academic institutions, R&D organizations and industries during the journey of small space craft and payload development, as listed below.

- ISRO Centres across the country
- Laboratory of Atmospheric and Space Physics (LASP), University of Colorado, Boulder (for InspireSAT)
- Nanyang Technological University (NTU), Singapore (for InspireSAT)
- National Central University (NCU), Taiwan (for InspireSAT)
- California Institute of Technology and Jet Propulsion Lab (previous collaboration for AAReST)
- University of Surrey (previous collaboration for AAReST)
- Larsen & Toubro: L&T India (for PILOT and a newly proposed L&T-IIST Satellite- LISAT)

Recent Space Missions from SSPACE

4.3 Hybrid Rocket Development @ IIST

Following the successful launches of the past editions of IIST student rocket 'VYOM', the student- faculty team of IIST has initiated another research on hybrid-rockets with following objectives:

- Hybrid Rocket Propulsion Characterization
- Recovery of the vehicle with deep throttling of the thrust
- Rocket structures using composites and 3D printed components
- Restartability & Recovery with Landing Legs
- Retro-Propulsion

The above activity is initiated with the support of ISRO centres, especially VSSC, LPSC, IISU and CMSE.

4.4 Satellite Ground Station @ IIST

As a part of the Small Spacecraft Systems and Payload Centre (SSPACE) of IIST, a fully operational satellite ground station facility has been established. The objective of the station is to carry out Tracking, Telemetry and Commanding (TT&C) operations of student satellite missions. It also provides tracking and telemetry support for the stratospheric balloon borne payloads (radio-sonde experiments) launched periodically from Ponmudi Climate Observatory of IIST. The ground station facilitates learning and hands-on experience for students in the field of radio communication, satellite tracking, antenna positioning/ control systems along with telemetry data visualisation/ processing, real-time commanding and mission operations.

The mission control room of the ground station, located in the top floor of the Aerospace Engineering block, accommodates SDR-based Receivers, RF power amplifiers, Transmitters, Antenna controllers, Operator Consoles, Data storage, large display systems for real-time data visualisation and RF subsystem test beds. Electric cables and high-power RF cables from the control room run to the roof-top which accommodates both experimental and operational antennas. All the antenna systems have been mounted on motor driven azimuth-elevation rotator system. The operational VHF/ UHF antenna system consists of a high-gain circularly polarised crossed Yagi antennas mounted on the tracking pedestal, along with Low-Noise Amplifiers (LNA) and associated phasing feeder network. The operational S-band antenna system consists of a high-gain parabolic mesh dish of 4.5 m diameter with a rectangular RCP/LCP septum polariser feed and LNAs.

Presently, the ground station is capable of providing TTC support to any Low-Earth Orbit (LEO) satellite mission operating in VHF band: 144-146 MHz, UHF band: 434-438 MHz and S band: 2.2-2.4 GHz (on receive mode) of frequencies. Currently, all the antenna tracking operations employ TLE-based programme mode.

4.4.1 Stand-alone VHF / UHF SDR Ground Station Unit

The requirement of this integrated standalone unit came up when the existing operational VHF/UHF station on the Aerospace Block of the campus faced operational issues during very low-elevation passes of InspireSat-1 satellite, because of partial physical obstruction caused by the adjacent buildings in the campus. In order to solve this issue, an antenna installation on the roof-top of IIST Library, which is the tallest building in the campus was found ideal for installing the VHF / UHF antenna. However, the difficulty of laying 200 meters of RF cable from the main control room to the Library roof-top and the associated cable-loss of power was unacceptable. Hence, the idea of a new stand-alone VHF/UHF SDR-based Ground Station Unit was evolved and implemented.

This standalone Ground Station unit is designed with the latest state of the art technologies like wideband SDR (Software Defined Radio) based MODEM and fully integrated network-based architecture. In this architecture, RF loss is minimal, due to the co-location of RF power amplifiers very close to the antenna

pedestal. A weather proof 19-inch 24U equipment rack houses the VHF / UHF RF Power Amplifiers, LNAs, TR (Transmit-Receive) Switches, BPF (band Pass Filters), a USRP SDR Modem and an Intel-NUC computer running GNU-Radio software on Linux operating system. The Antenna Assembly is mounted on a set of Elevation-over-Azimuth rotators capable of 0-360-degree motion in Azimuth plane and 0-90-degree motion in elevation plane. These rotators are being controlled by TLE-based tracking software installed in the NUC-computer. The power control and monitoring of these subsystems, telemetry/ telecommand operations and downlink data dump file access can be carried out from any remote location, using a PC connected to the IIST campus network. This system has been tested successfully for uplink and downlink operations of InspireSat-1. The system is able to decode beacon packets and uplink commands throughout the pass duration without any frame loss.

The design, development and commissioning phase of the ground station was a true learning experience for the student- faculty research team. To the best possible the antenna systems, fixtures and related hardware, installation supports etc., were indigenously managed with the support of SSPACE and manufacturing lab facility of IIST. Sincerely acknowledgement is reported here on the support and guidance received from VSSC, URSC and ISTRAC during the establishment of this Satellite Ground Station facility.

Satellite Ground Station established @ IIST

4.5. Electric Propulsion and Diagnostics Facility

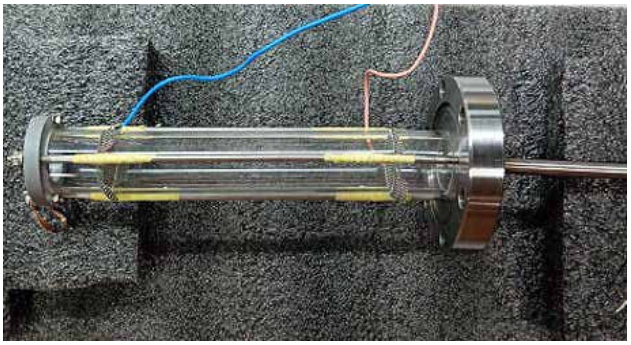
4.5.1 Vacuum Chamber Facility

In view of ISRO's future requirement of high thrust and high efficiency electric propulsion systems, an initiative was undertaken to establish necessary research infrastructure for future high thrust electric propulsion systems at LPSC, Valiamala. For this the "High Thrust Electric Propulsion" project was formed as an inter-center project with LPSC as the lead center. IIST is collaborating in this project for the design, development, testing and implementation of the diagnostic tools necessary for the proper characterization of the Stationary Plasma Thruster (SPT) being developed by LPSC under this project. All diagnostic tests on the SPT must be done exclusively in large vacuum chambers, since the studies of the thruster plume require high vacuum conditions of up to 10^{-7} mbar. The test and calibration of the probes also requires plasma and plume to be used, which requires high vacuum. With this in mind, the in-house designed vacuum chamber at the Electric Propulsion Diagnostics Lab at IIST is 1.5 m long and 1 m in diameter. Sensor and Payload Development Laboratory next to EPDL also has an in-house designed small vacuum chamber facility with 0.5 m diameter. The small vacuum chamber is also used to test the sensors, payloads that are built in the laboratory.

4.5.2 Plasma and Ion Sources

Two sources were developed in-house for testing and development purposes (a) Back diffusion plasma source and (b) Ion beam source. An electric thruster is known to produce both charge exchange ion clouds and ion beams, thus sources were developed to

produce both the environments created by the thruster. An ion beam deflector was also built to maneuver the ion beam as required for calibration of the probes being developed. The sources also required various gas lines to bring the gas wherever necessary. The plasma source can also be tuned to produce plasma conditions similar to that of lower earth ionospheric conditions, hence making the facility as **India's only ionospheric plasma simulator.** All the payloads that are to be taken to the lower earth atmosphere can hence be tested in this facility.



Plasma and Ion Sources Developed at IIST [with the support of Manufacturing Lab, IIST]

Vacuum Chamber Facility -1

Vacuum Chamber Facility-2

4.6 Centres of Excellence

The following Centres of excellence which are of multidisciplinary nature are functioning in IIST.

4.6.1 Advanced Propulsion and Laser Diagnostics Lab

Advanced Propulsion and Laser Diagnostics (APLD) Facility is setup with an objective to perform propulsion research studies through laser diagnostic techniques. The laboratory has the capability to perform PIV and PLIF measurements, and is equipped with: (i) Double Pulsed Nd-YAG PIV Laser, (ii) Precision Dye Laser, (iii) Intensified CCD Camera, (iv) PIV CCD Camera (v) High Resolution Wavemeter (vi) Optical Tables, (vii) Optical Components and (viii) High Speed DAQ System. The lab would shortly be upgraded with a second dye laser for two line LIF thermometry measurements and particle size analyser for droplet size measurements. The basic propulsion facilities established under APLD are

- Test setup for Rocket Injector Spray Characterisation from atmospheric to critical conditions
- Single Element Coaxial Combustion Facility
- Supersonic Free Jet Facility

Academic/ project activities ongoing in this facility finds relevance to various ISRO activities such as

(i) Evaluation of 'Mixing and Combustion' efficiency of the fuel-oxidiser jet for any real scale engines (ii) Injector design based on characterisation of jet at supercritical conditions (iii) Investigations on combustion instability etc.

4.6.2 Centre of Advance Research in Nanoscience and Technology

Center for Nanoscience and Energy Materials was established in IIST to carryout focused research in the area of nanoscience and energy storage materials. The center undertakes research for development of silicon based anode and sulphur based cathode for the realization of high capacity lithium ion batteries. The center also do cutting edge research on the development of nanomaterials based chemical/ electrochemical sensors, organic light emitting diode and nanocomposites for structural and functional applications. The center is equipped with state of the art facilities such as atomic force microscope, particle size analyser, Glove box, electro-spinning machine, Contact angle Goniometer, HPLC, Planetary ball mill and surface area analyser.

4.6.3 Nems and Opto-Nanoelectronics (NEMO)

IIST took the initiative towards development of an R&D ecosystem in the area of VLSI, Micro Electro Mechanical Systems (MEMS)/ Micro/ Nano electronics/ optoelectronics and sensors at IIST for academia, ISRO and other research organizations. Department has established laboratories and research facilities in the area of Micro-Electro Mechanical Systems (MEMS) and Micro/ Nano electronics. These laboratories support the post graduate programme VLSI and Microsystems and research activities in the areas of micro/nano electronics, micro electromechanical systems (MEMS/ NEMS), devices and technologies across all departments in IIST. Close collaborations have been established with many ISRO centres like IISU, VSSC, SCL and IPRC. These are either through formal collaborative projects for development of Micro/ Nano sensors or service.

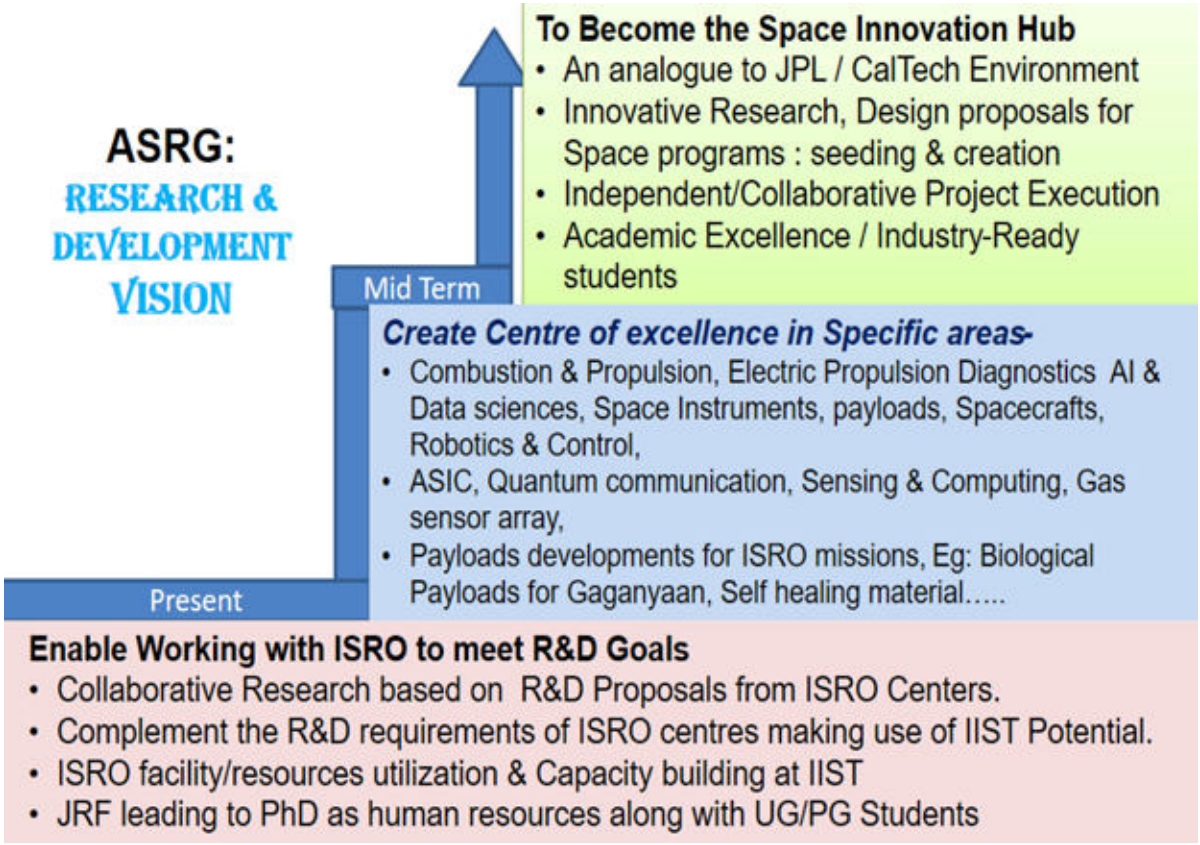
4.6.4 Computer Vision and Virtual Reality Lab (CVVR LAB)

CVVR lab in IIST is established with the aim of excellence in the area of virtual reality and intelligent computer vision for cutting edge space science, societal and technological applications. The lab is well equipped with highly efficient GPUs that help in accelerating the pace of research. Image processing and Computer Vision lab sessions for the UG and PG students are also conducted in the CVVR lab. Current research in the lab focuses on Virtual reality tools for Disaster simulation, Object tracking, landslide detection in satellite images, image fusion, etc.

4.7. Advanced Space Research Group (ASRG)

Recognizing the imperative need of reinvigorating and streamlining IIST's research environment to catch up with advances in the ever dynamic space sector, ADVANCED SPACE RESEARCH GROUP (ASRG) was constituted in IIST (vide Office Order No. SC/CH/A.22/92/2020 dated 29/10/20). ASRG, headed by the Chief Technology Officer, IIST and with members from all the academic departments as well as a member from the Capacity Building Programme Office (CBPO), ISRO has a focused goal to co-ordinate all joint Research activities between IIST and ISRO centres. ASRG is committed to its role as the unique liaison unit to facilitate the seamless integration of ideas, expertise and know-how between IIST and all the ISRO centres and thereby leveraging collective wisdom to forge the puzzle pieces for futuristic space programs. To this end, ASRG link units have been established at all participating ISRO centres and an Empowered Overseeing Committee periodically review the activities of ASRG.

4.7.1 Research and Development Vision of ASRG



Total projects approved	32
Participating ISRO Centres	VSSC, LPSC, IPRC, IISU, HSFC, NRSC, SAC, LEOS, ISTRAC
Participating Departments of IIST	Aerospace Engineering, Avionics, Chemistry, Physics, Earth and Space Science, Mathematics, Humanities
Total projects under consideration	09

4.7.2 List of IIST-ISRO projects approved under ASRG

Sl No	Project Identification Number	Title of the Project	IIST Focal Point	Collaborating ISRO Centre	ISRO Focal Point	Budget (Lakhs)	Status
1	IIST/ VSSC/03/2021/01 (Duration: 1 Year) MoU signed on 20 May 2022	Development of Control design strategy for coupled MIMO (multi input multi Output) systems	Rajesh Joseph Abraham	VSSC	Kapil Kumar Sharma	NIL	Completed
2	ST/VSSC/03/2021/02 (Duration: 1 Year) MoU signed on 20 May 2022	Control design strategy for systems with structured uncertainty.	Rajesh Joseph Abraham	VSSC	Anish Antony	NIL	Completed
3	IIST/ VSSC/03/2021/03 (Duration: 2 Year) MoU signed on 14 Dec 2022	Nano structured high performance anode materials for high power, higher safety and fast charging Li-ion battery.	Mary Gladis J.	VSSC	Jalaja K, S.V.S Narayana Murty, Bibin John, Mercy T D	11.64	In Progress
4	llST/ VSSC/03/2021/04 (Duration: 2 Year) MoU signed on 14 Dec 2022	High-Q dielectric thin films with tunablity in Microwave frequencies for Space applications.	K.B.Jinesh	VSSC	K.Ashok	40.64	In Progress
5	IIST/ VSSC/03/2021/05 (Duration: 2 Year) MoU signed on 14 Dec 2022	Development of Yttrium Iron Garnet (YIG) thin films for space applications and Dielectric Test setup for ceramics at high Electric field and temperatures.	K.B.Jinesh	VSSC	K.Ashok	9.64	In Progress
6	IIST/ VSSC/03/2021/06 (Duration: 1 Year) MoU signed on 14 Dec 2022	Design & Development of Magneto Dielectric Substrate/ Metamaterial based L- band Antenna	Basudeb Ghosh	VSSC	K.Ashok & Femina Beegum S	4.32	In Progress
7	IIST/ VSSC/03/2021/07 (Duration: 3 Year) : MoU signed on 14 Dec 2022	Implicit large Eddy Simulation of Jets.	Manoj T Nair	VSSC	Sanjoy Kumar Saha	13.52	In Progress
8	IIST/ VSSC/03/2021/08 (Duration: 3 Year)	Supersonic combustion of isrosene behind two strut configuration	V. Aravind	VSSC	Desikan. SLN & B. Murugan	22	Approved & MoU under progress

Sl No	Project Identification Number	Title of the Project	IIST Focal Point	Collaborating ISRO Centre	ISRO Focal Point	Budget (Lakhs)	Status
9	IIST/ VSSC/03/2021/09 (Duration: 2 Year)	Development of Graphene based anticorrosion coating for stainless steel bipolar plates of PEM fuel cells	K. Y. Sandhya	VSSC	Remyamol T	14.64	Approved & MoU under progress
10	IIST/ VSSC/03/2021/10 (Duration: 2 Year): MoU signed on 14 Dec 2022	Improved Silicon-graphene based composite as anode materials for lithium battery cells and exploring the possibility of other battery technologies	K. Y. Sandhya	VSSC	S.A. Ilangovan & S. Sujatha, Sci./ Eng. SG, PCM	31.64	In Progress
11	IIST/ VSSC/03/2021/11 (Duration: 2 Year): MoU signed on 14 Dec 2022	Graphene nano platelets incorporated zinc rich epoxy coating for corrosion protection of steel hardware	Mary Gladis J. Kuruvilla Joseph	VSSC	VSSC: Anoop S, Venugopal A, Jalaja K, Narayana Murty S V S	18.64	In Progress
12	IIST/IISU/03/2021/12 (Duration: 3 Year) : MoU signed on 23 March 2022	High Performance SAR ADC with auto calibration and self-correction for sensor closed loop application	Immanuel Raja	IISU	Raghunath K P & Rekha A R, ADC/ APNTD/LVIS	67.42	In Progress
13	IIST/ LPSC/03/2021/13 (Duration: 2 Year): MoU signed on 21 July 2022	Near and field diagnostics NET	Umesh R Kadhane	LPSC	Varaprasad Kella	32.28	In Progress
14	IIST/ LPSC/03/2021/14 (Duration: 3 Year)	Development and implementation of LIF inversion algorithm for NET diagnostics at SEP facility in LPSC	Umesh R Kadhane	LPSC	Varaprasad Kella	Under discussion	Approved & MoU under progress
15	IIST/ LPSC/03/2021/15 (Duration: 1 Year) : MoU signed on 21 July 2022	Life time predication of HET liner using simulations	Umesh R Kadhane	LPSC	Pranav Nath	4.32	In Progress
16	IIST/ LPSC/03/2021/16 (Duration: 3 Year) : MoU signed on 21 July 2022	Experimental and Numerical Investigation of Direct Contact Condensation of GCO2/ steam in LN2	Prathap C & Manu K V	LPSC	Deepak Agarwal, Anant Singhal	48.52	In Progress

Sl No	Project Identification Number	Title of the Project	IIST Focal Point	Collaborating ISRO Centre	ISRO Focal Point	Budget (Lakhs)	Status
17	IIST/LPSC/03/2021/ 17 (Duration: 3 Year)	Performance and Instability Analysis of Methane-Oxygen Combustion using shear coaxial injectoron	Aravind V	LPSC	Assiz. M. P, Muthukumaran CK, PRS LPSC	Under discussion	Approved & MoU under progress
18	IIST/LPSC/03/2021/ 18 (Duration: 3 Year) : MoU signed on 21 July 2022	Three-dimensional DSMC (Direct simulation monte- carIo) simuIation for satellite thrusters	Shine S R	LPSC	Arun Kumar; Deepak Agarwal, IPRC: Sri Vinse Antro.W	38.52	In Progress
19	IIST/HSFC/03/2021/ 19 (Duration: 3 Year) : MoU signed on 20 May 2022	Development of Real Time Gas Sensor Array to Monitor Critical Gases in Crew Module for Human Space Mission	Palash Kumar Basu	HSFC	Sreejith	274.71	In Progress
20	IIST/HSFC/03/2021/ 20 (Duration: 2 Year) : MoU Signed	Spaceflight Induced changes in Kidney Stone formation in Drosophila Melanogaster Experimentation. Biology payload for GAGANYAN.	K G. Sreejalekshmi	HSFC	External collaborator: Ravikumar Hosamani (UAS, Dharwad) Focal Point: Xavier Raja, HSFC	72	In Progress
21	IIST/ HSFC/11/2021/21 (Duration: 3 Year) : MoU signed on 20 May 2022	Development of Mathematical Human Thermal Behavior Model for a Reference Indian Subject linked to Human space flight program of HSFC. (Gaganyaan Projects)	Shine S R	HSFC	Chiranjivi, HSFC External collaborator: Eswer & Jayanand B Sudhir, SCTIMST, Trivandrum.	36.52	In Progress
22	IIST/SAC/11/2021/22 (Duration: 3 Year) : MoU signed on 25 Nov 2022	Machine learning driven Augmented Reality based Campus walk-through.	Deepak Mishra A M Ramiya	SAC	Jai G Singla SIPG, SAC	21.22	In Progress
23	IIST/SAC/11/2021/23 (Duration: 2 Year): MoU signed on 25 Nov 2022	Interference analysis and co-existence studies between GSO and NGSO satellite systems	Vani Devi M S. Chris Prema Lakshmi narayanan	SAC	S.C. Bera and Saket Buch SNPA, SAC	11.64	In Progress

Sl No	Project Identification Number	Title of the Project	IIST Focal Point	Collaborating ISRO Centre	ISRO Focal Point	Budget (Lakhs)	Status
24	IIST/ LPSC/11/2021/24 (Duration: 3 Year) : MoU signed on 21 July 2022	Cold Flow Characterization of a Dual Throat Nozzle (DTN) based Tri-Propellant Engine Propulsion System.	Deepu M.	LPSC	Bijukumar K. S.	61.52	In Progress
25	IIST/ VSSC/11/2021/25 (Duration: 2 Year) : MoU signed on 14 Dec 2022	Design of Multi-Channel Temperature Monitoring ASIC	Immanuel Raja	VSSC	Deepu Roy, Padmakumar VLDD/FCG/AVN	23.60	In Progress
26	IIST/ NRSC/11/2021/26 (Duration: 3 Year)	Cloud physical properties under Polluted and Unpolluted conditions for Climate Studies	P R Sinha	NRSC	S.V.S. Sai Krishna and Shivali Verma, NRSC	Under discussion	Approved & MoU under progress
27	IIST/ NRSC/11/2021/27 (Duration: 2 Year)	Automatic labeling methods for development of machine learning applications for inventory of horticulture plantations	A M Ramiya Deepak Mishra	NRSC	R. Hebbar, Vinod P.V, NRSC	Under discussion	Approved & MoU under progress
28	IIST/ NRSC/11/2021/28 (Duration: 3 Year)	DEEP CLOUD: Deep learning based system for time series Cloud detection using multi-sensor satellite Imagery	N. Rama Rao	NRSC	T. Sai Kalpana, NRSC	Under discussion	Approved & MoU under progress
29	IIST/IS-TRAC/11/2021/29 (Duration: 3 Year) : MoU signed on 20 Feb 2023	Tracking & Nowcasting of severe convective storms using deep learning (DL)/machine learning (ML) techniques	Deepak Mishra, Sumitra, PR Sinha, and Govindan Kutty	ISTRAC	V.K. Anandan (Dy. Director) / Shivang Mishra	27.52	In Progress
30	IIST/ LEOS/05/2022/30 (Duration: 1 Year) : MoU signed on 30 June 2022	Design and construction of MEMS-based portable Seismocardiogram for on-board Cardiac health monitoring of Astronauts	K.B. Jinesh	LEOS	Jiju John Division Head MEMS	11.22	In Progress

Sl No	Project Identification Number	Title of the Project	IIST Focal Point	Collaborating ISRO Centre	ISRO Focal Point	Budget (Lakhs)	Status
31	IIST/ VSSC/11/2022/31 (Duration: 3 Years)	Investigations on Laser Based -Powder Feed Type-Direct Energy Deposition (LAM-DED) for Additive Manufacturing of Components in Space Applications	V.S. Sooraj	VSSC	V. Anil Kumar	29.85	Approved & MoU under progress
32	IIST/ VSSC/11/2022/32 (Duration: 2 Years)	Indian Space Program and its Impact on the Industrial sector of India	Lekshmi V. Nair & Shaijumon C. S	VSSC	Santhoshkumar	7.64	Approved & MoU under progress

ASRG Projects under discussion

Sl. No	Tentative Project Identification Number	Title of the Project	IIST Focal Point
33	IIST/HSFC/03/2023/33	Aquaporin based filter for Water recycling	Gomathy N.
34	IIST/HSFC/03/2023/34	CO2 capture and Sabatier based reduction system	K.G. Sreejalaksmi
35	IIST/URSC/03/2022/36	Development of a multifold mirror/reflector	Sam Noble
36	IIST/SHAR/03/2023/37	Gas sensor for Launch Pad	Palash Kumar Basu
37	IIST/SHAR/03/2023/39	Fully Automated signal processing of Wind Profiler data with advanced filters for noise and Interference removal.	P R Sinha
38	IIST/SHAR/03/2023/40	Study on Lower & Middle atmospheric dynamics over SDSC SHAR using VHF Wind Profiler	P R Sinha
39	IIST/SHAR/03/2023/41	A study of association of wind and thermodynamics to the monsoon rainfall characteristics over SDSC SHAR	P R Sinha
40	IIST/SHAR/03/2023/42	A study of Tropopause Characteristics over SDSC SHAR using VHF Wind Profiler radar.	P R Sinha
41	IIST/IISU/03/2023/38	Design and Realization of Lower Body Humanoid Robot with human like walking ability	Sam Zachariah, Deepak Mishra, Rajeevan, Sam Noble V S Sooraj, Shine S R

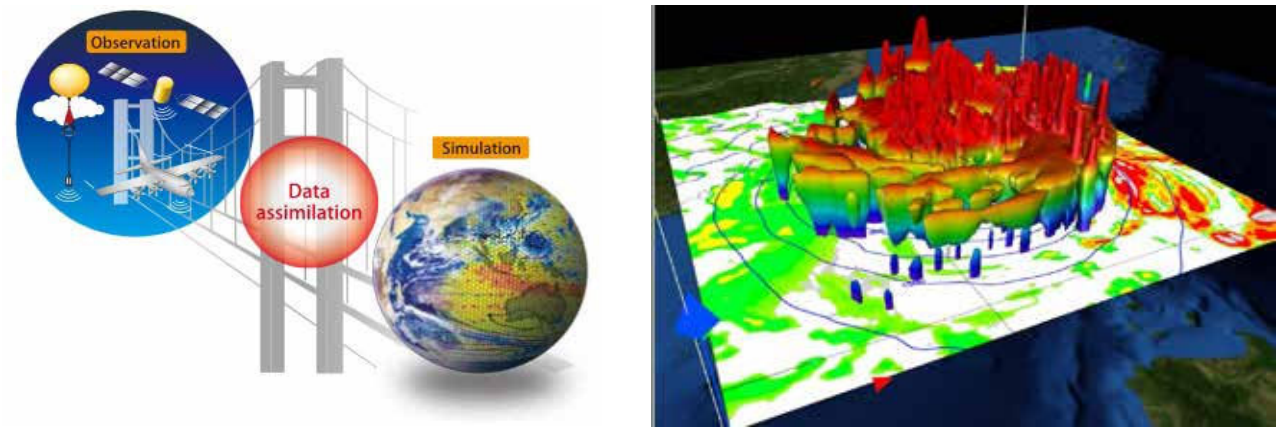
4.8 Externally Funded Projects

Sl. No	Title of Project	Funding Agency and Duration	IIST Focal point	Budget (Lakhs)
1	Development of a fast response TDLAS temperature sensor for high temperature applications	AR&DB, DRDO 3 Years	Rajesh Sadanandan, and Satheesh K	33.066
2	Effect of variation in bio-fuel composition on the flame stability and pollutant emissions under practically relevant flow conditions	DST-SERB	Rajesh Sadanandan	48.22
3	Flexible gear dynamics	DRDO-GTRE 30 Months	Praveen Krishna I. R.	61

Sl. No	Title of Project	Funding Agency and Duration	IIST Focal point	Budget (Lakhs)
4	Non-linear energy harvester	DST-TARE 3 Years	Praveen Krishna I. R.	18
5	Instrumentation and Signal Processing for Remote Monitoring of Bio-Parameters Based on Magneto-Plethysmographs	KSCSTE, ETP 3 years	Anoop C. S. Vineeth B. S.	18.80
6	Design and Technology Development for Polymer MEMS Integrated FET Single Axis Accelerometer Platforms	Kerala State Young Scientist Award Grant- KSCSTE	Seena V.	28
7	Fabrication of Polymer MEMS Broad Band Piezoelectric Vibration Energy Harvester (PVEH) Using Lead-Free Materials for Low-Frequency Applications	MeitY	Seena V.	N/A Idea to Innovation Scheme
8	Polymer MEMS Ring-Flexure-Membrane movable gate FET array: A Multi-Gas Sensor Platform	MeitY-IIT Bombay (INUP i2i Nanotech Hackathon 2022)	Seena V.	N/A Idea to Innovation Scheme
9	Fabrication of CMOS-MEMS Accelerometer with FET Based Transduction Technique	INUP I2I, IITB, MeitY	Seena V.	N/A Idea to Innovation Scheme
10	Investigation of TMDC based Thin film transistors for Ultra-Sensitive Nano mechanical Bio/chemical Sensor	SERB Extra Mural Research Funding	Seena V.	79.235 (Completed in May 2022)
11	Investigation, Design, and Implementation of Multifunctional 5G Antenna Systems for Cognitive Radio and mm-Wave Applications	DST-SERB	Chinmoy Saha	55.6
12	Architectures and Protocols for Integrated 6G-Satellite Networks	DST-SERB	Manoj B. S.	39.32
13	Influence of Massive stars on the surrounding interstellar medium	SERB	Sarita Vig	27
14	Implementation of Ensemble Forecast Sensitivity Approach to Estimate the Impact of Observations in IMD GFS forecast	Ministry of Earth Science (MoES)	Govindan Kutty	58
15	Improving the Prediction of Thunderstorms using Dual Resolution Hybrid Ensemble Variational Data Assimilation System in WRF model	Ministry of Earth Science (MoES)	Govindan Kutty	75
16	Structure of ultra-relativistic jets	SERB Mathematical Research Impact Centric Support (MATRICS)	Resmi L.	6
17	Constraining the Nature of Multi-messenger Transients with Coordinated Multi- wavelength Observations	Dept. of Science and Technology, 5th BRICS international multilateral call	Resmi L.	51
18	Max Planck Partner Group for Galactic Star Formation	Max Planck Society	Jagadheep D.	45
19	Monitoring the health of mangroves of Maharashtra using near real time remote sensing data	Mangrove Foundation, Government of Maharashtra	L. Gnanappazham	78.9

Sl. No	Title of Project	Funding Agency and Duration	IIST Focal point	Budget (Lakhs)
20	Vision Document for Geospatial technology based Market Intelligence System	Department of Horticulture, Government of Karnataka	L. Gnanappazham	21
21	Lifeline of Remote India-A national study on Telemedicine	ICSSR, Govt. of India	Shaijumon C.S., Lekshmi V. Nair	13
22	Determination of geodetic parameter based on SLR observations	National Centre of Geodesy	Rama Rao, S. Subrahamanian Moosath	140
23	Machine Learning Framework for Analysis of Social Media Text using Graph Network Data Modelling and NLP Techniques	SERB-TARE 3 Years	S. Sumitra	18.3
24	Parameter Identification for Diffuse Interface Models Describing Multiphase Fluid	National Board for Higher Mathematics/ DAE	Sakthivel K.	16.19
25	R-forms of R[X]	DST-SERB MATRICS	Prosenjit Das	6.6
26	Studies of Affine Spaces and Related Objects through Algebraic Group Actions and Locally Nilpotent Derivations	DST-RSF Indo-Russian join call for research exchange proposal	Prosenjit Das	68.22
27	Development of Novel Numerical Techniques for Miscible Displacement Problems in Porous Media	SERB DST 3 Years	Sarvesh Kumar	19.4
28	Turbulent induced aberrated wavefront correction without adaptive optics	SERB/DST	Narayanamurthy	52
29	Adsorption of metal atoms on TMDs and Band engineering	DST Mobility Project	Kuntala Bhattacharjee	30
30	Elemental composition and band structure of stanene like 2D Sn on MoS2 or WS2 substrates	UGC-CSR Project	Kuntala Bhattacharjee	0.9
31	Development of Atomic Layer Deposition System	DST 3 Years	Jinesh	120
32	Inegrated Battery Chargers for E-bikes and Cars	KSCSTE	Sudharshan Kaarthik	22.32
33	Applications of Fractional Order Calculus to Biomedical Signal Processing (SERB-DST)	DST/ SERB	N. Selvaganesan, S. Chris Prema	32
34	Development of Fractional Chaotic Observer For Secure Communication	IIT Palakkad Technology IHub Foundation Fellowship	N. Selvaganesan	20 (Research Fellowship)
35	Effect of Hydrogen blending in natural gas	Oil India Limited, Duliajan	Prathap C.	18.66
36	Genesis of organic molecules in the extra-terrestrial environment: role of energetic radiation	DST, Govt. of India under Indo- Italian join call for research exchange proposal	Umesh R. Kadhane	12
37	Design and fabrication of hardware for carrying fruit flies in Gaganyaan-1	TIFR Mumbai	K. G. Sreejalekshmi	17.1
38	Now and Then: Women of Muziris	Muziris Heritage Project	Babitha Justin	10
39	Design of a Transmitter with Integrated Power Amplifier (PA) for Millimeter-wave 5G Bands in 65nm CMOS	SERB-SRG	Immauel Raja	30

Sl. No	Title of Project	Funding Agency and Duration	IIST Focal point	Budget (Lakhs)
40	Discontinuous virtual element approximation for non-stationary fluid flow problem	DST-SERB	Sarvesh Kumar	6.6
41	Numerical Approximation of Optimal Control Problems Using Virtual Element Method	DST-SERB	Sarvesh Kumar	19.07
42	LOC approaches for Separation and analysis of Exosome Derived Biomarkers for Cancer Prognostics	DST-CNRS	Palash Kumar Basu	40
43	Development of Low-cost, Low Power, High-Performance Sensor Array on Flexible Substrate with Integrated Optical Source to Measure the Emission of Green House Gases: Applications towards Agriculture and Aquaculture including Harsh Environment	DBT-ATGC	Palash Kumar Basu, Priyadarshanam	50.25
44	Design and Development of Ferrite Dielectric Based Microstrip Isolator for X-band Application	ISRO S-TIC Cell, DOS	Chinmoy Saha	32.09
45	Research Fund for PhD students	IIT Palakkad Technology IHub Foundation Fellowship	B. S. Manoj	20 (Research Fellowship)



Atmospheric Modelling and Data Assimilation

4.9 ISRO Funded Projects

Sl. No.	Name of the Funding Agency	Title of the Project	Name of Faculty (Principal Investigator)	Amount	Status
1	Department of Space (DoS)	Initiation activities related to payloads recommended for the future planetary exploration	Umesh R. Kadhane	10,00,000	Ongoing
2	ISRO Inertial Systems Unit (IISU)	Surface Engineering Techniques for improving the life and performance of ball bearings in ISRO spacecraft mechanisms	Jinesh K. B.	49,60,000	Completed
3	ISRO Propulsion Complex (IPRC)	Design & Development of High Performance Hydrogen Sensor	Palash Kumar Basu	20,60,000	Ongoing

Sl. No.	Name of the Funding Agency	Title of the Project	Name of Faculty (Principal Investigator)	Amount	Status
4	Liquid Propulsion Systems Centre (LPSC)	Establishment of Laser Profilometry based on Holographic Principle	Dinesh Naik	47,54000	Ongoing (Closure report getting prepared)
5	Liquid Propulsion Systems Centre (LPSC)	Development of Laser Ignition Systems	Jinesh K. B.	31,14,000	Ongoing
6	Liquid Propulsion Systems Centre (LPSC)	Development of Surface Discharge Spark plugs	Jinesh K. B.	23,64,000	Ongoing
7	Department of Space [IPRC]	Development of Novel N2O4 scrubber system	Kuruvilla Joseph	4,00,000	Completed

4.9.1 Development of Surface Discharge Sparkplugs (SDS)

Surface discharge sparkplugs have been identified as the next generation sparkplugs, which have already identified their usage in aircrafts and racing cars, die to high plasma throughput and low power compared to the conventional sparkplugs. Another remarkable thing about semiconductor sparkplug is that the plasma generation does not depend on the pressure of the environment, and thus, the challenge posed by Paschen't law can be overcome.

Surface Discharge Spark Plugs developed at IIST

4.9.2 Development of Laser Ignition Systems (LIS)

An alternative to the conventional sparkplug that operates at a high voltage is to employ laser-based ignition in space missions. IIST signed another MoU with LPSC on developing Laser Ignition Systems (LIS) for future missions. The feasibility of LIS for space applications has been demonstrated by our team at IIST and LPSC.

Laser Ignition System developed at IIST

4.9.3 Hard Coatings for improved lifetime of Ball Bearings in ISRO Spacecrafts

Bearing coating developed for ISRO

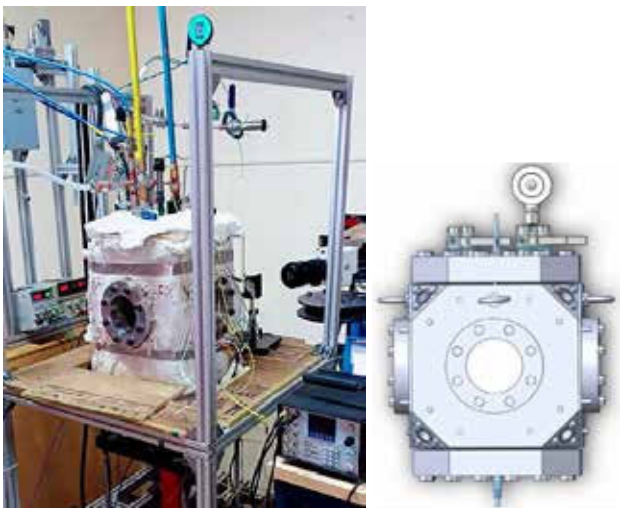
IIST signed an MoU with ISRO Inertial Systems Unit (IISU) for developing surface engineering techniques for improving the life and performance of ball-bearing systems in ISRO Spacecraft mechanisms. This mainly involves the studies on appropriate hard-coatings on ball-bearing systems in spacecrafts and to study the surface energy modification techniques for improving the wettability of steel ball-bearing systems. For the development of the hard-coatings, an in-house deposition system was designed and developed, and its optimization is currently in progress.

4.9.4 Other ISRO funded Projects completed by IIST

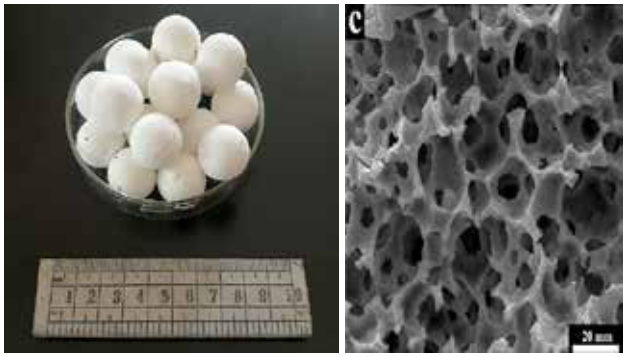
- A comprehensive study on crustal dichotomy and extensional tectonics in and around Valles Marineris, Mars [ISRO MOM-1 AO Project collaborating with

Physical Research Laboratory (PRL), Ahmedabad]

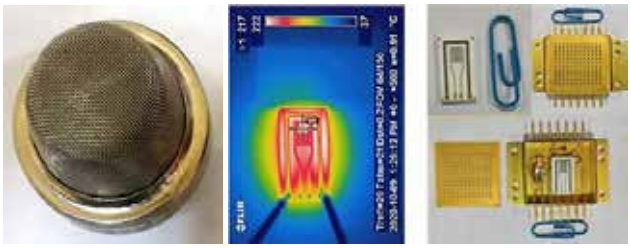
- Spectral Characterization and Morphology of Olivine-Pyroxene-Spinel Bearing Assemblages on Moon: Implications for the Lunar Endogenic Processes [ISRO Chandrayaan-1 AO Project, Space Applications Center, Ahmedabad].
- Indigenous design and development of reaction wheel actuator systems for small satellites [Collaborating ISRO Centre: IISU].
- ADCS test setup for spacecraft docking system using quadcopters [Collaborating ISRO Centre: VSSC].
- Development of MEMS Accelerometer with Ultra-Sensitive Transductions for Space Applications [Collaborating ISRO Centre: IISU].
- Intrinsically conducting polyimide composites with CNT or Graphene having electrostatic charge mitigating charactering for space application [Collaborating ISRO Centre: VSSC]
- Experimental investigation of laminar burning velocity of premixed ISROSENE/ AIR/ OXYGEN mixtures using freely expanding spherical flames [Collaborating ISRO Centre: LPSC].
- Development of control schemes for Multiphase Dual Converter fed open-end winding BLDC/ induction motor drives [Collaborating ISRO Centre: IISU].
- Development of Virtual Reality Model for Disaster Simulation [Collaborating ISRO Centre: NRSC].
- Object-based high resolution (optical) image analysis for landslide and land use land cover classification [Collaborating ISRO Centre: NRSC].



Laminar Burning Velocity Experiments



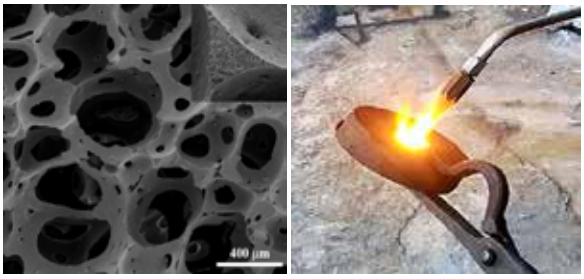
N_2O_4 scrubber system developed for IPRC / ISRO



High Performance Gas Sensors Developed for IPRC ISRO / HUMAN SPACE MISSION

4.9.5. Other research attempts at IIST

- Investigations on Eccentric Sleeve Grinding: An Intermittent-Progressive Machining Strategy for Fibre Reinforced Polymer Composites.
- Development of novel stochastic meshless methods for linear and nonlinear problems in structural mechanics.
- Experimental Studies of Selective Catalytic Reduction of NOx with NH3 on Cu-ZSM-5 Foam Catalysts.
- Self-excited oscillations in low-density round and rectangular jets.
- Numerical modelling and observational studies of Protostellar jets.
- Accretion Scenario of Black Hole X-ray Binaries During Outburst.
- Materials for Energy Storage Applications.
- Carbon and Ceramic Foams for Thermal Protection Applications.
- Development of Chemical/ Electrochemical Sensors.
- EMI Shielding Materials for Space Applications.
- Silicon based anode for high capacity Lithium ion batteries.
- Sulphur based cathode for Lithium ion batteries.
- Development of Indigenous 1U structures using Additive Manufacturing.

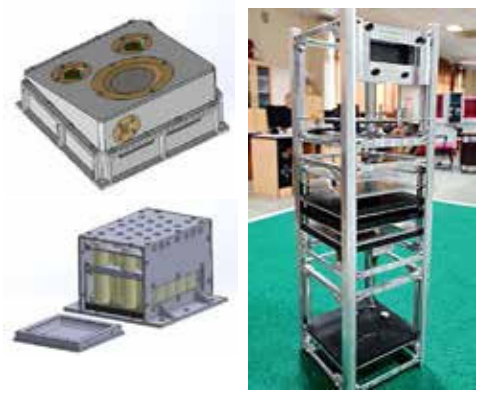


Thermal Protection Systems

EMI Shielding Systems Chemical / Electro Chemical Sensors

4.10 Recent space mission initiatives

Design of Suborbital Experimental Rocket (HyPER-ATD) - under preparation



Payloads /Satellites getting developed at IIST

4.11 MoUs and Collaborations

IIST has been striving to build a strong research tradition, which can be seen by the impressive statistics in terms of various research indicators which include active collaboration with other universities/ institutes at the national and international levels. To boost the diversity, exchange and internationalization among the student community, the institute has entered into collaborations with other Universities/ Institutes/ R&D organizations of eminence.

- Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST)
- Danish Aerospace Co.
- Human Space Flight Centre(HSFC), ISRO
- IISU/ ISRO
- VSSC/ ISRO
- SAC/ ISRO
- LPSC/ ISRO
- Laboratory for Electro-Optics Systems (LEOS)
- Delft University of Technology (TU Delft)
- Larsen and Toubro (L&T)
- Laboratory of Atmospheric and Space Physics (LASP)
- University of Colorado
- University of Cambridge
- Technion- Israel Institute of Technology
- Nanyang Technical University, Singapore
- University of Colorado, Boulder
- Niigata University, Japan
- Caltech University, USA
- University of Surrey, UK
- IIT Guwahati
- CNRS, FEMTOST, BESANÇON, France
- ISAE SUPAERO, France
- EWI TU DELFT
- Max Planck Institute for Radio Astronomy
- Belgo-Indian Network for Astronomy and Astrophysics (BINA)
- TIFR, Mumbai

- Public Health Foundation of India
- National Central University (NCU), Taiwan

MoU with NIT Calicut and IIT Palakkad is under review.

NOTE: Details of IIST MoUs can be viewed by using this barcode

4.12. Space Technology Innovation and Incubation Cell (STIIC), IIST

Indian Institute of Space Science and Technology (IIST) has established Space Technology Innovation and Incubation Cell (STIIC) within its campus to facilitate incubation of new enterprises with innovative technologies. It is a unique incubation centre within the country supported by Department of Space, Government of India and located inside the vibrant campus of IIST. The function of STIIC is formulated in-line with the expanding entrepreneurial ecosystem within the country. Through STIIC, IIST strives to achieve the mission to foster the spirit of innovation and act as a pedestal to assist knowledge driven enterprises to establish and prosper under systematized scientific guidance and thereby mould successful entrepreneurs.

By admitting the aspiring companies/entrepreneur teams, STIIC would facilitate and support product innovations and development, simulation and prototyping, pilot experimentation, product software testing, training, and other technology related work, in which there is considerable overlap with the institute's mandate. You may refer to the IIST website (www.iist.ac.in) to have a flavour of the academic and research activities we pursue.

In addition to mentoring and infrastructure support, STIIC would also back the startups in their investment search processes by organizing meet-ups, demo day events including pitch deck competitions with a larger participation from the ISRO experts so that their companies get better visibility and find suitable investments.

While the emphasis of the STIIC is on Space related innovations/ technologies, it covers all areas of science and technology in harmony with the Nation's interest.

Current status of incubation with STIIC

Sl. No.	Company Name	Status	Activity
1.	Vashishtha Research Pvt. Ltd.	Incubated	• Inspection and Measurement Instruments • Robotics and Machine Development • Electronics and Embedded software • Engineering software and 3D viewers
2.	SPACETIME 4D printing solutions LLP	Admitted (Pre-incubation)	• Developing 3D printers for 3D printing materials research • Direct printing from raw materials - customized 3D printers
3.	Bhuh Pramaan PVT Ltd.	Admitted (Pre-incubation)	• Developing innovative solutions in satellite image & Geo-spatial data processing
4.	Inter Cosmos Space Exploration Technologies Pvt. Ltd	Admitted (Pre-incubation)	• Develop a proof-of-concept on their product on satellite propulsion. HyperX, a 10 N bi-propellant thruster with a hypergolic, storable and highly throttleable fuel
5	SPACEONOVA	Admission offered	• Develop a Biomedical Social Bot to bring nurse like care for humans in space and to the homes of the patients on earth.

4.13. Product developed and technology transferred by IIST startups

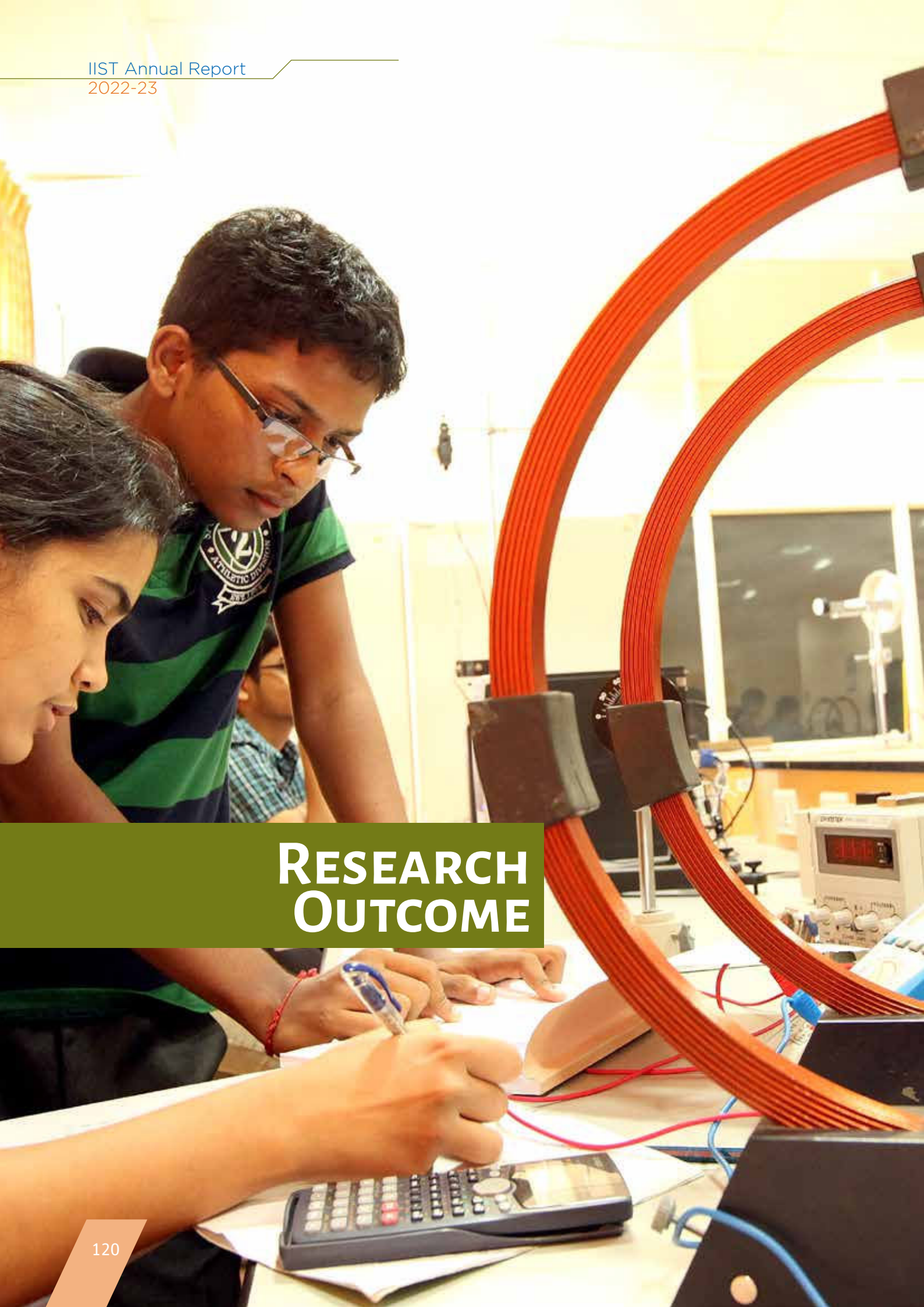
4.13.1 Developed and delivered 4 axis filament winding machine to IIT Jammu

M/s Vashishtha Research Pvt Ltd., the startup company incubated under Department of Aerospace Engineering IIST (by one of our research students) has successfully developed and delivered a 4 axis filament winding machine to IIT Jammu. The machine is capable of winding mandrels up to 1.5 m long and 0.4 m in diameter at speeds of upto 20000 mm/min. It is capable of accommodating 6 spools with 1.5 L heated resin bath. An indigenously developed filament winding pattern generation software is also supplied with the product.

4.13.2 Developed and delivered Halogen Lamp based Thermal Excitation System to CMSE / ISRO

M/s Vashishtha Research Pvt Ltd., the startup company incubated under Department of Aerospace Engineering IIST (by one of our research students) has successfully developed and delivered a halogen lamp based thermal excitation system to CMSE/ ISRO. The system is capable of generating thermal loading profiles of step, sinusoidal, frequency modulated and coded excitation. The system also includes an indigenously developed lamp controller board and software GUI. It can be used for thermographic inspection of aerospace structures.

Halogen lamp based thermal excitation system developed by M/s Vasistha Research Pvt. Ltd.



Research Outcome

5. Research Outcome

This chapter delves into the research outcomes achieved by IIST during the reporting period. As a leading institution at the forefront of space science and technology in India, IIST's commitment to innovation and exploration is evident through the publications and other advancements detailed herein. This chapter not only showcases the institute's unwavering dedication to pushing the boundaries of human knowledge but also underscores its pivotal role in shaping the future of space science and technology both nationally and on the global stage.

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- Saha, D. and **Chinmoy Saha**, 2022, December. MTM-EBG Loaded Circular Patch Antenna for ISM Band Applications. In *2022 IEEE Microwaves, Antennas, and Propagation Conference (MAPCON)* (pp. 1788-1791). IEEE.
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- Nisha and **Palash Kumar Basu**, December 2022,. Room Temperature Optical Hydrogen sensing properties of nanostructured sol-gel synthesised Pt-WO_3 thin films. *National Conference on Recent Trends in Materials Science and Technology (NCMST), (Poster presentation), IIST.*
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- B. S. Tina, S. Rohith, and **Seena, V.**, August 2022. Nanomechanical Membrane-Flexure (NMF) Device: A Versatile MEMS Platform for Gas Sensing

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- Pramod Martha, **Seena, V.**, August 2022, Sub-µm U-channel Suspended Gate-FET: A CMOS-MEMS Sensor Platform for Nano Force Sensor. *18th International Workshop on Nanomechanical Sensing, IISc Bangalore.*
- Jesma, R.R., Sreevatsava, N.M. and **Seena, V.**, January 2023. A Novel Dual Torsional MEMS Suspended Gate FET (DTM-SGFET) Accelerometer. In *2023 IEEE Applied Sensing Conference (APSCON)* (pp. 1-3). IEEE.
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- Sudarsanan, A.K., **Vineeth, B.S.** and Murthy, C.R., 2023. On the Optimal Tradeoff of Age of Information and Transmission Power for Point-to-Point Links. In *2023 National Conference on Communications, NCC 2023*. Institute of Electrical and Electronics Engineers Inc.

5.5.3 Chemistry

- Arya Nair J.S. and **K.Y. Sandhya**, 2022, August. Versatile MoS_2 hollow nanoroses for a quick-witted removal of Hg (II), Pb (II) and Ag (I) from water. *International conference on Emerging trends in advanced functional materials (ETAFM 2022), Catholicate college, Pathanamthitta*.
- Saisree,S. and **K.Y. Sandhya**, 2022, August. Sulfur and nitrogen doped Graphene quantum dots for the simultaneous sensing of cadmium lead and mercury. *International conference on Emerging trends in advanced functional materials (ETAFM 2022), Catholicate college, Pathanamthitta.*
- Dhrishya, V. and **K.Y. Sandhya**, 2022, August. Highly stable copper nanocluster at Sulphur doped NGQD for the selective detection of Pb(II). *International conference on Emerging trends in advanced functional materials (ETAFM 2022*), Catholicate college, Pathanamthitta.
- Arya Nair J.S. and **K.Y. Sandhya**, 2022, December. Versatile MoS_2 hollow nanoroses for a quick-witted removal of Hg (II), Pb (II) and Ag (I) from water. *2nd International Conference on Water Technologies 2022 (ICWT 2022), IIT Bombay.*
- Dhrishya, V. and **K.Y. Sandhya**, 2022, December. Plastic derived carbon combined with MoS_2 for supercapacitor. *National conference on Recent trends in materials science and technology, NCMST-2022.*

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- Archana V.S. and **K.Y. Sandhya**, 2023, March. Selective sensing of histidine by poly aniline derived nitrogen doped graphene quantum dots. *Indian Analytical Science Congress 2023.*
- Saisree S. and **K.Y. Sandhya**, 2023, March. A highly stable copper nano cluster on nitrogen-doped graphene quantum dots for the simultaneous electrochemical sensing of dopamine, serotonin, and nicotine. *Indian Analytical Science Congress 2023*.
- Govind Kumar Sharma and **Nirmala Rachel James**, 2022, November. Flexible, Carbon Black incorporated carbon nanofiber-based Polydimethylsiloxane composites for EMI shielding. *International Conference on Science and technology of polymers and Advanced Materials through Innovation, Entrepreneurship and Industry, SPSI-MACRO-2022.*
- Govind Kumar Sharma and **Nirmala Rachel James**, 2022, December. Highly Flexible PEDOT: PSS-Polyvinylpyrrolidone Coated Carbon Nanofiber-Polydimethylsiloxane composites for EMI shielding. *National conference on Recent trends in materials science and technology, NCMST-2022, IIST, Thiruvananthapuram*.
- Govind Kumar Sharma and **Nirmala Rachel James**, 2023, February. Highly Flexible PEDOT: PSS-Polyvinylpyrrolidone Coated Carbon Nanofiber-Polydimethylsiloxane composites for EMI shielding. *National conference on Advanced Materials and Manufacturing Technologies, AMMT-2023*.
- Govind Kumar Sharma and **Nirmala Rachel James**, 2023, March. Flexible N-Doped Carbon nanofiber-Polydimethylsiloxane Composite Containing $La_{0.85}Sr_{0.15}CoO_3$ nanoparticles for Green EMI Shielding. *National Conference on New Developments in Polymeric Materials, DPM-2023.*

5.5.4 Earth and Space Science

- Humaira Sanam, Anjana Anie Thomas, Arun Kumar Prasad and **Gnanappazham L.**, 2022, September. Multi-sensor Approach for the Estimation of Above Ground Biomass of Mangroves by - International Society of Digital Earth (ISDE), *9th Digital Earth summit, Chennai.*
- Adithy R. Nair , **Gnanappazham L.**, 2022, November. Classification of Coastal Mangroves Using Sentinel 2 Data Sharpened with Google Earth Images. *ISRS and ISG Symposium, NRSC, Hyderabad.*
- Manjunath C.B., Neeraj V. and **Gnanappazham L.**, 2022, November. A comparison of pixel-based and object-based image analysis with Machine Learning Algorithms for Heterogeneous Horticultural landscapes. *ISRS and ISG Symposium, NRSC, Hyderabad.*
- Sanam, H., Mathai, A.K. and **Gnanappazham L.**, 2023, January. Multi-resolution remote sensing for the specieslevel classification of mangroves. In *2023 International Conference on Machine Intelligence for GeoAnalytics and Remote Sensing (MIGARS)* (Vol. 1, pp. 1-4). IEEE.
- **Gnanappazham L.**, Arun K. Prasad, Nithin D. Pillai and Yeshwanth A., 2023, March. Biomass Estimation of mangroves using optical remote sensing. *NISAR Science Workshop, Space Application Centre, Ahmedabad.*
- Haritha, A., **Rajesh, V.J.**, Kumar, S., Santosh, M. and Thesniya, P.M., 2022. Spectrochemical and stable isotopic characteristics of magnesite deposit from Salem, Southern India: CO_2 repository through supergene processes. *Ore Geology Reviews*, p.105016.
- Haritha, A., P. M. Thesniya and **Rajesh, V.J.**, 2022, June. Mineralogical Characterization and genesis of dunite hosted magnesites of Salem, Tamil Nadu, Sothern India. *6th National Geo-Research Scholars Meet (NGRSM-2022), Organized by the Wadia Institute of Himalayan Geology (WIHG) and the University of Ladakh (UoL), University of Ladakh.*
- Deepchand V., Haritha, A., P.M. Thesniya, **Rajesh, V.J.**, and B.R. Binoj Kumar, 2022, June. Comparative Textural, Chemical, and Spectral characterization of Chromites from Nuggihulli Schist Belt, southern

India; Implications for ore quality estimation. *6th National Geo-Research Scholars Meet (NGRSM-2022), Wadia Institute of Himalayan Geology (WIHG) and the University of Ladakh (UoL).*

- Preeti Kumari, Kavish Madhan and **Rajesh, V.J.**, 2022, November. Sambhar Lake in Rajasthan, India as a potential terrestrial Martian Analogue site for hypersaline environment. *Meteoroids, Meteors and Meteorites: Messenger from Space (MetMESS 2022), Organized by Planetary Laboratory Analysis Section Division, Physical Research Laboratory (PRL), Ahmedabad.*
- Deepchand V., Haritha, A., **Rajesh, V.J.**, and B.R. Binoj Kumar, 2022, December. Spectral and Chemical Studies on Chromites from Nuggihalli Region, Karnataka; Potential Industrial Applications. *National Conference on Recent Trends in Material Science and Technology (NCMST 2022), IIST, Thiruvananthapuram.*
- Haritha A., and **Rajesh, V.J.**, 2022, December. Spectroscopic techniques as a tool to characterize naturally occurring magnesite and its applications. *National Conference on Recent Trends in Material Science and Technology (NCMST 2022), IIST, Thiruvananthapuram.*
- Deepchand V., **Rajesh, V.J.**, Haritha A., and Binoj Kumar, 2023, January. Exsolution Micro-Textures in Cr-V-Ti Magnetite (Lodestones) of Southern India; Remnants of Complex Magmatic Processes. *3rd International Conference on Geology: Emerging Methods and Applications (GEM 2023). Christ College, Irinjalakkuda*.
- Deepchand V., A. Haritha, **Rajesh, V.J.** and R.B. Binoj Kumar, 2023, January. Chemical and Spectral Characterization of Chromites and its Comparison with ASTER Indices: A Case Study from Archean Greenstone Belts in Western Dharwar Craton. *Current Trends in Earth System Sciences (CTESS), University of Kerala, Kariavattom Campus.*
- Deepchand V., **Rajesh V.J.**, Tomson J.K. and R.B. Binoj Kumar, 2023, February. An Integrated Micro-Textural, Spectral, and Geochemical Characterization of Cr-V-Ti Magnetite of Southern India; Implications for the Similar Fe-Ti Oxides on Mars. *Frontiers in Geosciences Research Conference (FGRC), Physical Research Laboratory (PRL), Ahmedabad.*
- Preeti Kumari, Kavish Madhan, and **Rajesh, V.J.**, 2023, March. Spectrochemical characterization of Evaporite from Sambhar Lake, Rajasthan, Northern India: Implication for the hypersaline lake as a potential terrestrial Martian Analogue. *Indian Planetary and Science Conference (IPSC 2023). Indian Planetary Science Association (IPSA), Physical Research Laboratory, Ahmedabad.*
- Galodha, A., Vashisht, R., **Nidamanuri, R.R.** and **Ramiya, A.M.**, 2022. Deep Convolution Neural Networks with Resnet Architecture for Spectral-Spatial Classification of Drone Borne and Ground Based High Resolution Hyperspectral Imagery. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, *43*, pp.577-584.
- Kaushik, M., **Nidamanuri, R.R.**, Aparna, B. and **Ramiya, A.M.**, 2023, January. Spectral discrimination of vegetable crops using in situ hyperspectral data and reference to organic vegetables. In *2023 International Conference on Machine Intelligence for GeoAnalytics and Remote Sensing (MIGARS)* (Vol. 1, pp. 1-4). IEEE.
- Palaparthi, A., **Ramiya, A.M.**, Ram, H. and Mishra, D., 2023, January. Classification of Horticultural Crops in High Resolution Multispectral Imagery Using Deep Learning Approaches. In *2023 International Conference on Machine Intelligence for GeoAnalytics and Remote Sensing (MIGARS)* (Vol. 1, pp. 1-4). IEEE.
- Sam P Raj, Rohit Srivastava, B L Madhavan and **P.R. Sinha**, 2022 November- December. Python package for the calculation of aerosol optical properties and mixing state. *TROPMET, Indian Meteorological Society and IISER Bhopal.*
- Nithish S., Dhanraj M. and **P.R. Sinha**, 2022, November-December. Aerosol - Warm Cloud Interactions and Cluster analysis of aerosols in different regions of India. *TROPMET, Indian Meteorological Society and IISER Bhopal.*
- Thejas K.V., Vijayakumar S. Nair, and **P.R. Sinha**, 2023, February. Study of Aerosol Interactions with Warm Clouds over eastern Indo-Gangetic plain during winter season using satellite data. *35th Kerala*

Science Congress, Kerala State Council for Science, Technology and Environment.

- Mohit and **P.R. Sinha**, 2023, March. Estimates of Mass Absorption cross-section of black carbon for Aethalometer measurements at four sites in the Arctic. *National Workshop on Boundary Layer Exchange Processes and Climate Change (NoBLEXClim), SRMIST.*
- Thejas K. V., Vijayakumar S. Nair, and **P.R. Sinha**, 2023, March. Possible role of entrainment mixing in reversing Twomey effect over eastern Indo-Gangetic plain during winter season. *National Workshop on Boundary Layer Exchange Processes and Climate Change (NoBLEXClim), SRMIST.*

5.5.5 Mathematics

- Tushar, J., Kumar, A. and **Sarvesh Kumar**, 2021, December. Virtual Element Methods for Optimal Control Problems Governed by Elliptic Interface Problems. In *International Conference on Frontiers in Industrial and Applied* (pp. 521-533). Singapore: Springer Nature Singapore.
- Kappiyath, A., Sreelatha, S.V. and **Sumitra, S.**, 2022, June. Self-Supervised Enhancement of Latent Discovery in GANs. In *Proceedings of the AAAI Conference on Artificial Intelligence* (Vol. 36, No. 7, pp. 7078-7086).

5.5.6 Physics

- Nirala, G., Pradyumna, S.T., **Kumar, A.** and Marino, A.M., 2022, June. Information Encoding in Bright Twins Beams as Tailored Spatial Correlations-A Perturbative Approach. In *Quantum 2.0* (pp. QM3C-4). Optica Publishing Group.
- Athira, T.S. and **Dinesh N. Naik**, 2022, April. Sensitivity Enhancement through Interference: Sensing Changes in Phase Difference between Complex Fields using Non-linear Variation in Phase of the Resultant Field. *Information Photonics 2022 (IP2022).* The Group of Information Photonics, Optical Society of Japan.
- Athira, T.S. and **Dinesh N. Naik**, 2022, October. Generation of phase singularities in spectral interference. In *Frontiers in Optics (pp. FM4C-4).* Optica Publishing Group.
- Surya Kumar Gautam, and **Dinesh N. Naik**, 2022, October. Phase retrieval iterative algorithm for a special object. In *Frontiers in Optics + Laser Science 2022 (FIO, LS)*, Optica Publishing Group.
- Surya Kumar Gautam, and **Dinesh N. Naik**, 2022, October. How to improve quality of reconstruction from phase retrieval iterative algorithm. In *Frontiers in Optics + Laser Science 2022 (FIO, LS)*, Optica Publishing Group.
- Harikrishnan, P., Athira, T.S. and **Dinesh N. Naik**, 2022, November. Calibration of Tunable wavelength Holographic Profilometer. *XLV Symposium of the Optical Society of India, Conference on Optics, Photonics & Quantum Optics (COPaQ-2022), IIT Roorkee.*
- Reuben S. Mathew, Athira T.S., Harikrishnan P. and **Dinesh N. Naik**, 2022, November. Sensitivity and Range Characterization of Optical Gyroscope using Controlled Rotation Stage. *XLV Symposium of the Optical Society of India, Conference on Optics, Photonics & Quantum Optics (COPaQ-2022), IIT Roorkee.*
- Surya Kumar Gautam and **Dinesh N. Naik**, 2022, November. Problem and Solution For Holography. *XLV Symposium of the Optical Society of India, Conference on Optics, Photonics & Quantum Optics (COPaQ-2022), IIT Roorkee.*
- Surya Kumar Gautam and **Dinesh N. Naik**, 2022, November. Holography vs Edge Point Referencing, *XLV Symposium of the Optical Society of India, Conference on Optics, Photonics & Quantum Optics (COPaQ-2022), IIT Roorkee.*
- S. Saini, G.M. Gouda and **Bhattacharjee, K.**, 2022. Low Dimensional Structural Derivatives of Carbon from HiPCO SWCNTs'. *66th DAE Solid State Physics Symposium 2022*.

- Athira, T.S. and **Dinesh N. Naik**, 2023. Nonlinear phase accumulation for a linear path delay in low coherence fourier transform spectral interferometry. *Physica Scripta*, *98(6)*, p.065509.
- Tillo, D. and **Narayanamurthy, C.S.**, 2022, October. Novel Method for Large Range Measurement of Retardation by Stokes Polarimeter. In *Laser Science* (pp. JTu5B-2), Optica Publishing Group.
- Akanksha Gautam, Athira, T.S., **Dinesh N. Naik**, Rajeev Singh, **Narayanamurthy, C.S.** and Rakesh Kumar Singh, 2022, November. Interferometry with a light emitting diode. *XLV Symposium of the Optical Society of India, Conference on Optics, Photonics & Quantum Optics (COPaQ-2022), IIT Roorkee*.

5.6 Patents

5.6.1 Patents under review

- *Title:* IoT enabled biomedical wearable clothing system for healthcare assistance.

  Name of the Inventor: **Manoj B.S.**

  Status: Patent application under review
- *Title:* Low-dielectric ceramic composition and a process of producing the same.

  Name of the Inventor: B. Masin, K. Ashok, H. Sreemoolanadhan and **K. Prabhakaran** *Status:* Patent application under review
- *Title:* Feedback Enabled Adaptive Power Distributed WPT receiver

  Name of the Inventor: R. Gharate, Gopika R. and **Chinmoy Saha**

  Status: Patent application under review
- *Title:* Swirl Stabilized Liquid Fuel Burner with multi-point Aerated Injector

  Name of the Inventor: **Rajesh Sadanandan** and Prakash R.S.

  Status: Patent application under review
- *Title:* Digitizing Interface Circuit Topology and a Measurement Strategy for Grounded RC-based Impedance Sensors

  Name of the Inventor: Elangovan K. and **Anoop C.S.**
  Status: Patent application under review
- *Title:* Reconfigurable Grinding Wheel with In-built cooling and Self-adaptable lubrication system via Additive Manufacturing

  Name of the Inventor: **V.S. Sooraj** and Sarath Babu Thekkoot Surendran

  Status: Patent application under review

5.7 Awards and Achievements

Many of the faculty members, staff and students were bestowed with honours, awards and elected as Fellows of several professional national and international bodies thereby raising the glory to the Institute. They are:

5.7.1 Notable Achievements

- Dr. Kuruvilla Joseph, Outstanding Professor and Dean (SA, SW and OR) have been listed among the top **2 percent Scientists by Stanford University**, across the world in all subject fields for the year 2022-23.
- Dr. Kuruvilla Joseph - Nominated as **Fellow** in Astronautical Society of India.
- Dr. Kuruvilla Joseph - Nominated as **Honorary Fellowship** of Indian Society of Analytical Scientists.

Aerospace Engineering

- Rishab, Ravi Ranjan Kumar, Santhosh Kumar, P. Chakravarthy and S.V.S. Narayana Murty, best oral presentation award, NMD- ATM 2022, 13-16 November 2022.

- Arun D.I., P. Chakravarthy and B. Santhosh, best published paper award under the young researcher category - 2020, Indian Institute of Metals Trivandrum chapter, held on 25 March, 2023.
- Arun D.I., P. Chakravarthy and B. Santhosh, best paper published under the young researcher category - 2019, Indian Institute of Metals Trivandrum chapter, held on 25 March, 2023.
- Ms.Neelima Patnaikuni, Prof. Brahm Prakash best thesis award, Indian Institute of Metals Trivandrum chapter, held on 25 March, 2023, (Research supervisors - P. Chakravarthy and S.V.S. Narayana Murty).
- Neelima Patnaikuni, P. Chakravarthy and S.V.S. Narayana Murty, best paper published under the young researcher category for the year 2019, Indian Institute of Metals Trivandrum chapter, held on 25 March, 2023.
- Anup Tiwari, best M.Tech. thesis award, Indian Society of Heat and Mass Transfer Regional chapter, Trivandrum under the guidance of Mahesh S.
- Aryadutt Oamjee, Innovative Student Project Award, Indian National Academy of Engineering (INAE) for the Doctoral Level, 2022 (Research Supervisor - Rajesh S.).
- Shine S.R. Embassy of France in India Funding for Research Trip to France for Indian Faculty 2022.
- Gulzar Ahmed, best M.Tech. thesis award, Indian Society of Heat and Mass Transfer Regional chapter, Trivandrum 2022 under the guidance of Shine S.R.

Avionics

- Anoop C.S., Outstanding Reviewer recognition, 2022 - IEEE Transactions on Instrumentation and Measurement.
- Anoop C.S., received IEEE senior member recognition 2022.
- Basudev Majumder, Sidhharth Upadhyay, Sarath Sankar Vinnakota, Top 15 popular article in IEEE Photonics Journal for the month of May 2022.
- Akash Ganguly, best thesis award - B.Tech. thesis, IEEE MTTS - Kerala Section (Research Supervisor - Immanuel Raja).
- Palash Basu, Abdul Kalam Technology Innovation National Fellowship 2022, INAE.
- Aishwarya B., INAE (Indian national Academy of Engineering) Innovative Student Project Award at Master level (Research Supervisor - Rajeevan P.P.).
- Rajesh Joseph Abraham, Vishesh Garg, INAE Innovative Student Project Award 2022 in M.Tech. category.
- Nianth A., Suja K. J., Seena V., INUP Idea to Innovation Hackathon 2022, FABATHON MeitY-IISc CeNSE, MEMS fabrication fully supported by this award.
- Joel Zacharias, Seena V., Meity IIT Bombay INUP-i2i Nanotech Hackathon Contest 2022, MEMS fabrication fully supported by this award.
- Gadipudi, INAE Innovative Student Project Award, B.Tech. Category in Electrical Engineering (Research Supervisor - R. Sudharshan Kaarthik).
- Balwant Kushwaha, Winner in Electrical Engineering Category, 2nd National Symposium and Research Colloquium, IEEE Kerala Section under the guidance of R. Sudharshan Kaarthik.
- R. Sudharshan Kaarthik, Outstanding Researcher Award, IEEE Kerala Section.
- R. Sudharshan Kaarthik, Outstanding Professional Volunteer Award, IEEE Kerala Section, IA/IE/PELS Joint Chapter, Kerala.
- Sudarsanan A.K., Best paper award in networking track, co-authored with Vineeth B. S. and Chandra R. Murthy, NCC2023.

Chemistry

- Varsha M.V. and Gomathi N., best oral presentation award, in International conference on Frontiers in Materials Engineering (ICFME-2022), IIT Indore.
- Varsha M.V. and Gomathi N., best poster award, in National conference on Recent trends in Materials Science (NCMST 2022), IIST.

- Chithra K.R., Varsha M.V., and Gomathi N., best poster presentation award in International Workshop and Conference on Membrane Assisted Water Purification Processes (ICMW 2023) organized by International and Inter University Center for Nanoscience and Nanotechnology (IIUCNN), Mahatma Gandhi and Lund University, Sweden & National Research Centre, Egypt, March 2023.
- Tomy A.M., and Jobin Cyriac, best presentation award, Material Research Society of India, Thiruvananthapuram chapter, Annual technical meeting 2022.
- Tomy A.M. and Jobin Cyriac, best poster award, in National conference on Recent trends in Materials Science (NCMST 2022), IIST.
- Sreekala K and Mary Gladis J., best presentation prize in International conference on Emerging Materials for Sustainable Development (EMSD-2022), IEEE and CSIR-CSIO, Chandigarh, October 2022.
- Sreekala K, Jithu Joseph, and Mary Gladis J., best poster award in Conference on Advanced Materials and Manufacturing Technologies (AMMT-2023), CSIR- NIIST, February 2023.
- Sreekala K., selected as a Future Research Talent (FRT) scholar as part of the 2023 FRT programme at the Australian National University (ANU) - travel grant: AUD$8,500 (Research Supervisor: Mary Gladis J.).
- Nirmala Rachel James, and Govind Kumar Sharma, best poster award, in National conference on Recent trends in Materials Science (NCMST 2022), IIST.
- Arya Nair J.S., Young Women Researcher in Chemistry by 8th Venus International Women Awards (VIWA 2023) (Research Supervisor - Sandhya K.Y.).
- S. Saisree, best oral presentation award in International conference on Emerging Trends in Advanced Functional Materials (ETAFM 2022), Catholicate college, August 2022 (Research Supervisor - Sandhya K.Y.).
- K.G. Sreejalekshmi, and Adarsh Jayagopal, best poster award in International Conference on Metrology for deployment of green hydrogen and renewable fuels in India funded by BMZ, the German Federal Ministry for Economic Cooperation and Development, April 2022.
- K.G. Sreejalekshmi, Shruti Diwase, best poster award in International Conference on Materials Science and Nanotechnology for sustainable applications, organised by University Department of Basic and Applied Sciences, MGM University, Aurangabad, March 2023.

Earth and Space Science

- Anindya Saha, received scholarship "Erasmus+ International Credit Mobility" awarded by the University of Liège on behalf of the European Commission, for his stay as doctoral student in the research department: SCIENCES - AGO to work under the supervision of Prof. Michaël DE BECKER, (Research Supervisor - A. Tej).
- L. Gnanappazham, Member, Expert Review Committee of DST INSPIRE Faculty.

Humanities

- Shaijumon C.S., Appointed as Vice Chairman of the Focus Group for Social Sciences in revising school curriculum by SCERT, Govt of Kerala.

Mathematics

- Janaki Raman Babu and Prosenjit Das, A. K. Agarwal Award for the year 2022.
- Prosenjit Das, SERB MATRICS grant.

Physics

- Sajith V. Sadasivan, Alpine Solid State NMR conference Travel award, Chamonix, Mount-Blanc France (Research Supervisor - S. Jayanthi).
- Dayal G., Jinesh K.B., best presentation award. First International Conference on Functional Materials for Advanced Technology. ICFMAT- I / Central University of Kerala, held on January, 2023.
- Narayanamurthy, C.S., Galileo Galilei Medal 2022, Instituted by International Commission for Optics (Ico), France, for Outstanding contributions to Applied and Adaptive Optics research in difficult environment.
- Narayanamurthy, C.S., Elected as Fellow of SPIE (Optics and Photonics), USA, 2023.

5.8 Seminars/ Workshops Organized

As part of Continuing Education, the institute organized several seminars/workshops and talks by renowned researchers and persons of eminence. The faculty members, staff and students also participated in several such events outside and inside IIST.

Seminars and Workshops organized in IIST

Sl. No.	Title	Organizers	Date
1	Geo-Innovation Challenge as part of National Geospatial Capacity Building programme with funding from Department of Science and Technology (DST)	A.M. Ramiya	April 20-22, 2022
2	Online Training session by Ms. Shinu Shobha, Programme Officer, US Consulate Chennai, on “How to apply for 2023-24 Fulbright-Nehru, Fulbright-Kalam and other Fulbright Fellowships”.	Shaijumon C.S.	April 21, 2022
3	“Landing gear system” Shri. R. Prem, Manager (Design), Landing Gear Design Department, Hindustan Aeronautics limited, Bangalore	Anup S.	July 8, 2022
4	Nabh-ÂSparsh, one day workshop organised on the occasion of World Space Week at IIST-Funding support from DST-SERB project	Sarita Vig	October 10, 2022
5	FDP on Control Systems Technology and Applications	Rajesh Joseph Abraham	December 12-16, 2022
6	A 3-day National conference in Materials Science and Technology - vNCMST-2022	Department of Chemistry	December 28-30, 2022
7	XIth IIST Astronomy and Astrophysics School (IAAS)	Astronomy Group-Department of ESS	December 14-23, 2022
8	Five week Course on Research Article Writing for research Scholars, by Dr Mackenzie Bristow from the University of Emory	Babitha Justin	January 30 - February 22, 2023

Sl. No.	Title	Organizers	Date
9	23rd National Conference on Atomic and Molecular Physics (NCAMP23)	Umesh Kadhane	February 20-23, 2023
10	National Conference on Applied Mathematics and Numerics (NCAMN) jointly organized by Post Graduate and Research Department of Mathematics, Mar Ivanios College, Trivandrum, and the Department of Mathematics, IIST, Trivandrum	Sarvesh Kumar	March 8-10, 2023
11	Strain rate dependent plasticity based damage model for predicting the behaviour of concrete under dynamic loads, Dr. Akshaya Gomathi K., Institute postdoc fellow, Department of Civil Engineering, IIT Hyderabad	Anup S.	March 9, 2023
12	Workshop on Theory and Numeric of Differential Equations sponsored by SERB project no: CRG/2021/002410 at IIST	Sarvesh Kumar	March 16-17, 2023

5.9 Institute Seminars/ Talks

Sl. No.	Title	Speaker	Date	Organizer
1	Genesis of organic molecules in the extra-terrestrial environment: role of energetic radiation	Dr. Umesh R. Kadhane, Professor, IIST	April 06, 2022	Sudheesh
2	Unfolding operators and its applications	Prof. Nandakumaran, Department of Mathematics, IISc, Bangalore	April 07, 2022	Prosenjit Das
3	Looking through a defective lens: How adaptive optics help us see the universe	Ms. Lekshmi S.R., Research Scholar, IIST	May 11, 2022	Sudheesh
4	Counting solutions of Laurent polynomials using Newton polytopes	Prof. J.K. Verma from Department of Mathematics, IIT Bombay	June 3, 2022	Prosenjit Das
5	Optical NDT Technologies	Ms. Keerthana George, M.Tech. Student, IIST	June 29, 2022	Sudheesh
6	Artificial Neurons: What Physics can do for the next generation artificial intelligence?	Dr. Jinesh K. B., Associate Professor, IIST	July 28, 2022	Sudheesh

Sl. No.	Title	Speaker	Date	Organizer
7	Rydberg atom interactions at the interface of an optical nanofiber	Ms, Aswathy Raj, Research Scholar, Okinawa Institute of Science and Technology Japan	August 06, 2022	Sudheesh
8	Megastructures in transit: Search for artificial alien architectures	Ms. Ushasi Bhowmick, Masters student (Astronomy and Astrophysics), IIST	August 24, 2022	Sudheesh
9	Wealth creation through mutual funds	Mr. John Abraham, Aditya Birla Sun Life (Mutual Funds), Trivandrum	November 18, 2022	Shaijumon
10	Wavefront tilt measurement using Shack Hartmann and Interferometric methods	Prof. A.R. Ganesan, Professor, Dept. of Physics, IIT Madras	November 25, 2022	Dinesh Naik
11	On the occasion National Mathematics Day, in honour of the Birth Anniversary of Indian Mathematical genius Srinivasa Ramanujan, “Ramanujan’s life and some of his impactful mathematical discoveries”.	Prof. Kalyan Chakraborty, Director, KSCSTE-Kerala School of Mathematics, Kozhikode, Kerala	December 23, 2022	Prosenjit Das
12	How precise is a Precision ADC?	Mr. Nithin Jose, Analog VLSI design engineer, Texas Instruments	January 20, 2023	Seena
13	On the role of complex aromatics in the molecular evolution of the universe	Mr. Arun S., Masters student (Solid State Physics), IIST	January 25, 2023	Sudheesh
14	Eigen vectors can make one rich - can they ensure fairness in the machine learning?	Prof. Ambedkar Dukkipati, Department of Computer Science and Automation, Indian Institute of Science	January 31, 2023	S.Sumitra
15	Climate change: The story of its discovery	Prof. R. Shankar, Institute of Mathematical Sciences, Chennai (Retd.)	February 01, 2023	Naveen Surendran
16	Bridging the gap between science and communication	Dr Mackenzie Bristow from the University of Emory	February 22, 2023	Babitha Justin
17	Organised invited lecture “Astronomy from ground and space”	Dr. Annapurni Subramanyam, Director - Indian Institute of Astrophysics, Bengaluru	February 23, 2023	Sarita Vig

Sl. No.	Title	Speaker	Date	Organizer
18	Translates of a line may not be a line	Dr. Animesh Lahiri, Chennai Mathematical Institute	February 24, 2023.	Prosenjit Das
19	Crystal growth and Semiconductor research at IKZ, Berlin, Germany including zone melting of Ge metal for making 12N purity	Dr. Sumathi Radhakrishnan, Head of Semiconductor Section, Leibniz Institute for Crystallography, Berlin, Germany	February 28, 2023	Jinesh
20	Primitive element theorem	Dr. Animesh Lahiri, Chennai Mathematical Institute	March 02, 2023	Prosenjit Das
21	Connecting dots: Multidisciplinary perspectives	Smt. Jaya G. Nair, Former Division Head VSSC	March 02, 2023	Shaijumon
22	High time resolution carbonaceous aerosol fingerprint using a total carbon - black carbon cass method	Dr. Martin Rigler, Scientific Analyzer, Slovenia, EU	March 08, 2023	P R Sinha
23	On the occasion of international womens day and pi-day: “Women in applied mathematics”	Dr. Aekta Aggarwal, IIM Indore	March 13, 2023	Prosenjit Das

5.10 Conference or workshop or seminar or FDP participated (not as resource person) by faculty members/ staff outside IIST

5.10.1 Aerospace Engineering

- Scientific Committee member in Indo-German International Conference on Metrology for the Deployment of Green Hydrogen and Renewable Fuels in India, April 4-6, 2022, organized by Physikalisch-Technische Bundesanstalt (PTB) Germany, in partnership with The Energy and Resources Instiute (TERI), Goa University (GU) - Rajesh S.
- Frontiers of Aerospace Systems and Technologies (FAST 2022), July 7-8, 2022, organized by VSSC - Aravind V.
- Frontiers of Aerospace Systems and Technologies (FAST 2022), July 7-8, 2022, organized by VSSC - P. Raveendranath.
- Frontiers of Aerospace Systems and Technologies (FAST 2022), 7-8 July, 2022, organized by VSSC - Sam Noble.
- 3D Printing Workshop, July, 2022, organized by LPSC - Sooraj V.S.
- INAE-ISRO Engineers Conclave, October 13-15, 2022, organized by LPSC - Aravind V.
- INAE-ISRO Engineers Conclave, October 13-15, 2022, organized by LPSC - Praveen Krishna I.R.
- INAE-ISRO Engineers Conclave, October 13-15, 2022, organized by LPSC - Sooraj V.S.
- Contest Judge for KSCTSE Techfest 2022, October 26-28, 2022, organized by at CUSAT - Praveen Krishna I.R.
- 27th National Conference on IC Engines and Combustion, November 5-7, 2022, organized by VIT - R. Sadanandan.
- International Conference COPEN 2022 and Pre-Conference Workshop, December 8-10, 2022 organized by IIT Kanpur - Sooraj V.S.
- 4th Structural Integrity Conference and Exhibition (SICE 2022), December 14-16, 2022, organized by Indian Institute of Technology Hyderabad under the aegis of InSIS - Anup S.

5.10.2 Avionics

- One-day virtual workshop on Intelligent Reflecting Surfaces: Fundamentals and Applications, May 21, 2022 organised by IIITB COMET Foundation - S. Chris Prema
- One-day virtual workshop on Intelligent Reflecting Surfaces: Fundamentals and Applications, May 21, 2022 organised by IIITB COMET Foundation - Vani Devi M.
- Advanced Training School in PYTHON and MATLAB/ OCTAVE-Based Orthogonal Time Frequency Space (OTFS) Modulation for 6G Wireless Systems, July 2-22, 2022, organized by IIT Kanpur - S. Chris Prema.
- Frontiers of Aerospace Systems and Technologies (FAST 2022), July 7-8, 2022, organized by VSSC - B.S. Manoj.
- Frontiers of Aerospace Systems and Technologies (FAST 2022), July 7-8, 2022, organized by VSSC - Priyadarshanam.
- Frontiers of Aerospace Systems and Technologies (FAST 2022), July 7-8, 2022, organized by VSSC - R. Sudharshan Kaarthik.
- International Conference on Electronics, Computing and Communication Technologies (CONECCT) July 08-10, 2022, organised by IEEE - Immanuel Raja.
- Faculty training programme on 5G wireless communication technology, July 28-30, 2022, organised by IEEE India council - S. Chris Prema.
- TCAD Circuit Simulation Workshop, August 1-5, 2022, dually organized by IIT Bombay and Synopsys - Seena V.
- INAE-ISRO Engineers Conclave, October 13-15, 2022, organized by LPSC - S. Chris Prema.
- INAE-ISRO Engineers Conclave, October 13-15, 2022, organized by LPSC - Sudharshan Kaarthik.
- IEEE INDIA Conference INDICON 2022, November 24-26, 2022, organized by IEEE - Sheeba Rani.
- International Conference on COMmunication Systems & NETworkS (COMSNETs 2023) Bengaluru, January 3-8, 2023, initiative by COMSNETS Association - Vineeth B.S.
- INUP- i2i Online Familiarization Workshop on Nanofabrication Technologies scheduled during January 23-25, 2023, organized by IIT Bombay - Seena V.
- National conference on communications (NCC 2023), February 23-26, 2023, organized by IIT Guwahati - Vineeth B.S.
- IEEE wireless communication and networking conference, in Glasgow, Scotland, UK- March 26-29, 2023, organized by IEEE -Vani Devi M.

5.10.3 Chemistry

- Materials research society of India, Trivandrum chapter, April 30, 2022, organized jointly by MRSI, Trivandrum Chapter and SCTIMST - Nirmala Rachel James.
- Frontiers of Aerospace Systems and Technologies (FAST 2022), July 7-8, 2022, organized by VSSC - Nirmala Rachel James.
- Frontiers of Aerospace Systems and Technologies (FAST 2022), July 7-8, 2022, organized by VSSC - K. Prabhakaran.
- Frontiers of Aerospace Systems and Technologies (FAST 2022), July 7-8, 2022, organized by VSSC - K.G. Sreejalekshmi.
- International conference on Emerging Trends in Advanced Functional Materials ETAFM-2022, August 11-12, 2022, organized by Catholicate College Pathanamthitta - Nirmala Rachel James.
- INAE-ISRO Engineers Conclave, October 13-15, 2022, organized by LPSC - K.G. Sreejalekshmi.
- National Conference on New Developments in Polymeric Materials (DPM-2023), March 2-3, 2023, organized by The Society for Polymer Science, India - Jobin Cyriac.
- National Conference on New Developments in Polymeric Materials (DPM-2023), March 2-3, 2023, organized by The Society for Polymer Science, India - Sandhya K.Y.

5.10.4 Earth and Space Science

- Frontiers of Aerospace Systems and Technologies (FAST 2022), July 7-8, 2022, organized by VSSC - Purna Ram Sinha.
- Diamond Jubilee Foundation Day, November 17, 2022, organized by Indian Institute of Tropical Meteorology, Pune - A. Chandrasekar.
- National Symposium on Tropical Meteorology (TROPMET 2022), November 29 - December 2, 2022, organized by IISER Bhopal, and IMS Bhopal - A. Chandrasekar.
- Chaired a session at the 41st Annual meeting of the Astronomical Society of India (ASI), March 01-05, 2023, organised by Astronomical Society of India, IIT Indore - Sarita Vig.
- 41st Meeting of the Astronomical Society of India (ASI), March 01-05, 2023, organised by Astronomical Society of India, IIT Indore - Vikram Khaire.
- Boundary Layer Exchange Processes and Climate Change (NoBLExClim-2023) workshop organized jointly by the Ministry of Earth Sciences (MoES) and Science and Engineering Research Board (SERB), DST, March 23-24, 2023, SRM University - Purna Ram Sinha.

5.10.5 Humanities

- Decolonizing Sociology: The Significance of W.E.B. Du Bois' Imagination of India, July 12, 2022, organized by Institute for Social Research and Action- Lekshmi V. Nair.
- Hundred Years of Sociology in India: Exploring Trajectories for the Future - Conference of Indian Sociological Society, December 20-22, 2022, organized by University of Science and Technology, Meghalaya - Lekshmi V. Nair.
- Technology, Culture and Society - 49th All Kerala Sociological Conference, February 10-12, 2023, organized by Farook College - Lekshmi V. Nair.

5.10.6 Mathematics

- Frontiers of Aerospace Systems and Technologies (FAST 2022), July 7-8, 2022, organized by VSSC - E. Natarajan.
- CoCAAG 2023, February 8-11, 2023, organized by IIT Hyderabad - Prosenjit Das.
- Workshop and discussion meeting on Affine spaces, algebraic group actions, and LNDs, March 11-18, 2023, organized by Indian Statistical Institute, Kolkata - Prosenjit Das.

5.10.7 Physics

- National Intellectual Property Awareness Program, April 20, 2022, organized by KIIT-TBI TTO in collaboration with Guwahati Biotech Park, Kamrup, Guwahati - K.B. Jinesh.

Student Activities & Outreach

6. Student Activities and Outreach

Student activities and outreach programs play a pivotal role in fostering a dynamic and inclusive learning environment at IIST. From the different fests to the students clubs to competitions and community engagement initiatives, IIST encourages its students to explore their passions beyond the classroom. These activities not only provide a platform for students to apply their theoretical knowledge in practical scenarios but also serve as a conduit for fostering collaboration, leadership skills, and a deep sense of social responsibility. Additionally, IIST's commitment to outreach extends beyond its campus, with programmes designed to inspire the next generation of scientists and engineers, ensuring that the institution's impact reverberates far beyond its academic boundaries.

The Dean of Student Activities and Student Welfare chairs the Student Activity Board (SAB), with the Registrar of IIST, heads of various departments and chairpersons of institute committees such as Sports, Technical, Cultural, Hostel, and Canteen committees and student representatives as members. Each of these committees is led by a senior faculty member and includes both faculty members and student members. These student representatives play a crucial role by offering feedback and suggestions on all matters related to student concerns, encompassing both curricular and co-curricular aspects. The board convenes on a monthly basis or as and when necessary to address specific needs. SAB assumes responsibility for organizing and coordinating significant events at IIST, including Dhanak, the intercollegiate cultural fest, Conscientia, the inter-collegiate tech fest, the Annual sports day of IIST, and all other student activities within the institution. Furthermore, SAB oversees the management of various student clubs and the mentoring system at IIST.

Students Activity Board

a. Sports Committee
b. Technical Committee
c. Cultural Committee
d. Hostel and Canteen Committee

6.1 Events & Activities under SAB

6.1.1. Annual Sports Meet 2022

The Annual Sports Meet was conducted during April 22-23, 2022 at the Magudagiri ground. Shri. Jiji Thomson, Former Chief Secretary, Govt. of Kerala and Director General, Sports Authority of India, inaugurated the Sports Meet by hoisting the IIST flag and lighting the torch. The finals of different track and other events were conducted. The students participated in the sports events under the

flags of five houses: Akashganga, Devyani, Kritika, Saptrishi and Sharmista. Dr. Y. V. N. Krishna Murthy, Registrar and Prof. Kuruvilla Joseph, Dean, Students Activities, IIST, offered felicitation addresses. Prof. N. Sabu, Chairman IIST Sports Committee, proposed the vote of thanks.

Extramural Events

IIST organized various tournaments, like "Institute Open Football, basketball, badminton tournaments, etc. Approximately 75 students of IIST students participated Manipal Institute Annual Sports Fest during 18-22 March, 2023 at Manipal, Karnataka.

6.1.2. Conscientia 2022

Conscientia, the four-day tech fest of IIST, organized from November 4 to 7, 2022 was centered around the theme "Suit Up Vyomnauts," symbolizing the grand endeavor of India's Human Space Flight Program. Sponsored by Skyroot aerospace pvt. Ltd. and Aeronautical Society of India, Conscientia witnessed the participation of over 1100 enthusiastic individuals.

The inaugural ceremony of Conscientia, 2022, was graced by the presence of Shri V.P. Joy, Chief Secretary to Government of Kerala as the Chief Guest. Joining him on the dias were Dr. S. Unnikrishnan Nair, Director, IIST/ VSSC, Dr. Kuruvilla Joseph, Dean SA, IIST and Dr. Venkata Sai Kiran C., Lead R&D, Skyroot Aerospace Pvt. Ltd.





Conscientia 2022 was led by a team from the technical committee of IIST with Shri Boddu Bharadwaj as the chief student coordinator and student representatives of the technical committee. Conscientia-2022 featured 33 events organized under robotics, astronomy, technology, gaming and theme categories.

Technical talks and workshops were another much sought after features of Conscietia. Technical talks were delivered by Shri R. Hutton, Human Space Flight Center on India's Human Space Flight Programme at Conscientia, Dr. Venkata Kiran, Skyroot Lead R&D and Director on the latest advancements in space technology and the challenges faced in the development of rocket engines and Dr. Ayyappan G. on the Insights and Perspectives on the Latest Technological Advancements in the Field of Space Technology.


The technical expo and workshops were a significant highlight of Conscientia, providing a unique opportunity for students to learn about the latest advancements in space technology and engineering. The technical expo featured exhibits from various ISRO centers like LPSC and VSSC, showcasing their latest projects and technologies. The workshops were conducted by Rocketeers, IIST Robotics Club and Aero Club. These workshops provided a hands-on learning experience for the students and helped them understand the practical aspects of engineering. The workshops covered topics like rocketry, robotics, and aeronautics, and the students got a chance to build and launch their own rockets, design and programme robots, and learn about aircraft design.

Apart from learning about space technology and engineering, the technical expo and workshops also served a social cause. The revenue generated from the workshops and sale of IIST merchandise like T-shirts and hoodies based on Vyomnauts and space themes were for social outreach activities and to conduct workshops for many government school students for free of cost. This initiative aimed to empower society by providing access to quality education and learning opportunities to students who may not have had the resources to pursue such activities otherwise.

6.1.3. Dhanak

'Dhanak, the three-day cultural extravaganza, held from March 17-20,2023, witnessed a massive turnout of 848 students from various colleges and universities. While Shri. Jayachandran, the renowned music director inaugurated the event with his divine music, Shri VJ James, a writer of unparalleled brilliance, adorned the event as the guest of honor, adding a touch of literary grandeur to the unfolding spectacle.


It had 33 events extended over 4 days that kept the participants engaged throughout. The major crowd pullers were the group dance competition, the battle of bands, solo singing, dancing competitions, treasure hunt, and fashion show. The Street Play was a standout event that addressed a serious issue of drug abuse in an entertaining yet impactful way. The workshops were informative and provided an excellent opportunity for students to learn and develop new skills. The organizers ensured that everything ran smoothly, from the registration process to the stage setup and the food stalls. The staff and volunteers were friendly and helpful, adding to the overall positive experience. A book exhibition and painting exhibition added more charm to Dhanak 2023.


2K
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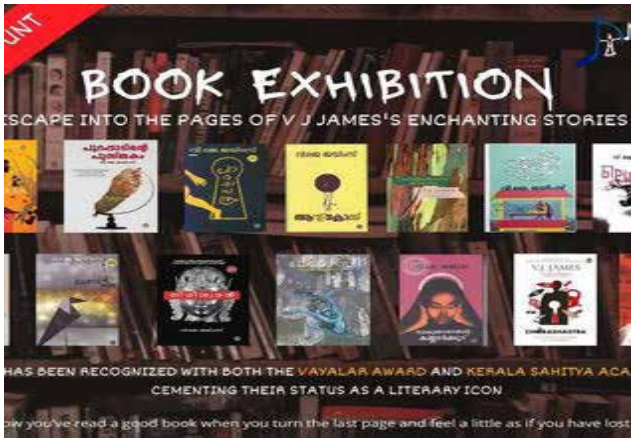

BOOK EXHIBITION
ESCAPE INTO THE PAGES OF V J JAMES'S ENCHANTING STORIES
HAS BEEN RECOGNIZED WITH BOTH THE VAYALAR AWARD AND KERALA SAHITYA ACA
CEMENTING THEIR STATUS AS A LITERARY ICON


Experience a world of colour and creativit
Painting exhibiti
is poetry that is seen rather than felt, and poetry is painting that is felt rather

6.1.4. Konchords

It is an evening of cultural explosiveness organized by the Music club hand in hand with the drama club and the dance club every semester. This event is a perfect opportunity for everyone to showcase their affinity for the performing arts on stage in front of a large audience under the open skies. The event was organized in the Amphitheatre under the starry skies of April. It included a plethora of cultural programmes with 35+ events including band performances, solo singing, solo dancing, standup comedy, group dance and singing, and acting. The open air theatre saw the biggest crowd gathered together during the semester.

6.1.5. MUN

The 10th edition of Annual Inter-College/University Model United Nations (MUN) organized from March 4-5, 2023 was inaugurated by Shri. T.P. Srinivasan, IFS(Rtd), former Indian Ambassador and permanent representative of UN. MUN is a simulation conference depicting the UN where students represent nations as diplomats. 78 students from different colleges and Universities discussed in two councils - UNHRC (United Nations Human Rights Council), UNCOPUOS (United Nations Committee On Peaceful Uses of Outer Space) where students from different colleges.



6.1.6. Induction Programme


The induction programme for the 2022 incoming batch of B.Tech. students at IIST was held from October 31-November 4. The programme was inaugurated by Dr. S. Unnikrishnan Nair, Director, IIST. The sessions were designed to provide information and support on issues relevant to new students and also to facilitate the ease of transition into the life of IIST as well as encouraging academic and personal success. It had various sessions handled by Registrar, Deans, the 7 different departments and by various units of IIST. Sessions on softs skills, life skills, drug abuse, personal

hygiene, yoga and basic self-defence techniques based on kalarippayattu, the ancient martial art form of Kerala also formed part of the program.

6.1.7. Mentoring System

IIST has an actively functioning mentoring committee under the Students Activity Board (SAB) since 2014. With the intricate landscape of academia and the demanding challenges posed by the field of space science and technology, a dedicated mentoring system becomes a compass guiding students towards academic excellence and personal growth. The system fosters a nurturing environment where experienced mentors guide and inspire students, facilitating their personal development, instils confidence and nurtures a sense of belongingness. By pairing students with experienced mentors, IIST ensures that each student receives personalized attention, tailored advice, and a platform to explore their aspirations. This mentoring system acts as a cornerstone supporting the students at times of need and helping the students to flourish into well-rounded professionals.

6.2 Outreach Programmes

6.2.1 Outreach by NIRMAAN

With a will to "demystify" science to the less privileged tribal students, the social outreach club of IIST- Nirmaan organized camps for the students of the tribal settlement of Thenmala, Njaruneeli and Athirapalli forest division. These camps organized from December 31, 2022 to January 2, 2023, January - March, 2023 weekends respectively, in collaboration with the Kerala Forest Department was an attempt to transform a routine curriculum subject into a lifelong passion among the forest-dependent communities in the State. School students of the tribal hamlet made their active presence in these programmes.

Titled *Arivanka Karumam* (which stands for Knowledge Village in the dialect spoken by the native Kanikkar tribe), the science camp of Villumala also witnessed students interacting with S. Unnikrishnan Nair, Director, IIST; Dr Y.V.N Krishnamurthy, Registrar, IIST; Dr Lekshmi V Nair Professor, IIST and the NIRMAAN volunteers. Smt. Bindya KY, Deputy Registrar of IIST also visited the camp.

Through the different classes, the vounteers had made an attempt to simplify concepts and scientific principles to help students enjoy science and understand its significance and application in our everyday life. The first session,

Vihang - The Water Rocket Workshop, introduced them to "the science of rocketry", de-constructed with simple water rockets, the second one, Lumière, threw light on optics. The participants also designed a water rocket with the guidance of the NIRMAAN volunteers. in the third session, aptly named after the *Harry Potter* spell, the students observed simple phenomena that at first sight seem so mysterious but in fact can be attributed to basic scientific laws and principles, such as friction and static electricity. Night sky observation with a telescope was the most sought after session. A number of villagers also turned up for the sky watch and many were excited to observe the magnified image of moon with all the craters. It took them on a virtual tour of the universe by unravelling the mysteries of space. The final session, Hakuna Matata (meaning 'no worries' in Swahili), takes a thematic deviation and had classes on career guidance and personality development to help prepare the students for their journey ahead. Details about different kind of Government schemes for the tribal community, internet banking, investment schemes etc were discussed which was followed by an introduction to computer and its basic working principles, working of social media, Wikipedia etc. Based on the special request from the officers of the forest department a special lecture on the harmful effects of drugs among the youth was also arranged. From lectures with demonstrations and do-it-yourself experiments, the sessions really ignited the scientific curiosity among the students.

During the conclusion session prizes were distributed to all the students along with certificates from forest department. Five best performers were presented a globe and "Wings of fire" written by Dr. APJ Abdul Kalam.

6.2.2 Programmes for the students of Ponmudi Government UP School

The social outreach club - NIRMAAN took sessions for the students during the first half of the odd semester of 2022. Nirmaan and AeroClub IIST jointly organized a session for the UPS Govt. school in Ponmudi on October 1, 2022. 17 students participated in the session. The ideas was to get them excited about rockets, aircrafts, drones and Aerospace engineering in general. They also flew one of their aircrafts and a drone made by one of their batch mates.



As major portion of the Ponmudi road at the 12th curve caved in, the family members of the students were finding it difficult to buy provision. NIRMAAN volunteers provided 37 kits worth Rs. 30,000, to 37 families of the school students to meet their daily needs during this hard time. The kits contained essential household items funded through donations. During the closing ceremony the club gifted the students pocket dictionaries, footballs, throw ball, carrom board and chess boards.

Installation of Smart Classroom in Government Upper Primary School at Ponmudi by IIST AP-S and MTT-S Student Branch Chapters


There is always a spectrum of opportunity, even in difficult time which was realized during the pandemic with covid enforced prolonged lockdown. A key takeaway evolved during the pandemic is the highly effective and successful remote education and teaching-learning process through smart facilities. IEEE AP-S and MTTS Student Branch Chapters of Indian Institute of Space Science and Technology in collaboration with Government Engineering College Barton Hill and AP-MTT-S Kerala section, successfully installed a Smart Classroom in Ponmudi Upper Primary School on July 28, 2022. The project was funded by Committee on Promotion of Equality (COPE) of IEEE Antennas and Propagation Society. The smart classroom at Govt. UP school was inaugurated by Dr.Y.V.N. Krishna Murthy, Sr. Professor, and Registrar IIST in august presence of Prof. Jawad Y. Siddiqui, Chair AP-S SIGHT commitee on July 28, 2022.

6.2.3 Beach Cleaning Drive

Twenty five students from IIST participated in the 'Swachh Sagar, Surakshit Sagar' campaign organised at the Kovalam beach. The 'Swachh Sagar, Surakshit Sagar' campaign was launched by the Ministry of Earth Sciences in association with the Indian Coast Guard, Ministry of Environment, Forest and Climate Change, National Disaster Management Authority, Seema Jagran Manch, Students for Development, and other organisations.

6.2.4 Nabh-Sparsh

On the occasion of World Space Week, a 1-day workshop Nabh-Sparsh was organised for college students (Bachelors and Masters level) on October 10, 2022. Nearly 45 students from 11 colleges of Thiruvananthapuram participated in the workshop. The workshop included lectures, lab-visits and demonstration activities. The workshop was supported by sponsorship from the Dept of Science and Technology (DST) and IIST.

6.2.5 Episteme

Episteme 2022, a camp for the highly abled students was organized in association with Pravaha- Agastya Foundation from June 6-17, 2022. 36 students who have demonstrated capabilities much ahead of their age in fields such as science and mathematics were selected for the camp. The camp was an expedition into the world of space science, math and natural sciences. The camp included expert lectures, scientific experiments, demonstrations, cultural events and visits to certain places of academic importance.

The camp was inaugurated by Dr. Y. V. N. Krishna Murthy, Registrar, IIST on June 6, 2022. Along with the 36 highly abled students and volunteers from Pravaha and Agastya Foundation, the faculty members, staff and students from IIST attended the programme.

6.2.6 YUVIKA - YUva VIgyani KAryakram (Young Scientist Programme) @ IIST

Students who got selected for the YUVIKA YUva VIgyani KAryakram (Young Scientist Programme) organised by ISRO visited IIST on May 23, 2022. Prof. Kuruvilla Joseph, Dean, Student Activities, addressed the students. A short video on IIST was played for the students to understand the academic programmes and life in the IIST campus. Students visited the ground station and the telescope in IIST. Dr Raveendranath, Dr Sudharshan Kaarthik, Dr Anand Narayanan, other faculty members and research scholars engaged the budding scientists.

6.2.7 English Language Support Programme

Dr Mackenzie Bristow from the University of Emory offered English programme at IIST from January 16 - Feb 22, 2023 as part of the English Language Support Programme offered by the Regional English Language Office of the US Embassy. The six weeks' piloted teaching programme consisted of modules in technical writing for B.Tech. first semester students and research writing programme for M.Tech. and Ph.D. scholars. Dr. Bristow with her pilot courses, employed sessions for technical writing including sending email, while thrusting on the English for Specific Purposes and Task-based language learning to enhance the students' language development. She also took sessions for the Ph.D. scholars to facilitate academic writing, fundamentals of peer review and revising, summarizing and paraphrasing techniques and online and corpus-based tools to improve written mechanics and grammar. Dr. Bristow also delivered a talk to the faculty members on "Bridging the Gap between Science and Communication."

6.3 Clubs

Guided and supported by faculty members of IIST, the following clubs functioned in IIST in the year 2022-23

6.3.1. IEEE Student's chapter

IIST has an active IEEE Student Branch functioning, since 2011. During the last one year, the student branch has organized several student-driven events and talks. IIST IEEE Industry Applications Society (IAS) Student Branch Chapter has been actively engaged in numerous activities over the past year.

Invited Talks

The club organized a talk on Electrical Power Systems and Converters for LV and Satellites by Shri. Manoj from IISU. The club was honoured to have Dr. Harish Sarma Krishnamoorthy from the University of Houston, Texas, delivering an expert talk on Powering Critical Applications on Earth, Moon, and Beyond.

IEEE MTT-S Kerala chapter and AP-MTTS Student Branch Chapters of Indian Institute of Space Science and Technology jointly organized an invited webinar talk on Emerging Trends in Reconfigurable Antennas for SatCom Applications on April 9, 2022. The technical talk was delivered by Dr Milind B Mahajan, Scientist, SAC Ahmedabad

Along with AP-MTT-S student branch chapters of GEC Barton Hill a L4 talk by Dr B N Suresh, Chancellor, IIST on Decision making and its impacts was organized on May 13, 2022.

Webinar talk on GNSS Technology

The technical talk was delivered by Shri Hemachandran S, Executive director, KELTRON on May 25, 2022. The talk focused on the applications of the technology along with the existing problems and potential solutions.


IEEE
DECISION MAKING
AND ITS IMPACTS
INVITED TALK ON
Emerging Trends in Reconfigurable
Antennas for SatCom Applications
Dr. Milind B. Mahajan
ISRO SAC, Ahmedabad
Indian Regional Navigation Satellite Syste
IRNSS - NavIC constellati
WEBINAR ON GNSS
TECHNOLOGY
2 DAYS ADVANCED WORKSHOP
HFSS Training & Antenna Fabrication

Women in Microwave colloqium

The event featured talks by Smt. Indu Gopan, ISRO, Dr. Debaraty Ganguly, IISc, Dr. Deepthi Das Krishna, CUSAT and Ms. Elizabeth George, IIST on July 27, 2022.

IEEE IIST SB AP-S COPE Funded Smart Classrooms in underprivileged Schools in India

A smart classroom facility was installed at Government Upper Primary School at Ponmudi, Kerala, (India) and Asananagar High School, Nadia, (India). The class room was inaugurated by various distinguished professors. The event was reported by a local media news outlet.

Two-Day Antenna Workshop

The training session held on August 19-20, 2022 was handled by Mr Shashikumar R and Mr Kamlesh Kumar, Entuple Technologies. The training began with the introduction to the software followed by basics of antenna design which will suit the beginners in the field. The first day covered the introductory lessons and the modal decomposition methods and the simulation considerations of electrically large structures and reflect arrays. The second day addressed discussed on the antenna fabrication with MITS-21 precision. The session focused on the application of the software for extracting the accurate results by simulating the design under consideration.

Learning With Graph Structured Data

IEEE Student Branch of IIST organized a talk by Rahul Singh (currently with Georgia Institute of Technology, Atlanta, United States) on Learning with Graph Structured Data on September 21, 2022. The speaker, Rahul Singh, is an alumnus of IIST who is now pursuing Ph.D. in Machine Learning at Georgia Institute of Technology, Atlanta, United States. The talk discussed inference and learning from aggregate data generated by a large population of individuals following a certain probabilistic graphical models (PGM).

Distinguished Lecture

IEEE AP-MTT-S Kerala section, AP-MTTS Student Branch Chapters of Indian Institute of Space Science and Technology and Government Engineering College Barton Hill jointly organized a distinguished lecture by Dr Debatosh Guha on September 24, 2022.

Space Startups Meet

Several notable startups including GalaxEye, Pixxel and Inspecity organised several events from October 27 to 28, 2022, included a conference, exhibition and workshops. The event were sponsored by GalaxEye Space. The conference gave the invitees a platform to present their technology and opportunities they have for students to work with them The student satellite team of IIST conducted a workshop on structural simulation as a part of the event. The workshop on Synthetic Aperture Radar processing was conducted by GalaxEye Space and headed by co-founder Mr. Denil Chawda.

Social Outreach Programs

The student volunteers of EdSoc teamed up with NIRMAAN club(Social outreach club of IIST) to hold interactive sessions teaching and demonstrating simple scientific experiments to increase interest in STEM field among the younger generation. The event was done at 2 government schools at Karipoor and Ponmudi on October 29, 2022.

Three Minute Project Thesis Competition

IEEE IIST Student Branch, IEEE AP-S, MTT-S, and IAS SBC IIST, and Conscientia (Annual Astronomy and Technology Festival) of Indian Institute of Space Science and Technology in association with IEEE AP-S and MTT-S Kerala Chapter organized a Three Minute Project Thesis Competition (3MPT) on November 5, 2022. This event is a chance for undergraduates and post-graduates to showcase and present their innovative projects.

Capture The Flag (Ctf)

IIST's IEEE Student Branch, in collaboration with the Conscientia 2k22, conducted a mind-bending CTF for the first time in the history of IIST on November 6, 2022. The competition based on cybersecurity skills in a real-time, fast-paced challenge solving game.

Treasure Hunt and Tree Plantation

The treasure hunt competition was organized as a part of IIST's technical fest on November 6, 2022. The competition involved challenges requiring engineering and mathematical aptitude. The competition was the most participated event at Conscientia with over 250 participants in 53 teams. The challenge was held in partnership with Tree Tag, a company that plants and geotags trees based on donation requests. EdSoc branch raised funds for 10 trees to be

planted by the students and an additional 30 trees were planted on behlaf the EdSoc Branch of IIST. The trees were planted at a government school in Meenamkulam.

Speciality Workshop On Handling Multi-Source Remote Sensing Data On Open-Source Platforms

The workshop aimed to enhance the knowledge of handling multi-source data and applying machine learning algorithms efficiently with interactive hands-on session on November 22, 2022.

Indian Medical Device Regulation: A Walkthrough

Ms. Amrutha C., Scientist 'C', Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum talked about regulatory affairs for medical devices, risk analysis, and post-market surveillance. The talk organised on November 29, 2022 was conducted virtually and 87 participants were presented during the talk. The virtual and physical memento was presented to the speaker by Dr. B.S. Manoj.

Powering Critical Applications On Earth, Moon And Beyond

An expert talk on Powering critical applications on earth, moon and beyond was delivered by Dr. Harish Sarma Krishnamoorthy, University of Houston, Texas on December 21, 2022.

Walk With Legend

The informal interaction organised on December 4, 2022 at Kanakakkunnu Palace, Trivandrum with Dr Goutham Chattopadhyay, Scientist NASA, gave the students a perfect platform to explore the possibilities of expanding the professional life. Dr T J Apren, Dr Chinmoy Saha and Mr Arijit Mitra took part in the event. The event which lasted for 2 hrs witnessed participation of 15 entries.

Advanced Antenna Workshop

Dr S. Unnikrishnan Nair, Director IIST and Dr Y V N Krishnamurthy, Registrar IIST graced the event and felicitated the programme conducted on December 5, 2022. The event featured talks by Dr Goutham Chattopadhyay, NASA, Dr K J Vinoy, IISc, Dr Immanuel Raja, IIST, Dr Priyadrshanam, IIST, Dr B S Manoj and Dr Chinmoy Saha , Dr T J Apren and Dr Ajay Pasulupetti, Ooga technologies. A Ph.D. WiM session was also arranged featuring the talks by Ms Ansha K K, CUSAT, Ms Chithra Liz Paulson, CUSAT, Ms Elizabeth George, IIST and Ms Gopika R, IIST.

6.3.2 Mathematics Club

The objective of this club is to provide a platform for having open discussions on any topic in Mathematics. *As part of* **Discussion** *of the* **Month** the following talks were organized by the club:

July 1, 2022	James T Kurian	The Poincaré-Bendixson Theorem
Sept 24, 2022	Jogender Singh	Fractal Geometry - an Introduction to Julia and Fatou Sets
Oct 7, 2022	Sidhartha Patnaik	Control Theory: History, Perspectives, Achievements, and Approaches
Nov 9, 2022	Janakiraman B.	Ring theoretic properties of C[0,1]
Dec 14, 2022	Sonu Bose	Efficient Numerical methods for Singularly Perturbed Differential Equations
Jan 11, 2023	Anjuna Dileep	On unique determination of unknown spatial load in a damped Euler Bernoulli Beam
Feb 8, 2023	Utkarsh Rajput	Formal systems and their applications
Feb 22, 2023	Subrahamanian Moosath K.S.	Some Basic Geometrical Concepts for Partial Differential Equations
Mar 29, 2023	Sudheer Mishra	Groups and their conjugacy

6.3.3 Astronomy Club

The Astronomy Club had a few weekly sessions, conducted usually on a Friday night, saw students come together from almost all the years and branches, for presentations, quizzes and discussions. The presentations were on a broad range of topics, from introductory astronomy to intermediate astrophysics, with speakers having varied levels of expertise. Faculty from the Department of Astronomy and Astrophysics also readily agreed to take out the time and present to the students, which were all received with enthusiasm and curiosity.

6.3.4 Jivyantra, Robotics Club IIST

The Robotics Club at IIST, known as Jivyantra, is dedicated to fostering a passion for robotics and technology among students. Jivyantra, the Robotics Club at IIST, is committed to merge the worlds of life and machines and to create a vibrant space for students to immerse themselves in technology, encouraging not just discussion but a way of life centred around robotics. From late-night code sprints to discussions on cutting-edge breakthroughs, the club aims to promote learning, idea sharing, innovation, and knowledge exchange.

The club has done a significant work in Embedded Systems and has worked with various microcontrollers and microprocessors such as Arduino, Raspberry Pi, and NodeMCU. The other events are the following

Monthly lecture series with hands on for the club members

Robotics Club does not look for talent, but it manufactures it. New junior members of the club were trained through various lectures. Starting with Shoonya, monthly lecture series were organised on Pratham, Dwitiya, Tritiya, and Chaturth to train the club members. The club has planned to continue this lecture series.

Conscientia 2023

During Conscientia 2022, the annual technical fest at IIST, the Robotics Club organized several successful events:

- **Arduino Hackathon**: An event promoting creative solutions using Arduino-based projects.
- **Line Follower**: A competition challenging participants to build robots capable of autonomously following predefined paths.
- **Maze Solver**: An event focused on the development of robots capable of navigating complex mazes.
- **Battle of Bots**: A thrilling robot combat competition that attracted participants from various institutions.

The club actively participated in events organized by other institutions and colleges, including Maze Solver and RoboSoccer competitions at LBSITW Poojappura, Trivandrum. This strengthened the presence of the club in the wider robotics community.

Arduino Hackathon event

Battle of Bot event at Conscientia 2023

Line follower event

Maze solver event at Conscientia 2023

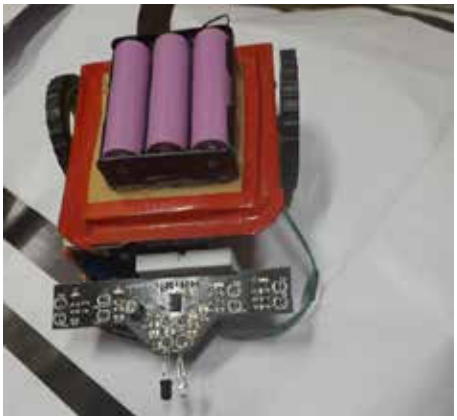
Workshops

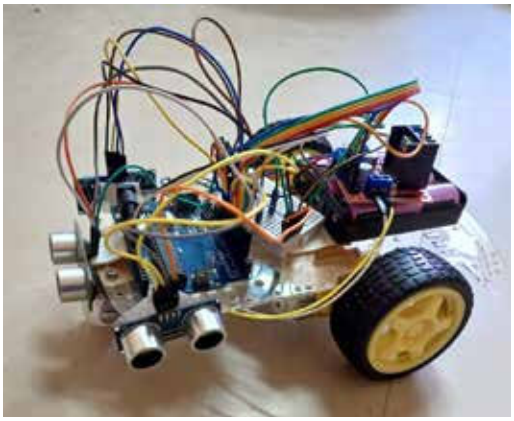
Jivyantra aims to foster creativity among school students also. Our club organized workshops for students of Holy Angels' ISC School, Thiruvananthapuram in March 2023

Projects

Despite resource constraints, the members successfully undertook various projects throughout the year, including:

- Wheeled bot responding to hand gestures and speech recognition.
- Line Follower Bots: Robots capable of autonomously tracking predefined paths.
- Object Avoidance Bots: Robots equipped with sensors to detect and avoid obstacles.
- Maze Solver Bots: Robots programmed to navigate intricate mazes.
- Remote-Controlled Car: An exploration of remote-control technology.





6.3.5 Aeroclub

The year began with the induction of the 2021 batch. This marked the beginning of a thrilling journey for the new members, who were eager to contribute their passion and expertise to the club's activities. The 2021 batch took up the challenge of building remote-controlled (RC) planes and successfully completed two projects: "Chintu" and "F22 Raptor". After finishing the building of the aircraft, the senior batch of 2020 organised a memorable flying session for Albatross, a RC plane built by 2020 batch. The event also includes the flying of the two new RC aircraft created by 2021 batch, enriching the experience for all the members. In November, Aeroclub played an active role in organising events during conscientia 2022, IIST's annual technical fest such as Techglide, RC car, RC Plane and Water Rocket.

Continuing the tradition, the Aeroclub welcomed the talented members of the 2022 batch. This induction marked the beginning of another exciting chapter, as fresh minds joined the club to explore the world of aviation and contribute to its activities. To encourage active participation, the club organized "Aeroglide," a glider-making competition that allowed juniors to showcase their creativity and engineering skills. Throughout the year, the Aeroclub organized various workshops to enhance members' knowledge and skills. A notable workshop on OPEN VSP, conducted by an M.Tech. senior. Additionally, workshops were even conducted jointly by the Aeroclub and IEEE on UAV Design for TKMCE college, fostering interdisciplinary collaboration and knowledge exchange. Recognizing the need for virtual engagement, the Aeroclub launched an initiative called "Aerotrivia". This online aeroclub quiz, held fortnightly, provided members with a platform to test their knowledge and engage in healthy discussions. We also setup an aircraft called "Grey wind" which was a built by a former aeroclub member. It was capable of complete autonomous flight. Could do way point missions, auto take-off, loiter etc. We used it for flying in a specific path for an M.Tech. project.

As the academic year drew to a close, the 2021 batch of the Aeroclub collaborated with Jivyantra, the robotics club of IIST. This collaboration resulted in the inception of some of the project ideas of the 2022 batch. Ending the academic year by a farewell to our aeroclub coordinator Sanjay. As our coordinator, he has always been there for us, encouraging and motivating us to pursue our dreams and helping us overcome any challenges that came our way.

From the induction of new members to the successful completion of RC plane projects, from organizing events during Conscientia 2022 to fostering collaborations with Jivyantra, the club has consistently pushed the boundaries of aerospace exploration and innovation. With each passing year, the Aeroclub continues to inspire and nurture the next generation of enthusiasts.

6.3.6 IIST Quiz Club

The Quiz Club of IIST is an informal gathering of quizzing enthusiasts which meets every Friday to hold a quizzing session. The club was established in the year 2008. The club is one of the most regular clubs on campus. Teams of two take part in the quiz which is usually held by a volunteering member (or team). The club members have organized quizzing events during the Azadi Ka Amrut Mahotsav and as part of Swachh Bharath program.

6.3.7 Movie Club

The Movie and Performing Arts Club of IIST is an active student club which holds its sessions approximately once every two weeks on Saturday nights. These sessions usually consist of the screening of award-winning and critically acclaimed movies. This year, the club has seen an admirable increase in the staging of skits and short plays, written by the students themselves, which has popularised a healthy culture of performing arts and stagecraft in the college.

6.3.8 Physics Club

Physics Club endeavours to instill curiosity amongst IISTians regarding Physics. Our one and only motto is 'Question Everything'.

6.3.9 Music Club

The Music Club at IIST (Indian Institute of Space Science and Technology) resonates with melodious harmony, creating a symphonic haven for budding musicians to explore their passion and cultivate their talents. With a diverse array of instruments and genres, the club serves as a creative outlet for students to engage in soulful compositions, rhythmic arrangements, and captivating performances. Beyond the notes, the Music Club fosters a sense of camaraderie, encouraging collaboration and artistic growth. By organizing captivating events and performances across the campus, the club enriches the cultural tapestry of IIST and provides a platform for musical expression to flourish. Through their melodious endeavors, the Music Club strikes a chord that harmonizes with the spirit of creativity and community at IIST. The following programs were conducted by the music club during the reporting period.

Music Club Induction Programme

The incoming batch of 2022 was welcomed to the campus on March 6, 2022 and the music club induction programme was held. They were made aware of the music club events and new and innovative events were planned to make the new semester as eventful and colourful as possible.

Jamming Sessions

These are the most fun part of the club, where all the students just come sing, jam and compose music together. The most creative vertical of Music Club, the Jamming session was held on May 21, 2022.

Independence Day 2022 and Republic Day celebrations

As a part of Independence Day celebrations, the entire weekend around 15th August was dedicated to celebrating 75 years of independence. The music club heartily took part in the event by collaborating with the drama club and the dance club to put up a fantastic cultural programme on Independence day and Republic day. A Mega cultural evening was also organized on the evening of August 14, 2022. Many events like Antakshari was hosted and cultural performances were done by the Music Club. Not only the students, but also the faculty and their family took part in the festive occasion.

6.3.10 Drama Club

The Drama Club is a vibrant and creative community dedicated to fostering a love for the dramatic arts among its members and the wider campus community. Throughout the year, the club has organized a wide range of activities. They have staged captivating and thought-provoking theatrical performances, ranging from classic plays to contemporary productions, providing entertainment and cultural enrichment to the IIST community. Additionally, the club frequently collaborates with other student clubs, fostering a dynamic and inclusive atmosphere for all those interested in the world of drama and theater.


6.3.11 Photography Club

The Photography Club at IIST serves as a creative haven for individuals passionate about capturing moments through the lens. With a shared enthusiasm for visual storytelling, club members come together to hone their photography skills, exchange artistic ideas, and showcase the world through unique perspectives. The club has helped IIST by providing photos for the annaual report and Self Study Report of NAAC. Through workshops, photo walks, and exhibitions, the Photography Club enriched the campus culture by infusing it with vivid imagery and a profound visual narrative, thereby encapsulating the essence of diverse experiences within the IIST community.



6.3.12 Dance Club

The Dance Club at IIST ignites the campus with the rhythmic energy of movement, providing a vibrant platform for self-expression and cultural celebration. Through captivating performances and engaging workshops, the club not only refines the dancing skills of its members but also weaves a tapestry of artistic inclusivity. During the reporting period they have contributed to significant occasions like the induction programme for the freshers, flash mob for increasing awareness of Space Program, Konchords, Independence day, Republic Day and Dhanak, thereby infusing these events with an extra layer of dynamism and joy. These programs serve as a testament to the club's commitment to fostering unity and diversity, while also showcasing the richness of dance as a universal language that transcends barriers. In doing so, the Dance Club enhances the vibrant spirit of IIST's cultural fabric and leaves an indelible mark on its community.


6.3.13 NIRMAAN - Social outreach club

With a will to "demystify" science to the less privileged tribal students, the social outreach club of IIST- Nirmaan organized science camp for the students of the tribal settlement of Thenmala and Athrirapally forest divisions and for selected students of Government Upper Primary School, Ponmudi. These camps were organized in collaboration with the Kerala Forest department and was an attempt to transform a routine curriculum subject into a lifelong passion among the forest-dependent communities in the State.

6.3.14 ANANTA - Yoga Club

The Yoga Club at the Indian Institute IIST is a vibrant hub for promoting physical and mental well-being among its students. Offering a diverse range of activities, the club conducted regular yoga sessions, meditation workshops, and wellness events. The club celebrated International Yoga day on July 21, 2023. Prior to International Day of Yoga, as suggested by Ministry of Ayush, IIST Yoga Club along with the The Art of Living Foundation of Thiruvananthapuram organized a wellness programme for IIST community on April 8, 2023. These activities aim not only to enhance flexibility and fitness but also to cultivate a peaceful and focused mind. The club often collaborates with experienced instructors and experts to provide valuable insights into the holistic benefits of yoga. Additionally, special events like yoga retreats and awareness campaigns contribute to fostering a health-conscious and balanced lifestyle within the IIST community.

6.4. Outreach Lectures by Faculty members

Sl.No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
Department of Aerospace Engineering				
1	Deformation processing of metal matrix composites, National symposium on Interdisciplinary Approaches in Materials Development for Strategic and Health Sectors	Chakravarthy P.	National Institute of Interdisciplinary Science and Technology, Thiruvananthapuram, July 8, 2022	
2	Flux bounded tungsten inert gas welding - mechanisms and processes, Indo-German Joint Scientific Workshop on similar/Dissimilar Materials Welding of Automotive & Aerospace Sectors (WSM 2022),	Chakravarthy P.	Vellore Institute of Technology, Vellore, September 23, 2022	
3	Science of Indian percussion drum at LBS college of engineering kasargod, in connection with the state wise inaguration of the national technological day celebrations	Praveen Krishna I.R.	Kerala State Council For Science, Technology And Environment (KSCSTE) and APJ Abdul Kalam Technological University	Invited lecture
4	Semi-analytical solution techniques for solving mechnaical systems with localized nonlinearities in	Praveen Krishna I.R.	One day training programme on Nonlinear Vibrations: Incorporating structural nonlinearities in predicting dynamic characteristics, HRDD, VSSC, June 30, 2022	Invited lecture
5	Experimental Evaluation of Nonlinear Normal Modes of a thin and highly flexible cantilever beam for A	Praveen Krishna I.R.	National Symposium on Vibrations: Modelling and Measurement, IIT Madras	Invited lecture
6	Conclave on Strategic and Regional Materials	Prathap C.	CSIR-NIIST, March 15, 2023	Invited lecture
7	Delivered 15 lectures to 6th sem B.Tech. Mechanical students in the topic of Introduction to combustion, flame and its applications	Prathap C.	Department of Mechanical engineering, Mepco Schlenk Engg. College, Sivakasi, January 20-21, 2023	Invited lecture
8	Effect of addition of H2 on Oil India Limited	Prathap C.	IIST, September 29, 22	Project progress meeting
9	Presentation about IIST and Indian Space Program	Shine S.R.	Institute of Research in Astrophysics and Planetology UniversitÃ© Paul Sabatier, Toulouse, December 5, 2022	
10	ISRO exploration program, and research on thermal modelling of astronauts	Shine S.R.	CNES, Toulouse, December 6, 2022	Invited talk
11	Development of human thermoregulation model and Research on heat transfer related to space applications at IIST	Shine S.R.	InstitutSupÃ©rieur de l'AÃ©ronautique et de l'Espace, ISAE SUPAERO, Toulouse, December 5, 2022.	Invited talk
12	Indian Space Research Organisation, ISRO and IIST's initiatives towards the Indian Space Program	Shine S.R.	InstitutSupÃ©rieur de l'AÃ©ronautique et de l'Espace, ISAE SUPAERO, Toulouse, December 8, 2022	Invited talk

Sl.No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
13	Mechanical Engineering- Nature / Bio Inspired avenues and contributions: Design and Manufacturing perspective	Sooraj V. S.	MCET- KTU, Trivandrum, November 11, 2022	Invited talk
14	Medium Independent Jet (MI-Jet) Engine for Hypersonic Propulsion	Aravind V.	PRL, Ahmedabad, February 2, 2023	Invited talk
	Department of Avionics			
15	Design Methods for PID-type (i.e. P, PI, PD, PID) Controllers, High-end workshop on Recent Trends in Soft sensing and State Estimation RTSSE-2022	N. Selvagenesan	NIT Calicut, July 21, 2022	Invited talk
16	Limit Cycle Predictions for System with Nonlinearity, High-end	N. Selvagenesan	Workshop on Smart Energy Systems For Sustainable Smart Cities : A Research Perspective, NIT, Puducherry, February 22, 2022.	Invited talk
17	Efficient Spectrum Utilization and Future Communication Systems	S. Chris Prema	LBS Institute of Technology for Women, Thiruvananthapuram, January 19, 2023	Invited lecture
18	Modelling and Control of Robots	Sam K. Zachariah	FDP organized by Govt Engg Collage, Palakkad. November 5, 2022	Invited talk
19		Sudharshan Kaarthik	KTU sponsored FDP at Muthoot Institute of Technology and Science, Cochin, January 17, 2023	Resource person
20	Introduction to software defined radio - IEEE COMSOC	Sudharshan Kaarthik	National Workshop on Electric Aircraft and Allied Technologies at CSIR-NAL Banglaore, April 28-29, 2022	Invited talk
21	Reinforcement learning for communication networks	Vineeth B. S.	FDP, organized by EICT, NIT Warangal, April 2022.	Invited talk
22	Digital communication - using Scilab	Vineeth B. S.	KTU-FDP, Mohandas College of Engg. and Technology, August 2022	Invited talk
23	Design and Development of Wearable Antennas for Biomedical Applications	Basudev Majumder	2 days Hands on Workshop organized by TIET-Virginia Tech Center of Excellence in Emerging material through virtual mode at Thapar Institute of Engineering and Technology (TIET) on February 16-17, 2023	Invited Lecture
24	Final review meeting for the DST Inspire Project	Basudev Majumder	DST Inspire, Indian National Science Academy, New Delhi on April 3, 2023	Participation
25	Integrated Sensing And Communication System- Evolution, Applications, And Open Research Areas	Vanidevi	National conference on Emerging Trends in Information and Communication Engineering -CARE college of Engineering, Trichy- May 2022	Keynote address
26	MEMS Beam-Mass and Beam- Membrane sensors with Electromechanical Transduction elements, INUP- i2i	Seena V.	Hands-on Training Workshop on Fabrication and Characterization of MEMS Devices IIT Bombay February 16, 2023	Invited Lecture

Sl.No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
27	MEMS: Microscale Machines & Nanomechanical Sensors	Seena V.	35th Kerala Science Congress, February 2023	Invited Lecture
28	MEMS Physical Sensors with Integrated FET based Electromechanical Transduction	Seena V.	6th IEEE International Conference in Emerging Electronics, Hilton, Bangalore, December 12-14, 2022	Invited Lecture
29	MEMS: Microscale Machines and Sensors -The Modern Lilliputians	Seena V.	Jawahar Navodaya Vidyalaya , Regional Children's Science Congress, NIIST, November 2022	Invited Lecture
30	CMOS-MEMS and Polymer MEMS for Nano Electro Mechanical Sensor Systems	Seena V.	Training Programme: Advanced Avionics-Advances in Avionics Industry & New Fabrication Techniques, Vikram Sarabhai Space Centre, Thiruvananthapuram, September 29-30, 2022	Invited Lecture
31	CMOS Power Amplifiers for 5G -	Immanuel Raja	IEEE Advanced Workshop on Microwave and Antennas, Thiruvananthapuram December 5, 2022	Invited Lecture
32	Microwave for Humanities	Chinmoy Saha	International Microwave and Antenna symposium), German University in Cairo, Cairo, Egypt, February 6-10, 2023	Invited Lecture
33	Trends, Techniques and Future Challenges in Antenna Engineering for Ground, Space and Versatile Applications	Chinmoy Saha	2nd International Conference Computational Systems and Communication (ICCSC 2023), LBSIT, Trivandrum, March 04, 2023.	Invited Lecture
34	Metamaterial Inspired Concepts: Trends, Techniques and Applications for Antenna Engineering'	Chinmoy Saha	National Science Day Celebration, University of Calcutta, India, February 28, 2023	Invited Lecture
35	Multifunctional UWB Antennas: Trends, Techniques and Application	Chinmoy Saha	4th International Conference on Computer, Communication and Devices, Haldia, WB, India, March 02, 2023.	Invited Lecture
36	Metamaterial Inspired Antennas: A Journey for a Decade and Future Directions	Chinmoy Saha	ISRO Satellite Tracking Centre (ISTRAC), Bangalore, India. December 16, 2022	Invited Lecture
37	Spectrum of Opportunities for Antenna Engineers: Academic, Research and Leadership Perspective	Chinmoy Saha	IEEE AP-Society AGM , Cochin, India, November 12, 2023	Invited Lecture
38	Trends, Techniques and Future Challenges in Antenna Engineering for Ground, Space and Versatile Applications	Chinmoy Saha	IEEE MTT-S Workshop, at IIT Kanpur, India, September 17, 2022	
39	Technologies for the Benefits of Humanity: Recent Activities of IEEE IIST Student Branch Chapter for Tribal School in Kerala	Chinmoy Saha	IEEE AP-S and MTT-S SIGHT workshop, MAPCON 2022, Bangalore, Indi, December 12, 2022	
40	Teaching and Research in Higher Education for Societal and Humanitarian Benefits: An Unique Example on Vision & Mission of Dr. A.P.J. Abdul Kalam	Chinmoy Saha	Faculty Induction Programme, UGC-Human Resource Development Centre, The University of Burdwan, WB, India, (August 25-September 23), 2022, September 05, 2022	

Sl.No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
41	Cognitive Radio for Strategic Applications	B. S. Manoj	CDAC Trivandrum. January 20, 2023	panel discussion talk
42	Recent advances in Internet of Medical Things	B. S. Manoj	Ignium - 2022 Flagship student conference of IEEE EMBS Kerala Chapter December 28, 2022	Inaugural lecture
43		B. S. Manoj	IEEE JC Bose Memorial Talk and EMBS Awards function jointly organized by IEEE EMBS, MTTS, and APS Kerala Chapters at Hotel Apollo Dimora, Trivandrum.	Welcome address
44	Advanced Satellite Networks	B. S. Manoj	advanced Microwave Workshop organized by IEEE MTTS and APS Kerala Chapters at Hotel Apollo Dimora, , Trivandrum, December 05, 2022	Keynote address
45	Areas and Possibilities for Collaboration between IIST and SCTIMST	B. S. Manoj	Sri Chitra Tirunal Institute of Medical Sciences and Technology, Trivandrum. November 11, 2022	
46	Multi-Modal Teaching for Education 4.0	B. S. Manoj	Institution of Engineers (India) State Center, Trivandrum, August 17, 2022	Invited talk
47	Satellite-6G Network Integration Roadmap on Reference Architectures, IEEE Future Networks	B. S. Manoj	Advanced Solutions for 6G Satellite Systems Workshop 2022, IEEE, July 19-21, 2022.	Invited talk
48		B. S. Manoj	Inaugural session of IEEE Women in Microwave 2022 colloquium, Trivandrum, India, July 27, 2022.	Welcome address
49		B. S. Manoj	Inaugural session of the IEEE SIGHT/COPE funding disbursement at Ponmudi Government UP School, July 28, 2022	Special translation service talk
50	Multi-Track Modular Teaching for Research Oriented Teaching	B. S. Manoj	Amity University, Delhi, India, May 26, 2022	Invited talk
51	Discrete Modelling of Spacecraft Attitude Dynamics and Kinematics - An Introduction to Variational Integrators	Harsha Simha	Workshop on Application of Computational Intelligence in Modelling and Control, Institute - NIT Calicut, January 24, 2023	Invited talk
52	Nanosatellite Technology one-day awareness programme to give impetus to research and development	Harsha Simha	Institute - MITS Madanapalle, June 17, 2023	Invited talk
		Department of Chemistry		
53	Graphene and MOF based materials for electrochemical sensing of biologically important analytes,	Gomathi	International Conference On Analytical And Bioanalytical Techniques Bioanalytica-2022, Virtual event held during organized by Magnus Group September 5-6, 2022	Invited talk
54	Mass Spectrometry: Principles and Applications	Jobin Cyriac	KSCSTE National Workshop on Characterisation Techniques, MES Mampadu College, Nilambur, Kerala, January 10, 2023	Invited talk

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55	Multifunctional Polysulfide Barriers for High-Performance Lithium"Sulphur Batteries	J. Mary Gladis	International Conference on Energy Conversion and Storage (IECS-2023), Organised by The Energy Consortium, IIT Madras, Chennai, January 18-20, 2023	Keynote lecture
56	Sustainable Materials for Futuristic Energy Storage Devices	J. Mary Gladis	International Conference on Interdisciplinary Research in Chemistry, Organized by Nesamony Memorial Christian college, Marthandam, ICIRC'23, Februrary 24-25, 2023	Plenary lecture
57	Technological advances in Energy storage systems	Mary Gladis J	Symposium organized by Science and Humanities association, St. Xavier's Catholic College of Engineering, Nagercoil, December 15, 2022	Keynote lecture
58	Graphene-Sulfur-Lithium Cobalt Vanadate Nanocomposite as Polysulfide Immobilizer for Advanced Lithium-Sulfur Batteries	Sreekala K, Jithu Joseph, Mary Gladis, J	National Convention of Electrochemists (NCE-22), organized by CSIR-CECRI, Karaikudi and PSG College of Technology, Coimbatore, August 26-27, 2022	Poster
59	Functionalized Separator as an Efficient Polysulfide Barrier for Advanced Lithium-Sulfur Batteries	Sreekala K, Jithu Joseph, Mary Gladis, J	National Conference on Recent Trends in Materials Science and Technology (NCMST-2022), organized by IIST and MRSI, Trivandrum, December 28-30, 2022	Poster
60	Biomass Derived Hierarchical Porous Carbon for High Energy Solid-state Supercapacitors	Jithu Joseph, Sreekala K, Mary Gladis J	International Conference on Emerging Materials for Sustainable Development (EMSD-2022). October 10-11, 2022 organised by IEEE and CSIR-CSIO, Chandigarh	Poster
61	Multifunctional Separator Coating as an Efficient Polysulfide Barrier and Mediator for Advanced Lithium-Sulfur Batteries	Sreekala K, Haritha H, Jithu Joseph and Mary Gladis J	International Conference on Emerging Materials for Sustainable Development (EMSD-2022), organized by IEEE and CSIR-CSIO, Chandigarh, October 10-11, 2022	Poster
62	Multi-functional nanocomposite separator coating as an efficient polysulfide barrier for advanced lithium-sulfur batteries	Sreekala K, Haritha H, Jithu Joseph and Mary Gladis J	MRSI-Annual Technical Meeting, organized by MRSI-Trivandrum Chapter, IIST, April 30, 2022	Poster
63	Graphitic carbon nitride-bioderived carbon composite as electrode materials for High-energy supercapacitors	Jithu Joseph, Sreekala K, and Mary Gladis J	National Conference on Recent Trends in Materials Science and Technology (NCMST-2022), organized by IIST and MRSI, Trivandrum, December 28-30, 2022	poster
64	Bioderived Hierarchical Porous Carbon for High Energy Supercapacitors	Jithu Joseph, Sreekala K , Mary Gladis, J	International Workshop on Nano-engineered Materials, (IWNEM 2023). organized by IISER, Thiruvananthapuram, January 6-7, 2023	Poster
65	Efficient Polysulfide Redox enabled by a Carbon Nanotube/ Manganese Sulfide Modified Separator for Advanced Lithium-Sulfur Batteries	Sreekala K, Jithu Joseph, Mary Gladis Joseph	International Conference on Energy Conversion and Storage (IECS-2023), , organized by the Energy Consortium, IIT Madras, Chennai, January 18-20, 2023	Poster
66	Graphitic Carbon Nitride- Carbon Composite as Electrode Materials for High-Energy Solid State Supercapacitors	Jithu Joseph, Sreekala K , Krishnendu K S, Mary Gladis, J	International Conference on Energy Conversion and Storage (IECS-2023), organized by the Energy Consortium, IIT Madras, Chennai, January 18-20, 2023.	Poster

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67	Carbon Nanotube/Nickel Cobalt Sulfide Nanocomposite Decorated Separator for Physicochemical Shielding of Polysulfides in Superior Lithium-Sulfur Batteries	Sreekala K, Jithu Joseph, Mary Gladis Joseph	Advanced Materials and Manufacturing Technologies (AMMT-2023), , organized by CSIR- National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram, February 24, 2023	Poster
68	Graphitic carbon nitride embedded bio derived carbon as an efficient separator for high energy Li-S Batteries	Jithu Joseph, Sreekala K, Krishnendu K S, Mary Gladis	National Conference on Advanced Materials and Manufacturing Technologies (AMMT 2023) organized by CSIR-National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram, February 23-24, 2023	Poster
69	Redox-Mediated Polymer Gel-electrolytes for High-energy solid state supercapacitors	Jithu Joseph, Sreekala K, Krishnendu K S, Mary Gladis, J	National Conference on New Developments in Polymeric Materials (DPM-2023), organized by SPSI Thiruvananthapuram Chapter, March 2-3, 2023	Poster
70	Electrospun Polymer Nanocomposites for EMI shielding Applications	Nirmala Rachel James	National Seminar on neoteric advances in Chemical Sciences organized by Dept. of Chemistry, Kerala University, December 15, 2022	
71	Space Biology- Applications, Challenges and Opportunities	K.G. Sreejalekshmi	.: Invited Lecture during Awareness webinar series on Challenges and Opportunities for Science Students in Space Sciences Organized by: Indian Space Industries, P C Jabin Science College, Hubballi, April 4-5, 2022	
72	Space Biology- A Design-Build-Test-Learn Platform	K.G. Sreejalekshmi	Organised by SPACEUP, Seminar Complex, CUSAT, Kochi, April 9-10, 2022	Plenary Talk
73	Space Biosciences: Translational Research Enabling Advancements in Space Explorations	K.G. Sreejalekshmi	INDO- SINGAPORE International Conclave on Translational Research in Healthcare Harnessing Next Gen AI enabled biotech innovations for sustainable healthcare, Organised by Centre for Drug Discovery & Development, Sathyabama Institute of Science and Technology, Chennai, September 12-13, 2022	Expert Lecture
74	Drosophila Payload for Gaganyaan	K.G. Sreejalekshmi	Space Biology and Biotechnology Symposium, 5 Nov 2022, Indian Institute of Science, Bengaluru, India,	Invited Lecture
75	Space Biosciences: Challenges and Opportunities	K.G. Sreejalekshmi	Science Day Lecture at National Science Day Celebrations, Organized by: School of Energy, Environmental and Natural Resources, Madurai Kamaraj University, Madurai, February 27, 2023.	Invited Lecture
76	Bioastronautics: Challenges and Opportunities	K.G. Sreejalekshmi	DBT Science Lecture - National Science Day Celebrations, Organized by: Department of Chemistry, Sri S R Naidu Memorial College, (MKU), Sattur, Virudhanagar Dist, Tamilnadu, February 28, 2023	Invited Lecture
77	Space Biosciences: Experiments in Space to Benefit Life on Earth	K.G. Sreejalekshmi	National Science Day Celebrations, Organized by: G.T.N. Arts College (Autonomous), Dindigul, Tamilnadu, February 28, 2023	Keynote Lecture

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78	An Introduction to Bioastronautics: from a Materials Science Perspective	K.G. Sreejalekshmi	Public Lecture, Periyar University, Salem, March 27, 2023	
79		Kuruvilla Joseph	Novel Conference on Development of Space Startup Ecosystem in India Hilton Convention Centre, Embassy Manyata Business Park, Bengaluru, Karnataka, India, July 24, 2022	Panellist
80	Leading the Institution to Excellence	Kuruvilla Joseph	CET, Thiruvananthapuram, Kerala, india, August 9, 2022	Resource Person
81		Kuruvilla Joseph	International Conference on Emerging Trends in Advanced Functional Materials (ETFM-2022) at Catholicate College, Pathanamthitta, Kerala, india, August 12, 2022	Keynote Speaker
82		Kuruvilla Joseph	International Conference on Materials for Sustainability Development (ICMSD-2022), organised by Central University of Jammu, Jammu, India, October 19, 2022	Keynote Speaker
83		Kuruvilla Joseph	MIT Induction Programme Organised by Mahaguru Institute of Technology, Kayamkulam, Kerala, India, October 27, 2022	Chief Guest and Keynote Speaker
84		Kuruvilla Joseph	DST-NISA training programme on Science & technology: Global Developments, Organised by National Institute of Advanced Studies, Bengaluru, Karnataka, India, December 01, 2022	Resource Person
85		Kuruvilla Joseph	7th National Conference on Bio Polymers and Green Composites in CIPET:IPT-Kochi , Kerala, India, December 03, 2022	Plenary Speaker
86		Kuruvilla Joseph	Second International Conference on Science and Technology of Advanced Materials- STAM 23 at Mar Athanasius College (Autonomous), Kothamangalam, Kerala, India, March 31, 2023	Plenary Speaker
Department of Earth and Space Science				
87	Star formation and its effect on the surrounding interstellar medium	Sarita Vig	Invited talk at the conference 'Star formation studies in the context of NIR instruments on 3.6m Devasthal Optical Telescope', Aryabhatta Research Institute of Observational Sciences (ARIES), Nainital, May 04-07, 2022	Invited Lecture
88	Human Resources	Sarita Vig	Conference 'Seven Years of AstroSat', ISROÂ Headquarters, Bengaluru, September 28--29, 2022	Panel Discussion
89	Astronomy and society	Sarita Vig	Workshop 'Future of Indian Astronomy', International Centre of Theoretical Sciences Bengaluru, October 31 - Novmber 02, 2022	Panel Discussion

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90	Introduction to stars and clusters and Birth of Stars	Sarita Vig	Invited lectures at the Women in Astronomy workshop on Introductory Astronomy and Astrophysics, Marthoma college, Chungathara, December 6-8, 2022	Invited Lecture
91	Research Career in Physics	Sarita Vig	Invited online lectures in workshop on Research careers, Training programme for students called Vigyan Vidushi 2022, organised by Tata Institute of Fundamental Research, June 6-14, 2022	Invited Lecture
92	Finding our place among stars	Sarita Vig	Kaapi with Kuriosity series, Jawahar Nehru Planetarium, Bengaluru, September 11, 2022	Invited Public Lecture
93	Behold, a star is born	Sarita Vig	International Centre for TheoreticalSciences (ICTS-ÂTIFR), Bengaluru, September 12, 2022	Invited colloqium
94	Finding our place among stars	Sarita Vig	SpaceUP Unconference, Cochin University of Science and Technology (CUSAT), April 9 2022	Invited Lecture
95	Behold, a star is born	Sarita Vig	Colloqium at the Indian Institute of Technology-Indore (IITI), Indore, November 17, 2022	Invited Lecture
96	Stars and the Interstellar Medium	Sarita Vig	National Initiative of Undergraduate Sciences (NIUS) Camp, organised by the HomiÂ Bhabha Centre for Science Education (HBCSE-ÂTIFR), Mumbai, June 11-19, 2022	Two invited lectures
97		Sarita Vig	Resource Generation Camp organised for OCSC camp for preparation of International Olympiad of Astronomy and Astrophysics, HomiÂ Bhabha Centre for Science Education (HBCSE-ÂTIFR), Mumbai, March 13-14, 2023	Resource person
98	Cosmic Wonders	Sarita Vig	Lecture to school students on occasion of National Science Day, Indian Institute of Technology-Indore (IITI), Indore, February 28, 2023	Invited Lecture
99	Stars, planets and exoplanets	Sarita Vig	Online lecture at New Order for Visionary Astronomy (NOVA 3.0) organised by space clubs of nine colleges in Kerala, March 27, 2023	Invited Lecture
100	Cosmic Wonders	Sarita Vig	Night sky watch, Payyanur College, Payyanur, March 25, 2023	Invited talk and Resource person
101	Predictability of an Extreme Weather Event over the Indian Subcontinent using Sensitivity Analysis in EnKF Data Assimilation System	Govindan Kutty	Tropmet 2022, IISER Bhopal, December 2022	Invited Lecture
102	Data Assimilation	Invited Lecture	National Training workshop on fundamentals of Data Assimilation, IITM Pune, September 2022	Invited Lecture

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103	Geospatial Intelligence: harnessing the power of Geospatial technologies for location intelligence	A.M. Ramiya	Dr P.R. Pisharoty Memorial Lecture. 35th Kerala Science Congress, Kuttikkanam, Idukki, February 10-14, 2023	Invited Lecture
104	Remote Sensing and Sustainability	A.M. Ramiya	Kalpana Youth Foundation, Space Education and Public Outreach World Space week India, October 7, 2022	Invited Lecture
105	Building modelling from LiDAR - Geospatial Analytics	A.M. Ramiya	One week Online workshop,JSSAcademy of Technical Education, Bengaluru, September 26-30, 2022	Invited Lecture
106	LiDAR Remote Sensing: Challenges and Opportunities	A.M. Ramiya	Geospatial Data Science and GeoAI"", Two days international online workshop, IIT Tirupati, Navavishakar I Hub Foundation, June 27-28, 2022	Invited Lecture
107	Terrain modelling	A.M. Ramiya	Level 1 DST-NGP sponsored, 21 days training prog on Geospatial technologies, VR Siddartha Engg College, Vijayawada, July 28, 2022	Invited Lecture
108	LiDAR Remote Sensing: Applications in Agriculture	A.M. Ramiya	Invited Talk, Advanced Geospatial Technologies in Agriculture. DST NRDMS Programme. TamilNadu Agricultural University, Coimbatore, May 11, 2022	
109	3D CityGML Building Modelling from LiDAR point cloud Data	A.M. Ramiya	Geospatial Innovations/Initiatives in the Academic Sector. Geo-enabling the Global Village. Pre-event leading to the Second United Nations World Geospatial Information Congress , April 18-19, 2022	Invited Talk
110	Temporal dependence of river discharge and precipitation over the Godavari basin using Event Coincidence Analysis method	Vibin Jose and A Chandrasekar	National Symposium on Tropical Meteorology (TROPMET 2022) on Advances in weather and climate prediction and climate change projection over South Asia: Applications in water and agriculture sectors at IISER Bhopal, India during November 29 - December 2, 2022	Invited Lecture
111	Turbulent flux transfer and coherent structures in ASL	Sonali Maurya, A Chandersekar and KVS.Nambodiri	National Symposium on Tropical Meteorology (TROPMET 2022) at IISER Bhopal, India during 29 November - December 2, 2022	Invited Lecture
112	Comparative Analysis of Soil Parameters during Landfall of Deep Depression System, using WRF and NU-WRF	Srikar, K and A Chandrasekar, 2022	National Symposium on Tropical Meteorology (TROPMET 2022) at IISER Bhopal, India during 29 November - December 2, 2022	Invited Lecture
113	WRF simulations of thunderstorm events with different PBL parameterization schemes over Kerala	Deebak V.S. Vijay and A. Chandrasekar	National Symposium on Tropical Meteorology (TROPMET 2022) at IISER Bhopal, India during 29 November - December 2, 2022	Invited Lecture
114	Signature of irrigation effects on soil moisture simulations over India using Land Information System	Anusree G K, Vibin Jose, and A.Chandrasekar	National Symposium on Tropical Meteorology (TROPMET 2022) at IISER Bhopal, India during 29 November - December 2, 2022	Invited Lecture
115	Soil-air interface solver for estimation of evaporation losses from different types of soil	Jiteshwar Dadich, Amit P Kesarkar, Jyoti Bhate, and A. Chandrasekar	National Symposium on Tropical Meteorology (TROPMET 2022) at IISER Bhopal, India during 29 November - December 2, 2022	Invited Lecture

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116	Retrieval of vertical profiles of minor atmospheric constituents for cloud microphysical modelling during precipitation events	Kavita Patnaik, Subhrajit Rath, Amit P. Kesarkar, Jyoti N. Bhate, and A. Chandrasekar	National Symposium on Tropical Meteorology (TROPMET 2022) at IISER Bhopal, India during November 29- December 2, 2022	Invited Lecture
117	Galaxy Redshift Surveys	Anand Narayan	Dayapuram Arts & Science College for Women, University of Calicut on December 5, 2022	Invited lecture
118	The Universe and Us	Anand Narayan	ISROs Young Scientist Programme (YUVIKA) held at VSSC Thiruvananthapuram on May 21, 2022	Invited lecture
119	Astronomy in the Age of Algorithms	Anand Narayan	Department of Computer Science, GRD College of Science, Bharathiar University, Coimbatore on April 20, 2022	Invited lecture
120	Stellar Occultation with DOT: Probing Planetary Atmospheres	Anadamayee Tej	The 3rd BINA workshop entitled Scientific potential of the Indo-Belgian cooperation, ARIES, Nainital, March 22, 2023	Invited Lecture
121	GRB+GW overview, Invited plenary at the Gravitational Wave	Resmi L	Physics and Astronomy Workshop, Melbourne, Australia (virtual talk), December 06, 2022	Invited Lecture
122	Relativistic outflows from Neutron Star mergers	Resmi L	Colloquium at the National Center for Radio Astrophysics, NCRA, Pune, November 25, 2022	Invited Lecture
123	Relativistic outflows from Neutron Star mergers	Resmi L	Dept. of Physics, IIT Bombay, November 28, 2022	Invited Lecture
124	HII regions and their dynamics	Jagadeep	8th Southern Regional Astronomers Meeting titled “Research in Astronomy: Opportunities and Challenges” at Rajagiri Institute of Science and Technology, Kakkanad, February 2, 2023	Invited review talk
125	Space-borne Lidar observations of ubiquitous elevated aerosol layer in the free troposphere over South Asia: Technical challenges and recommendation	P R Sinha	International Workshop on Technical and Scientific aspects of, Lidar Remote sensing of the Atmosphere (ITSLRA-2022) held during at Sathyabama Institute of Science and Technology, Chennai, July 13-15, 2022	Invited Lecture
126	How to probe AGN feedback using the intergalactic medium?	Vikram Khaire	colloquium at National Center for Radio Astrophysics, Pune, India on March 10, 2023	Invited Lecture
127	How to Find Alien Megastructures?	Vikram Khaire	seminar at Berkeley SETI Research Center, University of California, Berkeley on August 4, 2022	Invited Lecture
128	on Geology of our Moon and Chandrayaan Missions	Rajesh V J	Remote Sensing and GIS in Planetary Science at GEM (Geology: Emerging Methods & methods) 2023 and Annual General Body Meeting of AOQR, India, October 25, 2023	Invited Talk

Sl.No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
129	Role of Geology in Planetary Exploration	Rajesh V J	Current Trends in Earth System Sciences (CTESS), 2022-2023 Funded by the University of Kerala, held at Department of Geology, University of Kerala, Kariavattom Campus on January 21, 2023.	Keynote Lecture
130	Ultramafic rocks as Windows into the Petrogenesis and tectonic evolution of Precambrian terranes	Rajesh V J	Special Session during the 2022 Joint Fall Meeting of Korean Geological Societies and the 77th General Assembly of the Geological Society of Korea.	Invited Lecture
131	Lunar Exploration and ISROs Chandrayaan Missions	Rajesh V J	Christ College Chengannur, in connection with World Space Week Celebrations	Invited Lecture
Department of Humanities				
132	Edible Emotions: Reading Select Culinary Narratives	Gigy J Alex	School of English & Foreign Languages at The Gandhigram Rural Institute (Deemed to be University) Gandhigram Dindigul, July 15, 2022	Invited Lecture
133	Culinary Narratives: Fictions and Memories	Gigy J Alex	Salem Sowdeswari College (SFCW, Salem, October 28, 2022	Invited Lecture
134	Flavours of Fictions: Strategies to Read Culinary Narratives	Gigy J Alex	UGC - HRDC sponsored Refresher Course in English organized by the Department of English and Comparative Literature, School of English and Foreign Languages, Madurai Kamaraj University, August 13, 2022	Resource Person
135	Food and Cultural Studies: Research Perspectives and Approaches	Gigy J Alex	Cultural Studies Research Forum, TES. on, February 19, 2023	Invited Lecture
136	Food, Power and Identity: Culinary Resistance	Gigy J Alex	Socio-Cultural Spaces, National Seminar at Catholicate College, Pathanamthitta, March 23, 2023	Invited Lecture
137	Shifting paradigms: Translation and Culture	Gigy J Alex	National Seminar on Translation organized by the Department of English and Comparative Literature, School of English and Foreign Languages, Madurai Kamaraj University, March 03, 2023	Invited Lecture
138	PRA : Concepts and Tools	Lekshmi V Nair	PRA Workshop for M.A students, Loyola College. May 30 -31, 2022.	Resource Person
139	Quantitative, Qualitative and Mixed Method in Social Research	Lekshmi V Nair	Higher Secondary School Teacher Transformation Programme organised by SCERT at Loyola College. December 15, 2022	Invited Lecture
140	Social Science Research Methods	Lekshmi V Nair	Higher Secondary School Teachers Transformation Programme, 2023. Department of Sociology, Sree Sankaracharya University of Sanskrit, Kalady. January 27, 2023	Invited Lecture
141	From Trash to Treasure : The value of reverse logistics	Ravi V.	FDP on trends in Modeling supply chains-Analytical and Simulation Perspectiveâ€, College of Engineering, November 28, 2022.	Invited Lecture

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142	National Budget 2023-24: A Vision for Amritkaal	Shaijumon C S	Invited Lecture at the Institute of Cost Accounts of India, Cochin Chapter, February 16, 2023.	Invited Lecture
143	International Economic Institutions and it effectiveness during recession	Shaijumon C S	PG Dept of Management, SCM School of Business, Cochin, February 16, 2023	Invited Lecture
144	National Budget 2023-24: An Analysis	Shaijumon C S	Department Economics, University of Kerala, Karyavattom Campus, February 15, 2023	Invited Lecture
145	Discussion on the Union Budget 2023-24	Shaijumon C S	PG Dept of Commerce and Dept of Managment Studies, Christ Nagar College, Thiruvananthapuram, February 14, 2023	Invited Lecture
146	Fourth Industrial Revolution and Career in Economics	Shaijumon C S	PG Dept of Economics, St. Theresa's College, Ernakulam, January 25, 2023	Invited Lecture
147	Symposium on Prospects, Challenges and Work Life of Gig and Platform Workers in Kerala	Shaijumon C S	Kerala Institute of Labour and Employment (KILE), Thiruvananthapuram, October 29, 2022	Invited Lecture
148	Economics: The key to life and career during Industry 4.0	Shaijumon C S	Department of Economics, Govt. Women's college, Thiruvananthapuram, October 10, 2022	Invited Lecture
149	Career in Economics during Industry 4.0	Shaijumon C S	online induction program, Dept of Economics, University of Kerala, August 20, 2022	Invited Lecture
150	Curriculum Revision Meeting of the Focus Group	Shaijumon C S	Vice Chairman of Expert Group, SCERT Workshop for revising school curriculum in Kerala, August 10, 2022	Invited Lecture
151	Changing Pattern of Public Investment for Wealth Creation through Financial Markets	Shaijumon C S	Conference in connection with Azadi Ka Amrit Mahotsav (AKAM), Dept of Investment & Public Asset Management (DIPAM), Govt of India, June 10, 2022	Invited Lecture
	Department of Mathematics			
152	Topology	K S Subrahamanian Moosath	Eight lectures in the Annual Foundation School-I, IISER Trivandrum, Sponsored by NCM IIT Mumbai and TIFR Mumbai, May 31 - June 04, 2022 & June 14 - 18, 2022	Invited Lecture
153	Several Variable Calculus	K S Subrahamanian Moosath	Teachers Training programme for college teachers, IISER Trivandrum, Jointly organized by IISER Tvm and Collegiate Education dept Govt. of Kerala, July 15, 2022	Invited Lecture
154	Real Analysis	K S Subrahamanian Moosath	Four lectures in the bridge course, Dept. of Mathematics, University of Calicut, June 25-July 01, 2022	Invited Lecture
155	Functions of one and two variables	K S Subrahamanian Moosath	Induction Programme 2022, Dept. of Mathematics, University of Kerala, August 31, 2022	Invited Lecture
156	Non-Euclidean Geometry	K S Subrahamanian Moosath	Two lectures in the Refresher course for college teachers, University of Kerala, October 18-19, 2022	Invited Lecture

Sl.No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
157	Some basic Geometric concepts for PDE	K S Subrahamanian Moosath	Two lectures in the National workshop on trends PDE, St. Joseph College, Irinjalakkuda, February 16-17, 2023	Invited Lecture
158	Axiomatic Approach and Non-Euclidean Geometry	K S Subrahamanian Moosath	Three lectures in the Refresher course for College Teachers, University of Calicut, March 14-15, 2023	Invited Lecture
159	Information Geometry	K S Subrahamanian Moosath	National Seminar on Applied Mathematics and Numerics, Mar Ivanious College, Trivandrum, March 10, 2023	Invited Lecture
160	Information Geometry and Classification of Point Cloud Data	K S Subrahamanian Moosath	National Seminar on Glimpses on Analysis and Geometry, University of Calicut, March 21, 2023	Invited Lecture
161	Functions of one, two, and several variables	K S Subrahamanian Moosath	Three lectures in FDP on Analysis and Algebra, Rajagiri School of Engineering & Technology, Kochi, March 22, 2023	Invited Lecture
162	Complex Analysis	K S Subrahamanian Moosath	Two lectures in the Ganitha Garima-A workshop on core areas of Mathematics, University of Kerala, March 23-24, 2023	Invited Lecture
163	Neural Network and Applications	S. Sumitra	Talk delivered in “”CORDENum 23””, Organized by The Department of Mathematics, Mohandas College of Engineering, March 25, 2023	Invited Lecture
164	Machine Learning: A Branch of Mathematics	S. Sumitra	National Conference on Applied Mathematics and Numerics (NCAMN) 2022, March 09, 2023	Invited Lecture
165	Machine Learning and its Applications	S. Sumitra	International Conference on Advanced Information Science and Computing Systems””, Organized by The Department of Computer Science and Applications, Christ Nagar College, Thiruvananthapuram, January 28, 2023	Invited Lecture
166	Machine Learning	S. Sumitra	National Workshop on Recent Trends in Discrete Mathematics, Organized by IQAC and Department of Mathematics, Catholicate College, Pathanamthitta, December 20, 2022	Invited Lecture
167	Introduction to Machine Learning	S. Sumitra	TEQIP sponsored Online Short-Term Training Programme on AI Applications In Power Systems, Organized by Department of Electrical Engineering, Government Engineering College, Thrissur, December 19, 2022.	Invited Lecture
168	Introduction to Machine Learning & Mathematics Behind Machine Learning	S. Sumitra	SERB Karyashala: High-end workshop on Application of Artificial Intelligence in Power System Operation and Control””, Organized by Department of Electrical Engineering, National Institute of Technology Calicut, July25, 2022.	Invited Lecture

Sl.No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
169	Mathematical Foundations for Data Science	S. Sumitra	PG Enrichment Programme & Bridge Course for MSc. Mathematics 2022 Admission"", Organized by the Department of Mathematics, Cochin University of Science and Technology, July 19, 2022	Invited Lecture
170	Two dimensional approximation of thin piezoelectric shallow shells	N.Sabu	International conference in Applied Mathematics at St. Jude's College, Thoothoor, Kanyakumari Dist., July 29, 2022	Invited talk
171	Regularizing Effect of Damping Terms in Inverse Problems for Evolution Equations	Sakthivel K	International Conference on Quasilinear Equations, Inverse Problems and Their Applications, Sochi, Russia, August 22-26, 2022	Online talk
172	A Class of Inverse Problems of a Generalized Korteweg - deVries Equation	Sakthivel K	International Conference on Mathematical Sciences, Modeling and Computational Intelligence, Kumaraguru College of Technology, Coimbatore, September 29-30, 2022.	Invited Lecture
173	Dynamic Programming of the Stochastic Navier-Stokes Equations	Sakthivel K	International Conference on Dynamical Systems, Control Theory & Their Applications, IIT-Roorkee, July 01-03, 2022	Invited Lecture
174	Poisson Phase Type Distributions and Poisson Phase Type Processes	Deepak T G	Prof.A.Krishnamoorthy Endowment Lecture, Dept of Mathematics, St.Aloysius College, Thrissur, January 25, 2023	Invited Lecture
175	Probability-A Measure Theoretic Approach	Deepak T G	National Science Day Celebrations Dept. of Mathematics, Central University of Kerala, Kasargod, March 1, 2023	Invited Lecture
176	Mathematics in Management and Technology	Deepak T G	International Conference on Management and Technology 2023, School of Management Studies, Cochin University of Science and Technology, Kochi, March 31, 2023	Invited Lecture
177	Parametric Curves and their Arc-length Parametrization	Prosenjit Das	Siksha 'O' Anusandhan Weekly Academic Lecture (SOAWAL), Centre for Data Science, Faculty of Engineering & Technology, Siksha 'O' Anusandhan, Bhubaneswar, April 23, 2022	Invited Lecture
178	Locally nilpotent derivations of stably polynomial A^2-fibrations having polynomial kernels	Prosenjit Das	CoCAAG, IIT Hyderabad, February 08-11, 2023	Invited Lecture
179	Basic group theory and its applications	Prosenjit Das	UGC-Human Resource Development Centre (HRDC), University of Kerala, Trivandrum, February 22, 2023	Invited Lecture
180	Residual coordinates of affine fibrations and their applications	Prosenjit Das	Discussion meeting on Affine spaces, algebraic group actions, and LNDs, RSF Project no. 22-41-02019, DST TPN no. 64842, ISI Kolkata, March 11-18, 2023	Invited Lecture
181	Approximations in poroelasticity	Sarvesh Kumar	International Conference on Computational Partial Differential Equations and Applications (ICCPDEA-2022, BML Munjal University, India, September 06 - 08, 2022	Invited talk

Sl.No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
182	Application of poroelasticity and its approximations	Sarvesh Kumar	BITS-Pilani Pilani, Campus March 29, 2023	Invited Lecture
183	Formulations in poroelasticity	Sarvesh Kumar	Invited talk on, 9th International Conference on Mathematics and Computing, BITS-Pilani, Goa Campus, January 06-08, 2023	Invited Lecture
184	Virtual element methods for poro-elasticity	Sarvesh Kumar	National Conference on Applied Mathematics and Numerics, Mar Ivanios College, Trivandrum, March 8-10, 2023	Invited talk
185	Three and four field mixed formulation in poro-elasticity	Sarvesh Kumar	National Conference on Operation Research, Differential Equations, Numerical Analysis, Computing and Applications, Mohandas College of Engineering and Technology, Trivandrum, March 23-25, 2023.	Invited talk
186	Theory of SVD, Faculty Development Programme (Offline mode	Anilkumar C V	Linear Algebra and its Applications conducted by the Department of Mathematics, 2022, LBS Institute of Technology for Women, Thiruvananthapuram, April 11-13, 2022	Invited lecture
		Department of Physics		
187	Inverse scattering transforms and Solitons	S Murugesh	Workshop on Integrable systems, Bishop Heber College, Tiruchirappalli, November 1-2, 2022	Invited lecture
188	Solitons via Darboux transformations	S Murugesh	Workshop on Integrable systems, Bishop Heber College, Tiruchirappalli, November 1-2, 2022	Invited lecture
189	Spin based Batteries and Memory: Some results	S Murugesh	International Conference onNew Avenues in Applied Sciences, Lady Doak College, Madurai, February 2-3, 2023	Invited lecture
190	Women In Science : Careers have no Gender	S. Jayanthi	International Day of Women and Girls in Science:-Nedumangad Government College, February 2023	Invited lecture
191	Holography using Poynting's Theorem	C S Narayanamurthy	XLV OPTICAL SOCIETY OF INDIA SYMPOSIUM, COpaQ 2022, IIT Roorkee, Roorkee, Uttrakhand, INDIA, November 10-13 2022	Invited lecture
192	Quantum Technologies with Bright quantum Light	Ashok Kumar	Seminar on Space Quantum Frontiers, SAC Ahmedabad, May 19, 2022.	Invited lecture
193	Einstein-Podolsky-Rosen (EPR) Paradox with Light	Ashok Kumar	Training Programme of Quantum Computing for SAC (ISRO) Scientists/Engineers, Nirma University, Ahmedabad, May 26, 2022	Expert talk
194	Physics Nobel Prize-2022	Ashok Kumar	Laurels to the Nobel Laureates, Mar Ivanios College, Thiruvananthapuram, November 3, 2022.	Invited talk
195	Quantum-Enhanced Sensing with Squeezed Light	Ashok Kumar	International Conference on Complex Quantum Systems, BARC Mumbai, January 19, 2023	Invited talk

Sl.No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
196	Light-Matter interactions, Quantization of Light and Detection Schemes in Quantum Sciences	Ashok Kumar	Pre-conference School on overlapping areas of Atomic and Molecular Physics and Quantum Technology, IISER Thiruvananthapuram, February 16-17, 2023	Invited talks
197	Ameliorated phase sensitivity	J Solomon Ivan	Mach-Zehnder interferometer' at QIQT school, 2022, held at IISER Kolkata, via online. June 27, 2022	Invited lecture
198	Sensitivity Enhancement through Interference: Sensing Changes in Phase Difference between Complex Fields using Non-linear Variation in Phase of the Resultant Field	Dinesh N Naik	Information Photonics 2022 (IP2022), PACIFICO Yokohama, Japan, April 22, 2022,	Invited lecture
199	Adsorption of atomic Sn on WS2 surface: Emergence of hybridized in-gap states'	Kuntala Bhattacharjee	1st National Conference on Advances in Low-dimensional Materials for Optoelectronic and Nano Devices (ALMOND); organized by Institute of Physics (IOP), Bhubaneswar, India, March 3-5, 2023	. Invited Talk
200	Low Energy Electron Diffraction (LEED) & Reflection High Energy Electron Diffraction (RHEED)	Kuntala Bhattacharjee	High End Workshop on Scattering Methods (Electron, X-ray and Ion) for Materials Characterization; organized by Indian Institute of Technology, Bhubaneswar (IITBBS) and DST- SERB held at IITBBS, Odisha, India, June 13-20, 2022	Invited Lecture
201	Inspired by Brain: Next Generation Artificial Intelligence	K.B. Jinesh	ASME Webinar, St. Joseph College, Pala, September 29, 2022	Invited lecture
202	Scanning Probe Microscopy	K.B. Jinesh	Faculty Development Programme, CLIF, Kerala University, October 11, 2022	Invited lecture
203	Materials for Next Generation Artificial Intelligence	K.B. Jinesh	NSAMAP 2023, St. Thomas College, Kozhancherry, February 12, 2023	Invited lecture

Events & Visits @ IIST

7. EVENTS and VISITS @ IIST

After a hiatus of 3 years of pandemic and lockdown, the past year at IIST has been a remarkable journey of events, celebrations, and visits that have enriched the campus and the academic community. From cultural festivals like Diwali and Holi to scientific symposiums and workshops, the year was filled with a diverse range of activities that showcased the vibrancy and inclusivity of IIST. The celebrations were a testament to the harmonious blend of cultures and traditions that thrive in the institute, creating an enriching environment for both students and faculty. In addition to these festivities, IIST welcomed numerous distinguished guests and dignitaries, who graced our campus with their presence and shared valuable insights, contributing to our continuous quest for knowledge and excellence. This chapter encapsulates the essence of the vibrant IIST community, where learning goes beyond textbooks and embraces the joys of shared experiences and intellectual growth.

7.1 Events

7.1.1. Azadi Ka Amrit Mahotsav

The official journey of Azadi Ka Amrit Mahotsav was flagged off in IIST on 15th August 2021. Azadi Ka Amrit Mahotsav is an initiative of the Government of India to celebrate and commemorate 75 years of India›s independence, its glorious history, culture and achievements. Inauguration of 'Azadi Ka Amrit Mahotsav Programmes@IIST 2022 and culmination of one year of its celebrations was organized with a variety of programs from August 12-15, 2022. As a curtain raiser of this programme there was a family gathering of all the permanent faculty members and staff of IIST followed by dinner on August 12, 2022. Dr D. Sam Dayala Dev, Director, IIST, inaugurated the programme. The evening was graced by the Mohiniyattam performance by Dr Neena Prasad, the renowned Mohiniyattam dancer and academician, who has carved her own path in Mohiniyattam with her own choreography, research and study. An exponent in the field of Mohiniyattam, she has proved her proficiency in Bharatanatyam, Kuchipudi, and Kathakali as well.

Social and cultural events, Space on Wheels, plantation drives, GIS day celebrations, programs showcasing the technological accomplishments of our country, seminars and talks, Book Fest, Photo Exhibition, 75 Fun Facts in Chemistry, 75 Elements in Periodic Table, 75 Breakthrough Materials, Poster Exhibition, Film show, Tracking the Footsteps of Mahatma, Art & Science of Forecasting, Bike-o-Roptor Design Contest, Talk on Startup Journey, Digital Poster Competition, Painting Exhibition etc. among other activities, marked the 4-day program.

7.1.2. New Director assumes Charge

Dr. S Unnikrishnan Nair, Distinguished Scientist / Director, VSSC, assumed the charge of the Director, IIST on September 20, 2022.

7.1.3. SPIC MACAY

IIST hosted a SPIC MACAY programme on November 1, 2022, as part of the induction programme. Shri Shashank Subramanyam, the renowned flautist performed the Carnatic flute, accompanied by Shri Trivandrum Sampath on violin, Shri Palakkad Mahesh on mridangam and Shri Udupi Sreedhar on ghatam.

7.1. 4. 8th Dr. APJ Abdul Kalam Lecture & Inauguration of Crystal Jubilee Celebrations of IIST

The 8th Dr APJ Abdul Kalam Lecture was delivered by Dr. K. Radhakrishnan, Member, Space Commission and Former Secretary, DoS/Chairman, ISRO on Life Lessons in Leadership. The talk was held in a hybrid mode on October 12, 2022. His talk included the essence of leadership and his tryst with lessons in leadership in ISRO. The event also witnessed the inauguration of the "Crystal Jubilee Celebrations of IIST" by Shri. S Somanath, Secretary, DoS/Chairman, ISRO, President GB, IIST. He said that ISRO and IIST have to remodel themselves to adapt to the transformations taking place in the space ecosystem. Dr. B.N. Suresh, Chancellor, IIST addressed the gathering. Dr. S. Unnikrishnan Nair, Director, IIST& VSSC welcomed the gathering and Prof. Kuruvilla Joseph, Registrar, IIST proposed the vote of thanks. Dr. V. Narayanan, Director, LPSC and Dr. Samdayal Dev, Director, IISU also attended the programme along with faculty members, students and staff of IIST.




7.1.5. Inauguration - Infrastructure Facilities

Shri. S. Somanath, Secretary, DoS/Chairman, ISRO, President GB, IIST unveiled the IIST Plaque, laid foundation stone for the Crystal Jubilee hostel block and inaugurated IIST Transport Operation & Maintenance Facility on October 12, 2022. Dr. B. N. Suresh, Hon. Chancellor, IIST, Dr. K. Radhakrishnan, Member, Space Commission / Former Chairman, ISRO, Dr. S. Unnikrishnan Nair, Director, IIST, Dr. V. Narayanan, Director, LPSC, Dr. Samdayal Dev, Director, IISU, Prof. Kuruvilla Joseph, Registrar, IIST, Deans, HoDs, faculty and staff attended the programmes.


7.1.6. Inauguration of IIST IEEE EdSoc Chapter

Dr. Kuruvilla Joseph, Dean (SA & OR) / Registrar inaugurated the IIST IEEE EdSoc Chapter on 7th October 2022 at 4 PM.

7.1.7. Hindi Technical Seminar

IIST, in association with VSSC, LPSC, IPRC and IISU, jointly organised the Hindi Technical Seminar on the topic Recent Advances in Space Research: Opportunities for Innovation and Incubation on November 25, 2022. Dr YVN

Krishna Murthy, Registrar, IIST, welcomed the gathering. Dr Unnikrishnan Nair, Director IIST, delivered the Presidential Address online. Shri. Nilesh M Desai, Director, SAC, delivered the keynote address. Shri. M. Badarinarayana Murthy, Director, IPRC, Shri Suresh M S, AD, LPSC, Shri K S Mani, AD, IISU, Shri M G Som Shekharan Nair, JD(OL), HQ, Dr Kuruvilla Joseph, Dean (SA,SW&OR) and Smt. Cimy Asaf, AD(OL), IIST were part of the august gathering.

As part of Hindi Technical Seminar 2022 celebrations, classical dance performance showcasing three dance forms of Southern India - Mohiniyattom, Kuchipudi, and Bharatanatyam was organized in IIST.

7.1.8. Swachhta Pakhwada 2023

IIST kick started the Swachhta Pakhwada 2023 by administering Swachh Bharat Pledge. Prof. Kuruvilla Joseph, Outstanding Professor & Dean (SA, SW & Outreach), administered the pledge to Officers and Staff in front of the administrative block,. Faculty members and students took the pledge from their respective departments. As part of Swachhta Pakhwada -2023, a webinar on the Importance of Health, Personal hygiene and cleanliness was organised on February 8, 2023. Dr. L.B. Shaebha Irence, Medical Officer, IIST handled the session. Cleaning drives within the campus and in the neighbouring community were also organized as part of this.

7.1.9. Improving Research Writing Using Grammarly

IIST Library has organised an Online Workshop on 'Improving Research Writing Using Grammarly' on May 9, 2022.

7.1.10. Training Programme on Procurement

A Training Programme on Procurement was organised by IIST Purchase Section for the faculty, officers and staff on March 8, 2023.

The training programme included the following sessions:

- Role of Indenting Officers in Procurement by Shri. H. Ramakrishnan Sr. Head, PSD, VSSC
- GeM procurement - Role of Indenting Officers by Smt. R. Sobha, Senior PSO, VSSC
- DOS Proposal Drafting & Addressing Clarifications by Dr. T.S. Deepu, Senior PSO, DOS

7.1.11. International Women's Day Celebrations

In connection with International Women's Day celebratiions, a formal function was organised in IIST on March 8, 2023. The Chief Guest for the function was Ms. Nishanthini R, IPS, DIG of Police, Thiruvananthapuram range. Ms Nishanthini played a key role in inducting Women battalion in Kerala Police and is keenly involved and associated with the Government's efforts to eliminate all sorts of crimes against women and children. the Guest of honour of the programme was Dr. Jaya G Nair, Former Scientist/ Engineer, VSSC, who has contributed immensely to software and system development of various ISRO missions as scientist/engineer with VSSC. She shared her experiences as a lone women student of Computer Science, during her B.Tech. at CET, Trivandrum and also her observations regarding the ambitions and dreams of her women colleagues in VSSC.




Following the meeting, students of IIST presented cultural programme. A short video presentation titled Women Uninterrupted highlighted the commendable roles of Women in IIST as supporting staff, faculty and students. This was followed by a music programme and dance performance in tune with the theme of the day.

Book Festival

A book exhibition cum sale was organised on March 8, 2023 to highlight the achievements and contributions of women writers and artists and to promote gender reading and gender literacy among IIST communit. There were books covering a variety of genres and time-periods like fiction, poetry, non-fiction, memoirs, graphic novels, plays, self-help women in science, technology books, travel writing, women and history, books by and about women historians, economists, writers, artists and politicians.

Cancer Screening Camp

Preliminary cancer screening (breast cancer) check up was organised on March 10, 2023. A team of doctors and nurses from Regional Cancer Centre (RCC), Trivandrum conducted the check up for nearly 160 faculty members / staff / students of IIST. The screening camp was conducted at the Medical Facility, IIST. The staff at the medical fa-

cility extended their support to conduct the programme in a systematic manner.

7.1.12. Academic Visit to VSSC

A one-day academic field visit to SPL Labs and VSSC Facilities for M. Tech, Ph.D. students of the Department of Earth and Space Sciences, IIST, was organized on March 10, 2023. Details of the state-of-the-art instrumentation commissioned in the TELRS area for surface (aerosols, clouds) and boundary layer observations, including the Met facility and Doppler Weather Radar (DWR) facility were explained. The students also witnessed the Rocket launch during the visit.

7.2 Celebrations @ IIST

7.2.1. Birth Anniversary of Dr. B. R. Ambedkar

IIST celebrated the 131st Birth Anniversary of 'Bharat Ratna' Dr. B. R. Ambedkar on April 29, 2022. The portrait of Dr. B. R. Ambedkar placed in the Library building was garlanded in the morning to pay homage to the founding father of the Constitution. IIST organised a webinar where, Dr. Anitha C. Kumar, Professor, School of Chemical Sciences, Mahatma Gandhi University, Kottayam, Kerala was the Chief Guest.

7.2.2 International Day of Yoga

The International Day of Yoga was celebrated on June 21, 2022. The Ministry of AYUSH had declared the theme of the year as Yoga for Humanity, highlighting the importance of yoga as an active process to overcome the challenges to physical and mental health in this age of pandemic. IIST celebrated the 8th edition of international yoga day with a 90-minute hands-on session in the morning on the theory and practice of asanas and pranayama, followed by a lecture and interaction on how to channelize our awareness to aspects of the mind and the body gaining control over our responses to external happenings. Both sessions were led by Smt. Kamala Bharadwaj, founder-director of Satya Foundation, Bengaluru.

7.2.3 Partition Horrors Remembrance Day

As part of observance of 'Partition Horrors Remembrance Day' in the year of Azadi Ka Amrit Mahotsav, an exhibition of photographs has been arranged in the Library. These photographs were curated by ICHR and IGNCA. Dr. G. Ayyappan, Prof. Satish Dhawan Professor & Chief Technology Officer, IIST inaugurated the exhibition. Digital display of the photographs were arranged as part of the programme.

7.2.4 Independence Day Celebrations

IIST celebrated the 76th Independence Day with various programmes. Dr. D. Sam Dayala Dev, Director, IIST, Dr. Kuruvilla Joseph, Dean (SA & OR) / Registrar, IIST, Deans, Heads of the Departments, faculty members, officers, staff, family members and invited school students attended the colourful programme by adhering to the Covid-19 protocols. Dr D Sam Dayala Dev, Director, IIST hoisted the flag in front of the administrative building, delivered the 76th Independence Day Speech and inspected the Guard of Honour.

In his speech, Director summarised the achievements made by IIST for the last year and congratulated the award winners among the faculty members and students. He distributed prizes for winners of various competitions. This

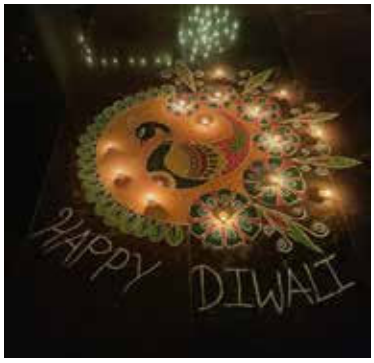
was followed by the skill demonstration by the CISF. Planting 75 selected trees in the campus - From Roots to Shoots, Independence Day Rally in which faculty, students, staff and others participated and programmes organised by the IIST Cultural Committee and IIST Music Club followed.

7.2.5. Sadbhavana Diwas

IIST observed the Sadbhavana Diwas on August 18, 2022 in honour of the birth anniversary of former Prime Minister Late Shri Rajiv Gandhi. Dr Kuruvilla Joseph, Registrar, IIST, administered the Sadhbhavana Pledge in front of the administration block. Deans, Officers and Staff from the administration participated in the programme. Faculty, Students, Officers and Staff from other Department / Sections of the institute took the pledge from their respective Departments / Sections.

7.2.6. Diwali

The Diwali celebrations on October 24, 2022 at IIST were a magnificent spectacle of light and joy as the campus came alive with the warm glow of lamps and the crackling brilliance of fireworks. Students joined together to illuminate the premises with an array of beautifully decorated diyas, symbolizing the triumph of light over darkness. The night sky was aglow with a breath-taking display of fireworks, symbolizing the spirit of this festival and the unity among the IIST community in embracing the traditions and values that Diwali represents.



7.2.7. Vigilance Awareness Week

With the theme, Corruption free India for a developed Nation, Vigilance Awareness Week brings together all stakeholders to collectively participate in the prevention of and fight against corruption and to raise public awareness regarding the existence, causes and gravity of and the threat posed by corruption. IIST observing Vigilance Awareness Week during the period October 31 to November 06, 2022.

7.2.8. Constitution Day

The Constitution Day commemorates the adoption of the Constitution of India. Constitution Day was celebrated on November 26, 2022 in IIST campus. Dr YVN Krishna Murthy, Registrar, IIST administered the pledge to the Deans, Faculty members, Officers and other staff of IIST.

7.2.9. World Hindi Day

World Hindi Day is observed on 10th January every year in all Centers/ Units of DoS. As part of the World Hindi Day Celebrations - 2023 various competitions were conducted for the faculty and staff members from January 10 -16, 2023 and for the students of the Institute from January 11-13, 2023. Winners were awarded certificates in the prize distribution function held on January 26, 2023. Rolling trophies for the year 2022-2023 were also awarded to the house that secured the highest points. Avionics House from the Students category and General Services House from the Staff Category won the Rolling trophies.

7.2.10. Republic Day Celebrations

74th Republic day was celebrated in all its grandeur in IIST. Dr. S. Unnikrishnan Nair, the Director of IIST, delivered the message, followed by the inspection of the guard of honor. The day's festivities included a wide array of social and cultural performances by students, staff, and CISF personnel, along with the presentation of awards and prizes for various competitions, seminars, and talks. A notable highlight of the day was the visit by tribal students from Villumala to IIST.

7.2.11. National Science Day

As part of National Science day celebrations, Dr. S. Suresh Babu, Head and Scientist G, ATRF Branch, SPL, VSSC, ISRO delivered a talk on Aerosols and Climate on February 28, 2023.

7.2.12. National Mathematics Day

IIST celebrated National Mathematics day on 22nd December every year, on the birth anniversary of one of the greatest Indian mathematicians, Srinivasa Ramanujan. An online talk on the Life and Some of the Impactful Discoveries of Ramanujan was delivered by Prof. Kalyan Chakraborthy, Director, Kerala School of Mathematics

7.2.13. Holi

Amidst the backdrop of academia and scientific pursuits, Holi celebrated on March 8, 2023 brought a burst of vibrant energy, colour, and unbridled joy to the campus. The festivities typically began on the eve of the festival with the traditional bonfire, known as the "Holika Dahan,", where the student community came together to pray, sing, and dance around the flames, commemorating the victory of virtue. The next day saw students gathering in the open spaces, armed with an array of bright, powdered colors, smearing each other with hues that symbolize the triumph of good over evil. Water balloons and water guns added to the playful chaos, fostering an atmosphere of carefree revelry.

Beyond the colors and joyous chaos, Holi at IIST represents more than just a festival. It signifies unity, breaking down barriers, and fostering camaraderie among the diverse individuals who call the institute home. The celebration echoes the spirit of togetherness, reminding everyone that despite differences, they are all part of one big, colorful family.

7.3 Visits to IIST

- Ms Ruth Goode, US Embassy's Regional English Language Officer, Ms Shweta Khanna, English Language Specialist, US Embassy Delhi and Ms Brindha Balachandran, Education and English Language Outreach Coordinator, Chennai, visited Department of Humanities, IIST on April 8, 2022. The meeting was to explore the possibilities for helping in technical writing skills for IIST students and new possibilities of IIST becoming the nodal point of Language and Social Science outreach activities of the RELO.

- Dr Pawan K Goenka, Chairman, Indian National Space Promotion Authorization Centre (IN-SPACe), visited IIST on April 12, 2022. He had discussions with the Director, Registrar, Deans and faculty members of IIST.

- A delegation from France visited IIST on May 18, 2022 to discuss on future research, academic collaborations and exchange programmes.

- Shri M Maheshwar Rao, Additional Secretary, DoS visited IIST on October 13, 2022 and had meetings with Registrar, Deans, Heads of the Departments and Officers at IIST.

- The CEO of the Saudi Space Commission Dr. Mohammed bin Saud Al-Tamimi met the Director IIST on March 10,2023 to discuss aspects on cooperation with IIST, in training and developing national capabilities through space academic programs and sharing of educational curricula.

- As part of the 'Young Scientist Programme' under the banner of Kumari Aruvial Peravai, Kanyakumari - a voulntary group working among school children in Kanyakumari District. 100 students and 10 guides visited IIST on November 11, 2022. Dr. Umesh R. Kadhane, Professor, Dept. of Physics, Dr. Palash Kumar, Associate Professor, Dept. of Avionics and Dr. A. M. Ramiya, Assistant Professor, Dept. of Earth and Space Sciences gave talks on different topics. This was followed by facility visit to ground station, library and different labs. Prof. Kuruvilla Joseph, Dean (SA, SW&OP) interacted with the students.

7.4 Recognition for Units

- IIST received Certificate of Appreciation from DPIIT, Ministry of Commerce & Industry, Government of India in recognition for the active participation in the National Intellectual Property Awareness Mission (NIPAM).
- IIST won the third prize of the Town Official Language Implementation Committee (Office - 2) TOLIC Rajbhasha award for outstanding performance in the implementation of Official Language Hindi (Category-3) . Hindi Journal of IIST -'Antariksh Dhaaraayein' - was awarded the Second prizefor the best Hindi Journal. Prof. Kuruvilla Joseph, Registrar, received the TOLIC RAJBHASHA AWARD from Smt. G. sudharmani, Principal Accountant General & Chairman, TOLIC, Thiruvananthapuram. Smt. Cimy Asaf received the TOLIC RAJBHASHA AWARD for Best Hindi Journal. Smt. Bindya K. R, Deputy Registrar (Grade - I), Administration received the first prize for 'Tasweer Kya Boltee Hai Competition'- (Non Hindi Speaking Category). Dr. Ashok Kumar, Assistant Professor, Dept. of Physics received the consolation prize for 'Tasweer Kya Boltee Hai Competition' (Hindi Speaking Category).

Institute Facilities, Infrastructure & Other units of IIST

8. Institute Facilities, Infrastructure & Other units of IIST

In our ongoing commitment to provide an enriching and conducive learning environment for our students, the Institute has continued to invest in and expand its state-of-the-art facilities during the past year. These facilities serve as the bedrock of our academic and research endeavors, supporting our mission to nurture the next generation of leaders and innovators. From cutting-edge laboratories and well-equipped classrooms to extensive libraries and recreational spaces, our facilities reflect our unwavering dedication to academic excellence and holistic development. They are a testament to our belief that a world-class education is not only about what happens in the classroom but also about the broader experiences and opportunities that students encounter throughout their educational journey.

8.1 Multi-Disciplinary Computing Centre (MCC)

The Multi-Disciplinary Computing Centre (MCC) of the institute was established to provide a wide range of computer-aided solutions for various research problems and facilitate and support the institute's essential teaching and academic goals. Areas of research interests of the center include the following: Big Data Analysis, Climate Modelling, Computational Fluid Dynamics, Computational Structural Mechanics, Computation-Assisted Materials Science, Virtual reality, Machine Learning, Network Science and Engineering, Nonlinear Dynamics, and Geoinformatics. Currently, the center has a parallel computing facility with the computational power of 25 teraflops, 40 workstations, GPU servers, and 100 TB storage servers in the central facility. The following labs of various departments are also part of the center: Programming Labs (Mathematics, ESS), Machine Learning Lab (Mathematics), CADD Lab (Aerospace), Language Lab (Humanities), Computational Physics Lab (Physics), Molecular Simulation Lab (Chemistry), Virtual Reality Lab (Avionics), RF and Microwave Lab (Avionics). More than 200 students carried out their research/project work during the year 2022-2023 using the computational facility of the center.

8.2 Institute Library

IIST Library continued to support the academic and research activities of the institute by developing a balanced collection of print and electronic resources. Various tools and services suitable for delivering information services in the digital era are being followed in the library.

Statistics of library resources and details of expenditure during 2022-23 are given below:

Sl. No.	Resources	New Addition	Expenditure	Total No. as on 31st March 2023
1	Books	1258	47.37 lakh	35438
2	E-Books	Nil	Nil	8116
3	Print Journals	1	4.65 lakh	147
4	Individual Online Journals	6	15.34 lakh	10
5	Online Databases	Nil	200.92 lakh	21 (Full text databases : 20) (Bibliogrpahic database:1)

Sl. No.	Resources	New Addition	Expenditure	Total No. as on 31st March 2023
6	Online Tools a). Similarity Checking Tool b). Remote Access Facility c). Current Awareness Service			4
	d) Writing Assistance Tool		4.45 lakh	
8	Bound Volumes	129		1391
9	CD / DVD	7	Nil	1053
10	Maps	Nil	Nil	122
11	Reports	28	Nil	1322
12	Ph.D. Theses	44		142
13	Project Reports	28		1373

Library & Information Services

Library provides the following services for the user community:

Front Desk Services	Books on Call Service	Text Book Bank
Similarity Checking Service	Current Awareness Service	Inter Library Loan
IIST Virtual Library (IVL)	Social Media Management	Documentation Service
Library Web Portal	Shodhganga Co-ordination	Research Information Management Service
Digital Library	Multimedia Library	Resource Awareness Programme (REAP)
Reference Service	Web OPAC	Prior Art Search (ILL)
Graphic Design Service	Reprographic Service	Binding Service
Book Grant Management	Scanning Facility	Institution Membership

IIST library provides access to the following full-text e-journals:

American Institute of Aeronautics and Astronautics (AIAA), American Institute of Physics (AIP), American Mathematical Society, American Meteorological Society, American Physical Society (APS), American Society of Mechanical Engineers (ASME), Annual Reviews, ACM Digital Library, Cambridge University Press (CUP), Institute of Physics (IOP), IEEE Electronic Library (IEL), JSTOR, Optics Infobase, Oxford University Press (OUP), Royal Society of Chemistry (RSC), SPIE Digital Libray, Nature, Springer, Taylor and Francis and Wiley Online Library. In addition, the library subscribes to the bibliographic database - MathSciNet. The library provides access to e-books from publishers such as IOP, Taylor & Francis, CUP, IET, Springer and SPIE. These e-resources can be accessed through the campus network and IIST Virtual Library (IVL). IIST being a member of the Antariksh Gyaan consortium, the library has e-resource sharing and Inter library loan facility with other ISRO/DoS libraries.

The timing of the reading hall is extended till midnight to help users bring their books and read. Solar power for the library building was inaugurated during the reporting period. The library continued to act as the publishing house by designing and making documents such as newsletter, magazine, workshop and conference materials, administrative documents, convocation records etc. During the reporting period, book grant amounts to Rs.7.40 lakh were processed through the Book Grant Management System.

Four 'Book Fests' were organised in the library for users to select books for the library. Orientation programme and Resouce Awareness Programme (REAP) were organised for new students to familiarise library resources, procedures and practices. The library has organised an online workshop on " Improving Research Writing Using Grammarly" on May 9, 2022. "Library Week" was celebrated with webinars, workshop and read and share programmes.

8.3 Software Support Group

Manpower
1. Permanent (2) 2. Contract through Agency (1)

Software Support Group (SSG), led by a team of IT professionals, provides various software services and technical assistance at the Indian Institute of Space Science and Technology.

SSG implement software support and services to the various departments such as Academics, Administration, Transport, Canteen, Purchase, Stores, Accounts and Placement Cell in the Institute. SSG has designed, implemented, customized, tailored and updated many web applications without compromising on accuracy. SSG plays a vital role in providing software solutions based on the demand of the institute.

SSG Activities - A quick walkthrough

During the reporting year, accomplishments of SSG include the release of software, namely, Employee Leave Management System, GTE - PLR Data Management System, Article Submission & Review and Ph.D. Admission Requirement Collection. As part of the digital India initiative, several interfaces (APIs) were developed and hosted for the IIST JRF/SRF recruitment process on UMANG. The conference website and online registration forms were enabled for various departments in IIST.

Leave Management System - Manages employee leave requests for casual, special casual, vacation and earned leave.

GTE - PLR Data Management System - Role-based portal for GTE-PLR submission and approval.

Article Submission and Review Portal - Submit articles online for review and acceptance.

Ph.D. Admission Requirement Collection - Captures and consolidates the upcoming Ph.D. requirement.

a. Software tools enabled for various activities in the Institute:

Analysis, Design, Coding, Implementation, Maintenance and Enhancement

1. Attendance Management System- Automated the attendance processing of manpower contract personnel using biometric data to ease salary computation.
2. UG, PG and Ph.D. Admission Portal - Automated the entire admission process.
3. Book Grant Management System - Automated the book grant submission and approval process.
4. Canteen Booking System - Allows online booking and cancellation of breakfast/lunch/dinner services with an online payment mechanism.
5. Thesis Submission and Evaluation Portal - To submit thesis files for review and evaluation.
6. Online Counselling Software - For U.G. and P.G. admissions.
7. iCampus - Manages academic functions in the IIST campus.
8. Academic Portal - Student portal for viewing their academic records.
9. Online Student Feedback System - To record course feedback from students.
10. ISRO Absorption Counselling Software - For ISRO placement.
11. Convocation Portal - For registration and posting convocation-related information.
12. Material Management System - For Stores, Construction and Maintenance Division.
13. CHSS Card Printing System - For generating CHSS cards.
14. Student Activity Board - Best performer evaluation system.
15. Card Generation System - Printing identity cards for students and employees.
16. Payment Information System - For tracking budget details.
17. Student/Staff Directory - Information system of students and staff.

b. Customized Applications:

Implementation, Maintenance and Enhancement

1. COWAA IIST MIS
2. Canteen Stock and Credit Bill Software
3. TOMD for Transport
4. Stock Disposal Software
5. Personal Information System

c. Software Support:

Technical and User support

1. IIST Website
2. COINS and e-Procurement Software
3. COWAA Database support, backup and troubleshooting

d. Other Activities:

1. Analyze and provide various reports and charts based on the requirement
2. Application deployment, backup and version control

e. Current Software Development:

1. Article Processing Charge Management System
2. Hostel Management System
3. Asset Management System
4. Student Leave Management System
5. IIST Committee Data Collection

8.4 Construction and Maintenance Division CMD

The major works completed by CMD, IIST during the period are:

1. Supply, installation, testing and commissioning of 7.5 kWp solar-wind hybrid power plant with battery backup at climate observatory building in SSC campus at Ponmudi

- Completion cost : 16.20 Lakh

2. Construction of CISF Barrack at Ponmudi

- Total plinth area : 64 sq.m
- Occupancy : 7 Persons (3 bunk beds for 6 Jawans & Inspector)
- Cost of completion : 18.21 Lakhs

3. Labs in Avionics Block

Internet Lab Computer Vision

- Completion cost : 5.75 lakhs

Virtual Reality Lab

- Completion cost : 9.76 lakhs

ECAD/Network Lab

- Completion cost : 6.04 lakhs

PG & VLSI Lab

- Completion cost : 3.52 lakhs

4. Furnishing class rooms C/109 & C/110 with air-conditioning facility in Interdisciplinary Block

- Completion cost : 14.87 lakhs

Class room -C/109

Class room -C/110

5. Quantum Optical Technology Lab in Interdisciplinary Block

- Completion cost : 13.07 lakhs

6. Physical Metallurgy Lab in Aerospace Block

- Completion cost : 2.40 lakhs

8.5 Student Amenity Centre (SAC)

SAC houses multiple facilities that cater to the different needs of the IIST student community. The following facilities are currently operational in SAC.

- Indoor sports, fitness and recreation facilities
- Kitchen and mess hall with seating capacity of 450
- Amphitheatre with seating capacity of 820
- Multipurpose hall with seating capacity of 450

Sports & Fitness

A physically fit and active student is more likely to exhibit academic motivation, heightened alertness, and greater chances of academic success. Additionally, regular physical activity fosters self-discipline and confidence, while also promoting teamwork and a sportsmanlike spirit. To ensure comprehensive and balanced development, IIST encourages active student participation in a wide array of sports activities.

At IIST, we offer a structured programme designed to train students in various sports and fitness activities, overseen by qualified physical education instructors. Our student body is organized into different houses, and throughout the year, IIST hosts intramural competitions featuring various sports events, culminating in our annual sports day. Furthermore, IIST fields teams in a range of inter-university events, including cricket, basketball, volleyball, chess, football, and badminton. These teams consistently participate and compete in intercollegiate tournaments. In addition to the competitive sports, all our hostels are equipped with facilities for chess, carrom, and table tennis, which are accessible around the clock. For a broader range of amenities, the Students Amenities Center (SAC) provides the following facilities:

Recreation hall

- Chess, Carrom, Billiards and Table Tennis facilities
- Gymnasium equipped with Various facilities like treadmill, elliptic trainer, multigym and AB machine.
- Badminton courts
- Squash court

Students also have access to the following outdoor facilities

- Basketball court
- Volleyball court
- Outdoor gym
- Cricket net pitch area
- Cricket/Football ground






8.6 Medical Facilities

IIST Medical Facility functions 24 x 7 in a dedicated building with ample area for consultation and doing minor procedures with an emergency ward, male and female wards, nurse station, triage area, sterilization unit, storage, etc. Two doctors and four nurses are engaged on duty on contract basis. External isolation facility is maintained at Dhanishta hostel. A fully equipped Ambulance and a light vehicle are available round the clock to meet emergency situations. The students of the new batch are covered under Group Medi Claim Insurance Policy and Accident Insurance Policy. For specialized treatment, lab examinations etc., students were referred to outside hospitals recognized under

the insurance scheme. In the year 2022-2023, a total of 7440 patients were attended to by IIST medical services. All emergency medicines are in stock for the benefit of students and staff.



In connection with International Women's Day Celebration in IIST, a cancer screening camp was organized in IIST for all female faculty members and staff on March 10, 2023 in IIST Medical Services in collaboration with Regional Cancer Centre, Thiruvananthapuram. A blood donation camp was organised on November 2, 2022 by Union Bank of India working in the premises of IIST in collaboration with KIMS hospital and coordinated by IIST Medical Services. 48 donations were received. As part of Swachhta Pakhwada - 2023, a webinar was organized exclusively for girl students of IIST on February 8, 2023. Dr. L.B. Shaebha Irence, Medical Officer, IIST delivered the talk on the importance of "Health, Feminine hygiene and cleanliness".

8.7 Counselling Facilities

The counselling service at IIST is primarily a student support service intended to help students make the best of their learning environment and achieve their academic and personal goals. The centre is committed to providing a confidential, welcoming and non-judgmental environment in which students are free to explore any concerns they may have. The goal is to promote well-being, reduce emotional distress and foster resilience, thus empowering each student to face life's challenges with confidence and maturity. This year the service has also been extended to interested faculty and staff members.

A healthy emotional life is the foundation for personal, academic and professional success. Honouring individual differences, the counsellor uses compassionate, professional interactions to:

- Help develop the skills, attitudes, abilities and insights to meet both academic and life challenges.
- Develop healthy coping strategies that will have a positive impact on physical and mental health.
- Assist in overcoming personal challenges that may be hampering wellbeing and academic progress.

During this academic year around 300 individual counselling sessions were provided in face-to-face interactions. The transition to online support was successfully made where in-person interactions were not possible. These sessions were conducted through phone calls, text exchanges, zoom meetings and email.

8.8 Halls of Residence

IIST being a residential Institute offers accommodation to all the students. 11 Hostels (09 for Men & 02 for Women) inside the campus meets the accommodation requirements. Students were allotted single occupancy (Research scholars), Double occupancy (Post graduate and under graduate) and triple occupancy (first year under graduates) rooms in the reporting period. All hostels are provided with separate reading rooms, national and vernacular newspapers, television with satellite connection, safe drinking water (both hot and cold) and 24 hour uninterrupted power supply with generator backup. The Wi-Fi facilities of the hostels were augmented during the reporting period.

8.9 Canteen Services

Being a residential institute, canteen services in IIST has to cater to the majority of catering requirements of the students as well as faculty members and staff. 800 residential students as well as research scholars inside the campus and 200 officials which include faculty members, officers, staff make use of the canteen facility in two areas viz students mess in Students Activity Centre (SAC) with a capacity of 420 and Thripti Hall in Aditi building. All programmes organized in the Institute including workshops, conferences, meetings, students' cultural as well as technical festivals were supported by Canteen Services.

Canteen services in IIST is monitored by Students Canteen Management Committee (SCMC), Canteen Management Committee and Canteen Procurement Committee. Online meal booking has been made mandatory for faculty members, officers, staff and students.

8.10 Purchase and Stores Division

IIST Purchase Section is working based on GFR, DOS Purchase Manual and guidelines of CVC and Public Procurement Policy. The Government e-Market Place (GeM) is being utilized for institute procurements. During the financial year 2022-23, IIST procured items worth Rs.10.58 crores through 246 different Purchase Orders through GeM. 1600 indents worth Rs.34 crores were processed and 1248 purchase orders worth Rs.21.7 crores were released.

8.11 Transport Operations and Maintenance Division (TOMD)

The Transport Operations and Maintenance Division (TOMD) at IIST manages a fleet of 35 vehicles, encompassing a variety of categories, including light and heavy vehicles, two-wheelers, and an ambulance. TOMD primarily oversees the operation of 12 light vehicles and 5 route buses for the official transportation needs of faculty, officers, and staff. Furthermore, TOMD plays a pivotal role in facilitating internal transportation, supporting procurement activities across various service divisions, addressing the transportation requirements of students for both academic and non-academic pursuits, providing medical services, offering conveyance for official guests, and facilitating activities at Ponmudi Hills. Notably, during the reporting period, an additional 2 buses were procured to enhance our transportation capabilities.

8.12 Bank/ Financial Services

An exclusive branch of Union Bank of India along with its ATM, caters to the banking needs of students and staff.

8.13 Security Services

Campus security is entrusted to CISF personnel. Janitorial staffs cater to the security of all academic blocks, administrative block, library and hostels.

8.14 Other Units

8.14.1 Internal Quality Assurance Cell (IQAC)

The Internal Quality Assurance Cell (IQAC) of the Indian Institute of Space Science and Technology (IIST) plays a pivotal role in ensuring and enhancing the quality of education and research at the institution. IQAC is responsible for monitoring and evaluating various academic and administrative activities to maintain and improve the overall quality of the institute. This includes conducting regular meetings to review academic programs, faculty performance, and student outcomes, as well as assessing the adequacy of infrastructure and resources. IQAC also promotes research and innovation by facilitating collaborations, organizing workshops and seminars, and encouraging faculty and students to publish their research findings. Additionally, it ensures compliance with accreditation standards set by organizations like the National Assessment and Accreditation Council (NAAC) to maintain and improve the institute's ranking and reputation.

Furthermore, IQAC at IIST plays a crucial role in fostering a culture of continuous improvement and accountability. It collects and analyzes feedback from stakeholders, including students, faculty, and alumni, to identify areas for improvement and implement corrective measures. The cell also monitors the effectiveness of various policies and initiatives undertaken by the institute to ensure that they align with its mission and goals. By promoting transparency and accountability, IQAC at IIST helps the institution maintain high standards of education, research, and administration, ultimately contributing to its growth and success in the field of space science and technology.

8.14.2 Hindi Section and Official Language Implementation

IIST has a Hindi Section which not only caters to the constitutional and statutory requirements regarding the official language, Hindi, but also creates a conducive environment for the officials of the Institute to learn Hindi and work in Hindi. During the year, efforts were made for implementing the provisions of Official Languages Act and orders / instructions issued by the Department of official language from time to time regarding progressive use of Hindi.

Major Activities Related To Policy Implementation

- **Four Hindi Workshops:** June 14, 2022 for the executives, on September 28, 2022 for the faculty members, on December 19, 2022 for the employees of administrative areas and on March 9-10, 2023 for the employees and officers of technical areas.

Executives, Deans and HoDs attending the Hindi Workshop

faculty members

Employees of Administrative areas

Technical areas

- **Four Quarterly meetings** of the **OLIC** were conducted on June 28, 2022, September 23, 2022, December 13, 2022, March 30, 2023 in order to review the progress in the implementation of OL Policy and four Quarterly Progress Reports regarding progressive use of Hindi in the Institute were sent to the Department of Official Language and Department of Space.
- **Spoken Hindi Classes** were conducted from April to June 2022 for the students, regular and contract staff of IIST. Shri. R. Jayapal, Former Senior Hindi Officer, IIST conducted the sessions in Online mode.

- **Independence Day Celebrations - 2023**

Hindi versification and Hindi Essay Writing competitions were conducted in online mode for the students of IIST in connection with the Independence Day Celebrations-2023. Cash prizes were awarded to the winners of Hindi Competitions. The faculty members of IIST who passed in the Hindi Praveen Examination conducted by Hindi Teaching Scheme was also awarded certificate during the programme.


Dr. R. Sudharshan Kaarthik receiving the certificate from Dr. Sam Dayal Dev, Director IIST

- **Hindi Fortnight Celebrations - 2022** were conducted in the Institute during the second half of September. Quotes on Hindi by eminent personalities were displayed on every day. During this fortnight, various competitions in Hindi like '***What does the picture say', Noting and Drafting, Hindi Typing*** for staff members and ***Hindi Story writing*** and '***Hindi Elocution, Hindi Versification*** for the students of IIST were conducted. Cash prizes were awarded to the winners of Hindi Competitions. Hindi Software Training Programme were also conducted for the Employees of Administrative areas and Officers / Assistants of Technical areas.


- **Hindi Technical Seminar- 2022**

One day **Hindi Technical Seminar** for DOS Centers / Units of Pool 'C' was organized by IIST in association with VSSC, LPSC, IISU, IPRC and APEP on **25th November, 2022** on the theme "***Recent advances in Space Research - Opportunities for Innovation and Incubation".*** The seminar was presided by Dr. S. Unnikrishnan Nair, Director, IIST. Dr. YVN Krishna Murthy, Registrar, IIST and Chairman, Organizing Committee, Hindi Technical Seminar delivered the welcome address. The seminar was inaugurated by Shri. Nilesh M. Desai, Director SAC who also delivered the keynote address in the technical session of the seminar. Shri. M. Badarinarayana Murthy, Director IPRC, Shri. Suresh MS, Associate Director, LPSC, Shri. KS Mani, Associate Director, IISU, Shri. MG Som Shekharan Nair, Joint Director (OL), ISRO Hq/ DOS and Dr. Kuruvilla Joseph, Dean (SA, SW and OR) offered felicitations. During the seminar, forty articles on various aspects of space science and research were presented in Hindi from VSSC, LPSC, IPRC, IISU, APEP including six articles from IIST. Six technical sessions and one poster session were held. The proceedings of the seminar were released at the seminar. The best poster and best paper in each session were selected and the authors were honored at the valedictory session by Shri. S. Suresh, Controller, LPSC. The seminar witnessed eminent scientists, engineers, researchers presenting their work and contribution in Hindi.

Inaugural ceremony

Release of Proceedings

Keynote Lecture by Director, SAC

Valedictory Function

- In connection with the World Hindi Day Celebrations - 2023 in IIST various Hindi competitions like Hindi Solo Song, Hindi Versification, Translation of Scientific/ Technical Matter were organized for the students of the institute on January 11-13, 2023 and Memory Test, Dictation & Simple Translation for the employees were conducted on January 10-16, 2023. Cash prizes and Certificates were awarded to the winners of Hindi Competitions in a Prize Distribution Function held during the Republic Day Celebrations on January 26, 2023.

- The fifth issue of Hindi House Journal of IIST named **'Antarish Dhaaraayen'** was released by Registrar, IIST during the 46th meeting of Official language Implementation Committee. The magazine contains articles, poems, and creative works of students and Staff of IIST as well as the technical articles in Hindi sent by the employees of various centre/ units of DOS/ ISRO.

- ***In-service Hindi Language Training***

Assistant Director (OL) conducted the Prabodh and Praveen Examination of Hindi Teaching Scheme during May 2022 at IIST. Dr Anoop C S, Associate Professor, Dr. Immanuel Raja, Assistant Professor and Dr Natarajan E, Associate Professor passed Hindi Prabodh Examination and Dr. Basudev Majumder, Assistant Professor passed the

Hindi Praveen Examination conducted by Hindi Teaching Scheme of Department of Official Language in May 2022. Prabodh and Praveen Examination of Hindi Teaching Scheme during November 2022 was conducted at LPSC. Dr. A M Ramiya, Associate Professor passed Hindi Prabodh Examination and Dr Samir Mandal, Professor passed Hindi Praveen Examination conducted by Hindi Teaching Scheme of Department of Official Language in November 2022.

- As the percentage of employees possessing working knowledge in Hindi in the institute is above 80, the **Institute was notified as an office possessing working knowledge in Hindi** as per Rule 10(4) of the OL Act 1976. **Individual letters** were re issued to **six officials** who possess **proficiency in Hindi** to use Hindi in their official works.
- Since IIST is a notified office **three sections of the Institute** viz. **General Administration, Establishment and Review** have been notified for doing entire work in Hindi/Bilingual.
- Record of Degrees conferred, Provisional Certificates, Degree Certificates and all other certificates such as certificate of participation/ certificate of merit etc., were prepared and issued in bilingual format (both Hindi and English). Institute Brochure, Annual Report 2021-2022 were prepared in Hindi.
- Standard forms used in various Administrative Departments and Academics were bilingualised, visiting cards, name boards and rubber stamps were prepared in bilingual format.
- Name plates containing local name, Hindi, English and Botanical names of major trees were prepared and displayed in IIST campus.

- In order to ensure the compliance of Official Languages Act, 1963, Official Languages Rules, 1976 and relevant orders issued by the Dept. of Official Language time to time, check Points were re- established.
- In order to encourage the progressive use of Hindi **the incentive scheme for doing official work in Hindi** was continued.
- Assistant Director (OL), IIST provided faculty assistance for the conduct of OL workshop in VSSC, IISU, LPSC and IIST.

PARTICIPATION IN TOLIC

- ***Joint Rajbhasha Utsav organized by Town Official Language Implementation Committee***

IIST, Valiamala is a member of Town Official Language Implementation Committee (Office-2), Thiruvananthapuram and actively participated in its activities. The employees of the institute participated in **Joint Rajbhasha Utsav** organized under the auspices of the TOLIC.

Awards received under TOLIC Rajbhasha Puraskar Yojana 2021-2022

- **IIST** was awarded **fifth position** in TOLIC Rajbhasha award for Outstanding Performance in the Implementation of Official Language Hindi (Category-3)
- **Joint Rajbhasha Utsav** organized under the auspices of the TOLIC, TVPM
- **Dr. Ravi V** won the **Third Prize** in Hindi Essay Writing Competition**'** and **Dr. Deepak Mishra**, Professor, Dept. of Avionics won **consolation prize in** '**Hindi Extempore'** competition.

CONFERENCE PROCEEDINGS

1. Srujna Juratagi & **K.G Sreejalekshmi**, 2022, November. "रैंडम पोज़िशनिंग मशीन (RPM)- सूक्ष्म गुरुत्वाकर्षण प्रयोगों के लिए एक मंच" in ***Hindi Technical Seminar (HTS)*** on अंतरिक्ष अनुसंधान में हाल की प्रगति - नवाचार और उद्भवन के अवसर held at IIST, Thiruvananthapuram.
2. Sunil Kumar, M. Kaif, Umesh R. Kadhane & **P.R. Sinha,** 2022, November. "वायुमंडलीय सूक्ष्म कण के रासायनिक गुण तथा आकार के अध्ययन के लिए स्वदेशी उड़ान - समय एरोसोल द्रव्यमान स्पेक्ट्रोमीटर (ToF- AMS) का विकास" in ***Hindi Technical Seminar (HTS)*** on अंतरिक्ष अनुसंधान में हाल की प्रगति - नवाचार और उद्भवन के अवसर held at IIST, Thiruvananthapuram.
3. **Deepak Mishra** & Soumya, 2022, November. "अंतरिक्ष प्रौद्योगिकी के लिए मेटा - लर्निंग" in ***Hindi Technical Seminar (HTS)*** on अंतरिक्ष अनुसंधान में हाल की प्रगति - नवाचार और उद्भवन के अवसर held at IIST, Thiruvananthapuram.
4. **Ashok Kumar,** 2022, November. "तीव्र प्रकाशिक क्वांटम इंटेंगल्मेंट का क्वांटम संचार में उपयोगिता" in ***Hindi Technical Seminar (HTS)*** on अंतरिक्ष अनुसंधान में हाल की प्रगति - नवाचार और उद्भवन के अवसर held at IIST, Thiruvananthapuram.
5. **Prashant Prakash Angarakh,** 2022, November. "लायडार प्रौद्योगीकी - नवाचार और उदभावन के अवसर " in ***Hindi Technical Seminar (HTS)*** on अंतरिक्ष अनुसंधान में हाल की प्रगति - नवाचार और उद्भवन के अवसर held at IIST, Thiruvananthapuram.
6. **Abhay Jain,** 2022, November. "अंतरिक्ष की सफाई" in ***Hindi Technical Seminar (HTS)*** on अंतरिक्ष अनुसंधान में हाल की प्रगति - नवाचार और उद्भवन के अवसर held at IIST, Thiruvananthapuram.

8.14.3 Gender Sensitization and Internal Complaints Committee

The Gender Sensitization Cell at the Indian Institute of Space Science and Technology (IIST) serves as a crucial institutional mechanism dedicated to fostering a gender-inclusive and equitable environment within the academic community. Its primary purpose is to raise awareness, promote understanding, and address issues related to gender discrimination, harassment, and bias. By conducting educational programs, sensitization workshops, and providing support to students and staff, the cell aims to create a safe, respectful, and empowering atmosphere where all individuals, regardless of gender, can thrive, pursue their academic goals, and contribute effectively to the scientific and academic endeavors of the institution. In connection with International Women's Day celebrations 2023, a number of programmes were conducted. The Chief Guest for the function was Ms. Nishanthini R, IPS, DIG of Police, Thiruvananthapuram range and the Guest of honour of the programme was Ms. Jaya G Nair (former Scientist/ Engineer, VSSC) who contributed immensely to software and system development of various ISRO missions.

A short video presentation titled 'Women Uninterrupted' highlighting the commendable roles of women in IIST as supporting staff, faculty and students, music programme and dance performance, book exhibition cum sale and preliminary cancer screening (breast cancer) check up were organized by the committee during the period under report.

In pursuance of UGC (Prevention, prohibition and redressal of sexual harassment of women employees and students in higher educational institutions) Regulations, 2015 read with Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013, an Internal Complaints Committee (ICC) has been constituted in IIST to deal with the complaints relating to Sexual harassment at work place.

8.14.4 SC/ST Cell

The Scheduled Caste/Scheduled Tribe Cell at our institution is dedicated to safeguarding the interests and addressing the concerns of employees and students belonging to the SC/ST category. It is noteworthy that no grievances were reported during the reporting period. In addition, the cell organized a commemoration event on the occasion of Dr. B. R. Ambedkar's birth anniversary. Instead of arranging a lunch, the celebration took the form of distributing sweet packets valued at Rs 350/- to all employees on November 30, 2022.

8.14.5 Anti-Ragging Cell

The Anti-Ragging Cell at the Indian Institute of Space Science and Technology (IIST) serves a critical role in ensuring the safety and well-being of students. The cell actively has promoted a campus environment that is free from any form of ragging, by conducting awareness programs as part of the induction program, a sensitization workshop, and ensured the strict enforcement of anti-ragging policies. It also played a vital role in promptly responding to complaints, providing support to victims, and taking necessary actions against those found guilty of ragging. Through these efforts, the Anti-Ragging Cell ensured that students can pursue their education in a secure and respectful atmosphere, fostering a conducive learning environment at IIST.

8.14.6 Grievance Redressal Cell

The Grievance Redressal Cell at the Indian Institute of Space Science and Technology (IIST) is dedicated to addressing and resolving various grievances and concerns of students, faculty, and staff in a fair and impartial manner. Its primary purpose is to provide a platform for individuals to voice their grievances related to academic, administrative, or personal matters. The cell conducts thorough investigations, facilitates communication between the concerned parties, and strives to reach amicable solutions. It also plays a pivotal role in ensuring transparency and accountability within the institution's operations. By fostering a responsive and supportive environment, the Grievance Redressal Cell contributes to enhancing the overall quality of education and administrative processes at IIST.

8.14.7 Public Information Cell

The institute has a Public Information Office which disseminates information in a time bound manner.

RTI Status

Application Received	Information Given	Appeal Received	Appeal Settled	CIC Hearing
44	34	2	0	Nil

Vigilance Status

Vigilance cases pending and disposed off in the year 2022-2023 - Nil.

8.15 Facilities for Persons with Disability

The buildings of IIST premises are equipped with facilities to enhance accessibility for individuals with reduced mobility, including disabled access ramps, elevators, and accessible restrooms. These features have been thoughtfully incorporated throughout the academic blocks, administrative building, and library, ensuring inclusivity

for all. Furthermore, the Student Activity Centre, hostels, and mess building also offer accessible toilets and ramps, further exemplifying our commitment to providing a barrier-free environment for individuals with disabilities.

IIST admits PwD students to UG & PG programmes as per Government of India guidelines with 5% reservation on horizontal level. In the 2022 UG admission, 7 seats were reserved out of the total of 168 seats and PG Admission 5 seats were reserved out of total 133 seats.



8.16 Inhouse Publications

Surabhi is the a bi-annual art and creative journal of Arts and Literature published by Indian Institute of Space Science and Technology. It publishes creative and literary articles written by students, staff and faculty of IIST as well as employees from various centres of Department of Space. It also publishes interviews of interesting and talented personalities from DOS. The institute publishes its 17th and 18th volume during this period.

The Sounding Rocket (TSR) is the biannual student newsletter composed and designed by students at IIST chronicling life and times at the institute.

IIST News Letter brings out the latest developments in the institute. It covers the whole spectrum of activities in the institute. The 8th volume of the newsletter was brought out during this period

Antarish Dhaaraayen is the inhouse Hindi Journal of IIST. The E- Journal contains articles, poems, reports of major functions and creative works of students and personnels of IIST as well as the technical articles in Hindi sent by the employees of various centre/ units of DOS/ ISRO. The fourth issues was published during the period 2022-23.

Alumni @ IIST

9. Alumni @ IIST

The Indian Institute of Space Science and Technology Alumni Association (IISTAA) stands as a vibrant and integral part of the institution's legacy. Comprising a network of accomplished and passionate individuals who have graduated from IIST, the association serves as a bridge connecting the past, present, and future of the institution. With its roots deeply embedded in the rich heritage of space science and technology education, the IIST Alumni Association fosters a sense of community, collaboration, and a shared commitment to advancing the frontiers of space exploration. Through its diverse range of activities and initiatives, the association not only keeps the alumni connected but also plays a pivotal role in nurturing the institution's global impact and promoting the spirit of space innovation and exploration.

Life beyond IIST - Session for IIST Students by Thiruvananthapuram Chapter

'Life beyond IIST' was an informational session conducted by IISTAA's Trivandrum chapter, at IIST, in coordination with the IIST placement cell for students of IIST on April 8, 2022. The aim of the session was to make the students aware of the opportunities once they graduate.

The session focused on options available within and outside ISRO, higher studies, and important things to consider during the student- years. The students asked questions related to - centre preference, the research vs regular work at ISRO, finding better placements in the job market, experience of alumni, etc. The session was a great success with more than 50 students in attendance including both B.Tech. and M.Tech. students.

Futsal Reloaded

Trivandrum chapter of IISTAA successfully conducted a single day football event - Futsal Reloaded, on May 1, 2022. As the name suggests, it was a nod to one of the most popular events during college days.

The event was conducted at Nirmo Lawns, Kochuveli and was open to all B.Tech., M.Tech, Ph.D. alumni as well as faculty and staff. 4 teams registered (Goal Diggers, IIST Warriors, IIST Red Rangers and UDFC United) with 39 players in total. The event was attended by several alumni who cheered from the sidelines as the teams battled it out on the field. Goal Diggers won the tournament with IIST Warriors as runners-up.

Seek and Find - Session for Engineering Physics Students of IIST

An online session was conducted on May 7, 2022 to answer questions of current students from Engineering Physics branch of IIST. Students gained insights into various aspects and opportunities offered by the field which aimed at guiding their choices post-graduation. Queries of students regarding multiple centers and future aspects were answered by alumni from NRSC, PRL, SAC and URSC.

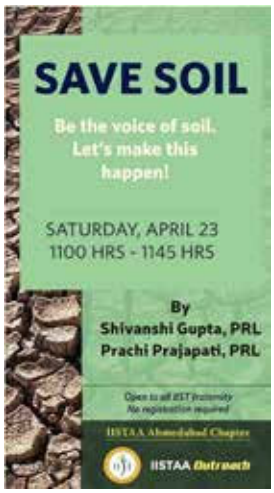
Get-Together by SHAR Chapter

SHAR Chapter of IISTAA organised a fun get-together for its chapter members and their families, on May 31, 2022, at the Housing Colony in Sriharikota. The event consisted of introduction of new members to the chapter, farewell to members who resigned from SHAR in the recent past, games and an open-mic.

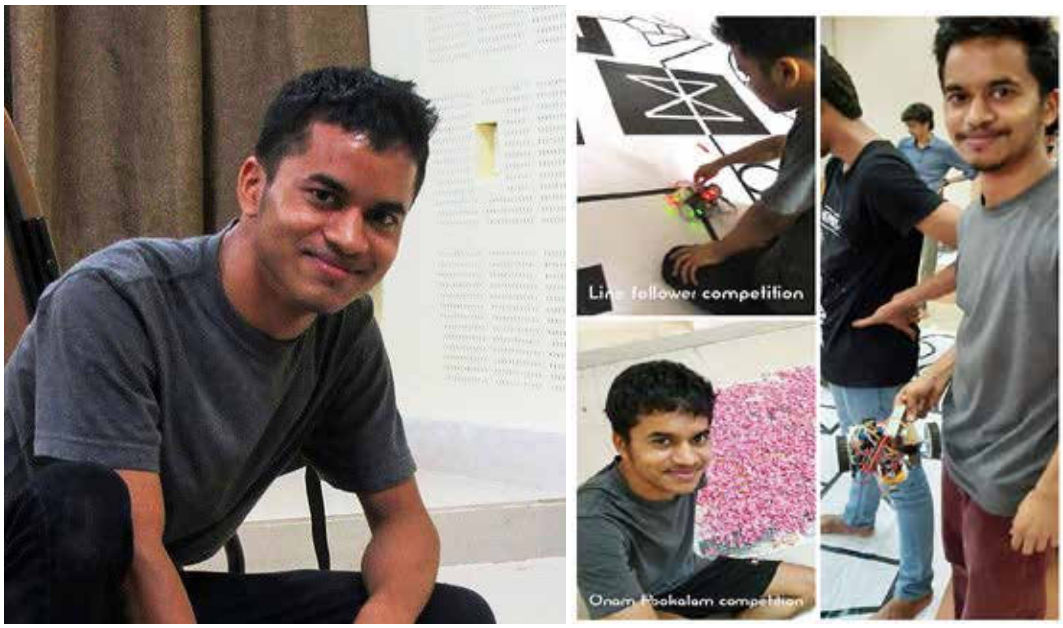
Save Soil

Ahmedabad chapter of IIST Alumni Association (IISTAA) organized a webinar on “Save Soil”, a talk focusing on the Soil Extinction - the Problem and the Solution. The Save Soil global movement, launched by Indian spiritual leader Sadhguru, raises awareness of land degradation and advocates for healthy soil. The initiative has supporters

spreading over a wide spectrum, from the 14th Dalai Lama, former ISRO Chairman Shri Kiran Kumar, in addition to environmentalists, various film personalities, sportspersons, and policymakers at the international levels. The talk was presented by Prachi Prajapati and Shivanshi Gupta and the event was coordinated with the help of executive members of Ahmedabad Chapter.



Condolence Meet for Niharranjan Pradhan



IISTAA grieved the loss of Niharranjan Pradhan, a B.Tech. Aerospace Engineering Graduate from the 2016 joining batch. Niharranjan worked as a Scientist/Engineer 'SC' in Vikram Sarabhai Space Centre. A virtual condolence Meet was held on May 22, 2022, in memory of Niharranjan - a diligent son, a loving brother and a caring friend. The batch-mates of Niharranjan made a memory book as a tribute to Nihar's life in which they shared in words and pictures their memories with Nihar.

T + 10 Years: Vyom

An online event was held commemorating a decade since the launch of Vyom, the first sounding rocket of IIST. 10 years ago, on May 11, 2012, a team of IIST students under the guidance of faculty, ISRO scientists and engineers pulled off the great feat of developing and launching the first student sounding rocket of India.

IISTAA organized the session on June 5, 2022, to celebrate the 10 years and reflect back on how the efforts of the

team culminated into the historic rocket launch. The Presidential address was given by Dr. B N Suresh (Chancellor, IIST). Dr KN Ninan, Former DD, VSSC and Emeritus Professor IIST delivered the Keynote address sharing the journey of the first Sounding Rocket team of IIST. The event was attended by Former Director, ISRO engineers, faculty, alumni and students of IIST.

Hakuna Matata

Hyderabad Chapter of IISTAA organized a meet-up on July 2, 2022 at Rspot Sports Centre, Moosapet. The event consisted various games and an open mic and snacks were served. The get together saw the participation of alumni and their families.

Meeting with Director, IIST

Few of the alumni members paid a visit to Dr. Sam Dayal Dev, Director IIST, on June 16, 2022 and the following topics were discussed.

1. Functioning of IISTAA office in college and possibility of a person from college deputed permanently for the same.
2. Smooth entry of Alumni into the campus - possibility of an entry card for everyone, which will be helpful especially for alumni who are not part of ISRO and want to visit the college.
3. CGPA to percentage issue and an intimation about our plan to present it in the academic committee.
4. Possibility of accommodation for alumni visiting the campus from outside of Trivandrum.

The Director expressed a keen interest in alumni affairs and the points discussed are expected to be followed upon in the coming months.

Alumni Participation in IIST IQAC

The Internal Quality Assurance Committee of IIST was set up in 2012. A functional IQAC and timely submission of the AQAR are minimum institutional requirements to apply for subsequent rounds of NAAC accreditation. Alumnus, Aditya Chapalkar, has been included as the alumni representative in the committee. He attended a meeting held on July 4, 2022 and shared insights from the meeting with the Executive Body in a subsequent meeting. The discussion revolved around ways to improve the NIRF ranking of the institute and alumni input and support is sought.

Azadi Ka Amrit Mahotsav

On the occasion of 75 years of our independence and as part of Har Ghar Tiranga campaign, IISTAA asked alumni to

send in pictures of themselves with the Tiranga.

Working for ISRO/DOS : Things you need to know

IISTAA successfully conducted an online session on, Working for ISRO/DOS : Things you need to know, for the graduating batch of 2022. The event was conducted on August 28, 2022. Various chapter representatives presented slides on centers in their cities. Students gained an insight into the work-life at various ISRO centers and had alumni from across chapters address their queries.

IISTAA extended a warm welcome to the latest additions to the alumni community and wished the graduating batch of 2022 great success in their endeavors.

Chapter-wise Annual General Body Meetings AGMs - 2022

To commemorate Alumni Day and IIST Foundation Day on September 14th, chapter-wise Annual General Body Meetings (AGMs) were organized, recognizing that IIST alumni are dispersed across various parts of India and abroad.

The Chapter executives organized offline meet-ups between September to November 2022. The Annual Report was presented by the Chapter Secretaries and the Audited Financial statements were presented by the Chapter Treasurers. Suggestions were sought from the alumni about improving the functioning of the association. National body supported the chapters for funding the meet-up. Registered members of the IISTAA received a discounted/free entry for participating in the AGM depending on the location and scale of the event. The Ahmedabad, Bangalore, Hyderabad and Trivandrum Chapters conducted meetings in their respective places.

Ankesh Mishra Memorial Quiz

The 3rd edition of the Ankesh Mishra Memorial Quiz (AMMQ) was successfully conducted on September 24, 2022 jointly by IISTAA and Quiz Club IIST.

AMMQ is an annual quiz organized by the IIST Alumni Association in memory of Ankesh, the beloved founder of the IIST Quiz Club. Over 50 alumni and students participated in the prelims and six teams proceeded to compete in the finals.

Webinar - Entrepreneurship Opportunities in the Space Sector

The SHAR Chapter organized a webinar on "Entrepreneurship Opportunities in the Space Sector", on 9th Oct, 2022 with Prateep Basu, CEO & Chief Product Officer at SatSure (2007 B.Tech. Aerospace Batch) and Divyanshu Poddar, CEO & Chief Educator at Rocketeers Research Institute (2009 B.Tech. Aerospace Batch) as speakers.

The webinar garnered tremendous success, with a significant turnout of alumni actively engaging and interacting with the speakers.

Memory Book for Niharranjan Pradhan

IIST Alumni from Batch of 2016-2020 compiled a Memory Book in the fond remembrance of their batchmate, Niharranjan Pradhan. Alumnus Aromal Loujan (B.Tech. 2016 Batch) with IISTAA President Surbhi Baghotia (B.Tech. 2008 Batch) handed over a copy to the IIST Library in Feb, 2023.

Coffee Talk: In Connection with Women's Day

In connection with the International Women's Day 2023, IISTAA kicked off its Coffee Talk online series on March 12, 2023. The talk was open to everyone, allowing for casual conversations with women from IIST, where they shared their diverse stories and celebrated their individual experiences.

Achievements

IISTAA congratulates Aishwary Mishra (Graduating Batch of 2017, B.Tech. Aerospace Engineering and currently pursuing Ph.D. at IIST), who won the logo design competition organized by IIST on October 12, 2022 by IIST. Marking the 15 years since its foundation, the institute organized a competition during the inauguration of the year-long crystal jubilee celebrations. The logo designed by Aishwary was unveiled by Shri. S Somanath, Chairman ISRO on IIST campus.

Aishwary led the Graphics Team of IISTAA's Outreach earlier and one of his major contributions included designing the logo of IIST Alumni Association.

Audit Report 2022-2023

BALAMURALI & ASSOCIATES

CHARTERED ACCOUNTANTS

"Thiruvathira" , T.C.50/100(2) , Kalady , Karamana.P.O- 695002
Ph- 91-9387496230 , ca.balamurali.tvm@gmail.com

INDEPENDENT AUDITOR'S REPORT

We have audited the accompanying financial statements of **INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY, Valiamala P.O., Thiruvananthapuram – 695547 which comprise the Balance Sheet as at 31 March 2023** and the Income and Expenditure Statement for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation of these financial statements that give a true and fair view of the financial position & financial performance of the Institute in accordance with the Accounting Standards issued by the Institute of Chartered A accountant of India. This responsibility includes the design, implementation and maintenance of internal control relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

Auditor Responsibility

Our responsibility is to express an option on these financial statements based on our audit. We conducted our audit in accordance with the Standards on auditing issued by the Institute of Chartered Accountants of India. Those Standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement,

Including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Institute's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of the accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Basis of Qualified Opinion.

1. Reconciliation of Fixed Assets with regard to quantity, location, cost is pending.
2. The balances in Sundry Creditors, Loans and advances and other personal accounts are subject to confirmation by respective parties.

Qualified Opinion

In our opinion and to the best of our information and according to the explanations given to us, subject to the above mentioned opinion, the financial statements give the information required by the Act in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India.

i. In the case of the balance sheet, of the state of affairs of the Institute as at 31st March 2023
ii. In the case of the Income and Expenditure statement, of the deficit for the year ended on that date.

For BALAMURALI & ASSOCIATES
Chartered Accountants
ICAI FRN - 012311S

BALAMURALI, M.Com,FCA
Proprietor
ICAI M.No-223319

BALAMURALI & ASSOCIATES
TRIVANDRUM
Chartered Accountants

Place: Thiruvananthapuram
Date: 30-09-2023

UDIN-23223319BGWJLM2894

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

BALANCE SHEET AS AT 31ST MARCH, 2023

(Amount in Rs.)

	Schedule	As at 31.03.2023	As at 31.03.2022
CORPUS/CAPITAL FUND AND LIABILITIES			
Corpus / Capital Fund	1	1,90,41,98,691	2,19,40,77,563
Reserves and Surplus		2	2
Earmarked Funds / Endowment Funds	2	4,39,07,552	3,50,74,653
Long Term Liabilities and Provisions	3	31,11,17,265	29,28,67,843
Current Liabilities and Provisions	4	35,59,93,091	31,17,81,815
TOTAL		**2,61,52,16,601**	**2,83,38,01,876**
ASSETS			
Fixed Assets	5	1,76,33,04,877	1,77,62,01,645
Long Term Assets, Loans, Advances etc	6	14,13,77,027	14,12,70,066
Current Assets, Loans, Advances etc	7	71,05,34,697	91,63,30,165
TOTAL		**2,61,52,16,601**	**2,83,38,01,876**
Significant Accounting Policies & Notes on Accounts	18		

As per our report of even date attached.

For Balamurali & Associates
Chartered Accountants
FRN : 012374S

For BALAMURALI & ASSOCIATES
Chartered Accountants
ICAI FRN - 012374S

C.A. Balamurali C. V.
(Proprietor, Mem No. 223319)

Proprietor
ICAI M No. 223319

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Dr. S. Unnikrishnan Nair
Director

R. Hari Prasad
Finance Officer

Place : Thiruvananthapuram
Date : 27th September, 2023

UDIN-23223319BGWJLM2894

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2023

(Amount in Rs.)

	Schedule	2022-23	2021-22
INCOME			
Grants / Subsidies	8	72,76,48,790	77,00,00,000
Fees / Subscriptions	9	8,07,53,467	5,74,60,593
Interest Income of IIST	10	95,41,761	75,13,433
Interest Earned on Grant & Retirement Funds	11	1,82,35,587	1,42,57,663
Other Income	12	40,54,054	29,16,634
TOTAL (A)		**84,02,33,659**	**85,21,48,323**
EXPENDITURE			
Establishment Expenses - Regular	13	39,53,85,382	41,28,79,727
Establishment Expenses - Support Services	14	17,99,80,146	15,85,82,114
Academic & Other Student Expenses	15	14,00,40,867	9,56,32,049
Other Administrative Expenses	16	12,77,02,949	9,47,86,121
Interest Refundable by IIST	17	1,82,35,587	1,42,57,663
Gross Deficit of Canteen Accounting Committee		11,76,089	13,91,208
Depreciation	5	24,13,99,391	21,75,24,515
TOTAL (B)		**1,10,39,20,411**	**99,50,53,397**
Excess of Income over Expenditure (A-B)		(26,36,86,752)	(14,29,05,074)
Less : Prior Period Items		**(50,99,880)**	**(7,101)**
Balance being Surplus/(Deficit) carried over to Corpus/Capital Fund		**(25,85,86,872)**	**(14,28,97,973)**
Significant Accounting Policies & Notes on Accounts	18		

As per our report of even date attached.

For Balamurali & Associates
Chartered Accountants
FRN : 012374S

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

For BALAMURALI & ASSOCIATES
Chartered Accountants
ICAI FRN 012374S

C.A. Balamurali C. V.
(Proprietor, Mem No. 223319)

Dr. S. Unnikrishnan Nair
Director

R. Hari Prasad
Finance Officer

Place : Thiruvananthapuram
Date : 27th September, 2023

UDIN-23223319BGWJLM2894

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

(Amount in Rs.)

	As at 31.03.2023	As at 31.03.2022
Schedule 1 :: CORPUS / CAPITAL FUND		
Total Grant Received - Capital and Revenue (A)		
Opening Balance of Total Grant Received	11,06,63,09,987	9,94,63,09,987
Add : Grant received during the year	73,11,00,000	1,12,00,00,000
Less : Grant returned [TSA]	34,28,210	-
Less : Capital Grant refundable [Sch Commerical Bank]	3,12,92,000	-
Less : Revenue Grant refundable [Sch Commerical Bank]	23,000	-
	11,76,26,66,777	11,06,63,09,987
Total transfer to Revenue Grant (B)		
Opening Balance of amount transferred to Revenue Grant	5,89,00,37,442	5,12,00,37,442
Add : Transfer to Revenue Grant of 2022-23	72,76,48,790	-
Add : Transfer to Revenue Grant of 2021-22	-	77,00,00,000
	6,61,76,86,232	5,89,00,37,442
Surplus / Deficit transferred from Income & Expenditure Account (C)		
Opening Balance of net income / (expenditure)	(2,98,21,94,982)	(2,83,92,97,009)
Add/Deduct : - Current Year Surplus / (Deficit)	(25,85,86,872)	(14,28,97,973)
	(3,24,07,81,854)	(2,98,21,94,982)
Balance at the year end (A - B + C)	**1,90,41,98,691**	**2,19,40,77,563**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS	1 DOS - Dr. Palash - HSP - Real TIme Gas Sensor	2 DOS - MOM2 - RPA - Dr. Ambili KM	3 DOS-SAC- Dr. Rajesh V J	4 DOS - Dr. Umesh - Planetary Exploration	5 DOS - Dr. Rajesh V J (Spectral)	6 VSSC - Dr. Natarajan E	7 IISU - Dr. Umesh Kadhane - Proj Assistant
a) Opening balance of the funds	-95,77,937	-26,54,198	2,39,168	3,22,790	1,90,528	1,04,676	97,235
b) Additions to the Fund							
i) Donation/Grants	0	0	0	20,00,000	0	0	0
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	-95,77,937	-26,54,198	2,39,168	23,22,790	1,90,528	1,04,676	97,235
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	1,33,18,779	0	0	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	1,33,18,779	0	0	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	4,87,200	0	1,53,147	7,000	0	0
- Rent/Consumables	16,898	0	0	1,57,521	0	0	0
- Other Administrative Expenses	4,17,880	11,470	0	4,559	0	0	0
Sub Total	4,34,778	4,98,670	0	3,15,227	7,000	0	0
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	1,37,53,557	4,98,670	0	3,15,227	7,000	0	0
Net Balance payable as at the year-end (a+b-c)	**0**	**0**	**2,39,168**	**20,07,563**	**1,83,528**	**1,04,676**	**97,235**
Net Balance receivable as at the year-end (c-a-b)	**2,33,31,494**	**31,52,868**	**0**	**0**	**0**	**0**	**0**

Note : Classified under Current Assets under Sch 8

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	**8** IISU - Perf. of Ball Bearings - Dr. Jinesh KB	**9** IPRC - Dr. Palash - 2018 - Hydrogen Sensor	**10** ISRO-GBP - ABLN & C Project	**11** ISRO -Dr. K G Sreejalekshmi - Gaganyaan	**12** ISRO - MOM - Dr. Rajesh VJ	**13** LPSC - Dr Dinesh N Naik	**14** LPSC - Dr.Jinesh K B - Laser Ignition System
a) Opening balance of the funds	1,54,631	-44,820	7,23,170	3,88,651	6,16,323	-19,34,826	3,77,025
b) Additions to the Fund							
i) Donation/Grants	0	0	0	14,40,000	0	0	0
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	1,54,631	-44,820	7,23,170	18,28,651	6,16,323	-19,34,826	3,77,025
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	39,728	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	39,728	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	0	66,794	0	0	0
- Rent/Consumables	0	0	0	4,484	0	0	0
- Other Administrative Expenses	0	0	0	4,559	0	0	0
Sub Total	0	0	0	75,837	0	0	0
iii) Fund Returned to the Funding Agency	1,54,631	0	0	0	0	0	0
Total (c)	1,54,631	0	0	1,15,565	0	0	0
Net Balance payable as at the year-end (a+b-c)	**0**	**0**	**7,23,170**	**17,13,086**	**6,16,323**	**0**	**3,77,025**
Net Balance receivable as at the year-end (c-a-b)	**0**	**44,820**	**0**	**0**	**0**	**19,34,826**	**0**

Note : Classified under Current Assets under Sch:7

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	15 LPSC - Dr. Jinesh K B - SDS	16 LPSC - Dr. Umesh K - Monte Carlo Model	17 LPSC - Dr. Umesh Kadhane	18 LPSC Dr. Umesh K - Plasma Thruster	19 LPSC - High Thrust EPS - Dr. Umesh K	20 NRSC - P R Sinha - Balloon Launching	21 DAE - 2022 - Dr. Sakthivel - NBHM Multiphase
a) Opening balance of the funds	3,96,062	18,084	2,92,830	-1,13,754	-1,53,768	0	0
b) Additions to the Fund							
i) Donation/Grants	0	0	0	0	0	0	5,99,200
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	3,147
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	3,96,062	18,084	2,92,830	-1,13,754	-1,53,768	0	6,02,347
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	0	0	1,09,950
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	0	0	0	1,09,950
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	0	0	0	0	50,000
- Rent/Consumables	0	0	0	0	0	4,291	0
- Other Administrative Expenses	0	0	0	0	0	0	52,200
Sub Total	0	0	0	0	0	4,291	1,02,200
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	0	0	0	0	0	4,291	2,12,150
Net Balance payable as at the year-end (a+b-c)	**3,96,062**	**18,084**	**2,92,830**	**0**	**0**	**0**	**3,90,197**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**1,13,754**	**1,53,768**	**4,291**	**0**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	22 DBT - Dr. Palash - 2017- Liquid Biopsy for Cancer	23 DBT - Dr. Palash - Green House Gases	24 DBT - Dr. Shaiju - Ramalingaswami Fellowship	25 DBT- RamaRao (Rural Urban Interface)	26 DOH - Dr.Gnanappazham L - 2023 - Market	27 DRDO - ARMREB - Dr. K. Prabhakaran	28 DRDO - DR.Praveen Krishna IR- 2022- Gas
a) Opening balance of the funds	-5,58,074	-1,54,608	-62,595	48,12,580	0	-20,021	0
b) Additions to the Fund							
i) Donation/Grants	0	0	21,58,380	0	10,27,000	1,42,483	33,72,000
ii) Income from Investment made on account of Funds	0	0	6,482	1,21,030	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	-5,58,074	-1,54,608	21,02,267	49,33,610	10,27,000	1,22,462	33,72,000
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	3,44,915	15,71,020	8,11,040	0	1,12,462	52,000
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	0	2,79,415	1,76,345	1,51,536	0	10,000	0
Sub Total	0	6,24,330	17,47,365	9,62,576	0	1,22,462	52,000
iii) Fund Returned to the Funding Agency	0	29,501	21,415	42,42,826	0	0	0
Total (c)	0	6,53,831	17,68,780	52,05,402	0	1,22,462	52,000
Net Balance payable as at the year-end (a+b-c)	**0**	**0**	**3,33,487**	**0**	**10,27,000**	**0**	**33,20,000**
Net Balance receivable as at the year-end (c-a-b)	**5,58,074**	**8,08,439**	**0**	**2,71,792**	**0**	**0**	**0**

Note : Classified under Current Assets under Sch 7

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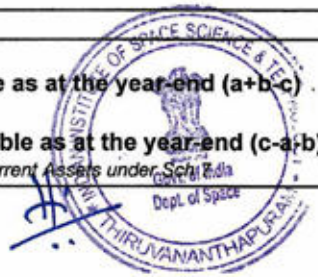
SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	29 DRDO - Dr. Rajesh S. - 2022 - TDLAS Temp Sensor	30 DRDO - SASE - Dr. Govindankutty M	31 DST - Dr. Rama Rao N	32 DST - CNRS - Dr. Palash Basu - 2020 - Biomarker	33 DST-Dr Jinesh KB- Atomic Layer Deposition	34 DST - KIRAN - WOS(A) - Pushpa K - Quantum	35 DST - NGP - A.M Ramiya - Smart Cities 3D
a) Opening balance of the funds	0	1,60,490	52,757	9,87,889	33,09,078	1,54,106	1,50,025
b) Additions to the Fund							
i) Donation/Grants	24,57,000	0	0	4,97,168	0	0	0
ii) Income from Investment made on account of Funds	32,102	0	0	0	66,234	0	516
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	24,89,102	1,60,490	52,757	14,85,057	33,75,312	1,54,106	1,50,541
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	1,28,940	0	0
- Others	0	0	0	0	0	0	-27,095
Sub Total	0	0	0	0	1,28,940	0	-27,095
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	1,12,097	0	0	1,75,000	10,27,407	0	2,14,727
- Rent/Consumables	31,860	0	0	0	1,19,952	0	0
- Other Administrative Expenses	0	0	0	3,34,755	31,049	0	0
Sub Total	1,43,957	0	0	5,09,755	11,78,408	0	2,14,727
iii) Fund Returned to the Funding Agency	0	0	0	0	2,54,280	1,54,106	1,08,123
Total (c)	1,43,957	0	0	5,09,755	15,61,628	1,54,106	2,95,755
Net Balance payable as at the year-end (a+b-c)	**23,45,145**	**1,60,490**	**52,757**	**9,75,302**	**18,13,684**	**0**	**0**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**0**	**1,45,214**

Note : Classified under Current Assets under Sch 7



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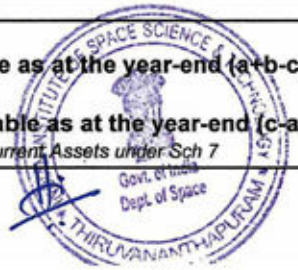
SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	36 DST - NRDMS - Dr.Ramarao - 2022 - Geodesy	37 ICSSR - Dr. Shaijumon - 2020 - Tele Medicine Units	38 IITG - Dr.Prathap - 2022 - Hydrogen	39 INAE - Dr. Palash - 2022 - Abdul Kalam Fellowship	40 KSCSTE - Dr.Anoop C.S - 2022 - Magneto -	41 Mangrove Cell - Dr. Gnanappazham - 2018	42 Max-Planck - Dr. Jagadheep - 2017
a) Opening balance of the funds	0	2,01,351	0	0	0	7,08,947	18,19,262
b) Additions to the Fund							
i) Donation/Grants	20,93,120	0	13,99,544	19,00,000	9,58,600	3,19,082	0
ii) Income from Investment made on account of Funds	23,328	43,640	0	24,406	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	21,16,448	2,44,991	13,99,544	19,24,406	9,58,600	10,28,029	18,19,262
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	67,672	2,21,140	0	0	0
- Others	0	0	0	0	0	6,36,190	0
Sub Total	0	0	67,672	2,21,140	0	6,36,190	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	92,967	0	2,68,027	1,25,000	0	0	3,90,834
- Rent/Consumables	0	0	25,228	0	0	2,98,200	0
- Other Administrative Expenses	0	84,076	27,867	0	0	93,639	42,469
Sub Total	92,967	84,076	3,21,122	1,25,000	0	3,91,839	4,33,303
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	92,967	84,076	3,88,794	3,46,140	0	10,28,029	4,33,303
Net Balance payable as at the year-end (a+b-c)	**20,23,481**	**1,60,915**	**10,10,750**	**15,78,266**	**9,58,600**	**0**	**13,85,959**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note : Classified under Current Assets under Sch 7



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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	43 MeitY SAMEER - Dr. Priyadarshnam	44 MoES - Dr. Govindankutty - Thunderstorms	45 SERB - Dr. Ashok - Quantum Communicatio	46 SERB - Dr. C S Narayanamurthy - Wavefront	47 SERB - Dr. Immanuel R - 5G Bands	48 SERB - Dr. Chinmoy Saha - 2020 - 5G Antenna	49 SERB - Dr.Prosenjit Das - R-Forms of R(X) - 2023
a) Opening balance of the funds	5,34,796	12,88,373	2,33,599	36,06,033	7,27,394	11,65,448	0
b) Additions to the Fund							
i) Donation/Grants	0	0	0	0	0	0	2,20,000
ii) Income from Investment made on account of Funds	15,888	23,554	620	1,92,854	13,592	15,239	1,343
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	5,50,684	13,11,927	2,34,219	37,98,887	7,40,986	11,80,687	2,21,343
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	1,26,178	0	27,47,782	24,406	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	1,26,178	0	27,47,782	24,406	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	1,45,485	5,98,173	0	3,66,833	0	4,94,966	0
- Rent/Consumables	0	8,303	91,516	0	0	2,51,819	0
- Other Administrative Expenses	0	86,580	0	97,679	1,44,935	0	0
Sub Total	1,45,485	6,93,056	91,516	4,64,512	1,44,935	7,46,785	0
iii) Fund Returned to the Funding Agency	4,05,199	5,16,769	0	0	0	0	0
Total (c)	5,50,684	13,36,003	91,516	32,12,294	1,69,341	7,46,785	0
Net Balance payable as at the year-end (a+b-c)	**0**	**0**	**1,42,703**	**5,86,593**	**5,71,645**	**4,33,902**	**2,21,343**
Net Balance receivable as at the year-end (c-a-b)	**0**	**24,076**	**0**	**0**	**0**	**0**	**0**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	50 SERB - Dr Rajesh S - Variation in Biogas Fuel	51 SERB - Dr. Resmi L - 2017 - Gamma Rays	52 SERB - Dr Resmi L - Ultra Relativistic Jets	53 SERB - Dr. Sarita Vig - 2019 - Young Massive Stars	54 SERB - Dr. Sarvesh - 2020 - Virtual Element	55 SERB - Dr Sarvesh K - Novel Numerical	56 SERB - Dr. Seena V - Nanomechanical Sensor
a) Opening balance of the funds	34,53,101	6,10,500	2,20,072	2,06,492	55,378	7,88,740	-5,04,306
b) Additions to the Fund							
i) Donation/Grants	0	0	0	4,00,000	1,50,000	0	12,33,794
ii) Income from Investment made on account of Funds	1,16,697	0	4,775	5,278	4,522	21,585	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	35,69,798	6,10,500	2,24,847	6,11,770	2,09,900	8,10,325	7,29,488
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	1,63,468	0	1,32,839	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	1,63,468	0	1,32,839	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	2,29,000	0	0	4,10,680	0	40,000	9,168
- Rent/Consumables	1,37,593	0	0	0	28,896	0	0
- Other Administrative Expenses	1,46,133	0	37,516	81,303	20,000	1,01,656	7,20,320
Sub Total	5,12,726	0	37,516	4,91,983	48,896	1,41,656	7,29,488
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	5,12,726	0	2,00,984	4,91,983	1,81,735	1,41,656	7,29,488
Net Balance payable as at the year-end (a+b-c)	**30,57,072**	**6,10,500**	**23,863**	**1,19,787**	**28,165**	**6,68,669**	**0**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	57 SERB - 2018 - Dr. Umesh K. - PAH	58 SERB - Prof.Manoj B S - 6G Satellite	59 SERB - Prof.Selvaganesan N - Biomedical	60 SERB - Dr. Seena V	61 SERB - 2019 - Dr. Vineeth B S - Wireless ReLod	62 TIFR - Gaganyaan-I - Sreejalekshmi K G	63 UGC - DAE - Dr. Kuntala B
a) Opening balance of the funds	1,18,893	0	0	(8,981)	61,451	0	49,400
b) Additions to the Fund							
i) Donation/Grants	0	17,27,490	18,28,000	0	0	10,00,000	0
ii) Income from Investment made on account of Funds	0	0	0	0	159	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	1,18,893	17,27,490	18,28,000	-8,981	61,610	10,00,000	49,400
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	56,833	0	0	0	0	0	0
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	-1,146	0	0	0	0	0	0
Sub Total	55,687	0	0	0	0	0	0
iii) Fund Returned to the Funding Agency	0	0	0	0	61,610	0	0
Total (c)	55,687	0	0	0	61,610	0	0
Net Balance payable as at the year-end (a+b-c)	**63,206**	**17,27,490**	**18,28,000**	**0**	**0**	**10,00,000**	**49,400**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**8,981**	**0**	**0**	**0**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	**64** DST Inspire - Dr. Mahesh S	**65** DST Inspire - Dr. Basudev M	**66** DST - Dr. Vikram Khaire	**67** IPRC-Dr. Kuruvilla-Novel N2O4	**68** 03-2021-16-LPSC-Dr.Prathap C-Condensation	**69** 03-2021-18-LPSC-Dr. Shine SR - Thruster	**70** 05-2022-30-LEOS-Dr. Jinesh KB - Seismocardiog
a) Opening balance of the funds	27,059	7,00,000	31,40,812	1,85,965	-	-	-
b) Additions to the Fund							
i) Donation/Grants	0	0	0	0	23,00,000	16,00,000	11,22,000
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	27,059	7,00,000	31,40,812	1,85,965	23,00,000	16,00,000	11,22,000
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	1,43,325	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	1,43,325	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	20,76,451	1,84,000	0	0	0
- Rent/Consumables	0	0	45,491	0	0	0	0
- Other Administrative Expenses	0	0	2,14,411	0	0	0	0
Sub Total	0	0	23,36,353	1,84,000	0	0	0
iii) Fund Returned to the Funding Agency	0	7,00,000	0	0	0	0	0
Total (c)	0	7,00,000	24,79,678	1,84,000	0	0	0
Net Balance payable as at the year-end (a+b-c)	**27,059**	**0**	**6,61,134**	**1,965**	**23,00,000**	**16,00,000**	**11,22,000**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	71	72	73	74	75	76	77
	IISU-Dr. Immanuel-High Performance	AICTE - INAE - Aswathy RV - 2017	AICTE - INAE - 2018 Batch	AICTE - INAE - 2019 - Nisha	DRDO - ARDB - UG,PG Girl Students	ICSSR - PDF - Dr. Aswathy VK - 2022	KSCSTE - PDF - Dr. Prescilla - 2018
a) Opening balance of the funds	-30,45,000	44,677	69,563	9,744	0	0	8,191
b) Additions to the Fund							
i) Donation/Grants	38,90,000	0	0	0	6,00,000	1,98,500	0
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	8,45,000	44,677	69,563	9,744	6,00,000	1,98,500	8,191
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	0	0	0	1,69,000	0
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	0	0	0	0	6,00,000	12,481	0
Sub Total	0	0	0	0	6,00,000	1,81,481	0
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	0	0	0	0	6,00,000	1,81,481	0
Net Balance payable as at the year-end (a+b-c)	**8,45,000**	**44,677**	**69,563**	**9,744**	**0**	**17,019**	**8,191**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	78 KSCSTE - PhD - Elizabeth George - 2018	79 KSCSTE - PhD - Haritha A - 2018	80 KSCSTE - PhD - Sanah Rahman K - 2021	81 SERB - PDF - Dr. Krishnaswamy R - 2017	82 SERB - TARE - Dr. Santhosh B	83 Tribal Affairs - Scholarship for ST Students	84 AICTE - ATAL - Dr.Rama Rao
a) Opening balance of the funds	8,023	0	1,50,246	1,86,299	2,49,120	0	93,000
b) Additions to the Fund							
i) Donation/Grants	0	5,00,387	4,99,687	0	1,00,000	9,000	0
ii) Income from Investment made on account of Funds	0	0	1,427	0	7,021	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	8,023	5,00,387	6,51,360	1,86,299	3,56,141	9,000	93,000
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	4,80,387	6,29,933	7,333	0	0	0
- Rent/Consumables	0	0	0	0	2,08,339	0	0
- Other Administrative Expenses	8,023	0	6,146	0	25,000	9,000	0
Sub Total	8,023	4,80,387	6,36,079	7,333	2,33,339	9,000	0
iii) Fund Returned to the Funding Agency	0	0	0	1,78,966	0	0	93,000
Total (c)	8,023	4,80,387	6,36,079	1,86,299	2,33,339	9,000	93,000
Net Balance payable as at the year-end (a+b-c)	**0**	**20,000**	**15,281**	**0**	**1,22,802**	**0**	**0**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	85 DST -NGP -Dr A M Ramiya-Geospatial	86 DST - NGP - RamaRao-Geospatial	87 Hindi Technical Seminar - 2022	88 Antrix Corporation - Colloquium Sponsorship	89 SERB - Travel Aswathy M (PhD) - 2022	90 SERB - Travel Babitha George - 2023	91 SERB - Travel Dr. Resmi L - 2022
a) Opening balance of the funds	2,00,000	6,00,000	0	4,626	0	0	0
b) Additions to the Fund							
i) Donation/Grants	0	0	5,62,500	0	2,10,253	1,30,958	6,00,284
ii) Income from Investment made on account of Funds	6,793	0	0	0	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	2,06,793	6,00,000	5,62,500	4,626	2,10,253	1,30,958	6,00,284
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	0	0	0	0	0
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	2,60,453	1,57,592	3,822	0	2,10,253	1,30,958	0
Sub Total	2,60,453	1,57,592	3,822	0	2,10,253	1,30,958	0
iii) Fund Returned to the Funding Agency	6,793	0	0	0	0	0	0
Total (c)	2,67,246	1,57,592	3,822	0	2,10,253	1,30,958	0
Net Balance payable as at the year-end (a+b-c)	**0**	**4,42,408**	**5,58,678**	**4,626**	**0**	**0**	**6,00,284**
Net Balance receivable as at the year-end (c-a-b)	**60,453**	**0**	**0**	**0**	**0**	**0**	**0**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	TOTAL	
	2022-23	2021-22
a) Opening balance of the funds	1,62,41,764.98	4,17,33,833
b) Additions to the Fund		
i) Donation/Grants	3,92,46,430.40	2,00,46,528
ii) Income from Investment made on account of Funds	7,52,232.00	8,17,105
iii) Other additions	0.00	1,551
Total (a + b)	5,62,40,427.38	6,25,99,017
c) Utilisation/Expenditure towards objective of funds		
i) Capital Expenditure		
- Fixed Assets	1,72,24,207.00	2,38,12,273
- Others	6,09,095.00	15,29,157
Sub Total	1,78,33,302.00	2,53,41,430
ii) Revenue Expenditure		
- Salaries, Wages & Allowance	1,19,59,879.00	1,47,51,764
- Rent/Consumables	14,30,391.00	26,21,588
- Other Administrative Expenses	47,94,933.84	25,29,645
Sub Total	1,81,85,203.84	1,99,02,997
iii) Fund Returned to the Funding Agency	69,27,219.00	11,12,825
Total (c)	4,29,45,724.84	4,63,57,252
Net Balance payable as at the year-end (a+b-c)	**4,39,07,552.38**	**3,50,74,653**
Net Balance receivable as at the year-end (c-a-b)	**3,06,12,850**	**1,88,32,888**

Note : Classified under Current Assets under Sch-7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

(Amount in Rs.)

	As at 31.03.2023	As at 31.03.2022
Schedule 3 :: LONG TERM LIABILITIES AND PROVISIONS		
a) Employee Provident Funds and Retirement Benefits		
- General Provident Fund	5,72,49,536	5,00,54,971
- Contributory Provident Fund	1,05,87,229	93,73,526
- New Pension Scheme	13,787	13,787
- Retirement Benefits - Provision	23,50,58,187	22,50,13,033
Sub Total (a)	**30,29,08,739**	**28,44,55,317**
b) Caution Deposit		
- Caution Deposit from Students	82,08,526	84,12,526
Sub Total (b)	**82,08,526**	**84,12,526**
TOTAL	**31,11,17,265**	**29,28,67,843**
Schedule 4 :: CURRENT LIABILITIES AND PROVISIONS		
a) Current Liabilities		
1. Sundry Creditors		
- For Goods		
Capital Goods	69,38,082.00	48,69,968
Revenue Expenditure	-	-
- For Services	2,12,85,389.00	1,92,72,011
2. Statutory Liabilities		
- Overdue	-	-
- Others	23,14,302.00	34,15,050
3. Other Current Liabilities		
- Interest refundable to DOS (received)	72,49,304.00	1,06,43,696
- Interest refundable to DOS (accrued)	1,11,570.00	13,40,599
- B.Tech Fees refundable to DOS	1,45,600.00	17,17,275
- SPCL-Interest on Mobilization Advance transferable to DOS	9,81,71,993.00	9,81,71,993
- SPCL-BG Invocation Balance transferable to DOS	14,75,33,007.00	14,75,33,007
- SPCL-BG Invocation Interest transferable to DOS	90,86,585.00	-
- Grant refundable to DOS	3,13,15,000.00	-
- Others	3,18,42,259.30	2,48,18,215
Sub Total (a)	**35,59,93,091.30**	**31,17,81,815**
TOTAL	**35,59,93,091.30**	**31,17,81,815**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

(Amount in Rs.)

Schedule 5 :: FIXED ASSETS

Particulars	Gross Block (at cost) as at 01.04.2022	Additions		Transfer to Installed from Uninstalled	Deletions	Gross Block (at cost) as at 31.03.2023	Rate of Deprec-iation	Depreciation					Net Block as at 31.03.2023	Net Block as at 31.03.2022
		Installed	Under Installation					As at 01.04.2022	For the year	Prior Period	Deletions	As at 31.03.2023		
Land	3,32,52,002	0	0	0	0	3,32,52,002	0.00%	0	0	0	0	0	3,32,52,002	3,32,52,002
Building	2,23,43,73,113	2,62,15,697	0	0	0	2,26,05,88,810	10.00%	1,17,14,59,663	10,89,12,920	0	0	1,28,03,72,583	98,02,16,227	1,06,29,13,450
Plant & Machinery	1,17,62,50,463	11,64,13,316	0	0	4,42,835	1,29,22,20,944	15.00%	79,25,07,045	7,49,67,051	0	66,425	86,74,07,671	42,48,13,273	38,37,43,418
Furniture & Fittings	19,53,22,121	87,59,338	0	0	0	20,40,81,459	10.00%	11,98,43,578	84,23,788	0	0	12,82,67,366	7,58,14,093	7,54,78,543
Ambulance	8,80,644	0	0	0	0	8,80,644	15.00%	7,07,268	26,006	0	0	7,33,274	1,47,370	1,73,376
Motor Cars & Bikes	1,67,45,834	10,79,755	0	0	0	1,78,25,589	15.00%	1,27,58,679	7,60,037	0	0	1,35,18,716	43,06,873	39,87,155
Motor Buses & Truck	1,36,04,639	22,76,684	0	0	0	1,58,81,323	15.00%	87,02,138	10,76,878	0	0	97,79,016	61,02,307	49,02,501
Computers	14,37,58,904	6,11,88,250	0	0	0	20,49,47,154	40.00%	12,87,48,843	3,04,79,325	0	0	15,92,28,168	4,57,18,986	1,50,10,061
Software	11,46,53,759	1,18,10,855	0	0	0	12,64,64,614	40.00%	9,82,83,314	1,08,89,511	0	0	10,91,72,825	1,72,91,789	1,63,70,445
Library Books	6,63,71,010	48,20,205	0	0	0	7,11,91,215	60.00%	6,51,94,565	35,97,990	0	0	6,87,92,555	23,98,660	11,76,445
Campus networking	4,99,01,793	3,17,365	0	0	0	5,02,19,158	40.00%	4,74,14,115	11,22,018	0	0	4,85,36,133	16,83,025	24,87,678
Canteen Equipments	2,26,04,389	16,58,200	0	0	0	2,42,62,589	15.00%	1,66,36,805	11,43,868	0	0	1,77,80,673	64,81,916	59,67,584
Soft Furnishing	10,43,023	0	0	0	0	10,43,023	100.00%	10,43,023	0	0	0	10,43,023	0	0
Uninstalled Assets														
Plant & Machinery	6,85,011	0	0	0	0	6,85,011	0.00%	0	0	0	0	0	6,85,011	6,85,011
Vehicles	14,42,397	0	0	14,42,397	0	0	0.00%	0	0	0	0	0	0	14,42,397
Computers	21,97,220	0	45,17,400	67,14,620	0	0	0.00%	0	0	0	0	0	0	21,97,220
TOTAL	**4,07,30,86,322**	**23,45,39,665**	**45,17,400**	**81,57,017**	**4,42,835**	**4,30,35,43,535**		**2,46,32,99,036**	**24,13,99,391**	**0**	**66,425**	**2,70,46,32,003**	**1,59,89,11,532**	**1,60,97,87,286**
Previous Year	**3,98,17,08,350**	**8,94,23,150**	**36,39,617**	**16,83,245**	**1,550**	**4,07,30,86,322**		**2,24,57,75,012**	**21,75,24,515**	**0**	**491**	**2,46,32,99,036**	**1,60,97,87,286**	**1,73,59,33,338**
Capital Work in progress	**16,64,14,359**	**0**	**2,62,81,927**	**2,83,02,941**	**0**	**16,43,93,345**		**0**	**0**	**0**	**0**	**0**	**16,43,93,345**	**16,64,14,359**
TOTAL													**1,76,33,04,877**	**1,77,62,01,645**

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2023

(Amount in Rs.)

	As at 31.03.2023	As at 31.03.2022
Schedule 6 :: LONG TERM ASSETS, LOANS, ADVANCES ETC		
a) Loans		
- Staff	1,05,87,069	1,13,77,107
b) Advances and other amounts on capital account recoverable in cash or in kind or for value to be received		
- Interim Advance to SPCL	12,43,00,000	12,43,00,000
c) Security Deposits	64,89,958	55,92,959
TOTAL	**14,13,77,027**	**14,12,70,066**
Schedule 7 :: CURRENT ASSETS, LOANS, ADVANCES ETC		
a) Current Assets		
1. Inventories		
- Canteen inventories	13,08,040	8,75,128
2. Sundry Debtors		
- Debtors outstanding for a period exceeding six months	-	-
- Others	-	-
3. Cash Balances in hand (including cheques/drafts and imprest)	2,00,835	1,26,678
4. Bank Balances		
a) With Scheduled Banks		
- On Current Accounts	11,53,390	(1,56,20,864)
- On Deposit Accounts	45,09,40,256	70,28,36,132
- On Deposit Accounts [ISAT Funds]	9,43,16,981	8,85,07,033
- On Earmarked & Retirement Benefits Accounts	10,35,43,456	9,12,57,076
b) With RBI Treasury Single Account	-	-
Sub Total (a)	**65,14,62,959**	**86,79,81,183**
b) Loans, Advances and Other Assets		
1. Advances and other amounts recoverable in cash or in kind or for value to be received		
- On Capital Account	10,37,675	1,66,823
- Prepayments	1,86,67,498	1,90,18,849
- Others	3,84,79,297	2,64,06,807
2. Income Accrued		
- On Bank Deposits	7,68,274	26,37,508
- On Other Deposits	1,18,995	1,18,995
Sub Total (b)	**5,90,71,739**	**4,83,48,982**
TOTAL (a+b)	**71,05,34,697**	**91,63,30,165**

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SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2023

(Amount in Rs.)

	2022-23	2021-22
Schedule 8 :: GRANTS / SUBSIDIES		
(irrevocable Grants & Subsidies Recovered)		
1. Central Government	72,76,48,790	77,00,00,000
TOTAL	**72,76,48,790**	**77,00,00,000**
Schedule 9 :: FEES / SUBSCRIPTIONS		
1. Entrance Fees	36,01,085	30,62,900
2. Annual Fees/Subscriptions	7,71,52,382	5,43,97,693
TOTAL	**8,07,53,467**	**5,74,60,593**
Schedule 10 :: INTEREST INCOME OF IIST		
1. On Term Deposit		
a) With Scheduled Banks	91,62,696	69,58,390
2. On Loans / Advances		
a) Employee/Staff	38,287	1,69,846
3. Others		
a) Interest on IT Refund	1,82,118	2,20,833
b) Interest Received - KSEB Caution Deposit	1,58,660	1,64,364
TOTAL	**95,41,761**	**75,13,433**
Schedule 11 :: INTEREST EARNED ON GRANT & RETIREMENT FUNDS		
1. On Term Deposit		
a) With Scheduled Banks	1,82,35,587	1,42,57,663
b) Others	0	0
TOTAL	**1,82,35,587**	**1,42,57,663**
Schedule 12 :: OTHER INCOME		
1. Rent Receipts	3,56,671	2,71,134
2. Sale of Tender Forms	7,500	16,500
3. Sale of Scrap / Vehicles / Trees	2,45,685	1,86,738
4. Income from other Institutions	13,52,931	11,28,255
5. Miscellaneous Income	20,91,267	13,14,007
TOTAL	**40,54,054**	**29,16,634**

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SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2023

(Amount in Rs.)

	2022-23	2021-22
Schedule 13 :: ESTABLISHMENT EXPENSES - REGULAR		
1. Salaries & Allowances	34,36,94,278	35,62,05,842
2. Contribution to NPS	3,09,09,705	3,00,71,161
3. Contribution to CPF	2,68,920	2,68,920
4. Medical Expense- Staff	37,45,654	34,21,373
5. Expense on Employees Retirement & Terminal Benefits	1,55,82,640	2,13,76,658
6. Interest on PF Contribution	11,73,745	15,02,823
7. Staff Training Expense	10,440	32,950
TOTAL	**39,53,85,382**	**41,28,79,727**
Schedule 14 :: ESTABLISHMENT EXPENSES - SUPPORT SERVICES		
1. Consultancy & Manpower Charges	8,84,43,455	7,84,82,990
2. Remuneration to Contract Employees	51,13,743	58,90,366
3. CISF Expenses	8,64,22,948	7,42,08,758
TOTAL	**17,99,80,146**	**15,85,82,114**
Schedule 15 :: ACADEMIC & OTHER STUDENT EXPENSES		
1. Admission Expense	45,71,355	17,73,626
2. Assistanceship to Students	3,26,92,637	2,49,01,955
3. Library Services	2,18,90,722	2,08,64,069
4. Academic Expense	4,56,85,960	3,14,13,532
5. Supplies & Materials	3,34,34,777	1,64,07,778
6. Student Activities Expense	17,65,416	2,71,089
TOTAL	**14,00,40,867**	**9,56,32,049**
Schedule 16 :: OTHER ADMINISTRATIVE EXPENSES		
1. Maintenance & Upkeep		
Repairs & Maintenance - CMD	3,57,87,973	3,20,17,700
Repairs & Maintenance - Labs & Others	2,23,45,351	1,44,29,534
House Keeping Expense	8,57,027	7,19,565
Sub Total (a)	**5,89,90,351**	**4,71,66,799**
2. Professional Charges		
Audit Fees	1,25,400	1,90,550
Legal Expense	1,57,641	2,53,880
Sub Total (b)	**2,83,041**	**4,44,430**
3. Administrative Expenses - Others		
Vehicle Operating Expense	1,49,77,832	98,29,593
Electricity & Water Charges	2,24,82,781	1,93,55,511
Travelling Expense	31,52,290	4,66,039

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SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2023

(Amount in Rs.)

	2022-23	2021-22
Research & Development Expense	1,39,71,272	1,06,23,211
Printing & Stationery	28,29,465	16,04,089
Advertisement & Publicity	2,94,924	3,46,095
Hospitality Expense	19,90,635	7,73,793
Telephone & Internet Expense	40,25,388	25,61,832
Office and other Miscellaneous Expense	36,98,971	11,77,151
Recruitment & Review Expense	5,93,164	1,83,578
CEP & IPR Expenses	0	2,37,459
Compensation Paid	8,61,208	0
Bank Charges	1,16,617	56,175
GST - Input Tax Credit Utilized	-5,64,990	-39,634
Sub Total (c)	**6,84,29,557**	**4,71,74,892**
TOTAL	**12,77,02,949**	**9,47,86,121**

Schedule 17 :: INTEREST REFUNDABLE BY IIST

Interest to CPF Fund [Expense]	4,85,167	3,75,464
Interest to DOS [Expense]	61,33,755	1,17,92,244
Interest to DOS [Expense] - SPCL BG	89,73,105	0
Interest to GPF Fund [Expense]	26,43,560	20,89,954
TOTAL	**1,82,35,587**	**1,42,57,663**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2023

A. Significant Accounting Policies

1. Basis of Accounting
   The financial statements have been prepared in accordance with the Generally Accepted Accounting Principles in India (Indian GAAP) and are prepared on accrual basis under the historical cost convention. The accounting policies adopted in the preparation of the financial statements are consistent with those followed in the previous year.

2. Use of estimates
   The preparation of the financial statements in conformity with Indian GAAP requires the Management to make estimates and assumptions considered in the reported amounts of assets and liabilities (including contingent liabilities) and the reported income and expenses during the year. The Management believes that the estimates used in preparation of the financial statements are prudent and reasonable. Future results could differ due to these estimates and the differences between the actual results and the estimates are recognized in the periods in which the results are known / materialize.

3. Inventories
   The inventories represents canteen inventories and is valued at lower of cost or net realizable value as certified by the Canteen Manager.

4. Depreciation
   a. Depreciation has been provided on the written down value method as per the rates prescribed in the Income Tax Act, 1961.
   b. Depreciation on assets acquired in a particular year is provided for the whole year irrespective of date of addition.
   c. Depreciation has not been charged on capital work in progress and on those assets under installation as on 31.03.2023.
   d. Software not having perpetual licenses are written off over the license period.
   e. Ebooks have been depreciated at rates applicable for software

5. Revenue Recognition
   a. Grant in aid received from the Department of Space, is accounted on accrual basis. Out of the total grant received, the amount received towards revenue expenditure is treated as Revenue Grant / income over the period necessary to match them with the costs for which they are intended to compensate, on a systematic basis. The remaining grant forms part of the Corpus Fund along with other grant received.
   b. Tuition fees, fines and other recoveries from underperforming students (as per the policy of the institute) are accounted on cash basis. As per Department of Space instructions, Fees received from B.Tech students (performing and non-performing students) who have joined the Institute prior to 2018 is not recognized as income and is shown as a liability payable to Department to Space after adjusting related costs. With respect to BTech students joining the Institute from 2018 onwards the Fees received is recognized as Income of the Institute.
   c. Interest income is accounted on accrual basis. Interest on deposits created out of grant received is refundable to Department of Space.

6. Fixed Assets
   a. Land – (i)The present activity of the Institute is in the Valiamala campus which has been handed over by LPSC vide letter no. VSSC/CMG/2010 dated 05.08.2010 and has been measured at 53.43 acres. No value has been separately provided in the books for this land. (ii) 20 acres of Land in Survey No. 4003 in Thennoor Village has been assigned and handed over to ISRO authorities on 31.12.2007 as per letter No. B8-85534/07 dated

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Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2023 (contd)

01.01.2008 of District Collector, Trivandrum subject to the condition that facilities stated by ISRO in their letter no. ISST-DIR-2007 dt 06.12.2007 should be set up in the property within 18 months. The said land should be used only for scientific and educational purposes. No value has been mentioned in the Land Assignment Order and hence the value of the property is taken at Re. 1/- for each property.

b. Building –Construction of buildings has been completed in 2020-21. Capitalisation has been done to the extent of bills received from the builder i.e 90%.
c. Plant and Machinery – It mainly constitutes Laboratory Equipment, Office Equipment, Electricals & Electronics and other Machinery.
d. Buildings and other Fixed Assets are carried at cost less accumulated depreciation. Cost comprises the purchase price or acquisition cost, installation charges and any attributable cost of bringing the assets to working condition for its intended use. Exchange differences arising on restatement / settlement of foreign currency payables relating to acquisition of depreciable fixed assets are adjusted to the cost of the respective assets and depreciated over the remaining useful life of such assets.
e. Capital Work-in-Progress pertains to construction in progress at Valiamala.
f. Assets that have been delivered to IIST up to 31.03.2023 have been recognized as assets but depreciation has not been charged on Assets under installation.

7. Foreign currency transactions
Foreign currency monetary items outstanding at the Balance Sheet date are restated at the year-end rates. Non-monetary items are carried at historical cost. The exchange differences arising on restatement / settlement of long-term foreign currency monetary items are capitalised as part of the depreciable fixed assets to which the monetary item relates and depreciated over the remaining useful life of such assets.

8. Earmarked / Endowment Funds
Earmarked / Endowment Funds mainly include external agency funding received for research & development purpose and conduct of seminars & workshops. Value of assets procured out of such funds for the purpose specified have gone to reduce the value of Fund in hand and have not been treated as an asset of the Institute as the ownership of the same vests with the funding agency. Earmarked / Endowment Funds are held in a separate Current Account linked to Term Deposits. The interest received in the account has been taken as the Institutes Income. Interest claims in the future, if any, from the disbursing parties of such Earmarked / Endowment Funds will be met at the time of the claim based on the deposit rates prevailing during the period of holding of the particular Fund. Based on Ministry of Finance directive, from 2022-23, funds of DST, DBT and MoES are being transferred to Zero Balance Subsidiary Accounts with banks specified by respective Department.

9. Employee Benefits
Employee benefits include General Provident Fund (GPF), Contributory Provident Fund (CPF), New Pension Scheme (NPS), and Group Insurance Scheme (GIS). The Institute's contribution to CPF and NPS are considered as defined contribution plans and are charged as an expense as they fall due based on the amount of contribution required to be made.
GPF and CPF funds are maintained separately by the Institute in Savings Bank Account and linked Flexi deposits. Annual Interest provision on GPF and CPF balance is made from Interest earned during the year from investment of such funds in flexi deposits. Interest earned over and above the provision made is transferred to an Interest Fluctuation Reserve and in the event of a shortfall in interest earned, the difference is met from such Reserve, and any balance shortfall after adjustment with Reserve is met by IIST.
Retirement Benefits consisting of pension fund, gratuity and leave encashment received from previous employers of employees joining from other Government organizations have been transferred to Department of Space. Funding of yearly requirement of pensionary & retirement benefits will be by Department of Space.

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Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2023 (contd)

10. Taxes on income
Being a non-profit institution existing solely for education purposes and being wholly financed by the Government of India, the income of the Institute is exempt under section 10[(23C)][iiiab] of the Income Tax Act, 1961.

11. Research and Development Expenses
Revenue expenditure pertaining to research is charged to the Income and Expenditure Account. Fixed assets utilized for research and development are capitalized and depreciated in accordance with the policies stated for Fixed Assets.

12. Provisions and Contingencies
A provision is recognised when the Institute has a present obligation as a result of past events and it is probable that an outflow of resources will be required to settle the obligation in respect of which a reliable estimate can be made. Provisions (excluding retirement benefits) are not discounted to their present value and are determined based on the best estimate required to settle the obligation at the Balance Sheet date. These are reviewed at each Balance Sheet date and adjusted to reflect the current best estimates.

B. Notes to the Accounts

1. Depreciation
Assets are depreciated at written down value method as per rates prescribed in the Income Tax Act, 1961 as recommended by the Office of the Principal Director of Audit, Scientific Departments, Bangalore. Software not having perpetual licenses are written off over the license period. Ebooks are depreciated at rates applicable for software.

2. Revenue
a. As per Ministry of Finance directive, from September 2022 Grant in Aid funds from Department of Space are being received in a Treasury Single Account opened specifically for this purpose. Balance available in this account is returned to Department of Space on 31st March of the respective financial year. Grant balance available in Scheduled Commercial Banks from previous transfers are to be refunded to Department of Space. Details of Grant in Aid for 2022-23 are summarised below

Revenue Grant received in Scheduled Commercial Bank Account	:	Rs. 33,06,00,000/-	Revenue Grant refundable from Scheduled Commercial Bank	:	Rs. 23,000/-
Revenue Grant received in Treasury Single Account	:	Rs. 40,05,00,000/-	Revenue Grant returned from Treasury Single Account	:	Rs. 34,28,210/-
Capital Grant received	:	NIL	Capital Grant refundable from Scheduled Commercial Bank	:	Rs. 3,12,92,000/-
Total Grant received	:	**Rs. 73,11,00,000/-**	**Total Grant returned / refundable**	:	**Rs. 3,47,43,210/-**

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Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2023 (contd)

b. Interest earned (actually received) on funds from grant-in-aid maintained in deposits is refundable to DOS. Interest of Rs. 72,49,304/- (excluding the interest received on the Provident Fund Accounts and Earmarked Funds) has been actually received on deposits during 2022-23 and the same has been shown as refundable to DOS.

c. Fees received from B.Tech students (performing and non-performing students) who have joined the Institute prior to 2018 is not recognized as income and is shown as a liability payable to Department to Space after adjusting related costs. Based on the Department of Space Letter No. B. 12011/7/2015-Sec.2 dated 21.10.2015, "Fees paid back by students on receipt of Assistanceship package and receipts from non-performing students" are to be remitted back to Government Account. During 2022-23, an amount of Rs. 1,45,600/- has been shown as refundable to DOS after deducting related costs.

d. With respect to BTech students joining the Institute from 2018 onwards the Fees received is recognized as Income of the Institute based on the decision of the Twelfth Finance Committee, IIST.

e. Canteen Accounting Committee accounts is maintained separately and the gross deficit / surplus, which is exclusive of administrative cost, is recognised in the Income and Expenditure Account.

3. Fixed Assets

a. Land – There is a stay by the Honorable High Court of Kerala on carrying out construction activities on a part of land (approximately 80 acres) purchased at Ponmudi in Trivandrum District for setting up the Institute. Over and above this 80 acres, approximately 20 acres of land at Ponmudi and 44.18928 acres at Valiamala has been transferred by the Government of Kerala free of cost in December 2007 and April 2009 respectively. These two properties have been brought into the books of accounts in 2013-14 by assigning a nominal value of Re. 1/- each. The present activity of the Institute is in the Valiamala campus which has been handed over by LPSC vide letter no. VSSC/CMG/2010 dated 05.08.2010 and has been measured at 53.43 acres. No separate lease agreement / transfer of ownership of land was obtained by IIST. No value has been separately provided in the books for this land.

b. Capital Work-in-Progress includes a sum of Rs. 5,56,14,037/- towards project management and consultancy charges and service tax of Rs. 7,73,61,215/-, both pending for appropriation to fixed assets on final completion of all buildings.

c. An amount of Rs. 6,85,011/- pertaining to assets that have been delivered to IIST before 31.03.2023 but under installation as on 31.03.2023 have been accounted as fixed assets & depreciation has not been charged on the same. This amount pertains to Office Equipment worth Rs. 6,85,011/- procured from CMS computers which has been uninstalled for 9 years.

4. Employee Benefits

a. Employer and Employee contribution to New Pension Scheme is being transferred to NSDL.

b. The Institute has entered into a Group Insurance Scheme (GIS) agreement with Life Insurance Corporation of India from 2011-12 onwards.

c. Provision for interest on PF Contribution, at the rates prescribed, have been made and the corresponding expenditure has been adjusted against Interest earned on GPF and CPF funds parked in Savings Accounts (linked to flexi deposits) and the balance interest earned has been retained as Interest Fluctuation Reserve. Provision for Retirement Benefits [Pension, Gratuity & Leave Encashment] has been incorporated based on the actuarial valuation provided by Life Insurance Corporation during 2018-19. Provision for 2022-23 has been made by assuming a 10% hike in service cost of 2021-22.

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In addition, the retirement benefits from the previous employers for the members governed under the GPF have not been received in all cases. Funds received has been transferred to Department of Space as advised by them. By way of DOS Letter No. E.28015/1/2016-V dated 11.08.2020, IIST has been advised to continue to project the funds requirements towards Pension & Retirement Benefits through Grant-in-Aid till common guidelines are issued to Autonomous Bodies.

5. Prior Period Item
Details of prior period items are as given below :-

Details	Prior period expenses
SSpace Revenue Expenses	4,16,105
Unloading Charges	400
MTech Hostel Fee refund	3,78,000
Total (A)	**7,94,505**

Details	Prior period income
Book grant refund	8,223
Depreciation reversal	66,425
Security deposit classified as expense earlier	34,000
Major Civil Works classified as expense earlier	57,37,137
Staff Training expense reversed	25,000
Supplies & Materials reversed	23,600
Total (B)	**58,94,385**

Net prior period income (A-B) = Rs. 50,99,880/-

6. Academic Expenses
Academic Expenses mainly include expenses towards Lectures for students, Project & Internship expenses, stipend / fellowship paid to PhD and M.Tech students and expenses incurred on Seminars, Symposia and Conferences.

7. Admission Expenses
Admission expenses include expenses incurred towards B.Tech, M.Tech and PhD admissions

8. Assistanceship to Students
As per the approval of The Chairman, Board of Management-IIST / Secretary, DOS vide Letter No. PP & PM : IIST : 09-10 dated July 17th, 2009, the B. Tech students of the Institute are entitled for an assistanceship of Rs. 49,000/- [increased to Rs. 51,400/- from Even semester 2014-15] for each semester towards Statutory Semester Fee, Student Amenity Fee, Hostel & Dining, Establishment charges and Medical cover. For the students who have joined the Institute prior to 2018, the assistanceship amount of Rs. 48,400/- (exclusive of book grant) for a semester is disbursed to eligible students based on the performance of the previous semester. The assistanceship amount disbursed is then remitted back by the students to the Institute and expenditure corresponding to the assistanceship so received (under Hostel, Dining & Medical cover) is set off against the assistanceship amount. In 2022-23, there were no such assistanceship cases.

From 2018 admission onwards fees is collected from all the students at the beginning of the Semester and the eligible Assistanceship is disbursed based on the performance of the student at the end of the semester. From 2021 admission onwards Assistanceship has been discontinued and Merit Scholarship is disbursed for a certain percentage of students based on performance.

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During 2022-23, an amount of Rs. 3,26,92,637/- was disbursed as assistanceship.

9. Supplies and Materials
   Supplies and Materials mostly consist of lab consumables.

10. Salary
    Salary cost for the month of March 2023 has not been taken into the books of accounts for 2022-23 as March salary for a particular year for central government employees is released in April of that year only. Expenditure for March 2022 to February 2023 has been shown in 2022-23.

11. Earmarked / Endowment Funds
    a. An amount of Rs. 252.81 lakhs pertaining to expenditure for Externally Funded projects has been met from IIST bank accounts and is to be transferred from the balance in Earmarked Funds bank accounts to IIST's main bank account.

    b. As on 31.03.2023, assets amounting to Rs. 11.71 crores have been purchased from externally funded projects. The same has not been included in the Balance Sheet of the Institute as the ownership of the same vests with the sponsor.

12. Format of accounts
    The accounts of the Institute are prepared as per proforma suggested by the Office of the Principal Director of Audit, Scientific Departments, Bangalore.

13. Insurance
    The Institute being an autonomous body under the Department of Space (DOS), it is governed by the rules and regulations as applicable to DOS. As per the "Book of Financial Powers" prescribed by DOS "No Government property whether movable or immovable shall be insured. No liability shall be incurred in connection with the insurance of such property without the prior approval of the Department of Space in consultation with the Member for Finance." The matter was taken up for consultation with the Department of Space during 2012-13 and it was decided in the Seventh Finance Committee meeting of IIST dated 3rd June, 2014 not to insure the assets of the institute.

14. Inoperative Balances
    An amount of Rs. 12.51 lakhs (credit balances) relates to balances that have been outstanding from prior to 01.04.2022.

15. Balances in personal accounts
    Balances in personal accounts are subject to confirmation from respective parties.

16. Contingent Liabilities
    a. The unexecuted portion of the contracts entered into by the Institute will form part of the current liability of the Institute. However, the same could not be quantified.
    b. Interest earned on Earmarked / Endowment Funds held in a separate Current Account linked to Term Deposits has been taken as the Institutes Income. Interest claims in the future, if any, from the disbursing parties of such Earmarked / Endowment Funds will be

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Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2023 (contd)

met at the time of the claim based on the deposit rates prevailing during the period of holding of the respective Fund

c. In the case of buildings / structures completed by SPCL, only 90% has been billed by SPCL and subsequently paid by IIST. The balance 10% (approximately Rs. 24.22 crores) has not been billed and the same will be paid only on completion of the project. In case of all other works completed by SPCL and not billed as on 31.03.2023 provision has not been made in the books of accounts since the same is not quantifiable.

17. Building Construction:
The institute entered into a contract with SPCL, Mumbai on 27.08.2008 for Rs. 278.60 crores with a completion period of 18 months for setting up building and infrastructure at its campus in Valiamala on turnkey basis. The work was completed and the building handed over on 06.02.2021. The Institute was holding the following instruments as security with respect to the contract with SPCL

Nature of security	Amount (in crores)
Security Deposit – Bank guarantee	12.14
Performance Bank guarantee	12.14
Bank guarantee against Interim Advance	12.43

Department of Space has directed the following recoveries with respect to the SPCL contract.

a. Liquidated Damages @ 10% of contract value towards compensation for delay – Rs.27.86 crores
b. Interest on retention of mobilisation advance beyond contractual period of 15 months - Rs.9.82 crores
c. Labour Welfare Cess – Deduction advised by C&AG – Rs.2.34 crores.

In order to effect the above recoveries, in 2021—22, the Bank guarantees available were submitted to the respective banks for invoking the guarantees. Out of the total amount of Rs.36.71 crores of BG, Rs.24.57 crores was credited to IIST. An amount of Rs.9.82 crores was adjusted against the interest on retention of mobilisation advance beyond 15 months against the amount received and the same is held in a separate account which is payable to DOS. Further, the balance amount received through invocation of BG is held separately with State Bank of India. The amount of Rs. 9.82 crores towards interest on mobilisation advance and the balance of Rs. 14.75 crores of the BG invocation have been shown as transferable to DOS.

In between, SPCL has moved High Court of Kerala and honourable High court has put an injunction on invoking the bank guarantee of Rs.12.14 crores submitted as Security Deposit. Now the matter is pending with Honourable High Court for decision. The final GST invoice for the above contract is yet to be submitted by SPCL.

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Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2023 (contd)

18. Figures for the previous year
Figures for the previous year have been regrouped and/or reclassified wherever considered necessary.

As per our report of even date attached

For Balamurali & Associates
Chartered Accountants
FRN : 012374S

C.A. Balamurali C. V.
(Proprietor, Mem No. 223319)

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Dr. S. Unnikrishnan Nair
Director

R. Hari Prasad
Finance Officer

Place : Thiruvananthapuram
Date : 27th September, 2023

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2023

(Amount in Rs.)

Receipts	2022-23	2021-22	Payments	2022-23	2021-22
I. Opening Balance			**I. Expenses**		
a.Cash and DD's in hand	1,26,678	1,12,220	**a.Establishment Expenses - Regular**		
b.Bank Balances			Salaries & Allowances (admin & faculty)	34,44,15,642	35,59,50,051
In current accounts	-1,56,20,864	-1,55,35,649	Contribution to NPS	3,09,09,705	3,00,71,161
In deposit accounts	79,13,43,165	21,84,38,948	Contribution to CPF	2,68,920	2,68,920
In earmarked/retirement benefits accounts	9,12,57,076	12,34,69,581	Medical Expense- Staff	40,64,881	31,56,479
In Treasury Single Account	0	0	Employees Retirement Benefits	55,37,486	1,22,44,700
			Interest on PF Contribution	11,73,745	15,02,823
II.Grants Received			Staff Training Expenses	(14,560)	32,950
a.From Government of India	72,76,71,790	1,12,00,00,000			
			b.Establishment Expenses - Support Services		
III. Interest Received			Consultancy & Manpower Charges	8,83,07,743	7,57,59,671
a. On Bank Deposits	98,03,005	60,20,017	Remuneration to Contract Employees	51,34,743	59,20,366
b. On Other Deposits	1,58,660	1,75,564	CISF Expenses	8,53,39,246	7,34,78,586
c. Loans, Advances etc	38,287	1,69,846			
d. Others	1,82,118	2,20,833	**c. Academic & Other Student Expenses**		
			Admission Expense	45,71,355	17,73,626
IV. Other Income			Assistanceship to Students	3,28,03,041	2,48,31,958
a. Entrance Fees	36,01,085	30,62,900	Library Services	2,25,07,776	2,08,27,338
b. Annual Fees/Subscriptions	8,18,10,007	5,78,26,643	Academic Expense	4,55,28,813	3,14,18,991
c. Other Income	40,54,054	29,68,497	Supplies & Materials	3,35,00,623	1,59,93,265
			Student Activities Expense	17,70,844	2,65,661
V. Any other receipts					
a. MCF Hassan - ISRO		0	**d. Other Administrative Expenses**		
b. Security Deposits received	5,48,418	19,33,395	Repairs & Maintenance	2,07,12,130	1,52,97,857
c. Earnest Money Deposits received	2,60,880	1,320	Repairs & Maintenance - CMD	3,05,00,147	3,20,93,103
d. Performance Guarantee received	2,12,635	71,992	House Keeping Expense	8,26,645	7,73,359
e. Advance for Research & Seminars	3,99,98,662	2,08,65,184	Audit Fees	1,25,400	1,90,550
f. BTech Fees refundable to DOS	1,45,600	17,17,275	Legal Expense	1,85,125	2,21,928
g. Caution Deposit from Students	26,55,000	23,90,000	Vehicle Operating Expense	1,48,46,279	98,03,846
h. Bond Amount received [Btech]	21,50,000	18,50,000	Electricity & Water Charges	2,20,43,059	1,91,17,711
i. Stale cheques	44,894	63,981	Travelling Expense	26,83,403	2,22,761
j. Canteen Accounting Committee	2,36,62,304	1,24,60,069	Research & Development Expense	1,40,13,937	1,06,02,309
k. Interest received and payable to DOS	72,49,304	1,06,43,696	Printing & Stationery	30,37,878	13,86,294

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RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2023

(Amount in Rs.)

Receipts	2022-23	2021-22	Payments	2022-23	2021-22
l. Net addition to Statutory Liabilities(Staff)	84,08,260	0	Advertisement & Publicity	2,94,924	3,52,846
m. Unexplained credits - Banks	4,150	250	Hospitality Expense	18,59,681	7,62,280
n. Recovery of loans to staff	8,90,038	7,12,771	Telephone & Internet Expense	40,17,602	27,19,948
o. Contingency advance	1,57,603	50,908	Office Expense	36,68,163	11,54,685
p. Increase in TDS, GST & Labour Cess	0	23,82,704	Recruitment & Review Expense	5,93,164	2,10,631
q. TDS/TCS refund from IT Department	36,87,692	29,28,819	CEP & IPR Expenses	0	2,37,459
r. SPCL-Interest on Mobilization Advance (to DOS)	0	9,81,71,993	Compensation Paid	8,61,208	0
s. SPCL-BG Invocation Balance transferable to DOS	0	14,75,33,007	Bank Charges	1,16,617	56,175
t. SPCL-BG Interest transferable to DOS	90,86,585	0	GST - Input Tax Credit Utilized	(2,53,798)	(1,34,742)
u. Sundry Creditors - Others - Net	0	2,90,459			
v. Sundry Debtors - Others - Net	0	94,401			
w. Security Deposit (Asset) received	34,000	0	**II. Payments made against funds for various projects**		
			DOS - Dr. Palash - HSP - Real TIme Gas Sensor	1,35,47,917	80,91,612
			DOS - MOM2 - RPA - Dr. Ambili KM	4,98,670	9,20,882
			DOS - Dr. Umesh - Planetary Exploration	3,63,317	6,61,619
			DOS - Dr. Rajesh V J (Spectral)	7,000	0
			IISU - Perf. of Ball Bearings - Dr. Jinesh KB	1,54,631	0
			ISRO -Dr. K G Sreejalekshmi -Gaganyaan	1,15,565	15,56,671
			NRSC - P R Sinha - Balloon Launching	4,291	1,03,425
			DAE - 2022 - Dr. Sakthivel - NBHM Multiphase Fluid	2,09,355	0
			DBT - Dr. Palash - Green House Gases	6,53,831	6,16,108
			DBT - Dr. Shaiju - Ramalingaswami Fellowship	21,60,850	27,23,042
			DBT-RamaRao (Rural Urban Interface) Phase-II	52,11,658	5,06,000
			DRDO - ARMREB - Dr. K. Prabhakaran	1,34,512	0
			DRDO - DR.Praveen Krishna IR- 2022- Gas Turbine	52,000	0
			DRDO - Dr. Rajesh S. - 2022 - TDLAS Temp Senso	1,43,957	0
			DST - CNRS - Dr. Palash Basu - 2020 - Biomarker	5,09,755	4,75,524
			DST-Dr Jinesh KB- Atomic Layer Deposition System	15,58,201	57,30,962
			DST - KIRAN - WOS(A) - Pushpa K - Quantum Mec	1,54,106	0
			DST - NGP - A.M Ramiya - Smart Cities 3D	2,95,755	22,50,471
			DST - NRDMS - Dr.Ramarao - 2022 -Geodesy	92,967	0
			ICSSR - Dr. Shaijumon - 2020 - Tele Medicine Units	2,13,707	2,97,057
			IITG - Dr.Prathap - 2022 - Hydrogen Blending	3,21,122	0
			INAE - Dr. Palash - 2022 - Abdul Kalam Fellowship	3,40,518	0

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RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2023

(Amount in Rs.)

Receipts	2022-23	2021-22	Payments	2022-23	2021-22
			Mangrove Cell - Dr. Gnanappazham - 2018	1,87,089	9,73,389
			Max-Planck - Dr. Jagadheep - 2017	4,45,288	7,95,291
			MeitY SAMEER - Dr. Priyadarshnam	5,50,684	7,50,258
			MoES - Dr. Govindankutty - Thunderstorms	13,36,003	11,01,472
			SERB - Dr. Ashok - Quantum Communication	91,516	18,21,845
			SERB - Dr. C S Narayanamurthy - Wavefront	32,12,294	3,61,467
			SERB - Dr. Immanuel R - 5G Bands	11,98,866	17,87,591
			SERB - Dr. Chinmoy Saha - 2020 - 5G Antenna	7,70,395	15,26,928
			SERB - Dr Rajesh S - Variation in Biogas Fuel	5,11,704	1,032
			SERB - Dr Resmi L - Ultra Relativistic Jets	1,79,312	0
			SERB - Dr. Sarita Vig - 2019 - Young Massive Stars	4,91,983	0
			SERB - Dr. Sarvesh - 2020 - Virtual Element Approx	1,82,541	0
			SERB - Dr Sarvesh K - Novel Numerical Tech	1,33,504	0
			SERB - Dr. Seena V - Nanomechanical Sensor	7,29,488	9,90,376
			SERB - 2018 - Dr. Umesh K. - PAH	55,687	11,31,864
			SERB - 2019 - Dr. Vineeth B S - Wireless ReLod	61,610	5,22,804
			DST Inspire - Dr. Basudev M	7,00,000	0
			DST - Dr. Vikram Khaire	24,88,740	20,24,209
			IPRC-Dr. Kuruvilla-Novel N2O4	1,84,000	2,14,035
			DRDO - ARDB - UG,PG Girl Students	6,00,000	0
			ICSSR - PDF - Dr. Aswathy VK - 2022	1,81,481	0
			KSCSTE - PhD - Elizabeth George - 2018	8,023	3,41,977
			KSCSTE - PhD - Haritha A - 2018	4,80,387	20,000
			KSCSTE - PhD - Sanah Rahman K - 2021	6,36,079	1,62,067
			SERB - PDF - Dr. Krishnaswamy R - 2017	1,86,299	0
			SERB - TARE - Dr. Santhosh B	2,33,339	96,792
			Tribal Affairs - Scholarship for ST Students	9,000	0
			AICTE - ATAL - Dr.Rama Rao	93,000	0
			DST -NGP -Dr A M Ramiya-Geospatial	2,67,246	0
			DST - NGP - RamaRao- Geospatial	3,300	0
			Hindi Technical Seminar - 2022	3,822	0
			SERB - Travel - Aswathy M (PhD) - 2022	2,10,253	0
			SERB - Travel - Babitha George - 2023	1,30,958	0
			IISU - Dr. Umesh Kadhane - Proj Assistant	0	56,129
			IPRC - Dr. Palash - 2018 - Hydrogen Sensor	0	5,574

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RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2023

(Amount in Rs.)

Receipts	2022-23	2021-22	Payments	2022-23	2021-22
			LPSC - Dr Dinesh N Naik	0	18,99,822
			LPSC - Dr.Jinesh K B - Laser Ignition System	6,247	2,96,712
			LPSC - Dr. Jinesh K B - SDS	0	2,35,196
			LPSC - Dr. Umesh K - Monte Carlo Model	0	-24,413
			LPSC - High Thrust EPS - Dr. Umesh K	3,786	12,45,270
			SAC - NavIC (IRNSS) Gagan	0	2,81,245
			DBT - Dr. Palash - 2017- Liquid Biopsy for Cancer	0	1,60,676
			DST - Dr. Rama Rao N	8,809	1,62,400
			DST - KIRAN - Pushpa K - Quantum Mech	0	7,46,830
			SERB - 2018 - Dr. Anand N. - Baryons	0	3,44,715
			SERB - Dr. Sarita Vig - Young Massive Stars	0	6,53,527
			SERB - Dr. Sarvesh - 2020 - Virtual Element	0	1,69,240
			IISU-Dr. Immanuel-High Performance SAR	0	30,45,000
			AICTE - INAE - 2018 Batch	0	31,265
			KSCSTE - PDF - Dr. Linsha V - 2019	0	4,27,914
			ATAL -AICTE - Life skills - Gigy Alex	0	93,000
			SERB - PDF Priyanka	11,980	4,471
			SERB - Dr. Seena V	19,621	0
			SERB - Dr. Jayanthi	30,450	0
			III. Expenditure on Fixed Assets & Capital Work-in-Progress		
			a.Purchase of Fixed Assets	20,25,73,126	8,18,09,128
			b.Expenditure on Capital Work-in-progress	2,41,94,683	2,33,84,544
			IV. Other Payments		
			Security Deposits (Asset) paid	9,30,999	3,00,000
			Security Deposits repaid to Contractors	4,15,727	19,44,885
			Earnest Money Deposits repaid	5,58,171	20,84,230
			Performance Guarantee repaid	48,962	80,673
			Loans to staff	1,00,000	48,60,000
			Canteen Accounting Committee	2,52,71,400	1,41,06,685
			Charges recoverable from banks	5,151	8,027
			Stale Cheques - paid	48,000	0
			Decrease in TDS, GST & Labour Cess	11,00,748	0

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RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2023

(Amount in Rs.)

Receipts	2022-23	2021-22	Payments	2022-23	2021-22
			Employee recovery - Ex ISRO employees	0	7,554
			TDS / TCS [from IIST]	28,98,801	20,90,790
			Unexplained credits - Banks - transferred	0	700
			Btech Fees refunded to DOS	17,17,275	1,34,73,502
			Interest refunded to DOS	1,06,43,696	73,39,210
			MCF Hassan - ISRO - net	5,34,948	13,922
			Caution Deposit repaid to Students	28,59,000	47,04,680
			Sundry Debtors - Others - Net	10,028	0
			Sundry Creditors - Others - Net	2,25,417	0
			Net decrease in Statutory Liabilities (Staff)	0	8,18,651
			IPRC - Honorarium released	0	1,500
			V. Closing Balances		
			a.Cash in hand	2,00,835	1,26,678
			b.Bank Balances		
			In current accounts	11,53,390	-1,56,20,864
			In deposit accounts	54,52,57,237	79,13,43,165
			In earmarked/retirement benefits accounts	10,35,43,456	9,12,57,076
			In Treasury Single Account	0	0
Total	1,79,36,21,086	1,82,10,91,624	**Total**	1,79,36,21,086	1,82,10,91,624

Significant Accounting Policies & Notes on Accounts 18

As per our report of even date attached.

For Balamurali & Associates
Chartered Accountants
FRN : 012374S

C.A. Balamurali C. V.
(Proprietor, Mem No. 223319)

Place : Thiruvananthapuram
Date : 27th September, 2023

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Dr. S. Unnikrishnan Nair
Director

R. Hari Prasad
Finance Officer

IIST-160-IP-E-11-2023

Indian Institute of Space Science and Technology

Declared as Deemed to be University under Section 3 of the UGC Act, 1956

An autonomous institute under Department of Space, Govt. of India

Valiamala P O, Thiruvananthapuram - 695 547, Kerala

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