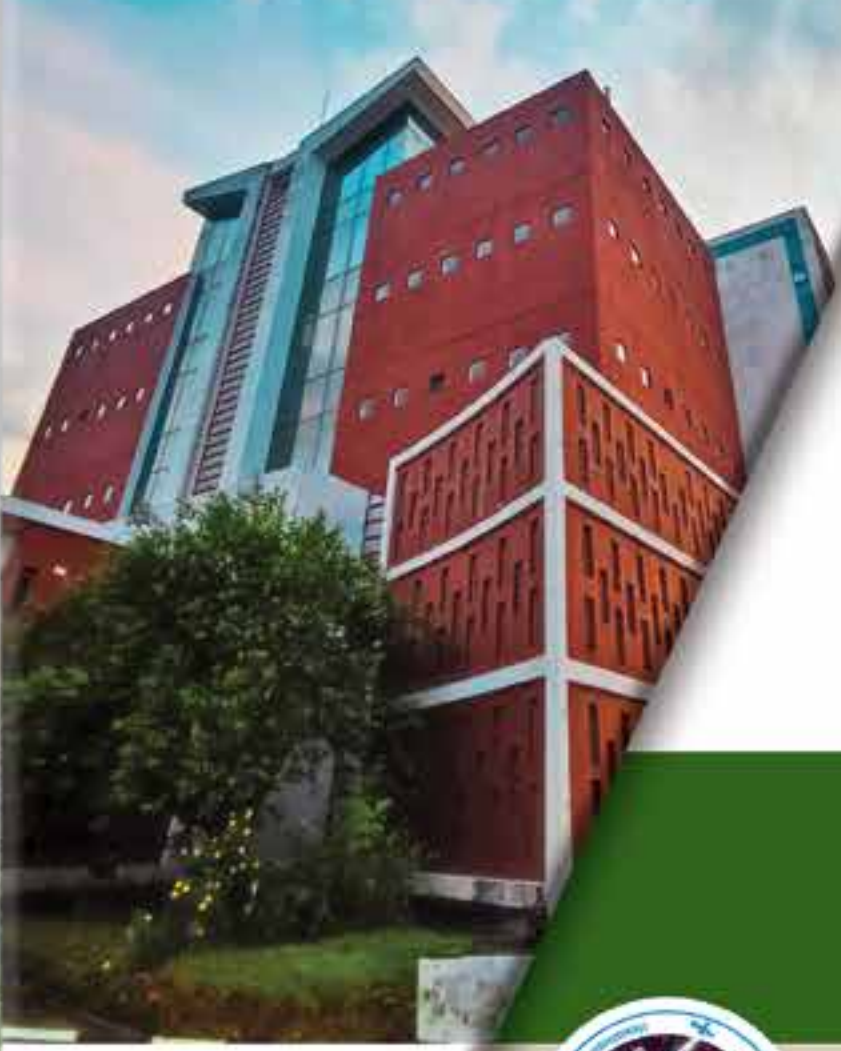


2023-24

ANNUAL REPORT

Indian Institute of Space Science and Technology

Thiruvananthapuram

Annual Report *2023-24*

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

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, Governing Body,IIST
Secretary, DoS

Dr. S. Somanath

Director
Chairman, Board of Management

Dr. Unnikrishnan Nair S.

Registrar

Dr. Y. V. N. Krishna Murthy
(till 13.09.2023)

Dr. Kuruvilla Joseph
(from 14.09.2023)

Deans

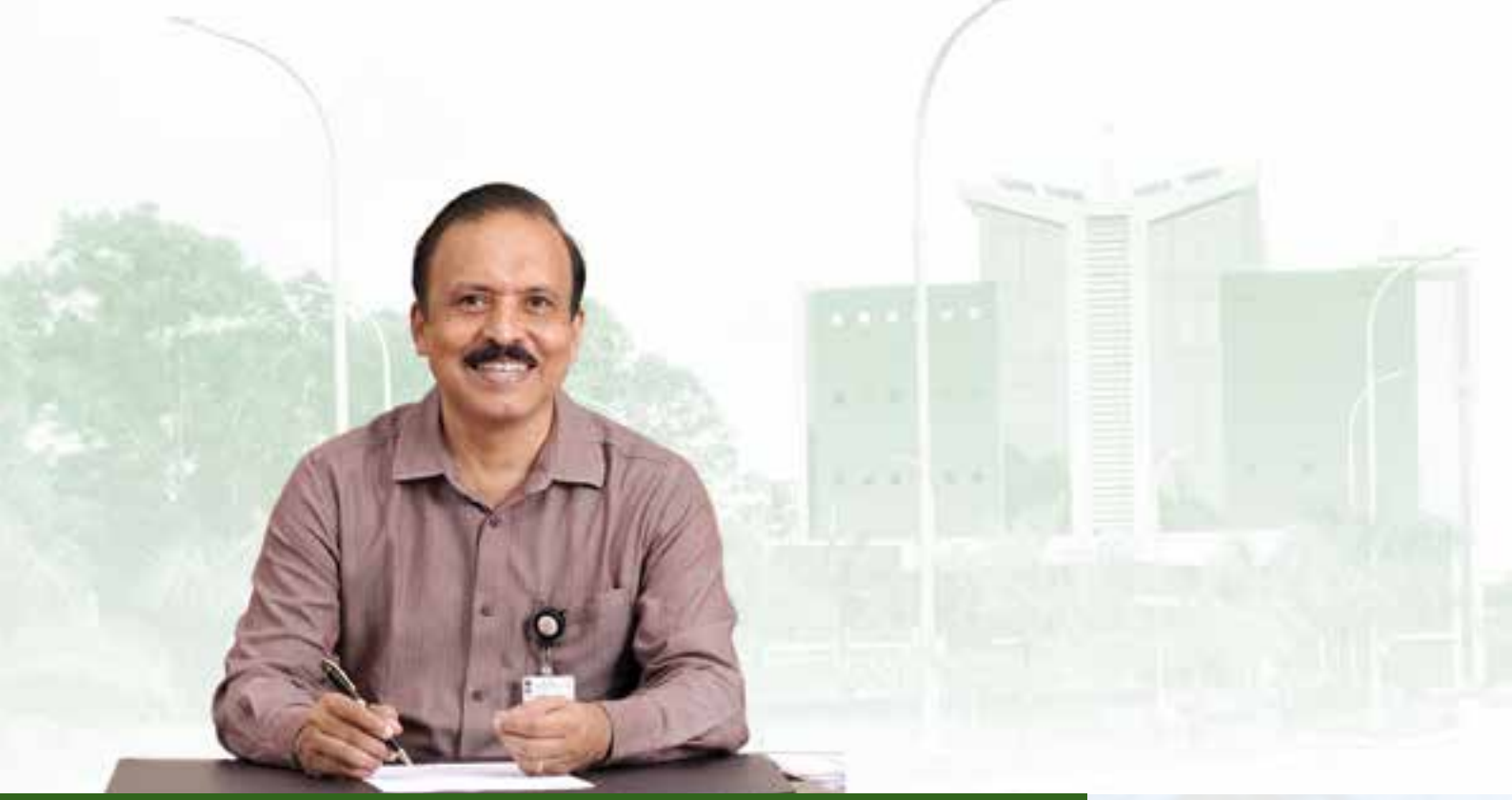
Dr. A. Chandrasekar
Research & Development (from 29.01.2024)
Academics (till 28.01.2024)

Dr. Raju K. George
Student Activities, Student
Welfare & Outreach (from 29.01.2024)
Research & Development (till 28.01.2024)

Dr. Kuruvilla Joseph
Academics (from 29.01.2024)
Student Activities, Student
Welfare & Outreach (till 28.01.2024)

Dr. C. S. Narayanamurthy
(IPR & Continuing Education,
& International Relations)

Contents



From Director's Desk

FOREWORD

Marking IIST's 16th year, this past year has been one of dynamic growth and transformation across curriculum development, research, collaborations, student engagement, and infrastructure expansion. While it is beyond the scope of this foreword to detail every initiative undertaken to enhance IIST, I am pleased to highlight a few of the most significant achievements. The strides IIST has made across all fronts in 2023-24 have been truly outstanding, and I wish to compliment the dedicated efforts of our faculty members, staff, and students. In accordance with the National Education Policy, we are in the process of revamping our curriculum, complemented by the introduction of a variety of multi-disciplinary courses. IIST is gearing up for NAAC re-accreditation and has secured the 48th position in the engineering category of the NIRF rankings.

In the academic year 2023-24, IIST had the distinct honour of hosting esteemed dignitaries, including Dr. S. Jaishankar, the Honourable Minister for External Affairs who visited IIST as part of the 'AmritKaalVimarsh - Vikasit Bharat @ 2047' initiative and Shri. Rajeev Chandrasekhar, as Minister of State for Electronics and Information Technology, as part of the 4th Semicon India Future Design Road show. Dr. S. Jaishankar lauded the exemplary practices of IIST in his subsequent engagements abroad, which we consider a testament to the institution's relentless pursuit of excellence. These visits underscored IIST's prominence in the national and international academic arena. I am also delighted to report that IIST has been selected as one among 100 for the prestigious 5G Use Case Labs program of the Government of India. Honorable Prime Minister Shri. Narendra Modiji has awarded the 5G Use Case Laboratory in online mode.

In the 11th convocation of IIST, B.Tech degree were conferred on 135 students and M.Tech degrees were awarded to 97 students and to 18 students from the dual degree programme. Ph.D. degrees were awarded to 25 students across all seven departments. A large number of them have joined various centres of ISRO. These students are a great resource to their communities, nation and the world as a whole for the way they imbibe the best spirit of scientific temper and ethical values. A large number of them directly serve the country as engineers/ scientists in ISRO. A total of 1316 graduates from the institute have joined ISRO so far. They are making significant contributions to recent space missions including Chandrayaan-3, Aditya L1 and Gaganyaan missions, showcasing their unparalleled expertise and dedication. The impact and the appreciation for this legacy is reflected in the recognition IIST

continue to receive. Few of our alumni are working in government civil services, while many are employed in prominent industries and some of them have launched their own start-ups and many are pursuing higher education. Over a short span of 16 years, IIST has evolved as a centre of multidisciplinary learning and research with a synergetic emphasis on space science, technology & applications. IIST has made significant technology demonstrations, with 5 of our payloads made by students and faculty being flown in PSLV. IIST successfully launched PILOT and ARIS-2 payloads on the POEM2 platform of PSLV C55 on April 22, 2023. Small-spacecraft Systems and PAyloadCEntre of IIST is getting ready with the Integrated Diagnostics Module payload for the upcoming electric propulsion satellite which will be launched by PSLV shortly. Many 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 scientist from ISRO/DoS centres, is one among them.

Currently, 40 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. As of April 2024, a total of 27 projects are approved and MoUs signed with ISRO/DoS centres.

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 more than 25 national and international universities, institutes, and R&D organizations. Since March 2023, 10 patents were granted to IIST. Faculty members have 228 publications in International and national journals. Four books were published by the faculty members and 28 articles as book chapters in edited volumes.

In alignment with the new space policy and the opening up of the space sector for private entrepreneurship, IIST has also established a Space Technology Innovation and Incubation Centre. Currently, five companies, ranging from deep tech hardware firms to geospatial data analytics and science podcasts, have been incubated and functioning actively under STIIC with many more in the pipeline.

To further strengthen the academic and research environment of the institute and keep pace with advancements in the Indian space ecosystem, concerted efforts are underway to expand IIST's research beyond its campus into other ISRO/DoS centers/units. The ISRO-IIST Research Enhancement Committee constituted by the Secretary of DoS in 2023 has submitted its report, and efforts are now focused on revising the MoU with the UGC accordingly.

IIST has been privileged to welcome renowned scientists, esteemed academicians, and distinguished guests, including international delegations, whose visits infused the institute with a wealth of expertise. These interactions have significantly enriched the academic landscape, fostering an environment ripe with innovation, collaboration, and global perspectives. The Institute's alumni have brought honour to their alma mater through their achievements and contributions in diverse fields and our engagements with them are steadily growing.

The campus buzzed with energy as it hosted a vibrant array of student activities and celebrations. This year, our institute has intensified its efforts to bridge the gap between academia and the community, fostering a spirit of inclusivity and shared growth. The science camps organized by the social outreach club, NIRMAAN in collaboration with local and tribal schools has provided valuable educational resources and mentorship, empowering young minds and promoting STEM education.

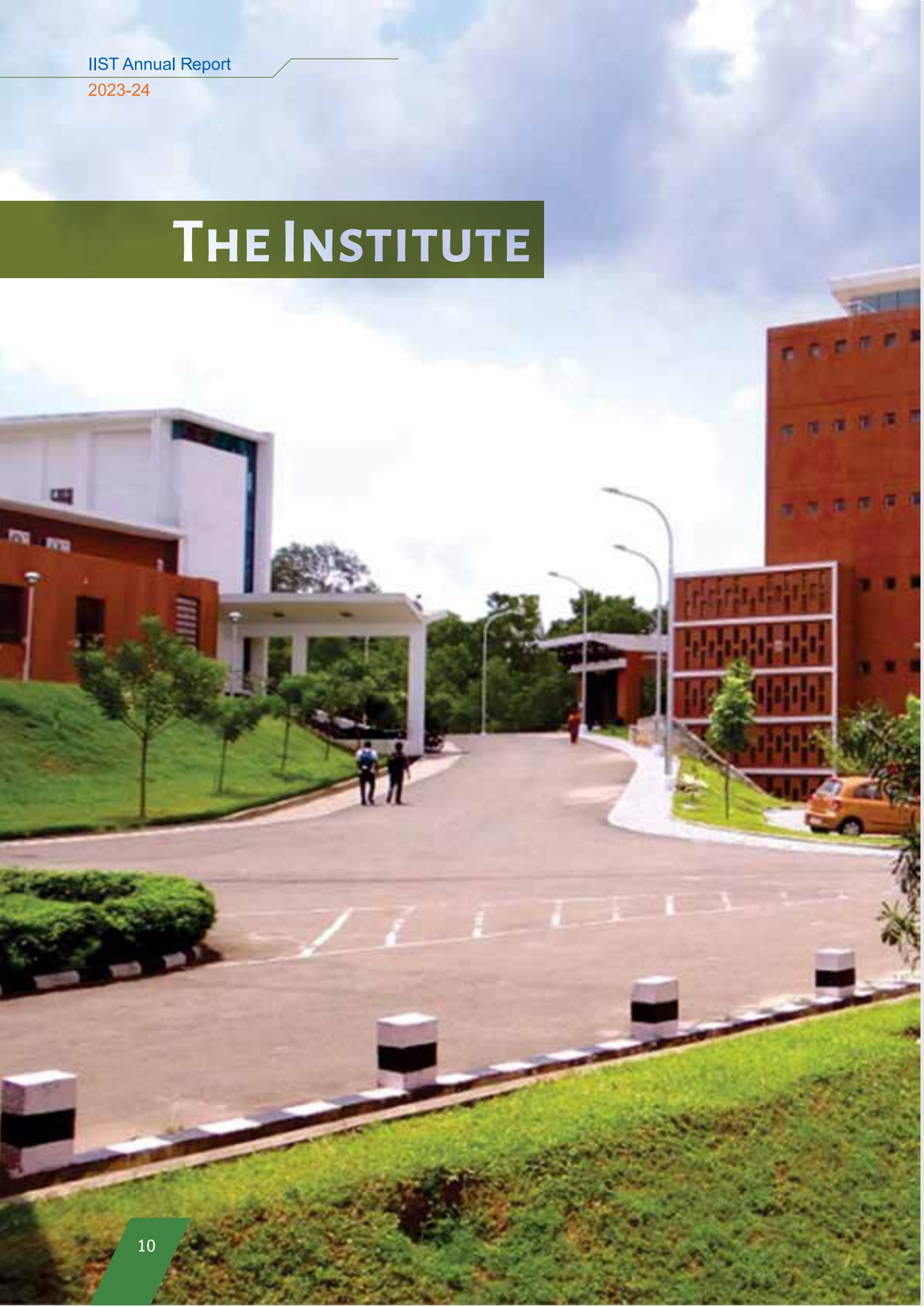
It is the people, who serve as true building blocks to an institution; they are what make an institution what it is. I express my appreciation to the Registrar, deans, faculty members, and the staff of IIST for standing by the vision of the institute. We express our sincere gratitude to Dr. B.N. Suresh, Chancellor, IIST for his invaluable guidance, Dr. S. Somanath, President, Governing Board, IIST for his unwavering support and involved leadership and to Dr. V. Narayanan, Director, LPSC for all the patronage provided as a friendly neighbour.

As I conclude, I am filled with a profound sense of optimism for the future. This year has marked incredible advances in India's space endeavours, achievements that stand as a testament to our nation's prowess. I am sure that our youth's boundless curiosity, innovative spirit, and unwavering commitment will elevate this prowess even further and will be driving force to attain the vision of Vikasit Bharath. Emphatically affirming this potent mix of the nation's context and youth power - science and people - and pledging my enthusiastic support for the synergies they promise, I bring my remarks to a close.

Thank you.

Unnikrishnan Nair S.
Director, IIST

The Institute



1. The Institute

The Indian Institute of Space Science and Technology (IIST), Thiruvananthapuram, Kerala, was established in 2007 as a centre for pioneering research and education in science and technology. Founded as a Deemed University under Section 3 of the UGC Act 1956 by the Department of Space, IIST holds the distinction of being Asia's first Space University. Over the past 16 years, the institute has evolved into a dynamic, multidisciplinary hub for learning and research, spanning fields such as Aerospace, Avionics, Chemistry, Earth and Space Sciences, Humanities, Mathematics, and Physics.

IIST offers undergraduate programs in three branches and postgraduate programs across 15 specialized areas in Science, Technology, and Engineering, with a strong focus on Space Science and Technology applications. Today, IIST stands as one of India's leading institutes in science and technology, known for its rigorous, interdisciplinary approach that blends knowledge and practice across diverse models, concepts, and technological applications.

As a centre for research and innovation, IIST engages with both local and global challenges, addressing technological and societal needs alike. Its commitment to research is evident in robust indicators, including research publications, patents, projects, industry partnerships and start-ups incubated. The institute also maintains a wide network of national and international partnerships through institutional MoUs and faculty-to-faculty collaborations, fostering a rich environment for academic and scientific advancement.

The institute exists as a vital, symbiotic partner to ISRO, channelling advanced thought and pioneering technology into ISRO's key areas of exploration. IIST students have numerous opportunities to contribute as interns and future employees across various ISRO centres, forming a critical talent pipeline for the nation's space endeavours. With state-of-the-art facilities across its departments and a culture that emphasizes interdisciplinary collaboration, IIST empowers its students and scholars in partnership with ISRO's extensive support network.

Students and researchers contribute enthusiastically across science, technology, humanities, management, and social sciences, thereby fostering a comprehensive approach to knowledge and research. In this way, IIST

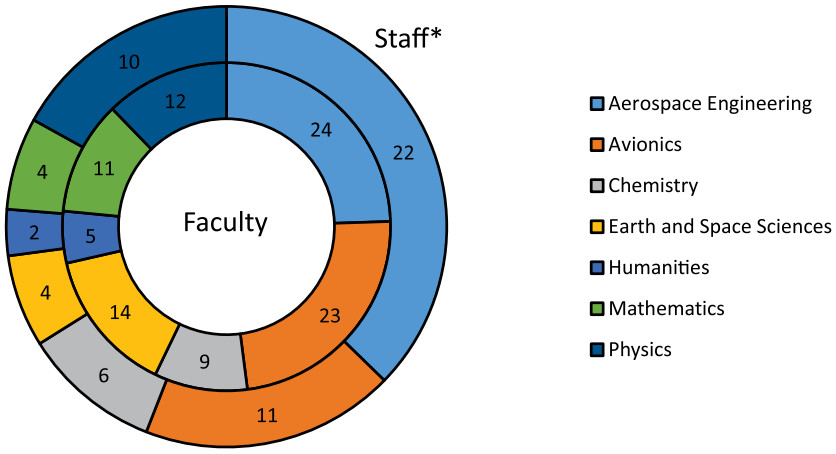
embodies the true spirit of the National Education Policy (NEP), championing equitable recognition across science, engineering, humanities, and management. Through its Doctoral and Post-Doctoral research programs, IIST invites students to boldly venture into innovative and interdisciplinary research, addressing some of the nation's most urgent challenges.

Among the key achievements of the past year, IIST successfully executed the PiLOT satellite project, launched aboard PSLV C-55 on April 22, 2023. This mission featured India's first 3D-printed aluminium structure and an on-board computer for technology demonstration, marking significant strides in innovative space technologies. The institute's Small-spacecraft Systems and PAyload Centre (SSPACE) is now advancing its next payload, GRACE (Gmc, Reprogramming, And Communication Experiment), alongside the development of indigenous payloads such as the Space Biology payload, InspireSat-3, LISAT, AHAN, and XNAV. Additionally, IIST will provide the Integrated Diagnostics Module payload for an upcoming electric propulsion satellite, slated for PSLV launch this year. Another groundbreaking development is the MEMS-based cardio sensor, the Seismo-cardiogram, which offers a resolution 1,000 times finer than that of an ECG. With visionary interventions, meticulous planning, bold decision-making, and strong leadership, IIST is poised to become a global hub for research, education, and innovation in space-related disciplines in the years to come.

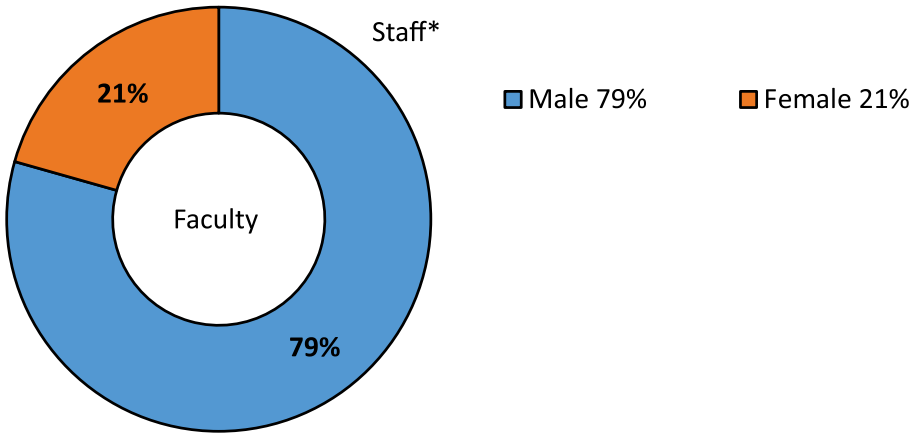
1.1 IIST at a Glance 2023-24

Departments and its strength

Faculty & staff strength in various department

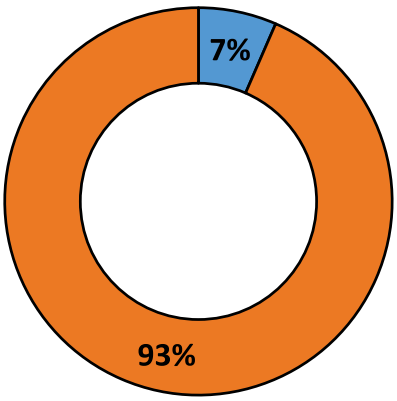


Gender wise distribution of faculty & staff in various department



Administration and other Essential Services

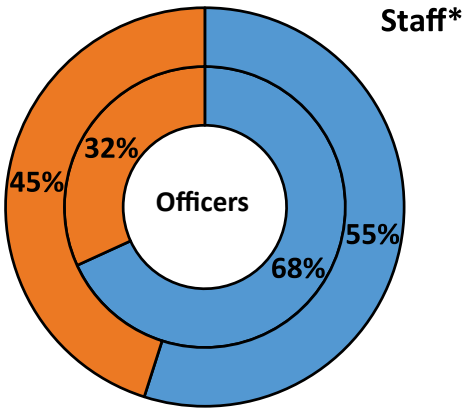
Administrative Strength



**Staff includes hired man power*

Officers-22 (7%) Staff *-315 (93%)

Gender Statistics - Administrative and other Essential Services



Officers : Male-10 Female- 4
Staff : Male-21 Female-11

Male Female

Students Strength *(as on 31-03-2024)*	
B.Tech. students enrolled in 2023	136
B.Tech. students in campus	582
Dual Degree students enrolled in 2023	20
Dual Degree students in campus	40
M.Tech students enrolled in 2023	138
M.Tech students in campus	254
Doctoral students enrolled in 2023-24	98
Doctoral students in campus	374

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

Research Outcome	
Book / Book chapters	28
Journal Papers	228
Conference Proceedings	191
PhD Thesis Defended	38
Patents Granted	10
Patent application submitted	07

Centres of Excellence	
Centres of Excellence	03

Awards and Achievements	
Awards and Recognitions	55

Research Resources	
New Books/ E-books/ Reports added in the library	3,540

Startups	
Incubated	05
Pre - incubated	04
Admission offered	01

Placements

Placement (B.Tech./ Dual Degree- ISRO)	98
Placement (B.Tech./ Dual Degree- Placement cell)	14
Placement (M.Tech. - Placement cell)	71

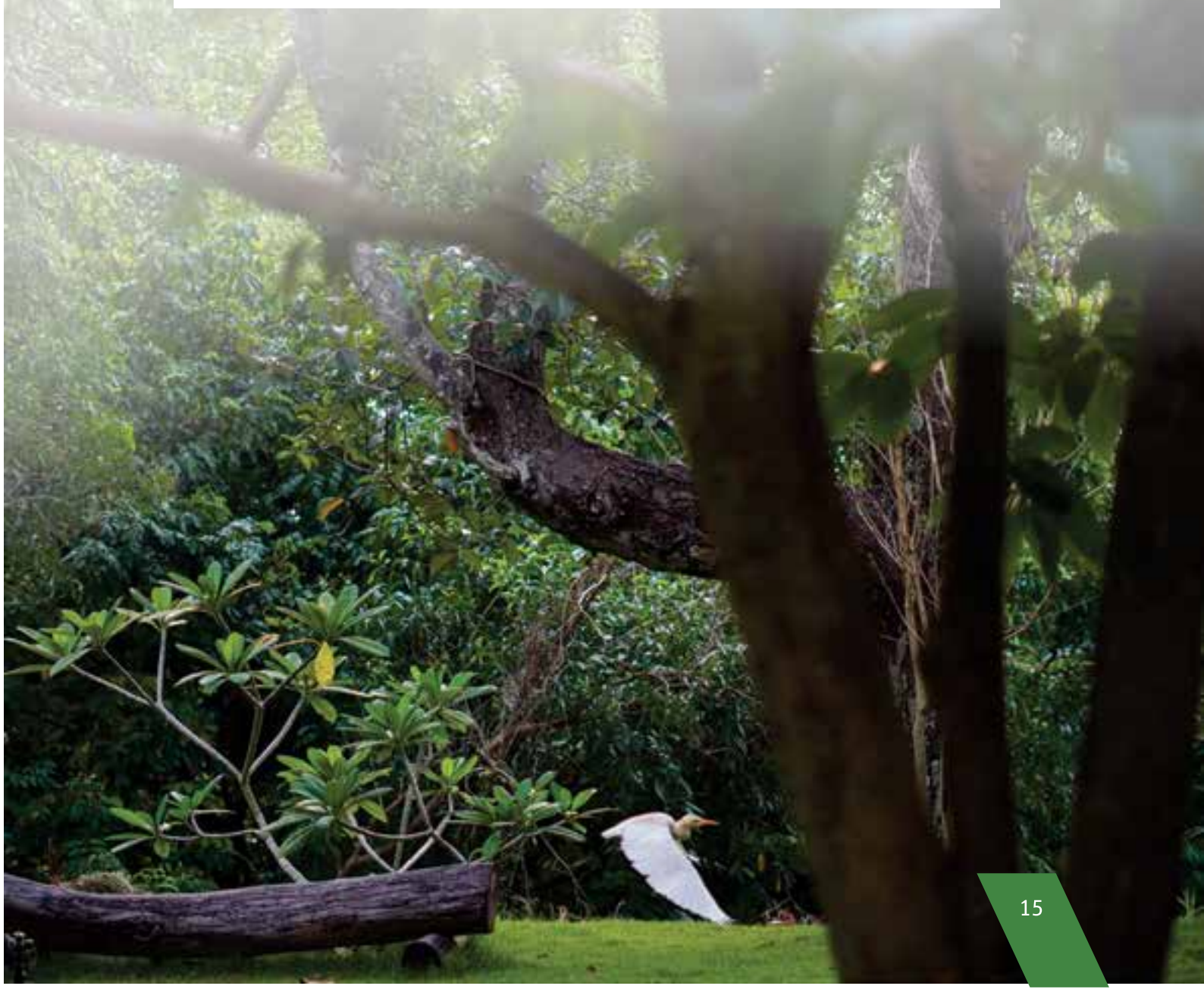
RTI Status

From April, 2023 to March, 2024 (Decentralised the processing of applications under RTI andCPIO, IISThas been disseminating the information directly to the applicants).

Application received	Information given	Appeal received	Appeal settled	CIC hearing
63	63	07	07	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
Sandhya Venugopal Sharma (from 02.01.2024) M. Maheshwar Rao (till 01.01.2024)	Additional Secretary & FA, DoS
Shantanu Bhatawdekar	Scientific Secretary, ISRO Headquarters
Unnikrishnan Nair S.	Director, VSSC
V. Narayanan	Director, LPSC
Nilesh M. Desai	Director, SAC
Prakash Chauhan	Director, NRSC
Unnikrishnan Nair S.	Director, IIST Secretary

1.2.2 IIST Governing Council

S. Somanath	Secretary, DoS/ Chairman, ISRO Chairperson
Sandhya Venugopal Sharma (from 02.01.2024) M. Maheshwar Rao (till 01.01.2024)	Additional Secretary & FA, DoS
G. Jayanthi	Joint Secretary (Finance), DoS
Shantanu Bhatawdekar	Scientific Secretary, ISRO Headquarters
Unnikrishnan Nair S.	Director, IIST Secretary

1.2.3 IIST Board of Management

Unnikrishnan Nair S.	Director, IIST Chairman
Sandhya Venugopal Sharma (from 02.01.2024) M. Maheshwar Rao (till 01.01.2024)	AdditionalSecretary& 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	Director, NIIST
Anil Bharadwaj	Director, PRL
A. Chandrasekar	Dean, Research & Development
Raju K. George	Dean, Student Activities, Student Welfare & Outreach
Kuruvilla Joseph	Dean, Academics
C. S. Narayanamurthy	Dean, IPR, Continuing Education & International Relations
N. Sabu	Professor, Department of Mathematics
Vani Devi M.	Assistant Professor, Department of Avionics
Kuruvilla Joseph	Dean, Academics & Registrar

1.2.4 IIST Finance Committee

Unnikrishnan Nair S.	Director, IIST Chairman
Sandhya Venugopal Sharma (from 02.01.2024) M. Maheshwar Rao (till 01.01.2024)	Additional Secretary & FA, DoS
Bijay Kumar Behera	Associate Director, BEA,ISRO
A. Chandrasekar	Dean, Research & Development
Raju K. George	Dean, Student Activities, Student Welfare &Outreach
C. S. Narayanamurthy	Dean, IPR, Continuing,Education & International Relations
Kuruvilla Joseph	Dean, Academics & Registrar
Manju M	Sr. Head Accounts/ IFA, LPSC, Valiamala
R. Hari Prasad	Finance Officer Secretary

1.2.5 IIST Academic Council

Unnikrishnan Nair S.	Director Chairman
A. Chandrasekar	Dean, Research & Development
Raju K. George	Dean, Student Activities, Student Welfare & Outreach
Kuruvilla Joseph	Dean, Academics
C. S. Narayanamurthy	Dean, IPR, Continuing Education & International Relations
K. Sudhakar	Former Professor, IIT, Bombay
K. R. Ramakrishnan	Former Professor, IISc, Bangalore
C. Anandharamakrishnan	Director, NIIST, Thiruvananthapuram
K. Kurien Issac	Senior Professor, (Superannuated on 30.9.2023) Department of Aerospace Engineering
Aravind V.	Professor, Department of Aerospace Engineering
A. Salih	Professor, Department of Aerospace Engineering
Manoj T. Nair	Professor, Department of Aerospace Engineering
Deepu M.	Professor and Head, Department of Aerospace Engineering
Anup S.	Professor, Department of Aerospace Engineering
Chakravarthy P.	Professor, Department of Aerospace Engineering
Deepak Mishra	Professor, Department of Avionics
N. Selvaganesan	Professor and Head, 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 and Head, Department of Chemistry
K. Prabhakaran	Professor and Head, Department of Chemistry
Rama Rao Nidamanuri	Professor and Head, Department of Earth and Space Sciences
Anandmayee Tej	Senior 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 and Social Sciences
V. Ravi	Professor, Department of Humanities and Social Sciences
Lekshmi V. Nair	Professor, Department of Humanities and Social Sciences
C. V. Anil Kumar	Professor and Head, Department of Mathematics
K. S. S. Moosath	Senior Professor, Department of Mathematics
N. Sabu	Senior Professor, Department of Mathematics
Deepak T. G.	Senior 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 and Social Sciences
Kuruvilla Joseph	Registrar Secretary

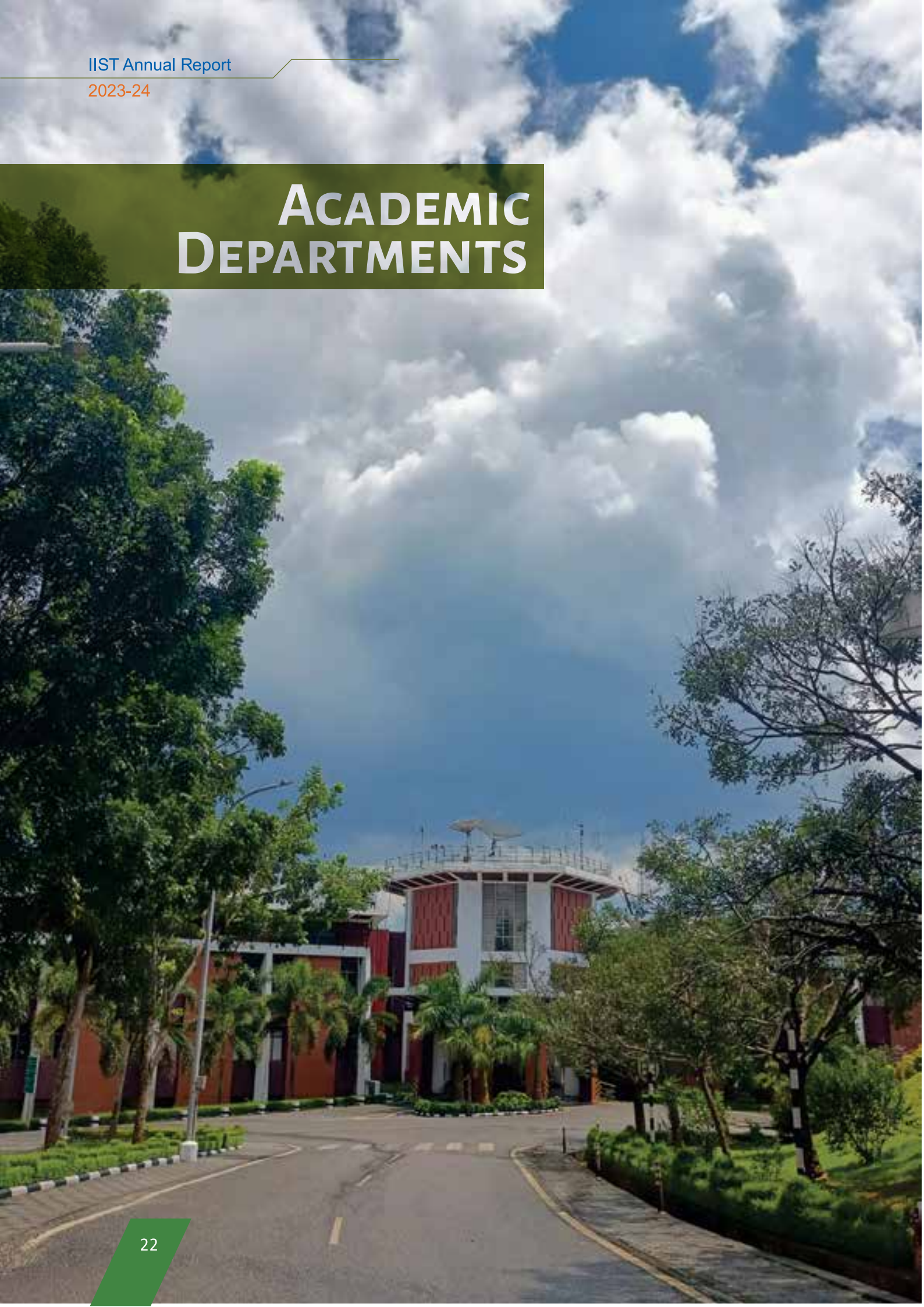
1.3 Functionaries in Academics, Administration and Other Units

Director		
S. Unnikrishnan Nair		
Registrar		
Kuruvilla Joseph	Outstanding Professor	
Deans		
A. Chandrasekar	Research & Development	
Raju K. George	Student Activities, Student Welfare & Outreach	
Kuruvilla Joseph	Academics	
C. S. Narayanamurthy	IPR, Continuing Education & International Relations	
Associate Deans		
N Sabu	Academics	
K. S. S. Moosath	Ranking, Accreditations & NEP	
Prathap C	Industrial Research /ASRG/Start-ups/Collaborations	
Nirmala Rachel James	Doctoral Programs and Projects	
Lekshmi V. Nair	Student Activities and Outreach	
Rajeevan P P	Student Welfare	
Umesh R. Kadhane	Programme Planning & Implementation and Infrastructure Development	
Anandmayee Tej	Continuing Education & International Relations	
Manoj B S	Campus communication, Data Network, Website	
Heads of Department		
Deepu M	Professor	Aerospace Engineering
N. Selvaganesan	Professor	Avionics
K. Y. Sandhya	Professor	Chemistry
Rama Rao Nidamanuri	Professor	Earth and Space Sciences
C. S. Shaijumon	Associate Professor	Humanities and Social Sciences
C. V. Anil Kumar	Professor	Mathematics
Sudheesh Chethil	Professor	Physics

Officers

S.N. Chandrasekaran	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 II (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 II (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 TOMD)
Cimy Asaf	Assistant Director (Official Language)

Academic Departments



Department of Aerospace Engineering

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 areas

(a) Aerodynamics and Flight Mechanics
(b) Thermal and Propulsion
(c) Structures and Design
(d) Materials, Manufacturing and Industrial Engineering

Fact File

Number of faculty	: 22+2#
Technical Staff	: 06
Tutors /Technicians	: 13
Non-teaching staff	: 3
Research Scholars	: 76
Number of PhDs conferred	: 10

Superannuated

Laboratory / Research Facilities

Department of Aerospace Engineering, IIST has the following 27 instructional/ research labs

- Advanced Propulsion and Laser Diagnostics (APLD) facility
- Aerodynamics Lab
- Aerostructures Lab
- CADD Lab
- Computational Heat Transfer Lab
- Computational Lab
- Cryogenic Lab
- Engineering Drawing Hall
- Engineering Workshop
- Experimental Composite Micro-mechanical lab and Raman Spectroscopy Facility
- Flame Diagnostics Lab
- Flight Mechanics Lab
- Fluid Mechanics Lab
- Heat Transfer Lab
- Heat Treatment and Metallography Lab
- High Speed Flow Lab
- Laser Absorption Spectroscopy Lab
- Manufacturing Processes Lab
- Mechanisms and Machine Elements Lab
- Metrology and Computer Aided Inspection Lab
- Micro-PIV Lab
- Robotics and Dynamics Lab
- Strength of Materials Lab
- Structural Dynamics and Vibration Lab
- Structural Health Monitoring (SHM) Lab
- Thermal Engineering and Propulsion Lab
- Thermal and Fluid Engineering Calibration Facility

Research and Development

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 Educational institutes/ Industries / R&D organizations including NIT Calicut, College of Engineering, Trivandrum, 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.

Research outcomes -Fact File

International Journal	: 35
Conferences	: 51
Book chapters	: 06
Patents	: 4 (granted)

Contributions to Institute Level Space Missions

- Conducted the 'Drop test to estimate dynamic parameters of Crew Module', by VSSC scientists and drone experts.
- Department 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 reusable 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

- Faculty members delivered 17 Invited lectures/ Keynote/ Seminar presentations.
- Faculty members organised 5 Conference/ Workshop/ Seminar/ Invited lectures/ Training programmes in IIST.
- Faculty members participated in 10 Conferences/ Workshop/Seminars.
- Students and a few faculty members/ staff visited the Aircraft training college at Southern Naval Command, Kochi.
- 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 Start-ups are mentored by faculty members of the 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 Pvt. Ltd.,** is an R&D startup conceived to develop indigenous, laser-based, optical and spectroscopic systems for various research institutes and private industries in India. The company aims to reduce dependency on foreign systems and to develop self-reliance in this area of research, aligning with “Make in India” policy.
- **M/s. Hathor Rockets Pvt. Ltd.,** is pioneering aerospace technology aimed at transforming the space economy with state-of-the-art rocket propulsion systems. Currently, the company is advancing through the phases of design, development, and manufacturing of reusable, throttleable, semi-cryogenic rocket engines.

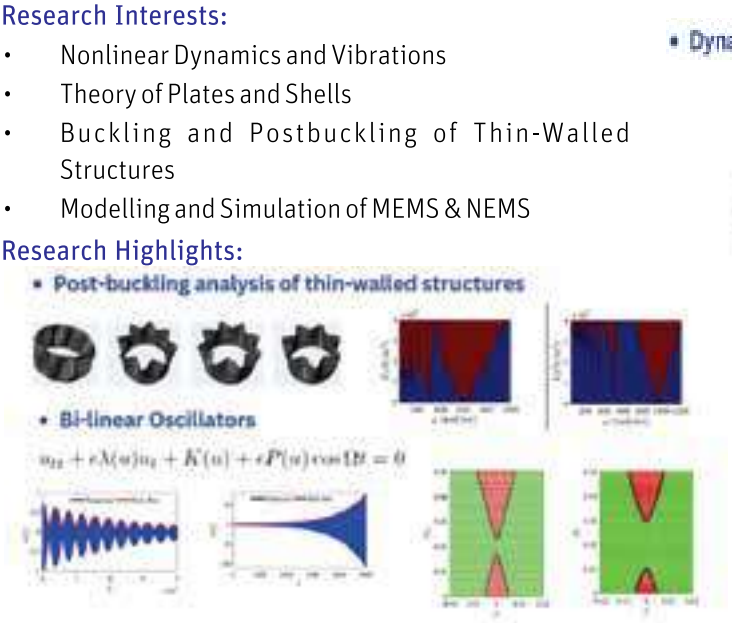
Faculty Profile

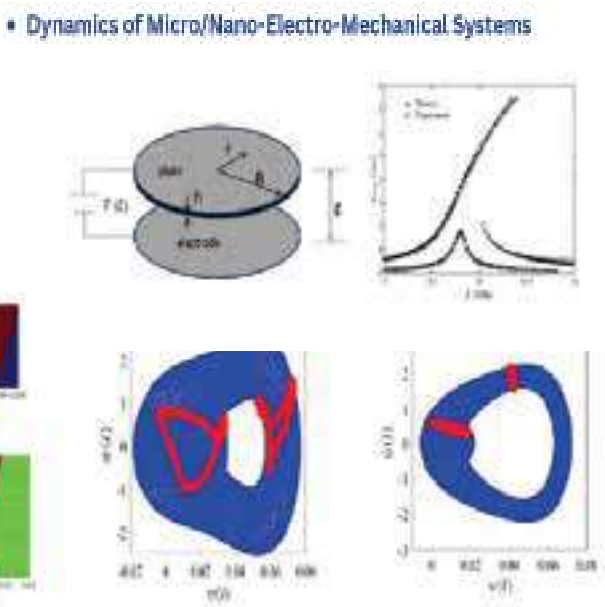
Anish Kumar, *Ph.D., Assistant Professor*

Research Interests:

- Nonlinear Dynamics and Vibrations
- Theory of Plates and Shells
- Buckling and Postbuckling of Thin-Walled Structures
- Modelling and Simulation of MEMS & NEMS

Research Highlights:





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

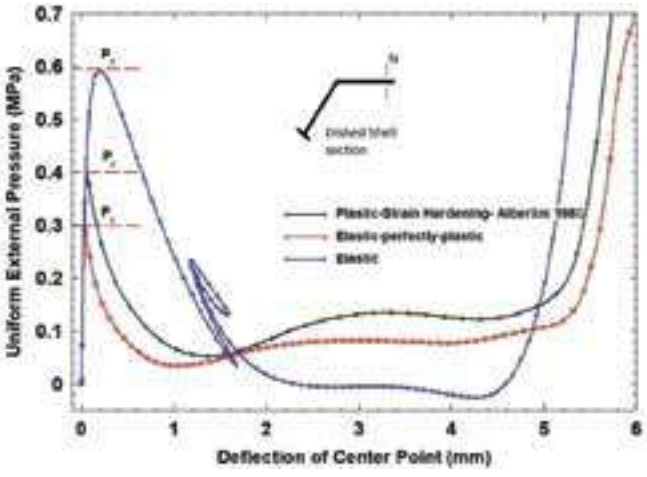
Anup S., *Ph.D., Professor*

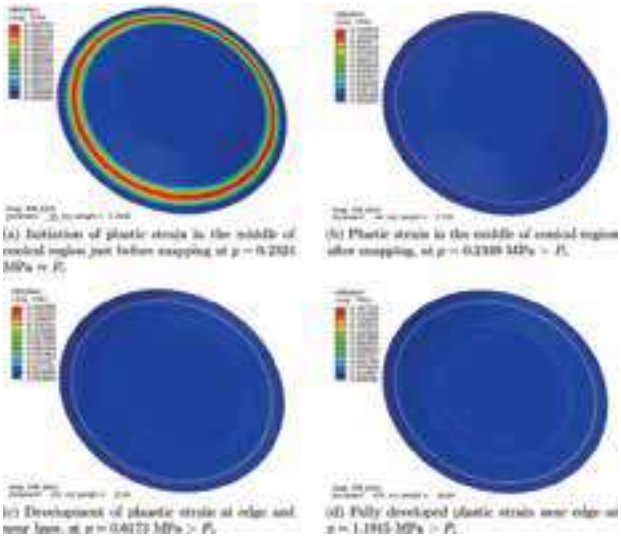
Research Interests:

- Mechanics of Bio-inspired composites
- Micromechanics
- Buckling of shells

Research Highlights:

- The dual thickness dished shells are made of conical frustum with a closed stiff top at the smaller diameter end of the frustum. Investigations were conducted into the snap through buckling of such shells & the significance of material plasticity in the phenomenon is established.
- It is found that the axisymmetric Eigen-mode imperfections has a significant effect on critical buckling pressure for the elastic material model, while with elastic-perfectly-plastic material models, the effect of imperfections are very small. This information could be used for the detailed design of dual thickness dished shells.





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

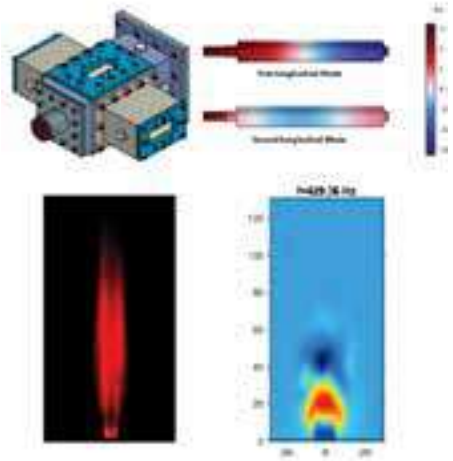
Aravind V., *Ph.D., Professor*

Research Interests:

- Outer Space: Small Satellite Launch Vehicle Development for Very Low Earth Orbit-300 km, Experimental Sounding Rockets, Small Satellite and Payload Development, Mentoring and Fostering Space Startups towards Atmanirbhar Bharath.
- Inner Space: Exploring the Human Consciousness and Potential through Ancient Indian Wisdom.

Research Highlights:

- Spray Characterization: High-speed and High-magnification LED/Laser Shadowgraphy, Mie-Scattering, PLIF, PIV, PDPA-LDV, Malvern Particle Size Analyzer.
- Supersonic mixing studies: High-speed Schlieren/Shadowgraphy, Mie-Scattering, PLIF, 2D and stereo-PIV, Unsteady Pressure Measurement.
- Combustion Instability: Triggering - O_2 flow rate Perturbation / secondary nozzle with toothed wheel, Flame characterization using PLIF.



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

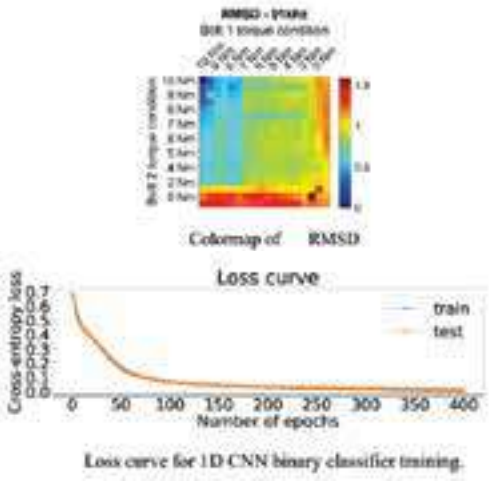
Bijudas C. R., *Ph.D., Associate Professor*

Research Interests:

- Wave propagation in thin walled structures
- Digital twin of structural systems
- Bolt loosening detection using guided waves and ML
- Impact studies on 3D composites embedded with SMA.

Research Highlights:

- Developed the digital twin of structural system with modal characteristics.
- Enhanced bolt loosening detection schemes are developed with the help of guided waves in plates fastened by bolts.



Loss curve for 1D CNN binary classifier training.

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

Chakravarthy P., *Ph.D., Professor*

Research Interests:

- Hot working process
- Incremental forming process
- Friction stir processing

Research Highlights:

- Single stage and multi stage incremental forming
- Hot deformation of Monel alloys
- Forming of sheet metals using pneumatic loading

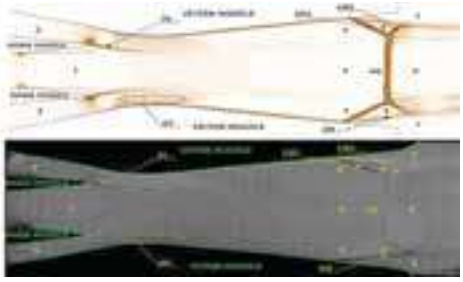
Reference: https://www.iist.ac.in/aerospace/chakravarthy

Deepu M., *Ph.D., Professor & Head of the department*

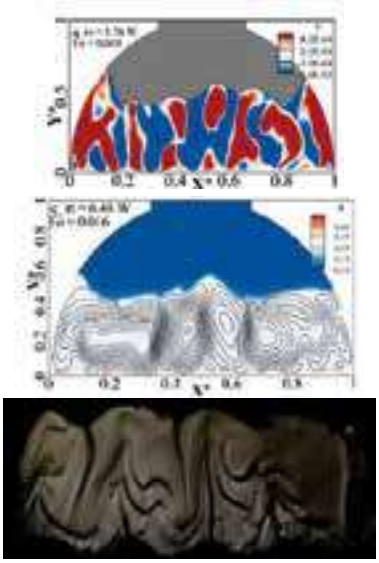
Research Interests:

- Latent heat storages
- Rayleigh–Bénard convection
- Non-conventional rocket nozzles
- Heat & mass transfer enhancement

Research Highlights:



Schlieren visualizations obtained numerically(top) and experimentally(bottom)for a typical Dual Throat Nozzle operation (LPSC-IIST Project).

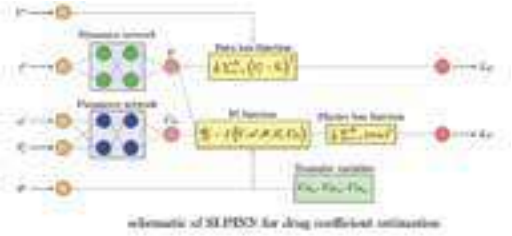


Reference: https://www.iist.ac.in/aerospace/deepu

Devendra Prakash Ghate, *Ph.D., Assistant Professor*

Research Interests:

- Aircraft design
- Machine learning
- Trajectory optimisation



Research Highlights:

- Developed Hermite-Simpson direct collocation trajectory optimization software for retro-propulsive landing of a reusable launch vehicle.
- Developed Physics Informed Neural Networks based robust system identification library for HANSA aircraft.

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

Dhayalan R., *Ph.D., Assistant Professor*

Research Interests:

- Design, fabrication and flight testing of Unmanned Aerial Vehicles.
- System identification and parameter estimation using neural networks for aerial vehicles.
- Control and guidance design for UAVs.

Research Highlights:

- Designed, Fabricated and flight tested a micro UAV of mass less than 250g, which can be used for shorter missions.
- A guidance algorithm combing Dubins path and Snap algorithm to find an optimum trajectory for aerial surveying multi-rotor UAV has been developed.
- A glider which can soar at large altitudes in Martian atmosphere has been designed using optimal soaring trajectory for Martian conditions.
- Development of coordinated control of swarm of Quadrotor drones connected with net to catch reentry launch vehicles has been carried out in simulation environments.

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

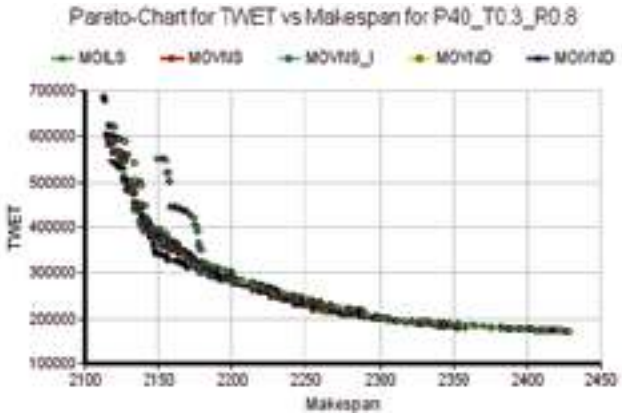
Girish B. S., *Ph.D., Associate Professor*

Research Interests:

- Sequencing and scheduling in manufacturing and aerospace systems.
- Just-in-time systems
- Optimization techniques applications

Research Highlights:

- Developed a novel method to generate Pareto-optimal front from a set of piecewise linear trade-off curves typically encountered in bi-objective JIT scheduling problems.
- Proposed a dynamic programming algorithm for satellite scheduling in COSPAS SARSAT system for disaster management.



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

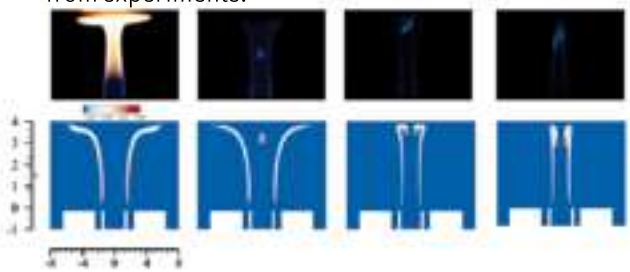
Mahesh S., *Ph.D., Associate Professor*

Research Interests:

- Jet Flame Research
- MILD combustion
- Flame Spread Studies in Terrestrial/Microgravity Conditions
- Sub-atmospheric Combustion

Research Highlights:

- Designed and developed a labscale experimental setup to investigate buoyant jet flame-wall interaction in the context of impingement flame heating.
- An open source CFD solver was utilized to model the buoyant jet flame-wall interaction which successfully captured the salient features observed from experiments.



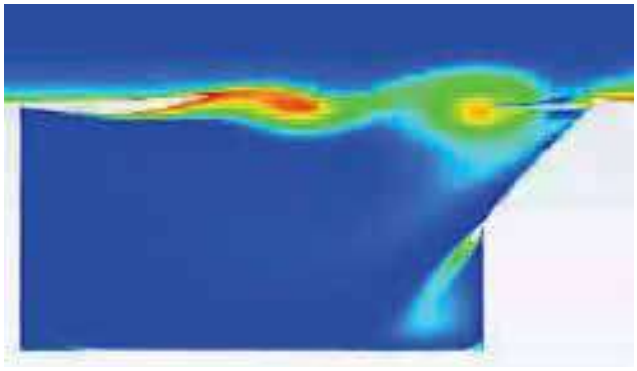
Experimental (Top Row) and CFD Results (Bottom Row) Depicting the Evolution of Wall Impinging Buoyant Jet Flames with Variation in Air Jet Velocity for a Fixed Power Level.

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

Manoj T. Nair, *Ph.D., Professor*

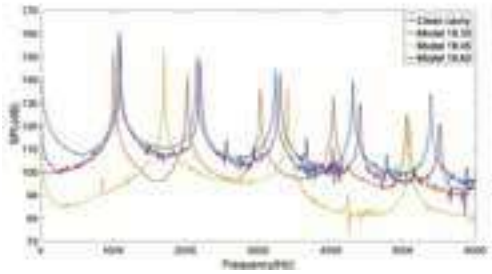
Research Interests:

- Aerodynamics
- Computational Methods
- Optimization
- Compressible and Incompressible Flows
- Aeroacoustics



Research Highlights:

- Numerical investigation of flow induced cavity oscillations at transonic speeds – effect of geometry.
- Study of supersonic flow past axisymmetric cavities.
- Study of the effect of vortex generators on slender bodies in supersonic flows Study of low Reynolds number compressible flows.
- Development of scale-adaptive TENO scheme based on a new smoothness indicator.

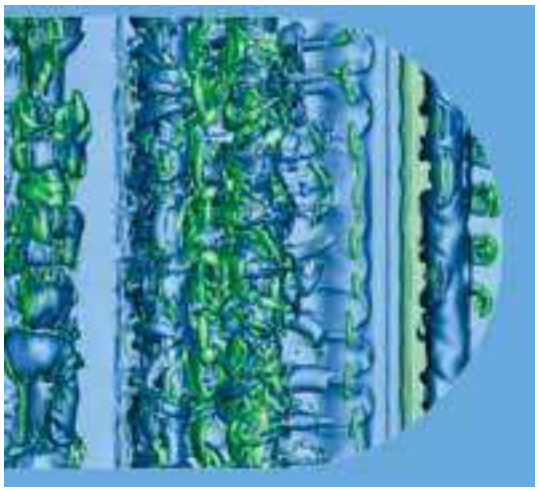


Reference: https://www.iist.ac.in/aerospace/manojtnair

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

Research Interests:

- Fluid Dynamics
- CFD
- Heat transfer



Research Highlights:

- **Phase Change Materials (PCM) Dynamics**: Focuses on the thermal behavior and melting dynamics of PCMs, particularly in complex enclosures.
- **Latent Heat Storage Systems:** Explores advancements in heat transfer physics to optimize energy storage solutions.
- **Fluid Dynamics:** Investigates the onset and development of turbulence in various flow configurations, such as diverging channels.
- **Thermal Convection:** Studies the interaction between thermal convection and PCM behavior in different geometric settings.
- **Analytical Solutions:** Applies analytical methods to solve complex problems in heat transfer and fluid dynamics.

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

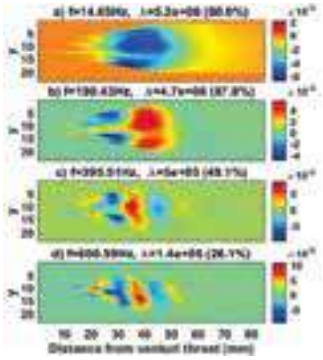
Pradeep Kumar P., *Ph.D., Associate Professor*

Research Interests:

- Two-phase flow and heat transfer
- Boiling
- Heat transfer in space application

Research Highlights:

- It was possible to experimentally assess and delineate the behavior of cavitation zone in planar cavitating venturi.
- Numerical prediction of cavitation behavior in cavitating venturi using two-fluid model.



Low and high Frequency Components in cavitation zone

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

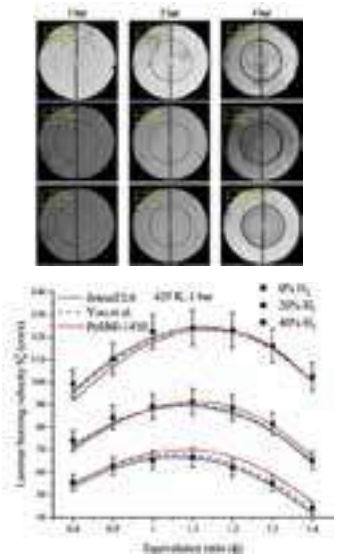
Prathap C., *Ph.D., Professor*

Research Interests:

- Turbulent swirl combustion
- Self-aspirating Burners
- Direct Contact condensation

Research Highlights:

- n-dodecane was considered as a surrogate for kerosene. To enhance the combustion characteristics of n-dodecane, H_2 was added in different proportions, and its burning velocity was measured using freely expanding spherical flames.
- premixed n-dodecane-oxygen (diluted with N_2, H_2O, and CO_2) was also studied at different pressures and temperatures. High-temperature oxy-n-dodecane flames were less sensitive to initial pressure. Jetsurf2.0 mechanism predicted LBV accurately.



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

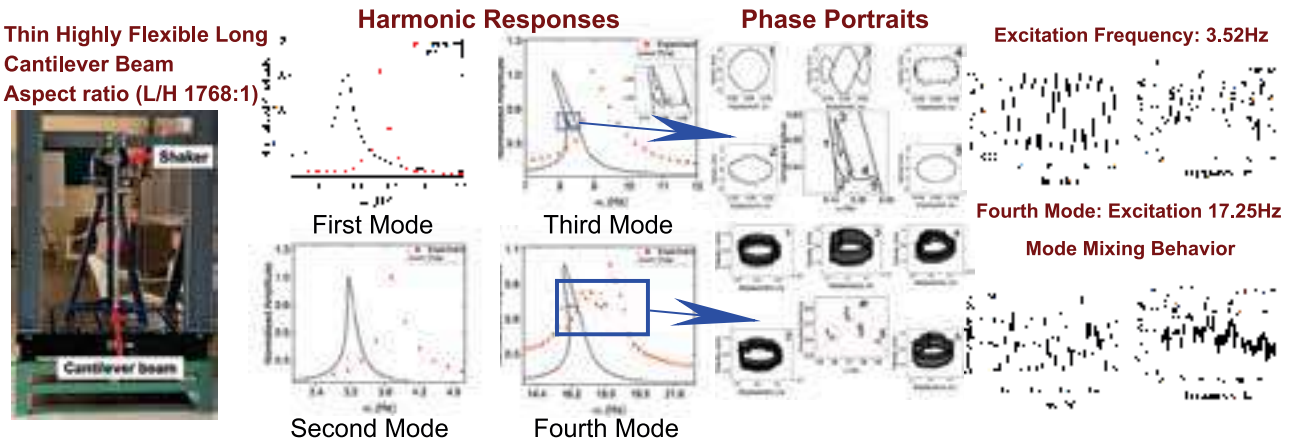
Praveen Krishna I. R., *Ph.D., Associate Professor*

Research Interests:

- Analytical, Numerical, and Experimental study of linear and nonlinear dynamics of mechanical and aerospace systems.
- Acoustics and Noise Control
- Fluid-Structure Interaction
- Nonlocal Elasticity

Research Highlights:

- Dynamic characteristics of a thin cantilever beam of aspect ratio (L/H) 1768:1.
- Modeling approach using ANCF and solution approach using TVM.
- The harmonic response curve shows softening behavior for higher modes.
- The Fourth Mode shows a mode mixing behavior.
- The higher harmonics of fundamental frequencies are present in the responses.



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

Rajesh S., *Ph.D., Associate Professor*

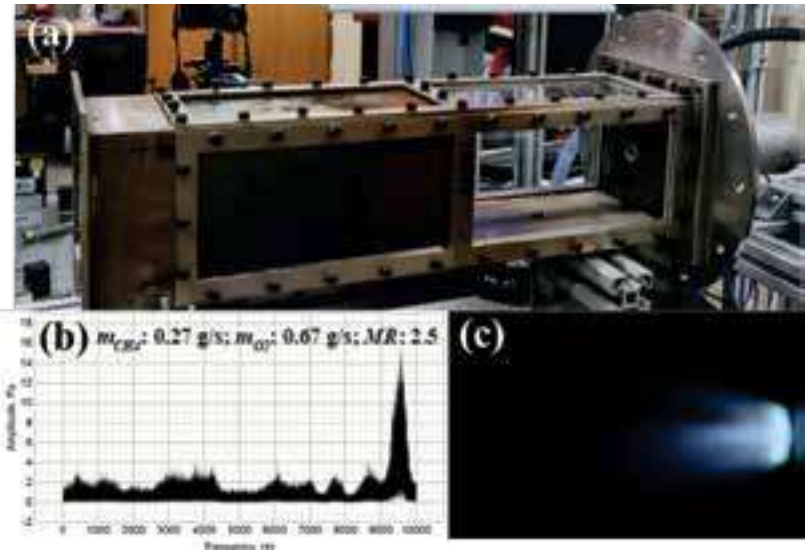
Research Interests:

- Rocket Propulsion: instability, throttling.
- Air-breathing Propulsion: Swirl combustion, Supersonic Combustion (Mixing, fuel injection dynamics, thermometry).

Research Highlights:

- Combustion Instability Studies in a Non-Premixed Swirl Coaxial Gaseous Methane Oxygen Injector

Combustion instability refers to self-sustained, large amplitude oscillations of pressure and velocity occurring in reacting flows. This phenomenon was present in applications like rocket propulsion, gas turbines utilized for aircraft engines, power generation, industrial boilers, etc. In liquid propellant rocket engines, where power density is higher than other power generating systems, combustion instabilities are found highly destructive as their pressure amplitudes are higher. Experimental investigations of combustion instability in a non-premixed swirl coaxial gaseous methane-oxygen injector at atmospheric conditions are performed using non-intrusive diagnostic techniques. The objectives include GOX Reynolds number's influence on the injector's thermos-acoustic stability, understanding fundamental coupling mechanisms, exploring combustion instability dynamics, etc. The experiments are being conducted in a Combustion Acoustic Rig (CAR) at IIST with the swirl coaxial injector mounted on a windowed combustor with a square section. The oxidizer flows through the core of the injector and fuel through an annular path. The combustor is instrumented for its dynamic pressure and temperature measurements. Heat release data is obtained using a photomultiplier tube. The optical characteristics of the flame were obtained using high-speed imaging of flame luminosity and CH* chemiluminescence. The Reynolds number of oxygen (Reox) and mixture ratio (MR) were varied and the system's flame characteristics and thermos-acoustic response were analyzed.



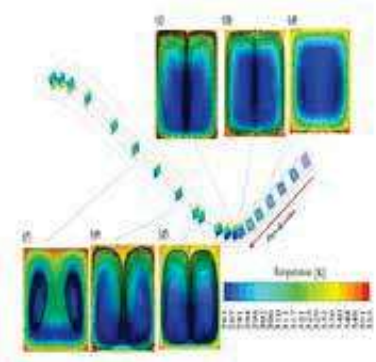
(a) Photograph of the CAR setup at for combustion instability studies.
(b) dominant acoustic instability frequency at a specific injector operating condition, and (c) corresponding flame luminosity.

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

Salih A., *Ph.D., Professor*

Research Interests:

- Modeling and analysis of compressible liquids.
- Chilldown of cryogenic feed lines.
- Thermodynamic and fluid-dynamic of cryogenic propellant tank.



Research Highlights:

- Development of a mathematical models for sloshing in cryogenic tank
- Study of effect orientation of cryogenic feed-line on heat transfer characteristics.
- 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

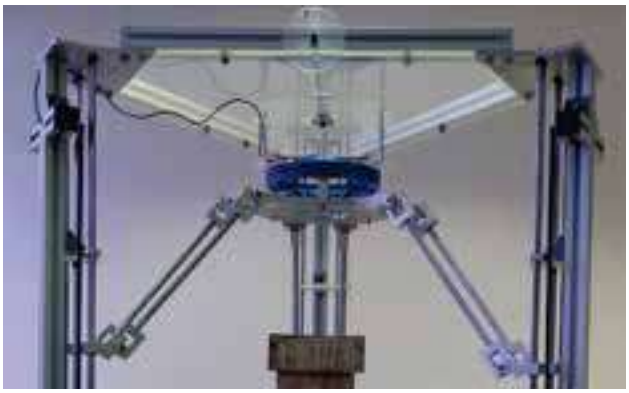
Sam Noble, *Ph.D., Assistant Professor*

Research Interests:

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

Research Highlights:

- Deployment mechanism for multifold mirror/ reflectors.
- Design and Realization of bipedal humanoid robot with human like walking ability in collaboration with VSSC under ASRG project.
- Development of a belt-driven actuator based stewart platform for docking.



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

Satheesh K., *Ph.D., Associate Professor*

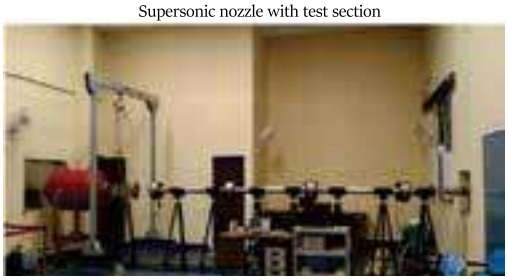
Research Interests:

- High enthalpy flows
- Laser absorption spectroscopy(TDLAS)

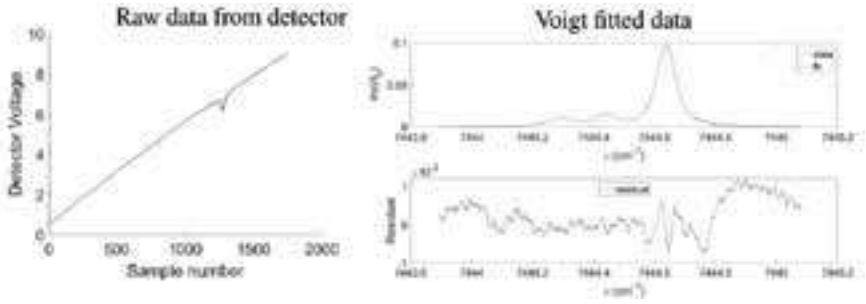
Research Highlights:

- TDLAS measurements of T and H_2O concentration carried out successfully in a standard flame.
- High T calibration cell developed for calibration of TDLAS sensors. Installation is currently in progress.
- Installation of the shock tube facility at the newly established high speed flow lab.

Supersonic nozzle with test section



Shock tube set-up



Experimental absorption spectra

TDLAS test set-up

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

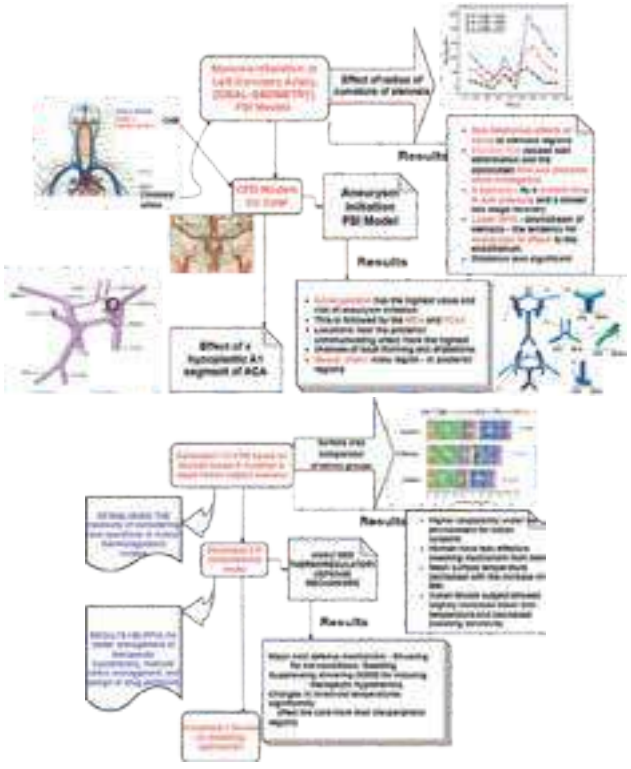
Shine S. R., *Ph.D., Professor*

Research Interests:

- Smart healthcare and medicine: Major works include the development of computational models to study the effect of plaque geometry on coronary artery wall, development of human thermoregulation model, analysis of thermoregulatory mechanisms, models for investigating aneurysm initiation, hypoplastic arteries.
- Heat Transfer in Space applications: Major areas of research involves film/regenerative cooling of liquid rocket thrust chambers, liquid rocket engine cycle analysis, cryogenic two phase flow, plume radiation modeling of solid rocket motors, micro nozzles associated with attitude control, and gas turbine blade cooling, Direct Simulation Monte Carlo Method.

Research Highlights:

- Studies on Human thermoregulation
- Studies on Cerebral artery hemodynamics



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

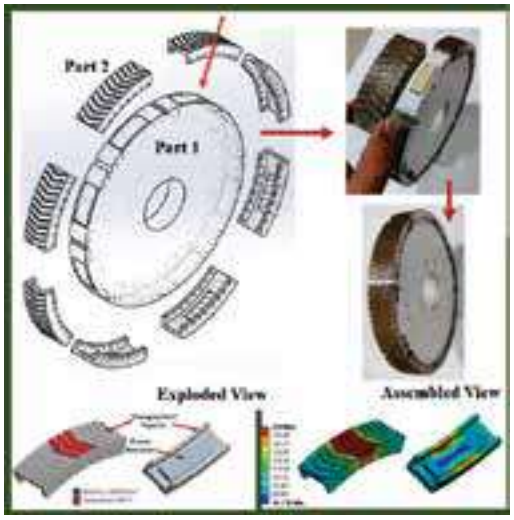
Sooraj V. S., *Ph.D., Associate Professor*

Research Interests:

- Additive and Subtractive Manufacturing
- Design for Manufacturing
- Precision Manufacturing for Space Applications
- Manufacturing for Bio-Medical Applications

Research Highlights:

- Development of a Self- Sweating type Grinding Wheel.
- Development of Innovative Machining Strategy for FRPs.
- Design for Manufacturing – Space Payloads
- Metal Additive Manufacturing for Aerospace Manufacturing.
- 3D printing solutions for Bio-medical applications
- Generative design and Topology optimization for Additive Manufacturing, with special focus on space applications.



Additive Manufacturing as a Potential Solution for Sustainable Green Subtractive Manufacturing.

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

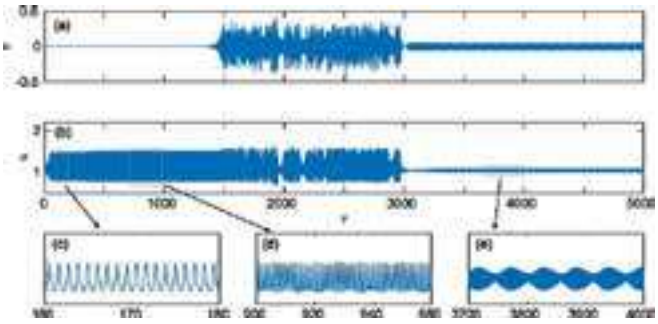
Vinoth B. R., *Ph.D., Associate Professor*

Research Interests:

- Flow instability
- Aerodynamics
- Aeroacoustics

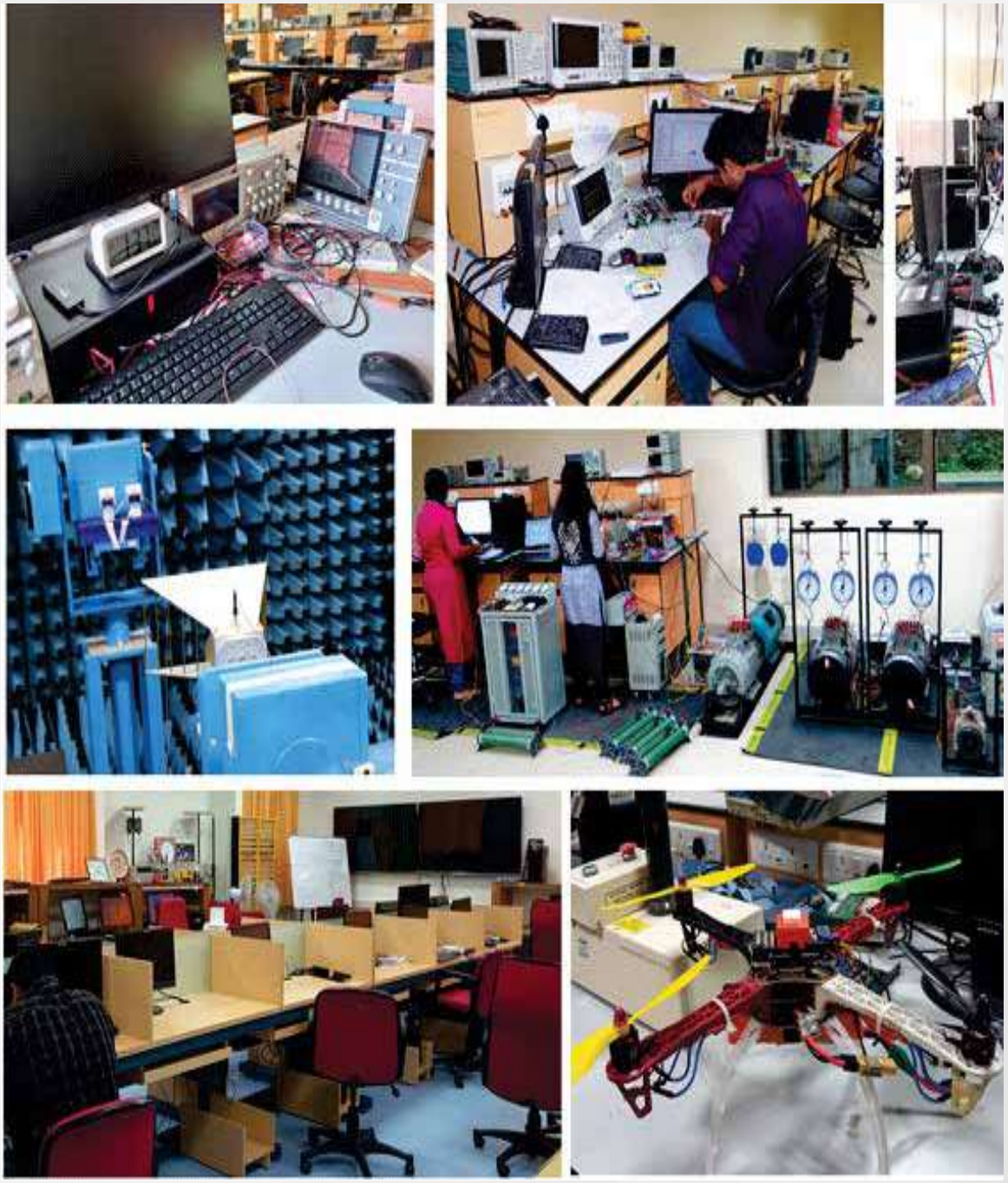
Research Highlights:

- Automatic derivation and development of stability code for non-ideal compressible flows.
- Applicability and its limitation of quasi-steady stability analysis for unsteady flows.
- Linear stability analysis are better suited for predicting the asymptotic state of complex flows than DNS due to multiple transient intermediate (unstable) states.



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 areas

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

Fact File

Number of faculty	: 23
Technical Staff	: 12
Non-teaching staff	: 02
Research Scholars	: 94
Number of PhDs conferred	: 11

Laboratory / Research Facilities

Department of Avionics, IIST has the following 14 instructional lab and 16 research labs:

- 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 (Gas Sensor and Bio Sensor Lab)
- Internet of Things (IoT) Lab
- Virtual Reality Lab
- Image Processing/Computer Vision Lab
- Communication Networks Lab
- Power Electronics in Electrical Distribution System Laboratory
- Power Electronics PG/Research Laboratory

Research and Development

- The intelligent robotics lab was augmented with state-of-the-art robotic systems such as KINNOVA 7DOF robotic arm and the Robotnik mobile robot. These systems are central to the lab's research in autonomous systems, human-robot interaction, and robotic manipulation. The combination of the KINNOVA robotic arm and the Robotnik mobile robot enables research in several cutting-edge areas.
- The ASIC characterization lab was upgraded with a 44 GHz Vector Signal Generator and a 6 GHz Digital Storage Oscilloscope.
- SSPACE facilities were augmented for Astrobiology payload development and experiments. Clean table, spectrophotometer, autoclave equipments were procured and setup.
- Digital signal processing lab was augmented with the VCK5000 Versal development card.
- Faculty members from the department have been contributing actively to Advanced Space Research Group (ASRG) activities.

[https://www.iist.ac.in/departments/projects/46].

- Department has initiated MoUs with various Industries / R&D organizations including:
  - R&DE(E), DRDO, Pune
  - IISc Bangalore
- There is ongoing research and development activity as part of MoUs with various national and international research institutions and universities such as:
  - TU-Delft
  - University of California San Diego
  - University of California Irvine
  - IEEE, New Jersey
  - Iowa State University, Ames, IA, USA
  - VSSC (ASRG)
  - 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/ETP etc.
- Dr. Harsha Simha published a book “Elements of Indic Knowledge Systems & Heritage” with Dr. Mohan Raghavan and Dr. C R Ramaswamy.

Research outcomes / publications

International Journal	: 56
Conferences	: 67
Book	: 01
Book chapters	: 03
Patents (Granted)	: 03

Contributions to Institute Level Space Missions

- Department of Avionics is actively involved in Small Satellite and Payload development (SSPACE) activities at IIST, with core focus on Onboard Computer System, Communication System and other Payload activities. Faculty members are involved in the development of PSLV InorbitaL Obc and Thermals (PILOT), which is a POEM mission for technology demonstration with the following key objectives.
  1. Qualification of inhouse developed OBC.
  2. Qualification of inhouse developed PSLV interface system.
  3. Qualification of 3D printed structure.
  4. Validation of the thermal model developed for the space mission.
  5. Education of the students in the development of space missions.
- Faculty from department are also involved in IIST Ground Station Development, Electronics design of Integrated Diagnostics Module (IDM) payload, prototype for the Satellite-based IoT on board unit, ground-station, as well as the sensors on the ground, and POEM Platform - PILOT and ARIS-2, as well as Advanced Retarding Potential Analyzer for Venus Mission (ARIS-Venus).
- Initiated CubeSat Development activities in association with L&T .

Outreach Activities

- Faculty members have participated in more than 32 conferences/workshops/seminars/FDPs.
- Faculty members from the department of Avionics organized a total 10 workshops/institute lectures/talks/ student visits and attended around 8 conferences/workshops for professional development (not as resource persons).
- Reviews /Technical discussions at ISRO /other organizations/Institutes.
- Contributed to various outreach activities for school/college students initiated by Student Activity Board at IIST.
- Faculty members have served on the editorial board for journals such as IEEE Access, IEEE Transactions of Instrumentation and Measurement, Springer Nature Computer Science Journal, Green Technologies and Sustainability Journal,Taylor and Francis/CRC Press book series titled "Advanced Systems and Networks", IEEE INGR Satellite-5G Roadmap document, Frontiers in Mechanical Engineering-MEMS, IEEE Transactions on Transportation Electrification, and IEEE Open Journal of Industry Applications.

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 **L&T defense**, Coimbatore for jointly developing LISAT satellite.

Faculty Profile

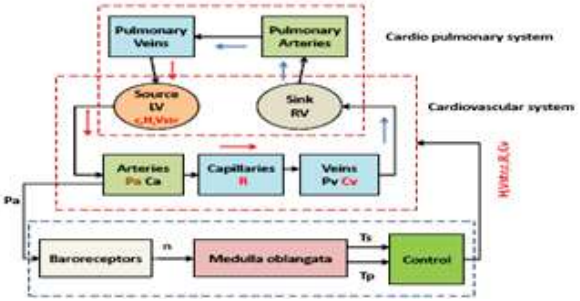
N. Selvaganesan, *Ph.D., Professor & Head of the department*

Research Interests:

- Adaptive Control
- Fractional Order Modelling and Control
- Physiological Modelling
- Fault/Disease Detection and Diagnosis

Research Highlights:

Baroreflex dysfunction is one of the common causes associated with the cardio vascular system. The buffering capability and baroreflex gain influences large variation in blood pressure for short term control. For regulating the blood pressure, an integrated analytical model for baroreflex control along with the cardiovascular system is presented to study the complex interactions between autonomic nervous system and cardiovascular system. In the proposed model, the autonomic nervous system utilizes sympathetic and parasympathetic nerve activities. This comprises a heart modelled by Muliers approach, systemic vasculature, baroreceptor sensor using stress-strain based Voigt model and Hodgkin-Huxley based autonomic nervous control. This model can handle the distribution of total blood volume changes under the influence of gravity upon postural changes by means of short term baroreflex control. The simulation is carried out for the integrated model along with (i) non pulsatile and (ii) pulsatile model of heart.



Block diagram representation for baroreflex control

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

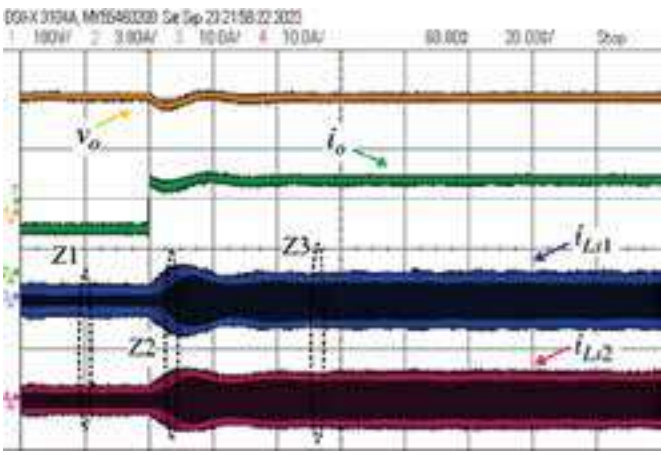
Anindya Dasgupta, *Ph.D., Associate Professor*

Research Interests:

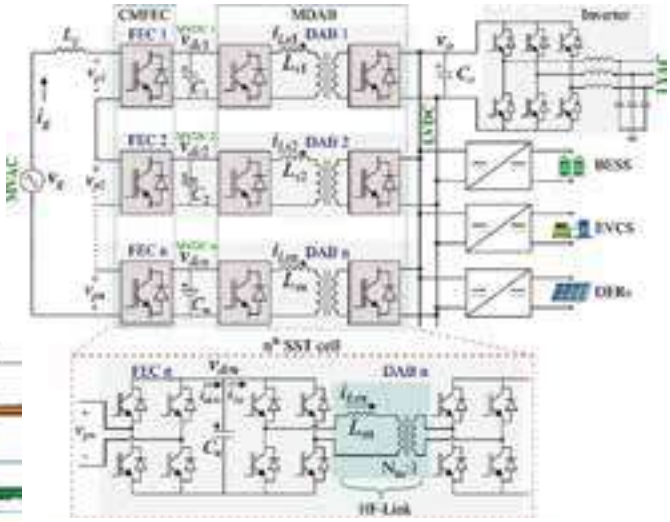
- Modelling and control of
- Modular high-frequency link converters
- Modular solid state transformers (SSTs)

Research Highlights:

Developed a high frequency current sensorless control scheme for modular solid state transformers in Input Series Output Parallel (ISOP) configuration with graduate student.



Experimental waveform for current sensorless power balance in DAB stage



A Three stage S State Transformer topology in ISOP configuration

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

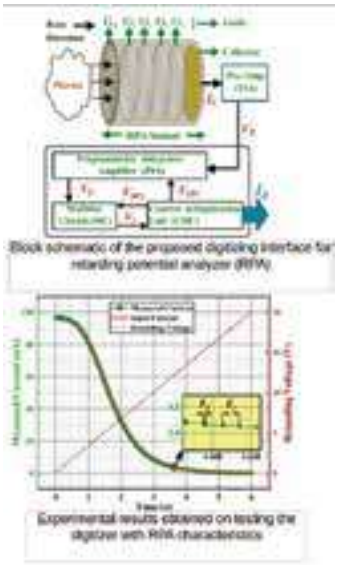
Anoop C. S., *Ph.D., Associate Professor*

Research Interests:

- Measurements and Instrumentation
- Interface Electronics
- Direct-Digitizers
- Analog Signal Processing

Research Highlights:

- Designed and developed efficient digitizing interfaces for current-output sensors, with specific focus towards the conditioning of plasma diagnostic probes.
- Developed advanced digitizers for special types of resistive sensors, including RC impedance sensors, π-type sensors, four-wire sensors.
- Designed and evaluated linearizing and digitizing interface schemes for LVDTs.



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

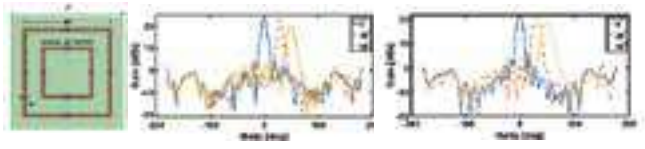
Basudeb Ghosh, *Ph.D., Professor*

Research Interests:

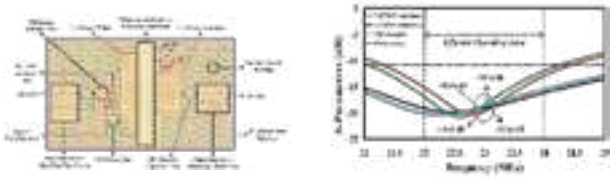
- Design and analysis of active and passive metasurface antennas
- Computational electromagnetics
- Synthetic aperture radar and microwave imaging

Research Highlights:

- Research on Multiband dual polarized reconfigurable Metasurface antenna.
- Design of power amplifiers for OTH radar.



Geometry of the unit cell and the radiation pattern at the designed frequencies



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

Basudev Majumder, *Ph.D., Associate Professor*

Research Interests:

- Antenna Design for future wireless energy harvester
- Microwave Circuit design for radar applications
- MMIC (Monolithic Microwave Integrated Circuit)

Research Highlights:

- Developed and demonstrated a 2 X 2 MIMO Antenna for RF Energy harvesting application at WLAN Band through experiment.
- Compact metasurface enabled beam switchable retro reflector for strategic application.
- Developed and demonstrated a broadband (3-30 MHz) LNA with 1.9 dB NF for OTH Radar Application.

2X2 MIMO RF Energy harvester

Compact Beam switchable Lens

3-30 MHz Broadband LNA with 1.9 dB NF

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

Chinmoy Saha, *Ph.D., Professor*

Research Interests:

- Microwave Wireless power transfer and energy harvesting,
- Antennas for space and ground applications,
- Small satellite antennas
- Metamaterial, metasurface and THz Technology.

Research Highlights:

- The numerical study as well as validation of the fabricated prototype with experiment, for a novel Yagi element integrated nested loop radiator which can perform as a parallel combiner is implemented by Ms Gopika R, Dr. Chinmoy Saha and Prof. Yahia M M Antar.
- The dual-port quasi self-complementary structure offer wider bandwidth for the current combiner action along with the end-fire radiation.
- The combiner radiator is measured and observed to perform for frequency range of 1.8-2.3 Ghz.
- With equal and out-of- phase port excitations end-fire radiation is experimentally validated with a mean gain value of 1dBi for the operating frequency range.
- The gain is further enhanced by a Yagi element to 3 dBi for the frequency range without compromising the combiner performance.
- The article written by Ms. Gopik R, Dr. Chinmoy Saha and Prof Yahia M M Antary, on this work is accepted for publication in IEEE Open Journal for Antennas and Propagation.

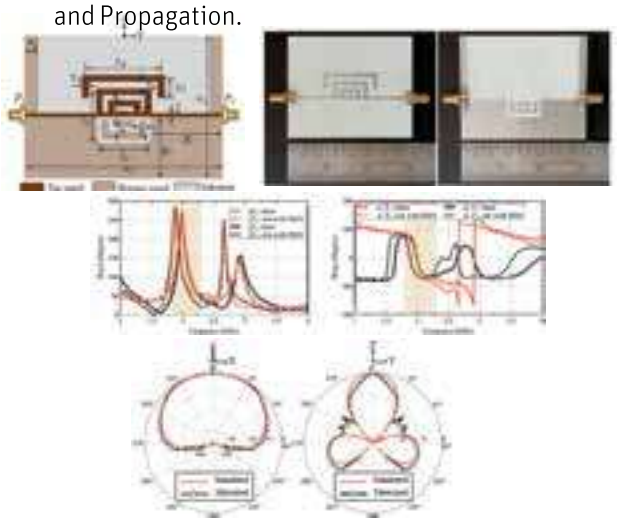


Fig. (from top to bottom, left to right) -Schematic of the combiner radiator, Fabricated structure - Front View, BackView , Magnitude of Z11 and Z21(f) Phase of Z11 and Z21, Radiation patten XZ plane and YZ plane.

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

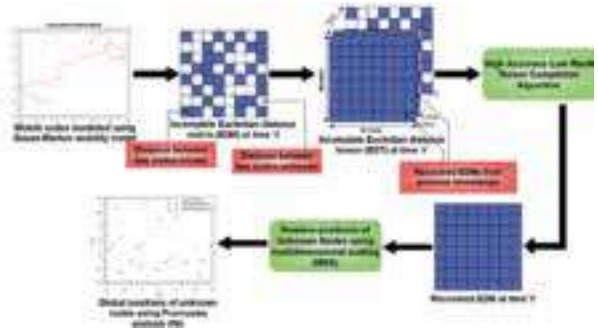
Chris Prema S., *Ph.D., Associate Professor*

Research Interests:

- 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.
- NOMA based AMC and interference management.

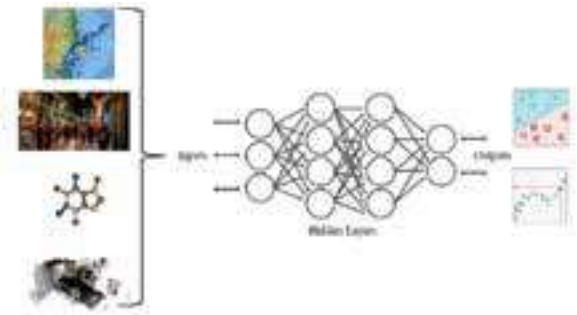


Reference: https://www.iist.ac.in/avionics/chrisprema

Deepak Mishra, *Ph.D., Professor*

Research Interests:

- 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-identifcation 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*

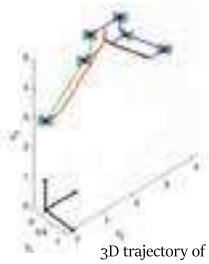
Research Interests:

- Spacecraft Attitude Dynamics and Cooperative control
- Complex Systems
- Control of Unmanned Aerial vehicle

Research Highlights:

- Modelling and Control of port position of a quadcopter using real time kinetics (RTK) based navigation technology.
- Radial Basis Function Based Terminal Sliding Mode control for Cooperative control of Rigid Body attitude.
- Adaptive integrated guidance and control for air-breathing phase of reusable launch vehicle.

Quadcopter position Control demonstration using RTK



3D trajectory of autonomous docking of tiltrotors

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

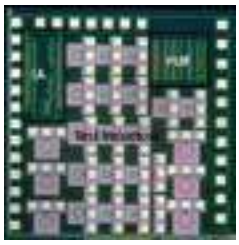
Immanuel Raja, *Ph.D., Associate Professor*

Research Interests:

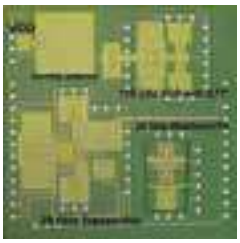
- Analog, mixed-signal & RF IC design
- Monolithic microwave integrated circuit (MMIC) design
- Payloads & module design for nanosatellite applications

Research Highlights:

- Design & realization of sub-THz signal generator with integrated on-chip antenna at 101-105 GHz in 65nm CMOS.
- Design & realization of a wideband power amplifier with 10.7 dBm Psat & 10% PAE with more than 5 GHz of S21 bandwidth.
- Design & realization of a fully integrated transmitter at 28 GHz in 65nm CMOS
- Design of ultra-wideband on-chip antennas in CMOS.
- Design of X-band 10W MMIC power amplifier.
- UHF receiver board for nanosatellite communication to be flown on Pilot-G2 payload.



Tapeout in UMC 180nm CMOS process



Tapeout in UMC 65nm CMOS process

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

Lakshminarayanan R., *Ph.D., Associate Professor*

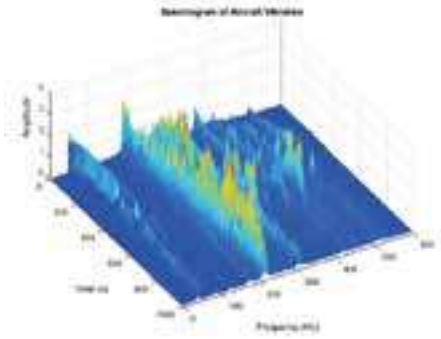
Research Interests:

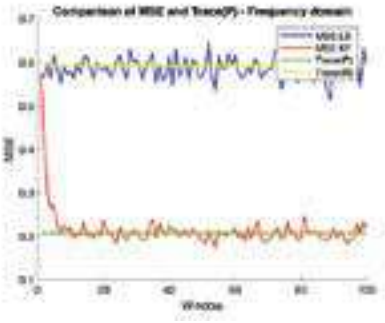
- Statistical Signal processing
- Machine Learning with applications to Digital Communications

Research Highlights:

- Dynamic Compressed Sensing (DCS): Extension of CS for time-varying signals. Dynamic signals are prevalent in fields like biomedical imaging and

- Dynamic Compressed Sensing (DCS): Extension of CS for time-varying signals. Dynamic signals are prevalent in fields like biomedical imaging and wireless communications, necessitating specialized methodologies. Challenges: Conventional CS techniques assume static signals, making them inadequate for dynamic systems. Objective: Explore the integration of Kalman filtering with the Orthogonal Matching Pursuit (OMP) algorithm to enhance reconstruction performance for dynamic signals. Sparse Signal Representation: Key to signal recovery from limited measurements. Theoretical Underpinnings: Overview of the compressive sensing reconstruction process and recovery guarantees.
- Spectrogram Analysis: Practical insights into dynamic signals motivate the development of new methodologies. Fusion of Kalman Filtering with DCS: Enhancing dynamic signal reconstruction through Kalman Filtering. Empirical Analysis: Application to single and multiple cosine signals with time-varying amplitudes. Results: Kalman filtering significantly improves reconstruction accuracy under dynamic conditions.





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

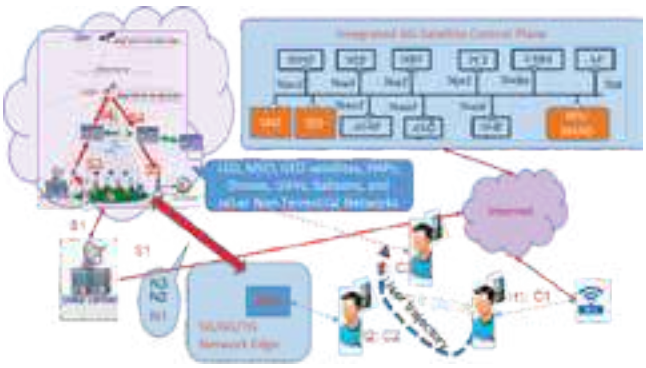
Manoj B. S., *Ph.D., Professor*

Research Interests:

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

Research Highlights:

- AI-driven networking: Several Artificial Intelligence (AI) based solutions for space and terrestrial applications have been developed by SysNet lab such as DeepStack and SADDLE, a novel transformer network based model tailored for spacecraft anomaly detection.
- Research on 6G networking and 6G-satellite networking and developed various architectural proposals for 6G-satellite integration. IIST has been granted a 5G Use case lab by Government of India. One of the important use cases related research is the development of 6G networks as well as 6G-satellite integration. As part of the research, architectural solutions, AI-based optimization approaches, as well as new low-latency web services such as Space Based Hosting have been developed in IIST's SysNet lab.
- Physical systems were modelled using small-world and scale-free models and analysis was conducted including emergence of news in YouTube and evolution of pricing of crude oil among the OPEC nations.
- Developed the first ever BCI datasets for Malayalam, Telugu, Odiya, and Marathi languages. These datasets were used for conducting research for helping patients with neurodegenerative diseases as well as for human space missions.



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

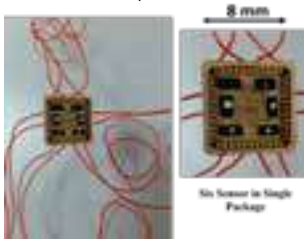
Palash Kumar Basu, *Ph.D., Associate Professor*

Research Interests:

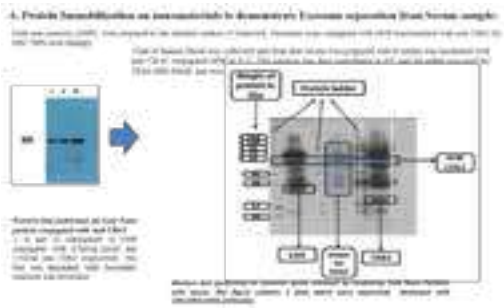
- Indigenous Development of Reliable Gas Sensor for Different Applications.
- Lab on Chip activity for diagnostics and prognostic of Cancer.
- Exhale Breath Analyser for non-invasive diagnosis of respiratory and cardiovascular diseases.

Research Highlights:

- Development of miniaturized 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 development has initiated lot of interest in Space Sector and Human Space Flight Centre (HSFC) is exploring the possibility to put three modules in the upcoming prestigious Gaganyaan Mission as a part of the Environmental Control and Life Support System (ECLSS).
- Development of 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, CH_4, NH_3, and CO_2 sensors (Version: 2) for various applications, including an environment monitoring system, manholes, and coal mines applications



Successfully Isolated Exosome from Human Serum for Liquid Biopsy of Cancer

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

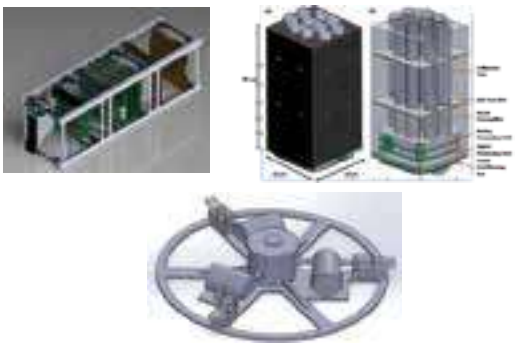
Priyadarshnam, *Ph.D., Professor*

Research Interests:

- Small satellites
- Space Mission development

Research Highlights:

- Twin explorer of asymmetry in aurora and solar wind-magnetosphere coupling
- Deep space Navigation mission design
- 3U CUBESAT mission FOR IN-SITU RADIATION DOSIMETRY
- SSPACE Astrobiology Payload development



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

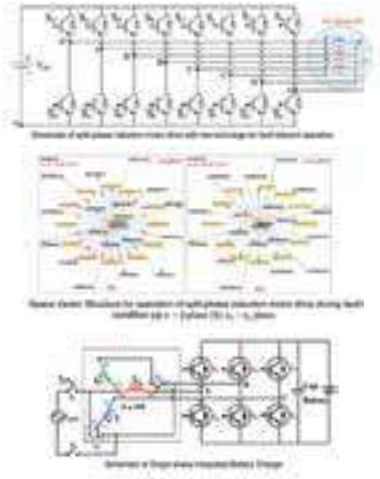
R. Sudharshan Kaarthik, *Ph.D., Associate Professor*

Research Interests:

- Grid-connected systems, Integrated Battery Chargers
- Motor-drives
- Fault-tolerant operation for Multi-phase machines

Research Highlights:

- Model Predictive Control Scheme for a Single-Phase Integrated Battery Charger with Active Power Decoupling for EVs.
- Speed-range Extension Scheme for a Split-phase machine under open-circuit fault condition.
- Torque ripple minimization by using multi-sequence PWM Scheme for a split-phase induction machine.



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

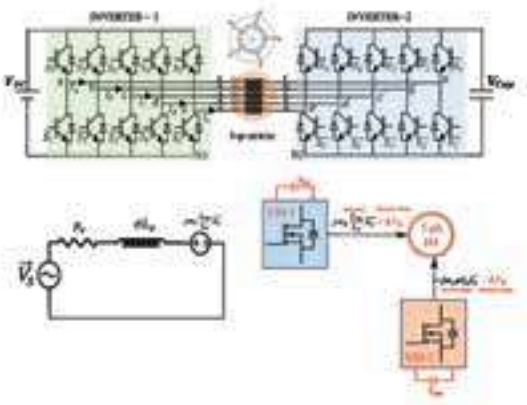
Rajeevan P. P., *Ph.D., Professor*

Research Interests:

- Power Electronics
- Control of Electric Drives
- Renewable Energy
- E-mobility

Research Highlights:

- Developed control schemes for speed range extension of dual inverter fed five-phase induction motor drives with open-end stator windings.
- Developed control schemes for speed range extension of direct torque controlled permanent magnet synchronous motor drives.
- Developed schemes for fault tolerant operation of BLDC motor drives.



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

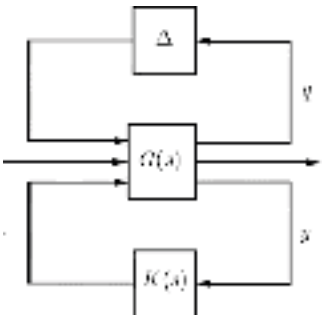
Rajesh Joseph Abraham, *Ph.D., Associate Professor*

Research Interests:

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

Research Highlights:

- Developed Robust Controllers for different applications like DC motor, vehicle suspension system etc.
- Developed the models of different FACTS devices for frequency control in power systems.



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

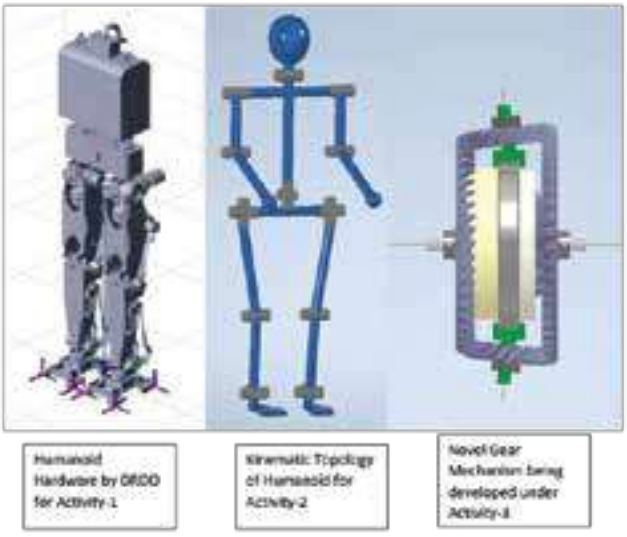
Sam K. Zachariah, *Ph.D., Adjunct Professor*

Research Interests:

- Design of Locomotion Control, Mechanisms, actuation systems for Legged robots
- Mathematical Modelling of multibody dynamical systems

Research Highlights:

- Development of Event Driven Autonomous Control (EDAC) for periodically stable dynamic walking of Humanoid and Quadruped Robots . The algorithm is being implemented on robot hardware platforms developed by DRDO, Pune.
- Design and Realization of bipedal humanoid robot with human like walking ability in collaboration with VSSC under ASRG project.
- Development of a novel single stage differential radius bevel gear mechanism with high reduction ratio and internal inertia compensation in collaboration with Aerospace Engg Dept.



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

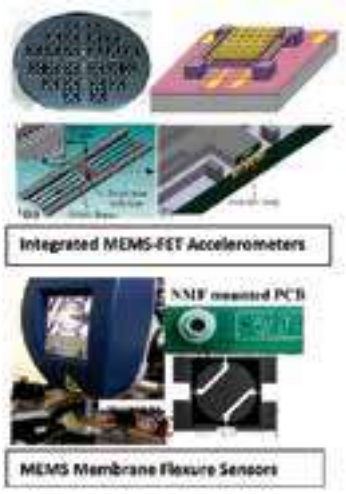
Seena V., *Ph.D., Associate Professor*

Research Interests:

- MEMS/NEMS Sensors
- MEMS Energy Harvesters
- CMOS-MEMS with VLSI & Microsystems Integration

Research Highlights:

- MEMS accelerometer sensor, Nanoforce sensors and gas sensors with MEMS with CMOS-MEMS intergration.
- CLIP SGFET for Closed Loop MEMS Accelerometer –Patent Granted Patent No:456720 CLIP-SGFET.
- OP-SGFET MEMS tilt sensor fabricated with Parylene MEMS on FET.
- Nanomechanical Membrane flexure (NMF) sensor developed and characterized. Application demonstrated for hydrogen leak detection in ppm range.



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

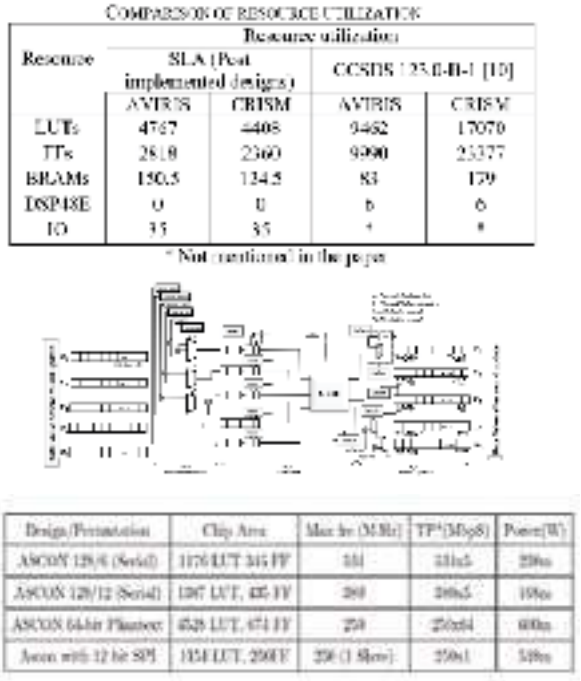
Sheeba Rani J., *Ph.D., Professor*

Research Interests:

- VLSI signal processing for Signal/Image/AI applications
- Robust Light weight cryptography architectures.
- Onboard processing of Deep learning models for image compression/biomedical image reconstruction
- Efficient onboard architectures for CCSDS based lossless/lossy hyperspectral image compression.

Research Highlights:

- Developed efficient onboard Multispectral and Hyperspectral Compressor (MHyC) for lossless compression.
- Developed efficient Light weight Ascon architecture with robustness for attacks.



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

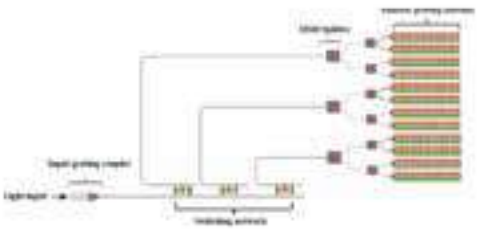
Sooraj R., *Ph.D., Associate Professor*

Research Interests:

- Photonic Integrated Circuits
- Semiconductor Optoelectronic devices

Research Highlights:

- Designed a Silicon optical modulator with enhanced carrier injection.
- Designed a two-dimensional optical beam steering device.
- Development of high-efficiency nanowire solar cells.



Schematic layout of the proposed 2-D fixed wavelength beam steering device.

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

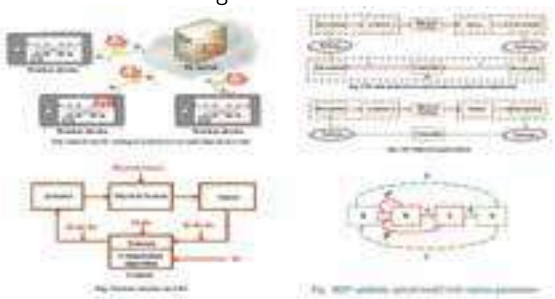
Sourav Bhowmick, *Ph.D., Assistant Professor*

Research Interests:

- Control of network systems
- Swarm robotics
- Security and resiliency of cyber-physical systems
- Spreading dynamics over networks

Research Highlights:

- Distributed formation, containment, coverage control, etc. of cooperative networked dynamical systems.
- Swarm robotics
- Network spreading dynamics
- Cyber attacks: introduced due to the distributed (local) nature of coordination to reach at the global solution.
- Differential Privacy (DP): Used by Google (Chrome), Apple (iOS) for hiding user information, where the aggregate/published data is insensitive to a single user's information.
- Federated learning with DP



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

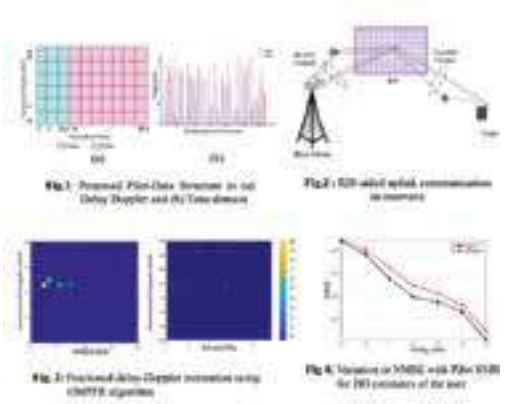
Vanidevi M., *Ph.D., Assistant Professor*

Research Interests:

- RIS based wireless communication
- OTFS based ISAC systems
- Hybrid beamforming in mmWave and terahertz system

Research Highlights:

- Wireless channel matrix model to capture practical delay-Doppler parameters.
- Devised a two-stage orthogonal matching pursuit with fractional refinement (OMPFR) algorithm.
- Novel delay doppler pilot structure used for RIS aided OTFS sensing.



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

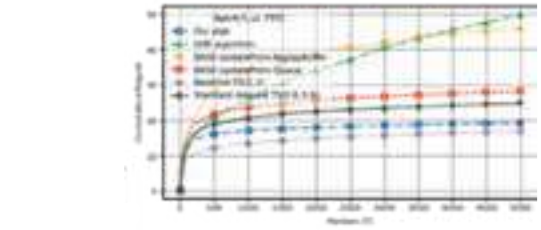
Vineeth B. S., *Ph.D., Associate Professor*

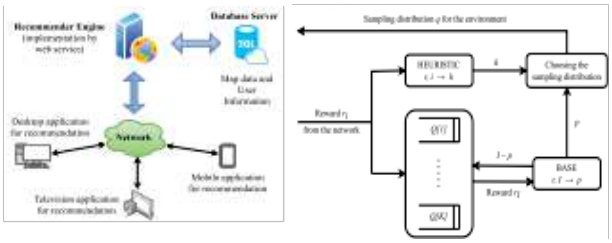
Research Interests:

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

Research Highlights:

- We considered a remote control problem, where an agent is situated at a remote location, and needs to control an environment, by communicating through a network.
- Development of algorithms for efficient agent learning despite network delays and losses.
- We considered standard bandit algorithms adapted to the case of network queues and observed the effect of service discpline of the bottleneck queue on learning performance (regret performance).
- Sampling based methods were observed to have good performance. Heuristic policies which use posterior sampling methods were proposed and their performance was analyzed.





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 areas

(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	: 03
Tutors/Technicians	: 01
Non-teaching staff	: 02
Research Scholars	: 41
Number of PhDs conferred	: 02

*including one DBT faculty

Laboratory / Research Facilities

The Department of Chemistry has one BTech/MTech instructional lab and following 11 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
- Space Biology Lab
- X Ray Diffractometer Lab

Research and Development

- 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 Journal	: 38
Conferences	: 19
Book	: 02
Book chapters	: 05
Patents	: 03
Projects	: 06

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.
- Faculties 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 30 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

- **SPACETIME 4D Printing Solutions LLP** is a startup initiative by one of the alumni from the Department of Chemistry and 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.
- **INTERCOSMOS Pvt. Ltd.:** Incubated within the Department of Aerospace Engineering, this startup, which is focusing on the development of green propellants is supported for their chemistry-related experiments by the laboratories of Department of Chemistry.

Faculty Profile

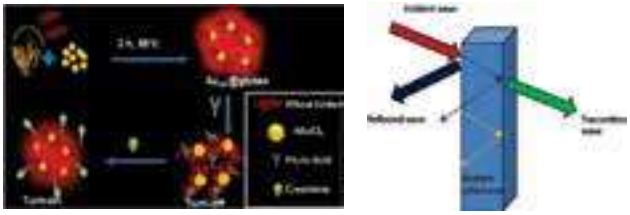
Kuruvilla Joseph, *Ph.D., Outstanding Professor & Dean (Academics)*

Research Interests:

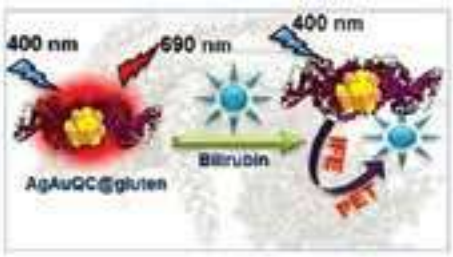
- Toughened Epoxy Composites for Structural Applications
- Bio-Nano Sensors
- Development of EMI Shielding Materials
- Bio-Composites, Polymer Blends
- Development of Low Cost High Strength Carbon Fiber
- Lignin based Carbonaceous Material, Nano Composites

Research Highlights:

- Development of flexible and efficient materials for EMI shielding
- Preparation of low-cost carbon fibers
- Structural Epoxy Nanocomposites for Space Applications
- Polyimide films with electrostatic charge mitigating properties for space application
- Nano Material Based Sensors Development of High Performance in-situ conducting Micro fibrillar Composites



Schematic of GO-g-PVP



Polymide aerogels for EMI shielding and thermal insulation applications

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

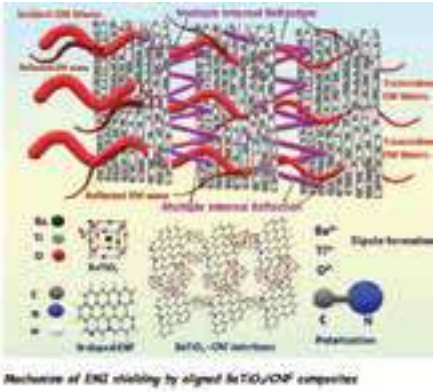
Nirmala Rachel James, *Ph.D., Professor*

Research Interests:

- Polymer nano-composites for EMI shielding

Research Highlights:

Flexible polymer composites based on carbon nanofibers from electrospun polymers with high EMI shielding property were developed.



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

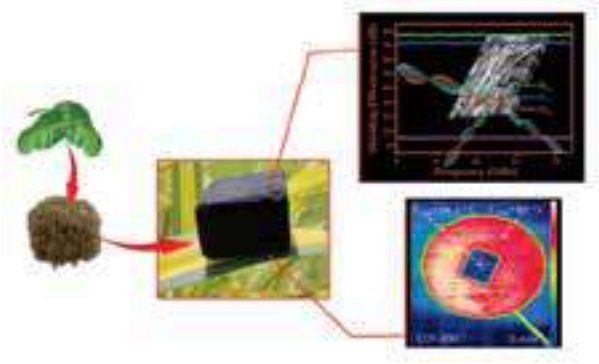
Prabhakaran K., *Ph.D., Professor*

Research Interests:

- Materials from renewable resources
- Thermal protection materials
- Materials for EMI shielding
- Low temperature co-fired ceramic (LTCC) materials

Research Highlights:

- Fire-resistant carbon composite foams of low thermal conductivity and high EMI shielding effectiveness have been realized from banana leaf fiber.
- CaV2O6 (calcium vanadate) has been used as an additive for low-temperature densification of ZnTiO3 and Alumina for LTCC applications.
- Thin carbon composite grids prepared from used cotton cloth demonstrated very high EMI shielding effectiveness.
- Natural rubber has been used a binder in alumina powder processing.



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

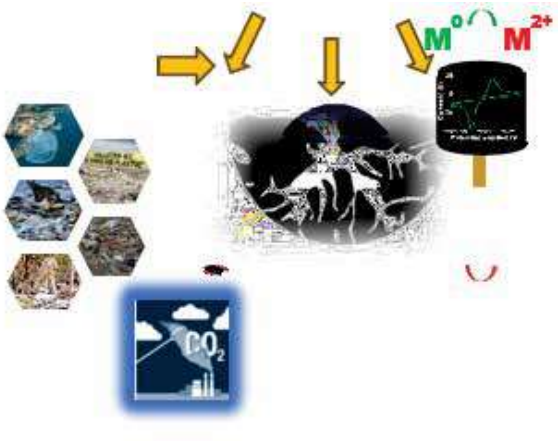
K. Y. Sandhya, *Ph.D., Professor & Head of the Department*

Research Interests:

- Materials for Sensors, Battery, Photocatalysis
- Upcycling of plastic wastes to advanced materials
- Design / synthesis of nano materials for mitigation of pollutants from water
- Green synthesis
- Sustainable materials

Research Highlights:

- Photocatalysis: A sustainable green chemistry approach that enables environmental remediation, water splitting, carbon dioxide reduction, self-cleaning surfaces to address environmental and energy challenges. The primary goal of the research is to tune the properties towards highly recyclable visible light-driven catalysts for pollutant remediation.
- Electrochemical sensors: Carbon-based nanomaterials, metal and metal oxide nanoparticles, conducting polymers, and nanocomposites are synthesized and applied for the detection of biomolecules, pollutants, biomarkers of non-communicable diseases etc.
- Waste-derived carbon materials sourced from various types of wastes, for an eco-friendly alternative to traditional carbon materials used in energy storage devices such as batteries and super capacitors.
- Capacitive deionization (CDI): Designing novel carbon and transition metal dichalcogenide-based CDI electrodes for desalination of water.



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

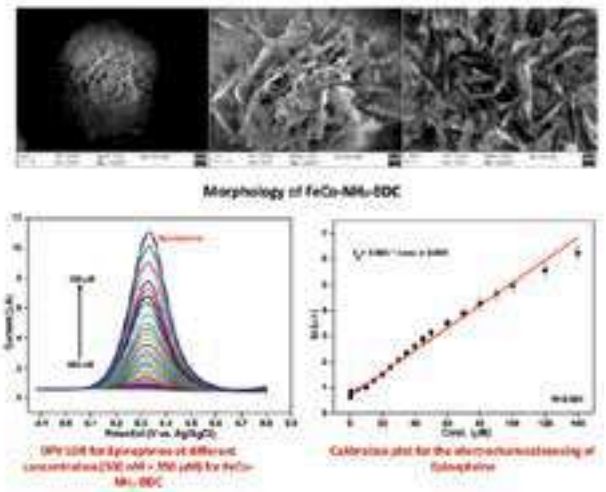
Gomathi N., *Ph.D., Professor*

Research Interests:

- Metal-organic framework (MOF)
- Electrochemical sensing
- Electrocatalysis
- Membrane-based water purification
- Carbon capture
- Adsorptive removal of emerging contaminants

Research Highlights:

- Developed silver incorporated Cu-MOF and for an efficient voltammetric detection of levofloxacin.
- Developed Bimetallic Fe-based MOF and used as Electrocatalyst for Water Oxidation and Sensing of Epinephrine.
- Adsorptive removal of ciprofloxacin, an antibiotic, using ZIF-8 metal organic framework derived carbon.



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

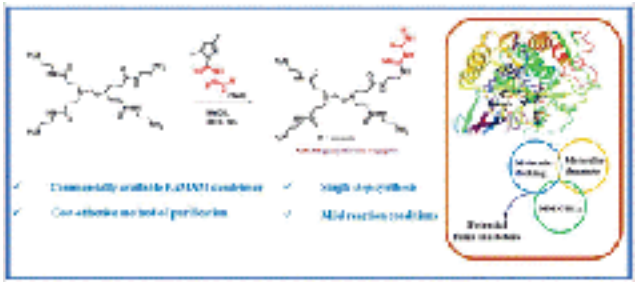
K. G. Sreejalekshmi, *Ph.D., Professor*

Research Interests:

- Molecular materials, Smart materials, Microgravity research, Space Biology & Bioastronautics.

Research Highlights:

- PAMAM conjugates as nanotheranostics
- Molecular docking and molecular dynamics assisted design of potential furin inhibitors.
  https://doi.org/10.1039/D3NJ00703K
- Start-up mentoring: SPACETIME 4D Printing Solutions LLP is focused on the development of customised 3D printers for Materials Research. Currently Spacetime is developing MAREP300, a 3D Printer dedicated to material research and composite development through direct extrusion additive manufacturing technology.



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

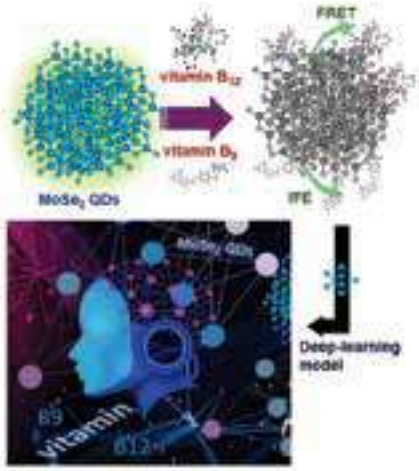
Jobin Cyriac, *Ph.D., Professor*

Research Interests:

- Chemical sensors
- 2D materials, Carbon quantum dots
- Raman spectroscopy
- Mass spectrometry

Research Highlights:

- Developed a deep learning- assisted discriminative detection of vitamin B12 and vitamin B9 by fluorescent MoSe2 quantum dots.
- A nickel-MoS2 based nanocomposite developed for the selective detection of dopamine and α-lipoic acid using electrochemical method.



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

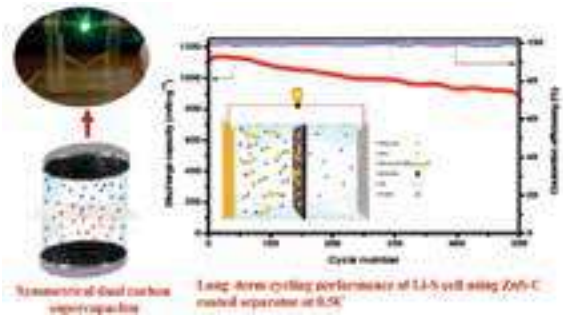
J. Mary Gladis, *Ph.D., Associate Professor*

Research Interests:

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

Research Highlights:

- Developed high-performance aqueous and diverse electrolyte-based super capacitors using sustainable materials.
- Fabricated Li-S batteries through a facile and cost-effective method using multifunctional separator coating materials.

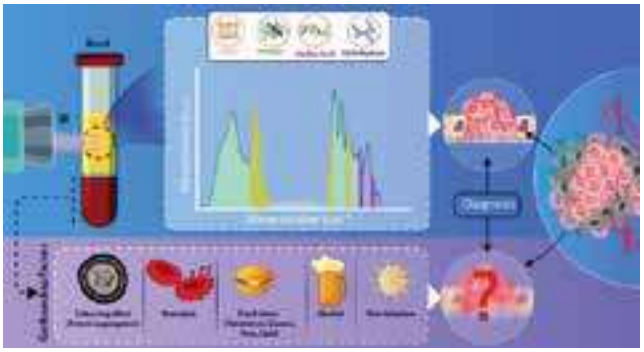


Reference: https://www.iist.ac.in/chemistry/marygladis

Shaiju S. Nazeer, *Ph.D., DBT Ramalingaswami Faculty Fellow*

Research Interests:

- Astro Biophysics
- Disease Diagnosis
- Imaging
- Spectroscopy
- Drug Delivery



Research Highlights:

- Developed Biological Cavity viewer of ~3mm diameter to carryout endoscopic/laparoscopic imaging.
- Developed Fluorescence Spectroscopic Mapping system for biochemical evaluation of tissues.
- Developed a protocol to carry out blood-based IR spectroscopic diagnostic studies.

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

Department of Earth and Space Sciences

2.4 Department of Earth and Space Sciences

Vision

The vision of the Department of Earth and Space Sciences is to lead in advancing knowledge and innovation in the fields of Astronomy & Astrophysics, Atmospheric sciences, Geology, and Remote Sensing. The department aims to provide a comprehensive educational experience that integrates practical skills, theoretical foundations, and cutting-edge computational methods. The department is also committed to producing highly skilled postgraduates capable of contributing to national space research and addressing global scientific challenges, including environmental monitoring and space exploration.

Mission

- To offer postgraduate and doctoral programs in inter-disciplinary 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 areas

(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	: 44
Number of PhDs conferred	: 04

Laboratory / Research Facilities

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
- Climate Observatory, Ponmudi
- Aerosol Research
- IIST Balloon Launch Facility
- Automatic Weather Station
- Planetary Analogue Research Facility

Research and Development

The research activities in the department are of an 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 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 the city of Thiruvananthapuram were obtained by Aerial Lidar Survey with funding from DST.
- Department has initiated MoUs with various R&D organizations and national and international universities including IIT Kharagpur, Mangrove Foundation Maharashtra, Niigata University, Japan.
- Faculty members from the Department holds various externally funded projects. The funding agencies include DRDO, DST-SERB, MoES, DBT, Mangrove Foundation Maharashtra, and Max-Planck Society, Germany,

Research outcomes / publications

International Journal	: 49
Conferences	: 26
Book chapters	: 02
Patents(filed)	: 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 vertical profile of ozone with meteorological parameters, Student Satellite Program (SSP), ExoWorld and so on.
- Faculty members are involved in payload development, science formulation, and data processing of ISRO missions to Moon, Mars, Venus and Sun

Outreach Activities

- Conduct various outreach/training programmes to school and college students such as Geoconnect, Astronomy School, STORM etc. Also contribute actively to various outreach activities for school/college students initiated by Student Activity Board of IIST.
- Students and faculty members of the department actively participate various conferences, workshops, seminars, FDPs and so on.
- Reviews/Technical discussions at ISRO and research organizations/Institutes.

Startup 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, Bhuhpramaan is dedicated to developing innovative solutions in satellite image and geo-spatial 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 most sought-after market and 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

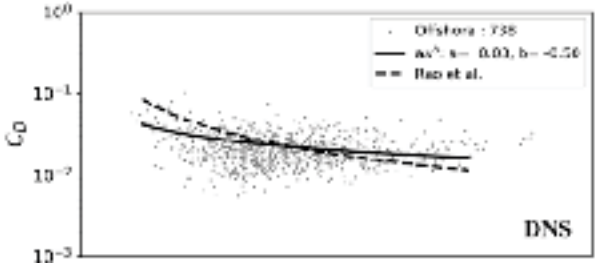
A. Chandrasekar, *Ph.D., Outstanding Professor & Dean (Research & Development)*

Research Interests:

- Numerical modeling of the atmosphere
- Data assimilation
- Mesoscale modelling
- Land-atmosphere interaction

Research Highlights:

Analyzed the land surface states and their interlinkages with the atmosphere. The turbulent flow over a coastal region is investigated to study the drag coefficient behavior during on-shore and off-shore winds.



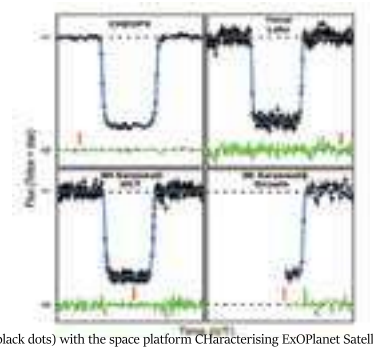
Drag coefficient variation with wind speed for on-shore and off-shore flows

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

Anandmayee Tej, *Ph.D., Senior Professor*

Research Interests:

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



Light curves (black dots) with the space platform CHaracterising ExOPlanet Satellite (CHEOPS), Yanqi Lake observatory, China, Himalayan Chandra Telescope (HCT), Mt. Saraswati, India and the GROWTH Telescope, Mt. Saraswati, India. The blue curves are best-fit synthetic light curves.

Research Highlights:

A recent ground-based stellar occultation observed on 6 October 2022 provides a new measurement of the atmospheric pressure on Triton. The campaign from India was led by A. Tej. The main inference obtained in this work is that the atmospheric pressure of Triton is essentially the same in 1989, 2017, and 2022, regardless of what occurred in between. Further, 2022 observation confirms the fact that the southern cap has not retreated below the 30°S latitude level since 1989 from its ≈15°S extent at that time. If this were the case, the surface pressure would have dramatically collapsed since 1989, and would be inconsistent with the 2017 and 2022 occultation results.

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

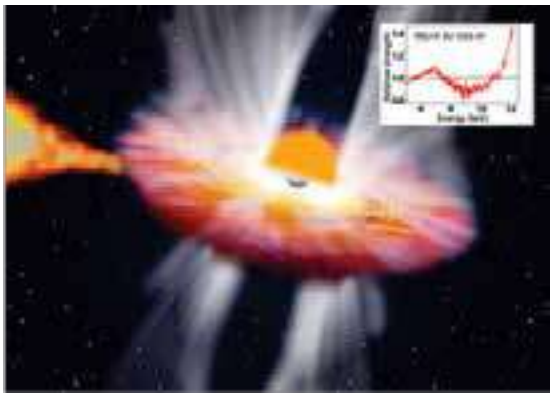
Samir Mandal, *Ph.D., Professor*

Research Interests:

- Accretion physics of compact X-ray binaries Particle acceleration and non-thermal processes Radiation hydrodynamics.
- Physics of astrophysical jets; Study of AGNs and TDEs.
- Classification and properties of cosmic sources using machine learning methods.
- Simulation of detector characteristics in X-ray domain.

Research Highlights:

We detected a strong absorption dip at around 9 keV in the radiation spectrum of the 2021 active phase of 4U 1543-47. An absorption feature at this energy has never been observed in any X-ray binary system. In general, X-ray binary systems show absorption signatures around 6.4 – 7 keV. The presence of highly ionized relativistic disk-wind is inferred from this absorption feature and the estimated wind speed is approximately 30 percent of the speed of light. Disk-winds of such large speed have never been reported in any X-ray binary system to date. Also, it becomes the first source to show disk wind signature among low inclination X-ray binary systems.



Black hole X-ray binaries are systems in which a black hole and its binary companion orbit around each other. The black hole is represented as a black region in the image and the companion star is shown in yellow color on the left side. The infalling matter is distributed in the form of a disk (red colored disk in the image) around the black hole, which is very hot and emits enormous amounts of energy, predominantly in X-rays. Also, a significant faction of this matter is lost as disk-winds (white color in the image). The radiation from the disk may get absorbed by the disk-wind, which produces an absorption dip in the observed radiation spectrum (shown in inset).

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

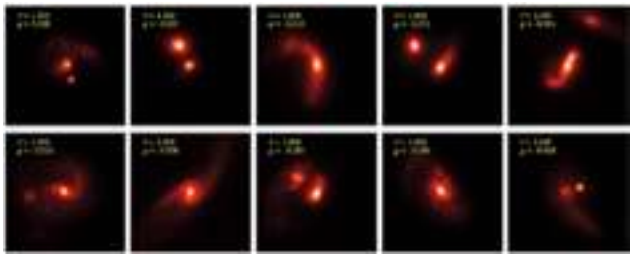
Anand Narayanan, *Ph.D., Professor*

Research Interests:

- Spectroscopic studies of diffuse gas in the universe.
- Clustering of galaxies within the large-scale structure.

Research Highlights:

- Part of the team that studied how environmental factors affect galaxy properties using data from the GAMA survey.
- Part of the team that developed and reported a new Bayesian MCMC approach towards ionization modeling of diffuse gas, by drawing samples from a probability distribution.



Optical images of galaxies from the GAMA survey

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

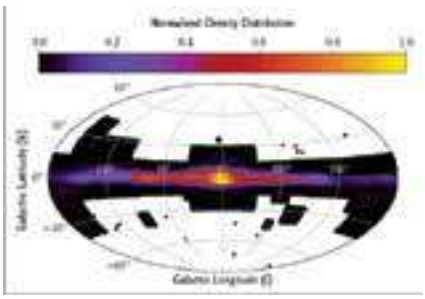
Sarita Vig, *Ph.D., Professor*

Research Interests:

- Early phases in Massive Star Formation
- Embedded Galactic clusters
- Globular clusters
- Galactic structure

Research Highlights:

- Identification of sources using ML techniques for the SPLICES catalog, with YSOs being targets for NASA's SPHEREx Mission.
- Study of RAFGL2591 and discovered new radio jet lobes at 0.6 pc from protostar.
- Identification and characterisation of hub and filaments, formation of massive stars in the hub-filament system of RCW 117.



Plot of spatial distribution of 1966 340 SPHEREx targets classified with probability exceeding 90per cent in first stage of two-stage classifier on the Mollweide projection of the sky plane. The regions of sky bearing SPHEREx targets are coloured using the colouring scheme displayed above the plot and those regions not bearing the SPHEREx targets are left blank.

Reference: https://doi.org/10.1093/mnras/stad2782

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

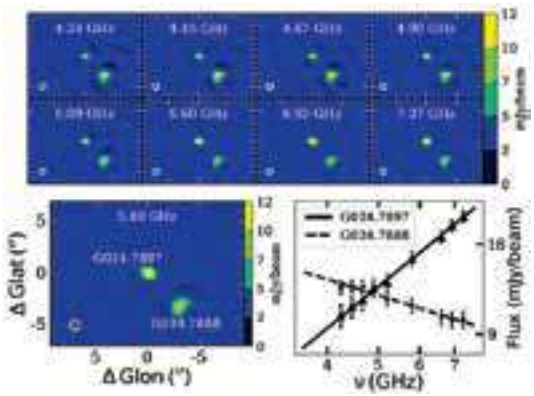
Jagadheep D. Pandian, *Ph.D., Professor*

Research Interests:

- High-mass star formation
- Astrophysical Masers
- Galactic Structure

Research Highlights:

- Release of the source catalog from the GLOSTAR survey in B-configuration. This study revealed the presence of many HII regions with negative spectral index such as that highlighted in the figure.
- The first large scale study of formaldehyde absorption in the Cygnus-X high-mass star forming region using data from the GLOSTAR survey including zero-spacing information from the Effelsberg telescope.
- Completed the pilot survey of the Metrewave Galactic Plane with the uGMRT (MeGaPluG) survey.



The figure shows the radio images of two Galactic HII regions, G024.7897 and G024.7888 from the GLOSTAR survey at a resolution of 1 arcsecond. The shaded circle in the bottom left shows the resolution of the maps. Bottom right: While the first source has a positive spectral index indicative of optically thick thermal emission, the second source manifests a negative spectral index which is not commonly observed in HII regions.

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

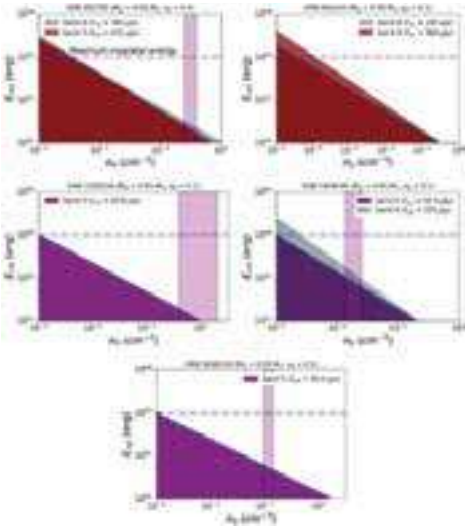
Resmi L., *Ph.D., Associate Professor*

Research Interests:

- Gamma-Ray Bursts
- Electromagnetic counterparts to gravitational wave sources
- Fast Radio Bursts
- Transient astronomy

Research Highlights:

- We made predictions of afterglow emission associated with compact object mergers detectable by the upcoming ground based gamma-ray observatory the Cherenkov Telescope Array (CTA).
- We used GMRT to detect late time emission of short GRBs, supposedly originating from the merger of compact objects. Our upper limits yielded insights into the potential formation of magnetars at the merger of neutron stars.



Limits on magnetar energy vs ambient number density for five short GRBs observed with the GMRT

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

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

Research Interests:

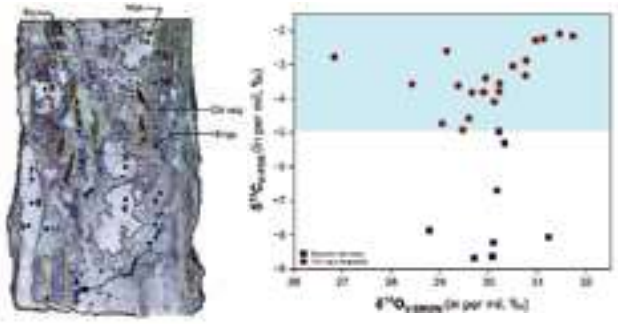
- Planetary Geology
- Terrestrial Analogue Research
- Astrobiology

Research Highlights:

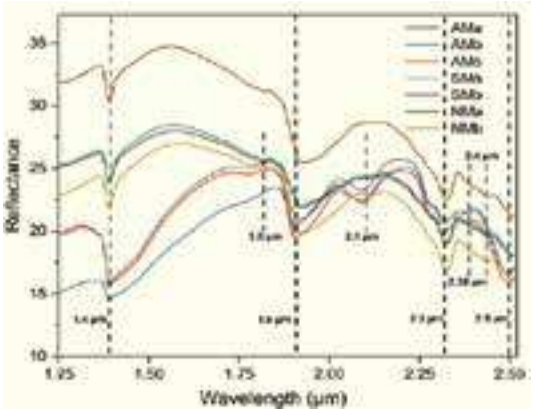
- Evolutionary history of Mars: Insights from morphology and mineralogy.
- Serpentine-Magnesite association of Salem - ultramafic complex, Southern India: A potential analogue for Mars.
- The study of sodium sulfate minerals in Sambhar Lake focused on the transformation sequence of thenardite and mirabilite in a hypersaline environment, with implications for Martian hypersaline environments.
- Multi-sensor analytics for chromite and magnesite mineralization mapping use advanced image processing and machine learning, improving mineral mapping accuracy and supporting sustainable resource management.
- Development of an indigenous Martian soil simulant involving geochemical and geotechnical testing of

basaltic rocks and red sand deposits, intended for rover testing and plant growth studies.

- Characterization of soil piping in the Western Ghats revealed that high drainage density, precipitation rates, and organic matter play critical roles in maintaining surface integrity, with limited influence from dispersion.



Macro-to-Micro scale stable isotopic investigation of carbonates



VNIR Reflectance Spectra of Carbonates

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

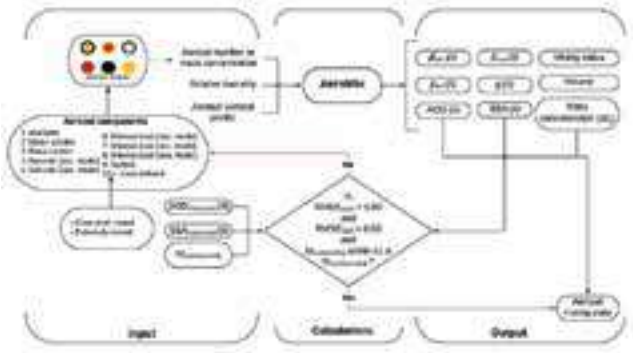
P. R. Sinha, *Ph.D., Associate Professor*

Research Interests:

- Develop instrumentation for aerosol measurement
- Aerosol mixing state
- Aerosol-Cloud interaction
- Aerosol-Cloud-Radiation interaction

Research Highlights:

- Developed an in-house common inlet system for aerosol sampling as per Global Aerosol Watch (GAW-WMO) standards and successfully installed it at IIST Ponmudi Climate Observatory.
- Developed a user-friendly Python package named “AeroMix” to provide an open-source tool for modeling aerosol optical properties and mixing states from the ground and satellite observations of aerosol optical properties.



Overview of the AeroMix workflow for modeling aerosol mixing states using the Mie inversion technique.

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

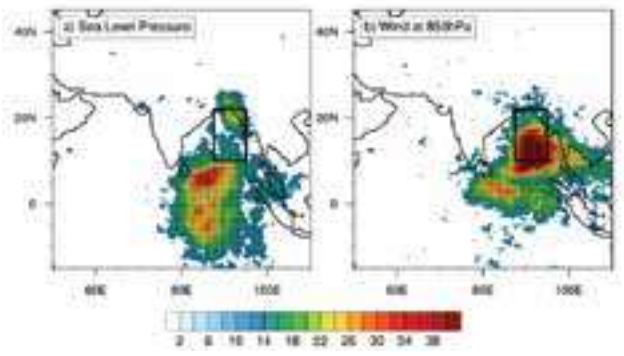
Govindan Kutty M., *Ph.D., Associate Professor*

Research Interests:

- Atmospheric Modelling
- Data Assimilation
- Predictability of Weather

Research Highlights:

- Developed a probabilistic method to identify regions of Initial Condition uncertainty in NWP models.
- Investigated the evolution of ocean thermal parameters during the intensification of three rare cases of rapidly intensified long-duration tropical cyclones.



Percentage of forecast cycles with grid point sensitivity statistically significant at the 95% confidence level for the sensitivity.

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

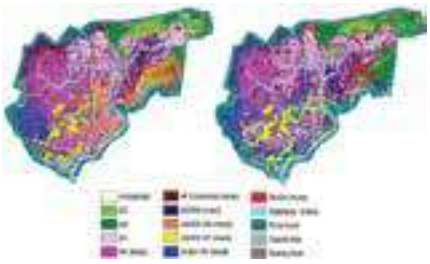
L. Gnanappazham, *Ph.D., Professor*

Research Interests:

- Machine learning algorithms for mangrove ecological studies.
- Geospatial tools to explore natural resources.
- Understanding Coastal geomorphology.

Research Highlights:

- Pursuing on monitoring the mangrove species in addition to mapping them.
- Understanding the sedimentation pattern of mangroves and their influence in mangrove ecology.
- Exploring the hyperspectral remote sensing to understand the mangroves plant physiology.



Map showing the Change detection of mangrove Species of Bhitarkanika National Park, Odisha between 2019 and 2024 using Sentinel 2A Multispectral data and time series NDVI analysis.

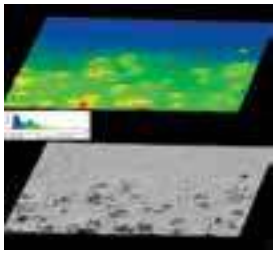


Figure showing very high resolution (better than 1cm) Digital Terrain Model and its Hill Shade visualisation of under Mangrove Forests of Thane Creek, Maharashtra generated using Terrestrial Laser Scanner.

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

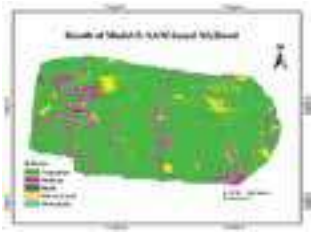
Ramiya A. M., *Ph.D., Associate Professor*

Research Interests:

- LiDAR Point Cloud Processing
- Hyperspectral/Multispectral/Microwave Remote sensing.
- Geospatial analysis

Research Highlights:

- Developed a novel framework for intelligent query and decision-making using point cloud data.
- Object detection from very high resolution UAV remote sensing data.
- Developed a comprehensive framework that utilizes satellite imagery and other relevant environmental and socioeconomic factors to assess the agro-economic health of Indian villages. This work is in collaboration with John Deere, India.
- Developed a webtool which highlights the Avalanche prone zones in India.



Segment Anything Model based XGBoost classification on Multispectral UAV drone images from Anad, Kerala

Crop classification map for Kasaba Hobli in Karanataka

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

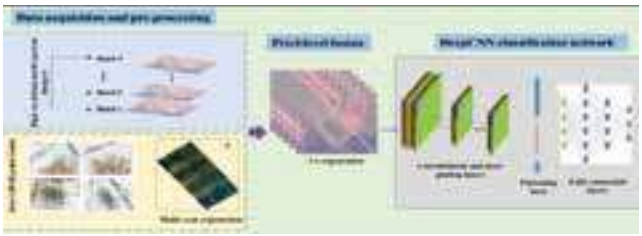
Rama Rao Nidamanuri, *Ph.D., Professor & Head of the department*

Research Interests:

- Hyperspectral imaging systems
- Real-time satellite image analysis

Research Highlights:

- 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.



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

Department of Humanities and Social Sciences

2.5 Department of Humanities & Social Sciences

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 areas

(a) Space Economics
(b) Technology Diffusion and Economic Development
(c) Cultural studies
(d) Gender Studies
(e) Visual Histories
(f) Supply chain Management
(g) Reverse Logistics
(h) Science, Technology and Society
(i) Study of the Marginalized Communities

Fact File

Number of faculty	:05
Technical Staff	: 01
Tutors/Technicians	: 01
Non-teaching staff	: 01
Research Scholars	: 25
Number of PhDs conferred	: 02
Post-Doctoral students	: 01

Laboratory / Research Facilities

Department of Humanities & Social Sciences, 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 Development

- 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 ASRG projects.
- The faculty members are currently engaged in several research projects, including The Impact of Telemedicine on Rural Areas of India, sponsored by ICSSR; an analysis of the space economy within the Indian Space Programme; the Muziris Heritage Project; research on tribal cuisines; and a study on supply chain management. This year, the department received a new project, Exploring the Socio-Cultural Framework of the Kattunaykan Tribal Community through its Indigenous Art Forms, also sponsored by ICSSR. Additionally, a project titled Role of Traditional Knowledge and Local Socio-Economic Structures in Adapting to Climate Change is in its final stages of approval from NICES, NRSC.
- Department has initiated MoUs with Centre for Development Studies (CDS), VSSC, US Consulate and has signed MoA with JNU , New Delhi.

Research outcomes / publications

Journal Papers published	: 06
Conferences	: 02
Short term training conducted	: 04
Three weeks training programme conducted	: 01
Plenary Sessions	: 26
Book chapters	: 06
Book	: 02

Department Activities

- Visits by external experts-4
- Executive programmes conducted by the dept-2
- Awareness programmes conducted-2
- Visit by students to other institutes-5
- Clubs initiated by the Department-4 (Dramatis club, Literature club, NIRMAAN club, Photography club Debate club, Money Minds club, Quiz club)

Faculty Profile

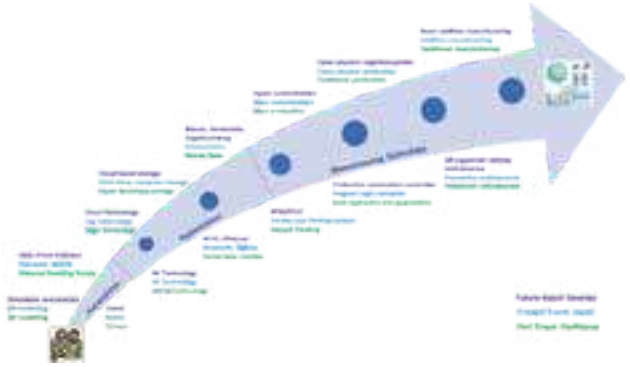
V. Ravi, *Ph.D., Professor*

Research Interests:

- Reverse logistics
- Supply chain management
- Digital supply chain
- Sustainable supply chain
- Smart manufacturing
- Multicriteria decision making

Research Highlights:

- A comparative analysis between conventional and smart supply chains is carried out.
- Built a conceptual framework for a smart supply chain.
- A thorough investigation of factors needed to transition from smart to smarter supply chains is undertaken.



Paradigm shift from traditional, smart to smarter supply chains

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

Babitha Justin, *Ph.D., Associate Professor*

Research Interests:

- Cultural Studies
- Gender Studies
- Digital Humanities
- Visual Histories

Research Highlights:

- Developed and augmented Audio Visual Lab for Visual ethnographic studies and visual historicisation.
- Published papers on women in Muziris and Kodungallur which is taking shape as a Routledge book.
- Digital Humanities exploration of Cyber Cultures and archival of folk cultures in Kerala.

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

Lekshmi V. Nair, *Ph.D., Professor*

Research Interests:

- Science, Technology & Society
- Tribal communities
- Social and Economic Research

Research Highlights:

- Impact of Mass Media on life and Culure of Adivasi Communities in Kerala.
- Impact of Indian Space Programme on Indian Industry.
- Impact of Telemedicine in the Remote Areas of India.

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

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

Research Interests:

- Food and Cultural Studies
- Food Representations in Cinema and Literature

Research Highlights:

- Engaged in the project on Mapping of Tribal Cuisines.
- Understanding Modernity and Sociocultural Significance of Cookbooks .
- Culinary Representations in Contemporary Malayalam Literature.

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

Shaijumon C. S., *Ph.D., Associate Professor & Head of the Department*

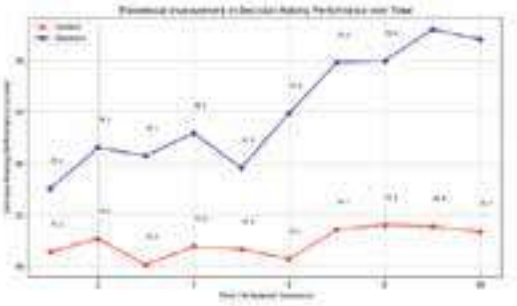
Research Interests:

- Space economics
- Neuro economics
- Development economics
- Indian economic development
- Macroeconomics

Research Highlights:

- Undertook a study on titled 'Oxytocin's Role in Space Team Dynamics and Cognition: A Neuroeconomic Perspective'.
- Presents a theoretical exploration of oxytocin's potential to enhance team dynamics and cognitive function in simulated space environments, framed within a neuroeconomic approach.
- The study propose an experiment to assess its application among crew members under the unique stressors of long duration space missions.
- This theoretical framework not only underscores the significance of psychological factors in space exploration but also opens new opportunities for utilising neurobiological insights to optimise team performance and mental health in the challenging environment of space.

Transportation of oxytocin to brain pathway made with bioRender



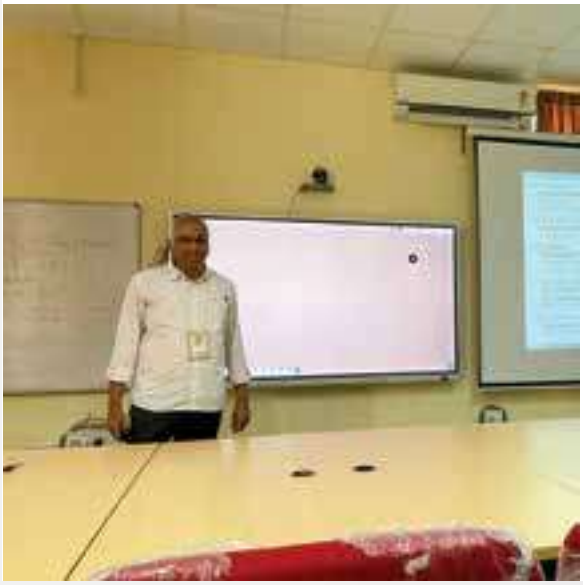
Theoretical improvement in Decision-making performance over time.

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 areas

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

Fact File

Number of faculty	: 11
Tutors /Technicians	: 03
*Non-teaching staff	: 01
Research Scholars	: 27
PhDs conferred	: 02

Laboratory / Research Facilities

Department of Mathematics, IIST has
One Programming lab
One M.Tech Machine Learning instructional lab
One Mathematics Research/Conference lab
One mini Research lab

Seminar/Conference/workshop arranged:

- May 22 - June 3, 2023, Young Talent Nurture.
- July 07, 2023, Prof. Larisa Beilina, Department of Mathematical Sciences, Chalmers University of Technology and Gothenburg University, Sweden, A posteriori error estimates and adaptive error control for permittivity reconstruction in conductive media.
- Nov 1-3, 2023, Peeyush Choudhary, Workshop on Wolfram Mathematica.
- December 26, 2023, Dr. E. Krishnan, former HoD, Department of Mathematics, University College, Thiruvananthapuram, Evolution of Convergence, on the occasion of National Mathematics Day (22 December, birth anniversary of legendary mathematician, Srinivasa Ramanujan).
- January 30, 2024, Prof. P. K. Ratnakumar, Dept. of Mathematics, Harish-Chandra Research Institute (HRI), Prayagraj (Allahabad), Young's inequality for the twisted convolution.
- February 07, 2024, Dr. Lakshmi S. Nair, Department of Orthopaedic Surgery, Connecticut Convergence Institute for Translation in Regenerative Engineering, Department of Biomedical Engineering, Department of Material Science and Engineering, Institute of Material Science, University of Connecticut Health, has delivered a lecture on "TRANSLATIONAL RESEARCH: BENCH TO BEDSIDE AND BACK".
- February 09, 2024, Prof. Venkateswaran Krishnan, TIFR-Centre for Applicable Mathematics, Bangalore, A simple range characterization for spherical mean transform in odd dimensions and applications.
- February 23, 2024, Prof. Natesan Srinivasan, Dept. of Mathematics, IIT Guwahati, Efficient Methods for the Analytical and Numerical Solutions of Time-Fractional advection-diffusion-reaction problems.
- February 14, 2024, Dr. N. Sukavanam, Emeritus Professor, Department of Mathematics, IIT Roorkee, Controllability and Computation of Control.
- March 07, 2024, Prof. Donatella Marini, Emeritus Professor, University of Pavia, Italy, Virtual Element Method: An Overview.

Mathematics Club talks:

1. May 18, 2023, Mr. Nikhil A. P., Structured Markov chain and their stationary distribution.
2. July 07, 2023, Nivedita Jain, Shallow Water Hydrodynamics.
3. September 29, 2023, Mr.Amit Viswakarma, Comparing Point Clouds.
4. January 10, 2024, Ms.Aleena Thomas, A topological proof of Cayley-Hamilton Theorem.
5. March 01, 2024, Mr.Devprakash Jha, Introduction to Tensor Products of Banach Spaces.

Post-graduate course(s)

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

Research and Development

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

Research outcomes / publications

Journal articles	: 12
Conferences	: 02
Book	: 01
Book chapters	: 01
Extramural projects	: 05

Faculty Profile

Anilkumar C. V., *Ph.D., Professor & Head of the Department*

Research Interests:

- Suspension Rheology, Nonlinear Dynamics, Time series Analysis.

Research Highlights:

- Examined the orientation profile of a rigid body suspended in a time-dependent uniform flow at low Reynolds numbers under the action of an external periodic field.
- Derived the unsteady equations governing the transport by considering the influence of both fluid and particle inertia.
- Observed the significance of the acceleration reaction term, which appeared in the governing equation, as the calculated value increases as the aspect ratio increases.
- The lift force exerted by the flow on the spheroid is insignificant since it is negligibly small.
- Provided phase diagrams of the solutions with functional relations with the particle's geometry, amplitude and phase of the external field, and Reynolds numbers. The steady-state solutions are orbits controlled by the parameters.

Observed a phase shift in position and velocity, a drift of orbits, and dependence of orientation movement on the aspect ratio and amplitude of the external field and the Reynolds number.

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

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

Research Interests:

- Applied probability
- Stochastic processes
- Queueing Theory

Research Highlights:

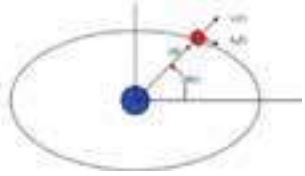
- Developed a finite capacity queuing system with energy-required service and general vacation times with a specific objective to analyze a battery-powered wireless network.
- Applied fluid queue theory to analyze wireless sensor networks that harvest energy from environmental sources.
- Developed a more general fluid queue model that allows for separate Markov fluid sources for vacation and service periods.
- Expanding this research into new application domains like electric vehicle charging stations, manufacturing and production systems etc.

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

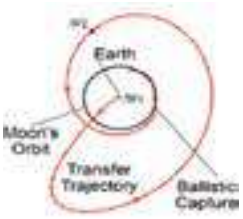
Raju K. George, *Ph.D., Outstanding Professor, Dean (SA, SW and OR)*

Research Interests:

- Controllability using Radial and Tangential Trusters
- Weak Stability Boundary Transfer
- Prediction of Space Debris propagation



Research Highlights:



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

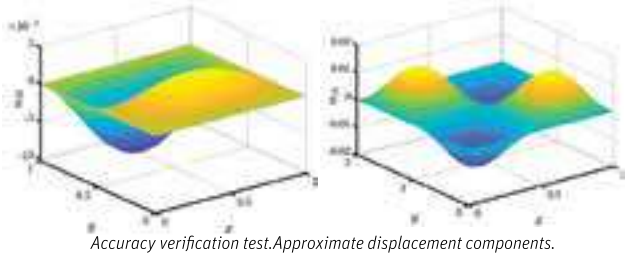
Sarvesh Kumar, *Ph.D., Professor*

Research Interests:

- Numerical analysis of Partial differential equations, Virtual element methods, Discontinuous Galerkin methods, Approximations of fluid flow Problems.

Research Highlights:

- We study here the interfacial Biot/elasticity problem having applications such as land subsidence, solid waste management, withdrawal of ground water, harnessing of geothermal energy, describing blood perfusion of deformable living tissues (such as cartilage), and many other scenarios of increasing complexity.
- The formulation of this problem requires a careful setup and analysis of transmission conditions. In the applications mentioned above, the elasticity equations interact with the quasi-static Biot's equations for poroelasticity.
- We propose, analyze and implement a virtual element discretization for an interfacial poroelasticity/elasticity consolidation problem. The formulation of the time-dependent poroelasticity equations uses displacement, fluid pressure and total pressure, and the elasticity equations are written in the displacement-pressure formulation.
- An important observation, however, is that, at least in the cases studied herein, numerical results indicate that those types of alternative stabilizations do not present significant differences (in terms of experimental convergence rates) with respect to the most widely adopted virtual element method stabilization (the dofi-dofi stabilizer), even in the case of meshes with small edges and for polynomial degrees larger or equal than 2. Thus, the advantage in this scenario seems to be confined to the convenience in the theoretical analysis.



Accuracy verification test.Approximate displacement components.

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

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

Research Interests:

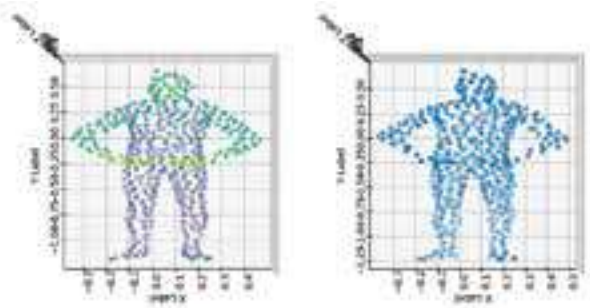
Differential Geometry and its Applications

Current topics of research are

- Information Geometry
- Point Cloud Comparison using information geometric tools

Research Highlights:

- Geometry of Infinite-dimensional statistical manifolds.
- Using divergence measures compare the point cloud data.



Left: The original point cloud sample extracted using FPS. Right: econstructed point cloud sample after passing the encoder output to the decoder model.

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

Kaushik Mukherjee, *Ph.D., Associate Professor*

Research Interests:

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:

- Computational investigation of multi-dimensional partial differential equations (PDEs) has always been of great interest to engineers and scientists due to wide applications of in real-life. Whenever dispersion or diffusion coefficient is substantially smaller than the advection term, those PDEs turn out to be singularly perturbed differential equations (SPDEs); and the corresponding models inherently become more complex due to the presence of the boundary layer phenomena. In connection with this, we develop and analyze higher-order uniformly convergent fractional-step fitted mesh methods (FMMs) for multi-dimensional singularly perturbed PDEs with time-dependent boundary data. SPDEs

play a crucial role in modelling several real-life problems which are often interpreted as nonlinear PDEs involving space and time variables. Such equations are incredibly significant for understanding various biological phenomena and their applications to the medical sciences. For this purpose, we develop and analyze two efficient higher-order FMMs for semilinear convection-dominated parabolic PDEs possessing regular boundary layer.

- 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 often arise in various branches of engineering, biological and chemical sciences etc. Due to presence of multiple diffusion parameters solutions of such system generally possess overlapping boundary layers. In this regard, we investigate efficient numerical approximation to the solution of a coupled system of singularly perturbed convection-diffusion problems on generalized adaptive mesh.
- On the other hand, the scaled first-order solution derivative represents a physically meaningful quantity, e.g., diffusive flux of a substance satisfying the Fick's first law and is proportional to the concentration gradient. It generally appears in the context of diffusion phenomenon in various branches of scientific and engineering disciplines, which can be modelled as SPDEs. As the diffusion parameter becomes smaller, the corresponding solution gradient becomes significantly large particularly within the boundary layer region. This motivates researchers for pursuing computational analysis to capture the scaled solution derivative efficiently, particularly inside the boundary layer region. So, we investigate robust numerical approximation to the scaled solution derivative for a coupled system of SPDEs.

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

N. Sabu, *Ph.D., Professor*

Research Interests:

- Homogenization
- Mathematical Elasticity
- Finite Element Method

Research Highlights:

- To study the lower dimensional approximation of elastic shallow shell or static problem.
- To study the lower dimensional approximation of eigenvalue problem for thin elastic shells .
- Two-dimensional approximation of dynamic problem for thin piezoelectric materials.
- To justify the scaling used in asymptotic analysis of thin elastic and piezoelectric structures.

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

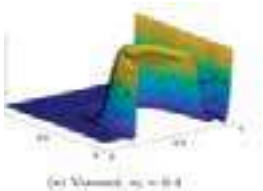
Natarajan E., *Ph.D., Associate Professor*

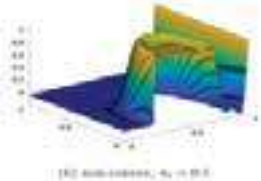
Research Interests:

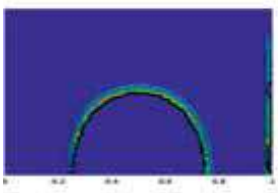
- Computational Mathematical

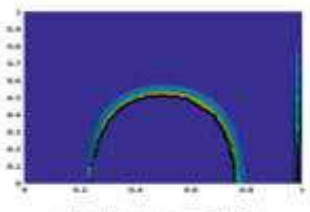
Research Highlights:

- Virtual element discretization of Stokes-Darcy problem.
- Virtual element method for the Oseen problem.









Surface plots (a)-(b) and isolines (c)-(d) for variant 1, VEM order $k = 1$.

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

Prosenjit Das, *Ph.D., Associate Professor*

Research Interests:

- Affine fibrations, Projective algebras, Affine forms, Cancellation problems, Epimorphism problems, Locally nilpotent derivations and allied areas.

Research Highlights:

- Discovered a criterion to determine residual coordinates of an A^2-fibration over a Noetherian ring containing Q.

A criterion to determine residual coordinates of A^2-fibrations

JUNAID RAMAN BABU and PROSENJIT DAS*

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

S. Sumitra, *Ph.D., Associate Professor*

Research Interests:

- Brain Computer Interface,
- Deep Learning,
- Kernel Methods .

Research Highlights:

- Developed Machine Learning-Based Classification models for Brain-Computer Interface Applications.
- Worked on Model-based Learning of Information Diffusion in Social Networks for Twitter.

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

Sakthivel K., *Ph.D., Associate Professor*

Research Interests:

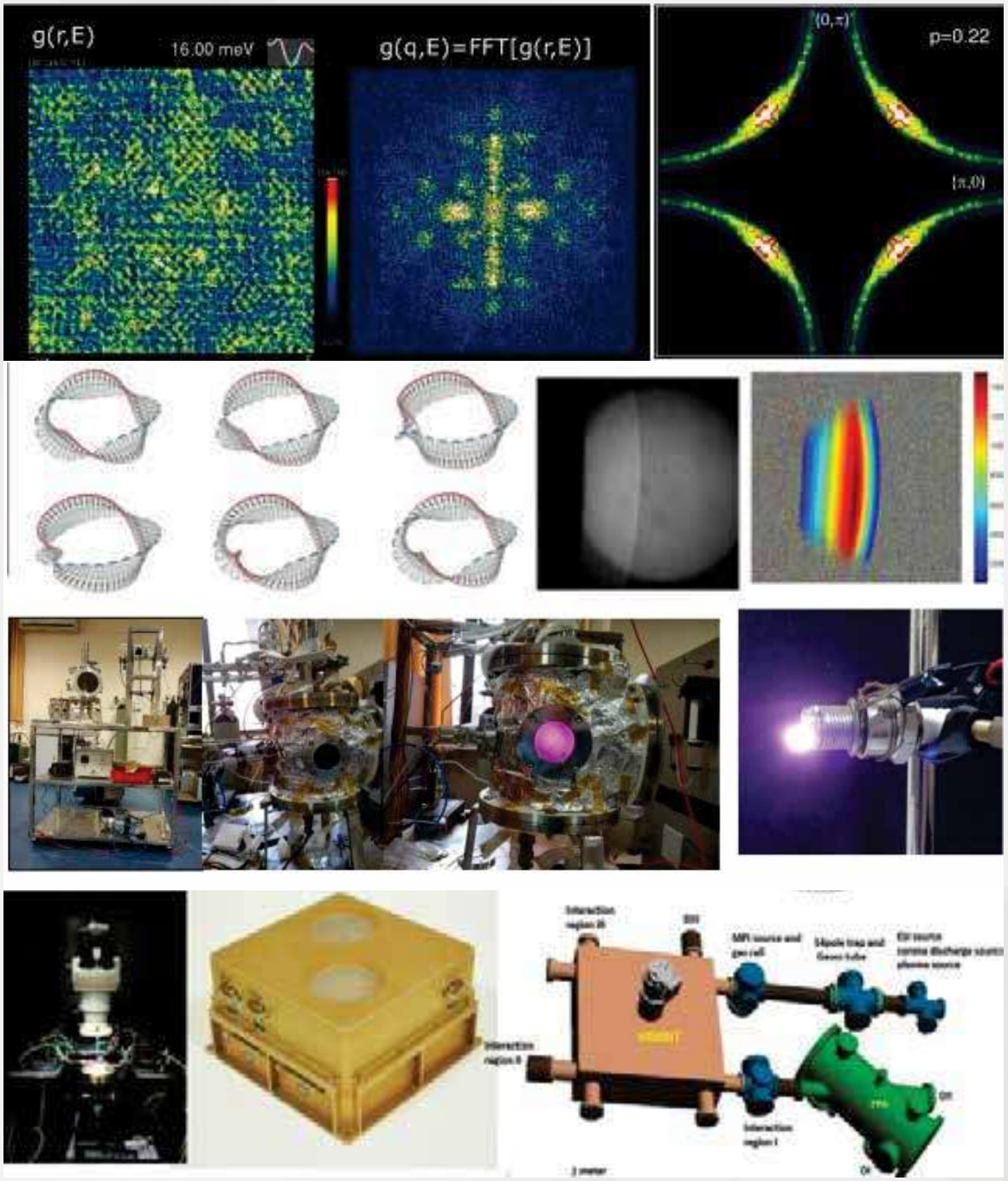
- Optimal Control Problems of Fluid Flow Models and Magnetization Dynamics, Inverse Problems of Beam, Plate and Fluid Flow Models, Dynamic Programming of Stochastic Fluid Dynamic Models.

Research Highlights:

- Studied the effect of Kelvin-Voigt damping in the determination of 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.
- Derived remarkable Lipschitz stability estimates for the transverse shear force in terms of the given measurement by a feasible condition only on the damping coefficient.

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

Department of Physics



2.6 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.

The core research areas

(a) Applied and Adaptive Optics, Quantum Technologies, Quantum Optics and Quantum Information.

(b) Atomic and Molecular Physics.

(c) Solid State Physics (Device Physics, Nuclear Magnetic Resonance, Scanning Tunneling Microscope), Theoretical Condensed Matter Physics .

(d) Statistical Physics, Integrable systems, Nonlinear Dynamics.

Fact File

Number of faculty	: 12
Scientific Officer C	: 01
Tutors/Technicians/TechnicalAssist	: 08
Non-teaching staff	: 02
Research Scholars	: 55
Ramanujan fellow	: 01
DST woman scientist	: 01
Post-doctoral fellows	: 01
Research Associates	: 01
PhDs conferred	: 07

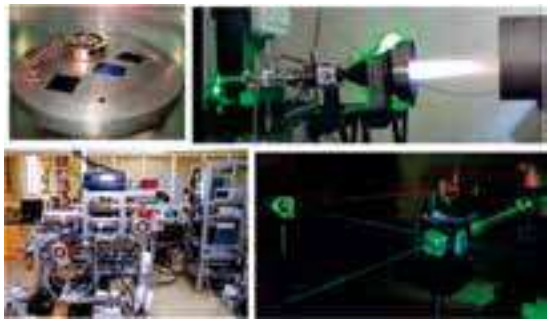
Laboratory / Research Facilities

Department of Physics, IIST has 8 instructional labs, which include:

1.General Physics Laboratory
2.Modern Physics Laboratory
3.Solid State Physics Laboratory
4.Applied and Adaptive Optics Laboratory (PG)
5.Optics Laboratory (UG)
6.Quantum Technology Laboratory
7.Computational Physics Laboratory
8.Solid State Technology 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



Research and Development

- 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 / publications

International Journal	: 31
Conferences	: 25
Patents(Granted)	: 01

Contributions to Institute Level Space Missions

- New technology (Plasma treatment for surface cleaning of ball-bearings) developed in the project with IISU has been space-qualified. It has become a standard practice to increase the surface wetting of ball-bearing systems.
- Carbon-nanotube coatings developed by Debashree Das, PhD students working at LEOS has been space qualified as a non-reflecting black surface for star sensors.
- ARIS201F was launched on April 22, 2023 on PSLV C55 mission.
- 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.

Symposium/Outreach Activities

- 3 days symposium on “Genesis and evolution of organics in space” January 18-20, 2024, 60+25 participants (in person participation of 60 by invitation others in online mode).
- Organised networking event on Holography and Diffractive Optics Technical Group Networking Lunch at Frontiers in Optics + Laser Science conference on October 12, 2023, OPTICA, Participants: 40+ (successfully organised with positive feedback and fruitful interaction with budding researchers).
- About 25 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. Solomon Ivan has received IOP trusted reviewer status from IOP Science.
- Dr. Biswajit Pathak was invited to serve as Guest Editor for the special issue on Diffractive Optics - Current Trends and Future Advances by Photonics Journal, MDPI Publication (2023).

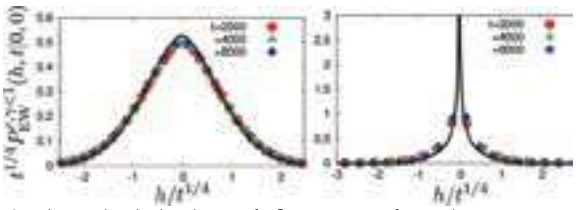
Faculty Profile

Apoorva Nagar, *Ph.D., Associate Professor*

Research Interests:

- Resetting in non-equilibrium systems.
- Resetting in systems with multiple degrees of freedom.
- Steady states and phase transitions.
- Nonequilibrium Statistical Mechanics, Biological Physics.

Research Highlights:



Steady state height distribution of a fluctuating interface undergoing stochastic resetting

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

Ashok Kumar, *Ph.D., Associate Professor*

Research Interests:

- Generation and Characterization of Quantum Entangled Light, Quantum Sensing, Quantum Metrology and Quantum Imaging, Quantum Cryptography and Quantum Communication.
- Bright Entangled Light beams and their Applications in Quantum Technologies.

Research Highlights:

- Encoded spatial information in bright entangled twin beams of light, leading secure encryption of the data for quantum cryptography applications.
- Generated Bright Quantum Squeezed Light in IIST
  1. Generated the bright-entangled twin beams of light and measured their intensity-difference squeezing of 4 dB, corresponding to a 60% noise reduction from the standard quantum limit (SQL).
  2. The squeezed light is an important resource for quantum-enhanced sensing, quantum metrology, quantum communication and quantum cryptography, and quantum information processing.

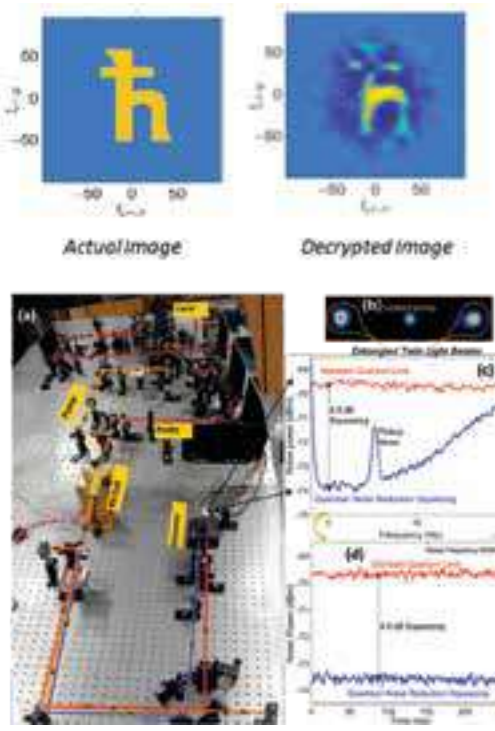


Fig. (a) Setup for generating bright squeezed twin beams of light, (b) images of generated twin beams, (c) intensity difference noise reduction vs noise frequency, and (d) noise reduction vs time at noise analysis frequency of 500 kHz.

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

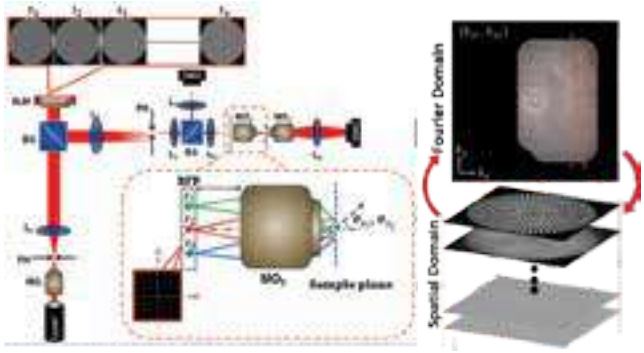
Biswajit Pathak, *Ph.D., Ramanujan Fellow*

Research Interests:

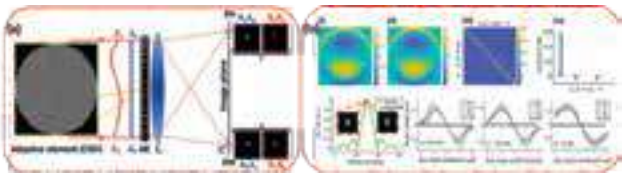
- Development of a Programmable Illumination Fourier Ptychography Microscopy System.
- Design and Implementation of Hybrid Holographic Modal Wavefront Sensing for Improved Aberration Correction.

Research Highlights:

- The advanced FPM system provides precise and dynamic control over the illumination and facilitates intensity uniformization, realization of different imaging modalities, and compensation of aberrations, of the illumination beams directly.
- By leveraging the complementary strengths of different orthogonal functions, the hybrid holographic modal sensing technique significantly improves wavefront estimation accuracy, enabling correction of both low- and high-order aberrations, in adaptive optics systems.



Schematic diagram of the advanced Fourier Ptychography microscopy system with programmable beam illumination.



Schematic diagram representing the sensing mechanism and the (b) corresponding results obtained using the quality metric parameter due to the incorporation of bias aberration modes.

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

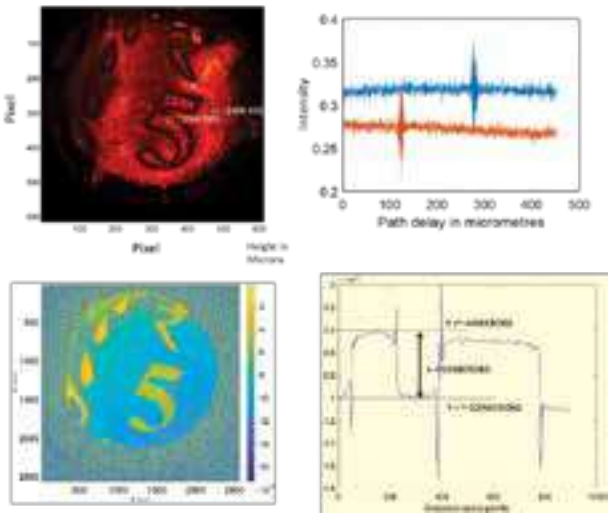
Dinesh N. Naik, *Ph.D., Associate Professor*

Research Interests:

- Coherent and Incoherent optics
- Optical Information Processing
- Singular Optics
- Optical Metrology
- Optical Fabrication and Testing

Research Highlights:

- Sensitivity enhancement in optical interferometers using phase of superposed fields.
- Development of Holographic Laser Profilometry for Surface Profile measurement of Ceramic Liner of Hall thrusters.



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

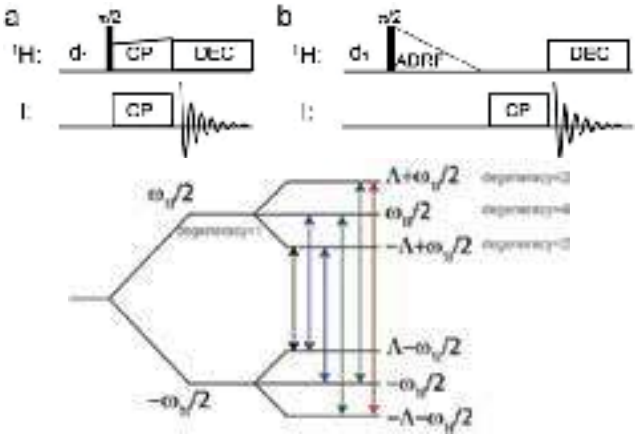
S. Jayanthi, *Ph.D., Associate Professor*

Research Interests:

- Nuclear Magnetic Resonance (NMR): Development of new sensitivity enhancement experiments, spin-dynamics associated with time-dependent Hamiltonians by developing theoretical models in complex spin systems, application of solid state MAS NMR in materials.

Research Highlights:

- Numerical computation of effective Hamiltonian associated with a time dependent problem: Matrix logarithm and Floquet theory.
- Cross polarization from dipolar-order under magic angle spinning: The ADRF-CPMAS NMR experiments.



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

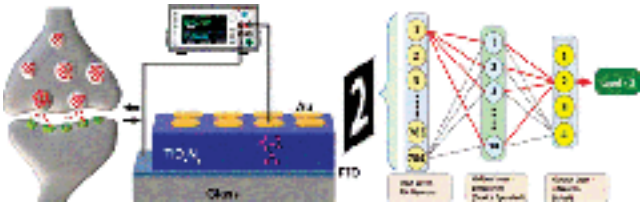
K. B. Jinesh, *Ph.D., Professor*

Research Interests:

- Memory technology for future data administration: semiconductor devises.
- Development of Functional coatings for ISRO missions.
- Molecular level spectroscopy of biomolecules for the detection of fatal diseases.
- Development of high-sensitive, low-cost medical diagnosis systems (Seismocardiogram with LEOS, digital X-ray flat-panel with IISU etc.) together with ISRO centers.
- In-house development of research equipments and their technology transfer for low-cost production to enhance Made-in-India program (Pulsed Laser Deposition system, Atomic Layer Deposition system etc.)

Research Highlights:

- Major breakthrough in neuromorphic research: we were able to do pattern recognition of hand-written digits using neuromorphic devices. Two papers were published based on this. Artificial neurons based on Titanium oxynitride has been published in ACS Applied electronic materials 2024, 6, 1, 319–329.
- Developed Seismocardiogram together with LEOS as a part of the ASRG project. First results of the heart sensing have been obtained at LEOS, Bangalore.



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

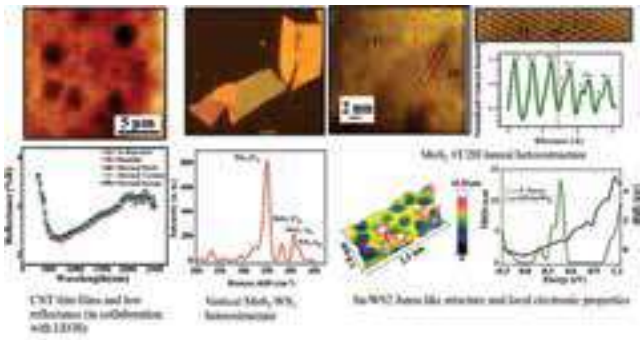
Kuntala Bhattacharjee, *Ph.D., Associate Professor*

Research Interests:

- Quantum and 2D materials
- van der Waal's (vdW's) Heterostructure
- Band Engineering
- Carbon Nanotube Based coatings for Stray Light Control 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 films for space applications.
- Investigation of electronic and electrical properties of 2D materials, TMD Janus like structures and local electronic properties, vdW's heterostructures based wide spectral range photo detectors for space related applications.



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

S. Murugesh, *Ph.D., Professor*

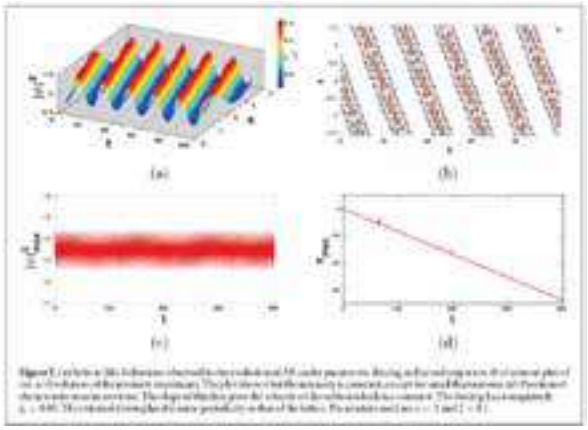
Research Interests:

- Nonlinear dynamics, solitons, and applications to condensed matter systems.
- Geometry and integrability, solitons.

Research Highlights:

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

  We have investigated the long time dynamics of spatially periodic breather solutions of the 1-D nonlinear Schrodinger 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.



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

C. S. Narayanamurthy, *Ph.D., Outstanding Professor & Dean (IPR, CE & IR)*

Research Interests:

- Applied Optics: Digital holography and applications, Optics for metrology, Non-Linear Applied Optics, Optical Interferometry, Freeform optics.
- Adaptive Optics : Wavefront sensing, Imaging through atmospheric turbulence, shearing interferometry for wavefront sensing and adaptive optics corrections.

Research Highlights:

- Freeform optical mirrors replacing conventional optical mirrors in a RC Telescope (Fig.1).
- Developed unconventional adaptive optics for turbulence impacted wavefront correction

  A new method for correcting wavefront aberrations using partially coherent Schell Model beams is shown in Fig.2a, b where the Gaussian Schell model beams greatly reduce the turbulence impact in the two different geometry.

  Post turbulence impacted beam shaping technique

  In post beam shaping technique the turbulence beam itself is shaped to get clean beam devoid of aberrations. Fig.3 shows such the experimental technique where the turbulence impacted beam itself is corrected by converting it on to different class of beams.

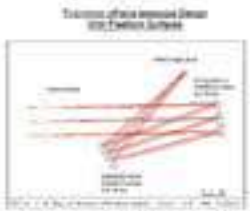


Fig.1

Fig.2a

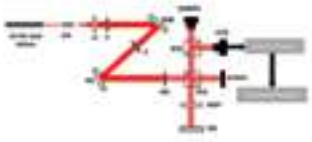


Fig.2b

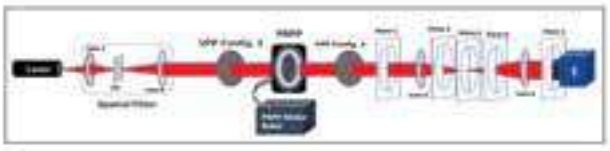


Fig.3

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

Naveen Surendran, *Ph.D., Associate Professor*

Research Interests:

- Condensed matter theory
- Topological phases
- Floquet phase transitions

Research Highlights:

- Dynamics of periodically driven three-dimensional Kitaev model.
- Dynamical freezing in driven bilayer graphene.

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

Solomon Ivan, *Ph.D., Associate Professor*

Research Interests:

- Classical optics
- Quantum Optics
- Quantum Information

Research Highlights:

- Showed quantum advantage with classical light towards the illumination problem. Ref. *Quantum illumination with classical correlated light, Abhishek Kumar, and J S Ivan, Quant. Inf. Process. 22, 5, (2023).*

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

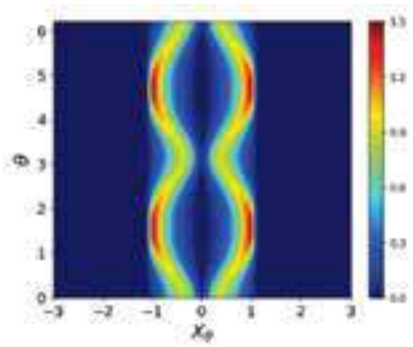
Sudheesh Chethil, *Ph.D., Professor & Head of the department*

Research Interests:

- Quantum Optics and Quantum Information, Quantum Computing, Nonclassicality and entanglement of quantum systems and its applications. Detection of Quantum Chaos and decoherence control using Adiabatic Gauge Potential.

Research Highlights:

- Estimation of the quadrature moments from optical tomogram.
- Janus-faced nature of q-deformed states.
- Decoherence of deformed states.
- Ergodicity breaking transition in bosonic system.



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

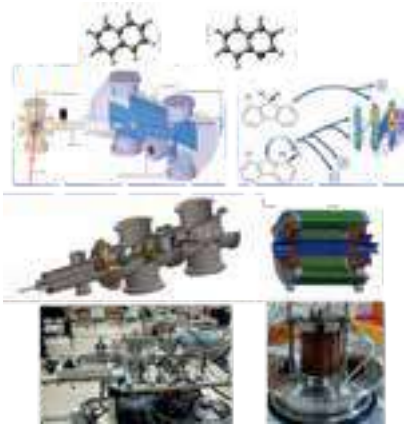
Umesh R. Kadhane, *Ph.D., Professor*

Research Interests:

- Molecular physics
- High energy radiation interaction with organic molecules
- Origin of prebiotic molecules in space

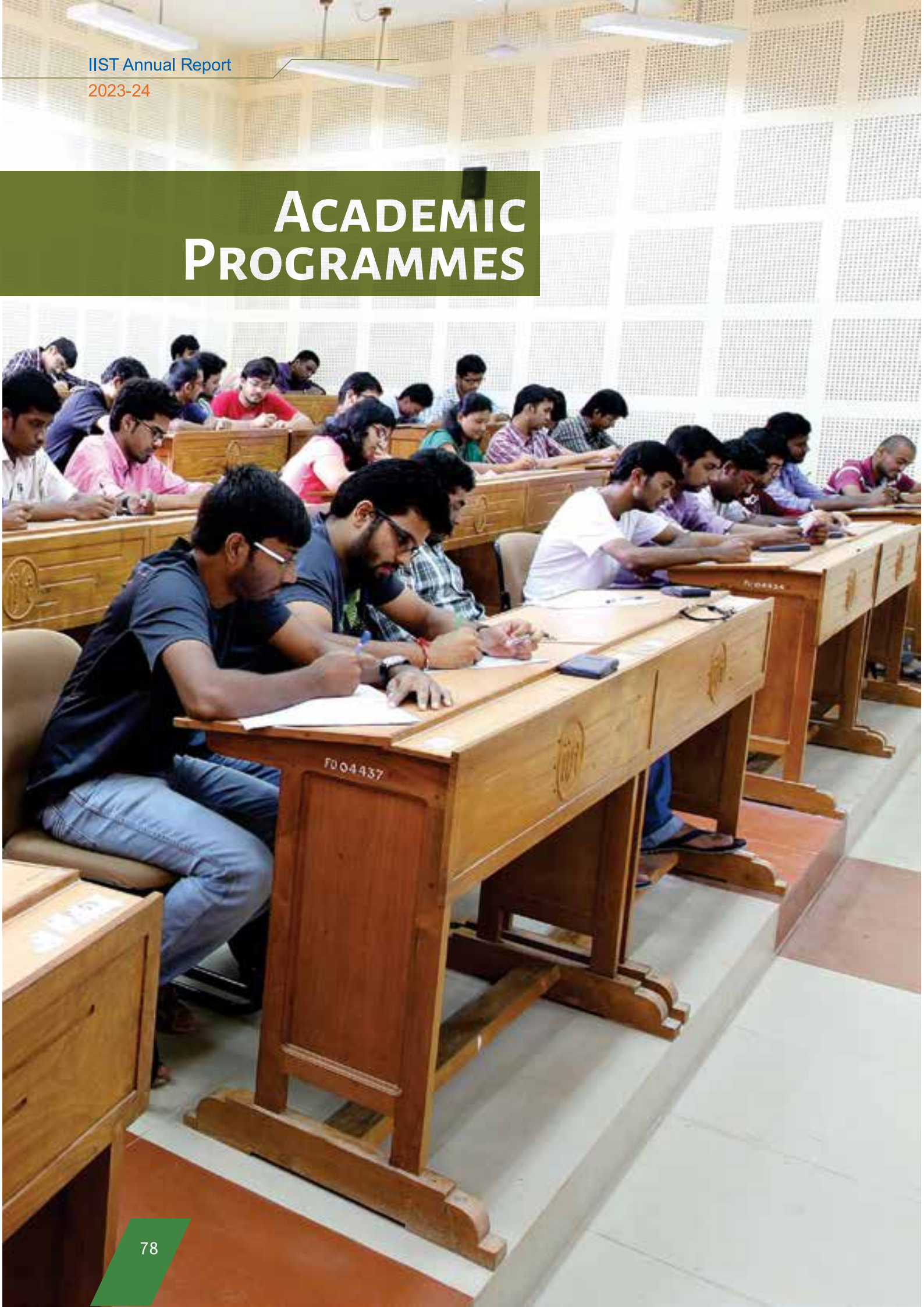
Research Highlights:

- Development of energy correlated time of flight mass spectrometer.
- EUV radiation interaction with PANH molecules.
- Planetary ionosphere plasma simulation facility .
- Electrospray ion source with 14 pole ion trap facility is under implementation.



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

Academic Programmes



3. Academic Programmes

IIST conducts graduate and undergraduate programs leading to B.Tech., M.Tech., M.S., and Ph.D. degrees in Science, Engineering, and Humanities. Short-term and certificate courses are also offered by the institute. The teaching methodology attempts to address interdisciplinary problems and challenges by applying inputs from fundamental and functional domains. Classes are taught in a variety of ways, ranging from traditional lectures to virtual classrooms. Students participate in internships, projects, and assignments, as well as field observations, presentations, debates, and seminars, and are encouraged to create industry links whenever possible. To maintain high-quality, holistic education for an expanding student population and to align with advancements in science, technology, and socioeconomic factors, the institute updates the syllabus of all programs every three years. A task force was established to study the National Education Policy-2020 (NEP-2020) and execute it at IIST. In alignment with the NEP, new elective courses have been launched, and it is advised that multidisciplinary courses, minor streams, skill enhancement courses, and value-added courses be instituted in the forthcoming years. IIST has started introducing NEP-2020 with a vision of providing holistic multidisciplinary education and its progressive transformation to a large multidisciplinary educational and research university in the future. The long-term action plan is already on the anvil to inculcate and promote collaboration with leading institutions to integrate diverse perspectives. Multidimensional institute development plans are framed to cater for the needs of progressive transformation of the institute to a world-class multidisciplinary education institution offering programs in the niche areas of science and technology. A modular flexible curriculum framework has been developed to accommodate the future needs of multidisciplinary academic programs.

In the reporting period, the institute provided two undergraduate programs, one dual degree program, fifteen postgraduate programs, and full-time/part-time Ph.D. programs.

3.1 Undergraduate Programmes

In the academic year 2023-24, students enrolled on BTech programs in Aerospace Engineering and in Electronics and Communication Engineering (Avionics), each with sanctioned strength of 72 seats and a dual degree program with BTech 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 Sciences or a Master of Sciences in Astronomy and Astrophysics or Quantum Technology.

Undergraduate programme enrollment for the academic year 2023-24

UG Programme	Gen	OBC	SC	ST	PD Gen *	PD OBC *	WGEN **	WOBC **	WSC **	EWS ***	PMSSS ****	Total
Aerospace Engineering	29	15	9	5	1	1	3	2	1	6	0	72
Electronics & Communication Engineering (Avionics)	24	16	6	5	0	0	3	2	1	6	1	63 +1 PMSSS
Dual Degree	9	5	3	1	0	0	0	0	1	1	0	20
Total	**62**	**36**	**18**	**11**	**1**	**1**	**6**	**4**	**3**	**13**	**1**	**156**

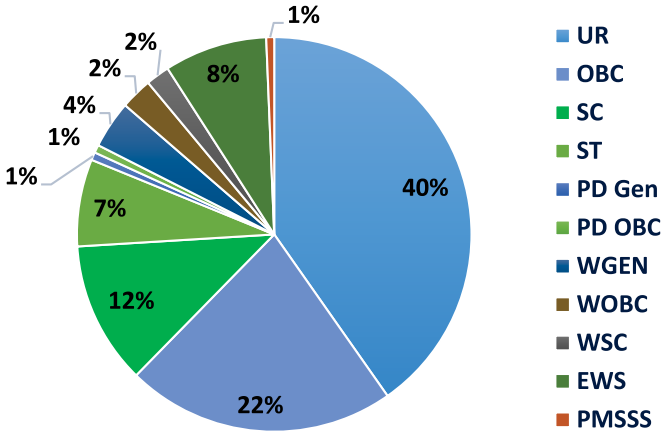
**Persons with disabilities (PD)*

***Women General, **Women OBC, **Women SC*

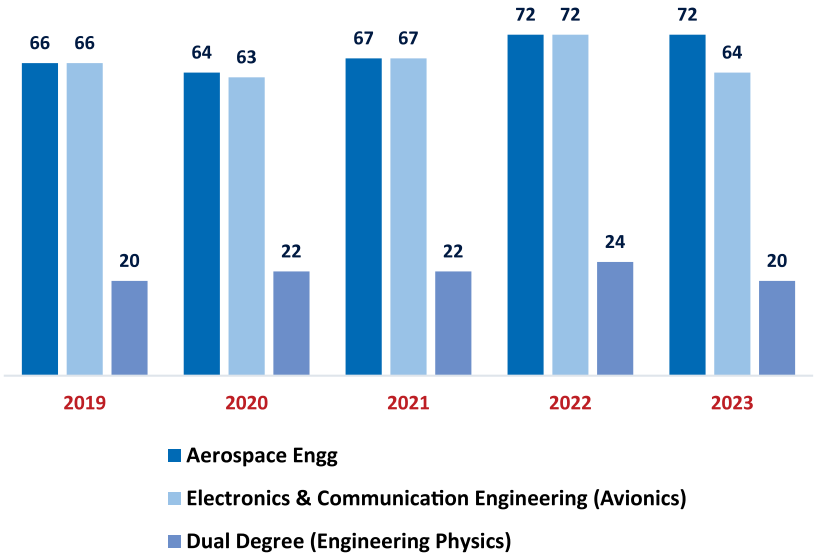
****Economically weaker sections (EWS). As per government directive, the reservation for the EWS has been started from the academic year 2019-2020*

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

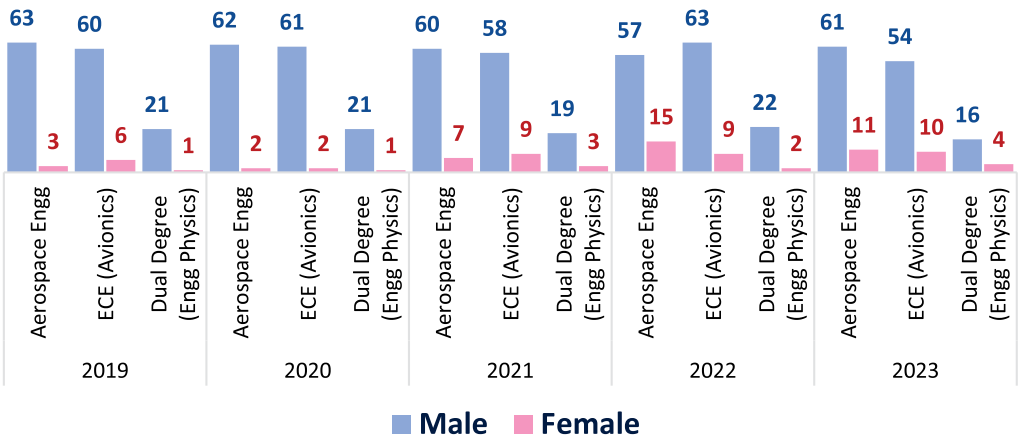
Distribution of B.Tech. & Dual Degree students enrolled in different categories (2023 admission)



Students enrolled in B.Tech & Dual Degree programme (Year wise)



Gender statistics of students enrolled in B.Tech & Dual Degree Programme (Year wise)



3.2 Postgraduate Programmes

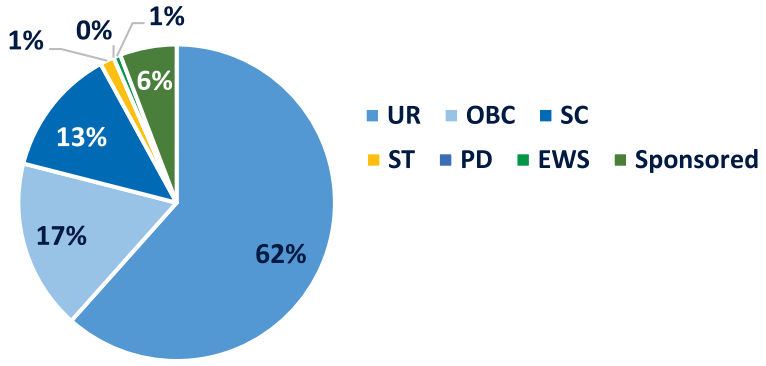
In the 2023-24 academic year, the institute provided 15 Master of Technology/Master of Science programs. Entry into the programs was based upon national examinations such as GATE or JEST, succeeded by an interview. The subsequent details pertain to the category-specific admissions of students during the reporting period.

Branch	2023 Enrolled							Tota l
	UR	OBC	SC	ST	PD*	EWS**	Sponsored	
Aerodynamics and Flight Mechanics	8	5	1	0	0	1	1	16
Structures and Design	7	2	1	1	0	0	0	11
Thermal and Propulsion	9	5	4	0	0	0	0	18
Control Systems	6	0	2	0	0	0	0	8
Digital Signal Processing	3	1	0	0	0	0	1	5
Power Electronics	3	1	2	0	0	0	0	6
RF and Microwave Engineering	6	1	1	0	0	0	0	8
VLSI and Microsystems	11	3	2	0	0	0	0	16
Materials Science and Technology	1	1	0	0	0	0	4	6
Astronomy and Astrophysics	4	0	0	0	0	0	0	4
Earth System Science	3	0	1	0	0	0	0	4
Geoinformatics	4	2	1	0	0	0	2	9
Machine Learning and Computing	12	0	2	0	0	0	0	14
Optical Engineering	3	2	1	0	0	0	0	6
Quantum Technology	5	1	0	1	0	0	0	7
Total	**85**	**24**	**18**	**2**	**0**	**1**	**8**	**138**

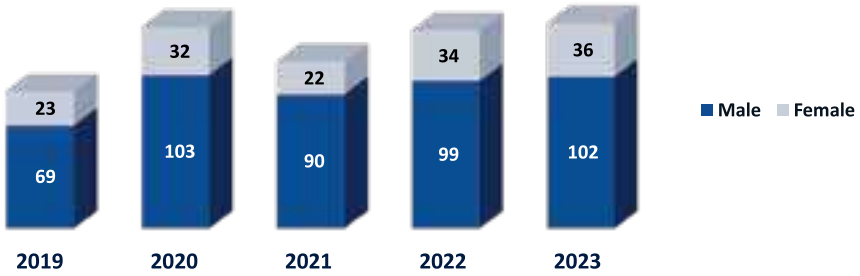
**Persons with disabilities (PD)*

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

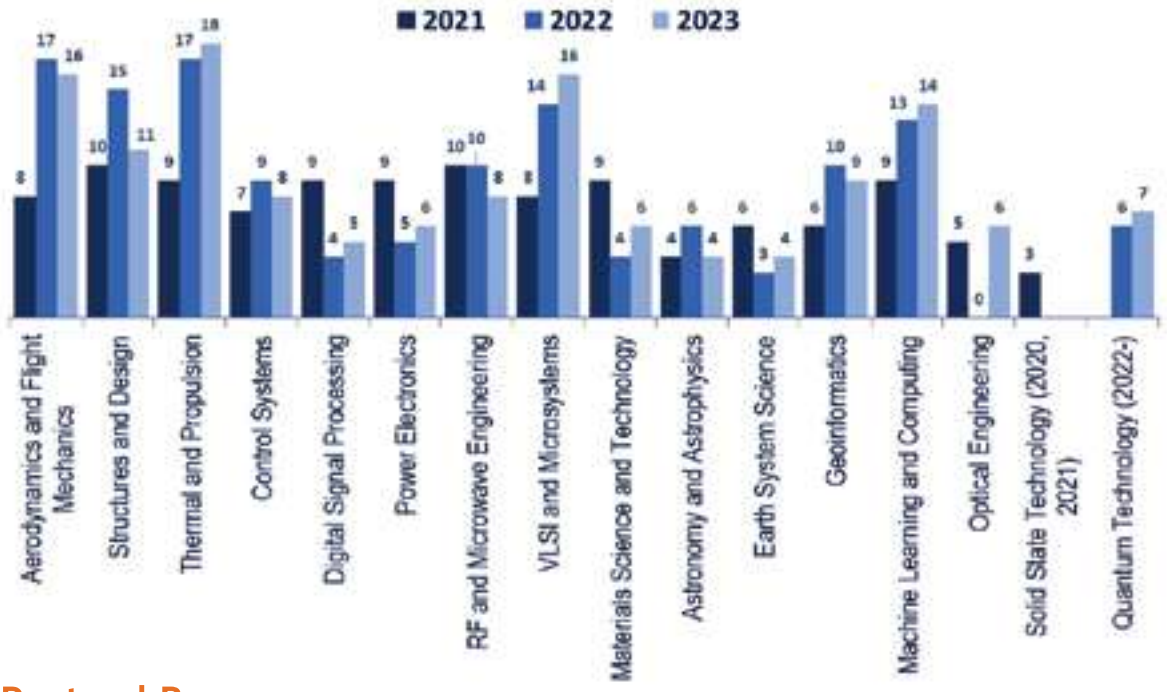
Distribution of M.Tech/ M.S. students in different categories (2023 admission)



Gender statistics of students enrolled in M.Tech/M.S. programme (Year wise)



Students enrolled in M.Tech / M.S. Programme (Year wise)



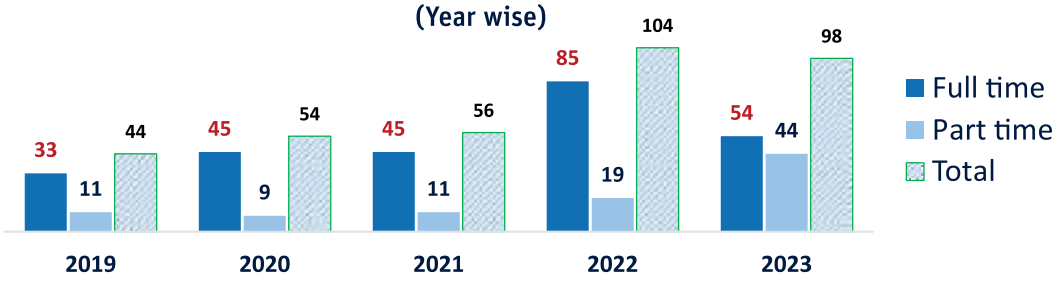
3.3 Doctoral Programmes

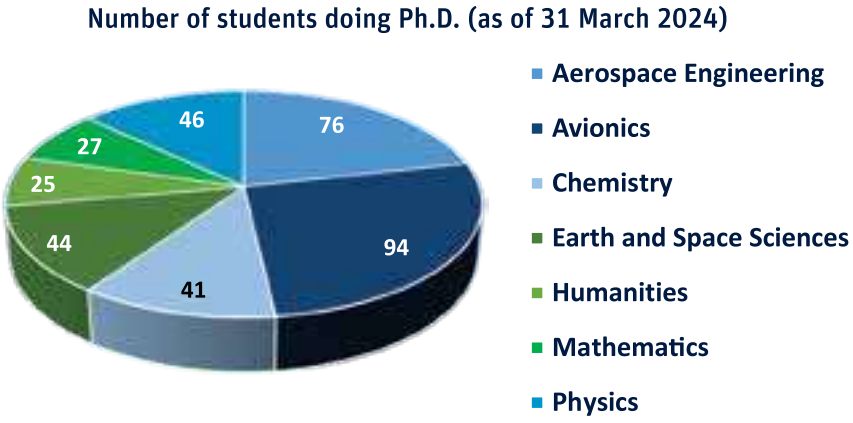
IIST is recognised for the excellence and diversity of its research, promoting scholarly inquiry through PhD programs governed by all seven departments. The faculty in the engineering, science, humanities and social science departments engages in active research in cutting-edge domains, including space-related topics, producing publications in prestigious international and national journals as well as patents. The faculty and students engage in international and national conferences. This year, admissions to PhD programmes were held in July 2023 and January 2024, with qualified GATE/UGC/CSIR NET-JRF/JEST or equivalent exams. During the reporting period, 98 students registered for PhD programmes, the details of which are provided below:

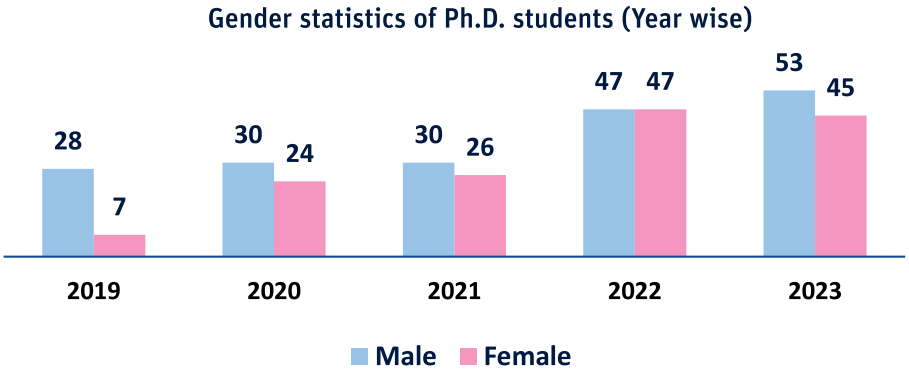
PhD Enrollment April 2023 to March 2024

Department	Full Time	Part Time	Total
Aerospace Engineering	9	9	18
Avionics	10	22	32
Chemistry	12	3	15
Earth and Space Sciences	6	1	7
Humanities	5	2	7
Mathematics	6	1	7
Physics	6	6	12
Total	**54**	**44**	**98**

Number of Ph.D. students enrolled since 2019 (Year wise)







3.4 Convocation

The 11th convocation of IIST was held on 18th August 2023 at Pearl Jubilee Auditorium LPSC campus, Valiamala. Padma Vibhushan Dr. B N Suresh, Chancellor ofIIST has presided over the function.

Dr. K Radhakrishnan, Member Space Commission and former Chairman ISRO & Secretary DOS was the chief guest and delivered the convocation address. Shri. S Somanath, Chairman ISRO, President IIST Governing

Body addressed the gathering and Dr. V Narayanan, Director LPSC was the Guest of Honour. The report on IIST activities was presented by Dr. S Unnikrishnan Nair, Director, and Chairman BoM, IIST. A total of 135 undergraduate degrees, 18 dual degrees, 97 postgraduate degrees and 38 Ph.D. degrees were awarded during the convocation.

Dr. S. Unnikrishnan Nair, Director of IIST, extended a warm welcome to the esteemed visitors, invitees, parents, students, educators, and staff. He presented the convocation report with a commitment that the institute will strive for academic and research excellence by introducing NEP-2020, strengthening collaboration with various ISRO centres, international collaborations, industry engagements and developing cutting-edge technologies and skilled manpower according to the changing ecosystem of New space policy. In his speech, Dr B.N. Suresh, Chancellor IIST, urged the graduating students to ensure that the knowledge they gained has to permeate into all the strata of society to provide a better quality of life for the wider spectrum of society. Shri. S. Somanath, President GB, emphasised that the space sector reform time has come for ISRO / DoS centres to concentrate on more R&D projects that will give an edge compared to the competitors. Therefore, the role of IIST in creating a research dominant culture within ISRO becomes most important and should become the integral part of the ISRO research canvas. Dr. V. Nararyanan, Guest of Honour, commended IIST for its remarkable achievements across various domains, including education, research, and satellite construction. In his convocation address, Dr. K Radhakrishnan congratulated the graduating students. He stated that in the near future, IIST will evolve as the beacon of futuristic knowledge, culture and ethics of the national space sector in its strive to gain prominence in the 'New Space Age'. The Indian higher education system is in transition, with a huge emphasis on research, innovation, and entrepreneurship.

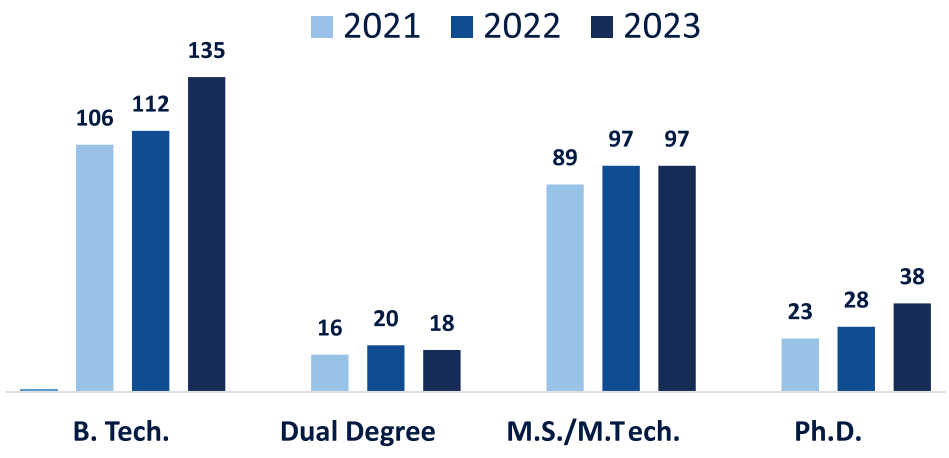
3.5 Degrees Conferred

In the 11th convocation of IIST, BTech degrees were conferred on 135 students, 71 students graduated in Aerospace Engineering and 64 in Electronics and Communication Engineering (Avionic). 18 Students of the Dual Degree program received their BTech degree in Engineering Physics and MTech/MS in their specialization - Optical Engineering, Solid State Physics, Earth Systems Science and Astronomy & Astrophysics. The M. Tech degree was conferred on 97 students (Department of Aerospace – 18, Department of Avionics- 39, Department of Chemistry -9, Department of Earth and Space Science - 15, Department of Mathematics - 8, Department of Physics –5) and Master of Science degree was received by 3 students from the Department of Earth and Space Science. PhD degrees were awarded to 38 students across all the seven departments. After degree were conferred in the 11th convocation, the total degrees awarded by the institute will be 1626 BTech, 104 Dual Degree, 784 MTech and 168 PhD degrees.

Degree Awarded – 11th Convocation (August 18, 2023)

Degree	Discipline	No. of Students Passed out
Bachelor of Technology	Aerospace Engineering	71
	Electronics & Communication Engineering (Avionics)	64
Dual Degree	B.Tech in Engineering Physics + M.Tech in Earth System Science	4
	B.Tech in Engineering Physics + Master of Science in Astronomy & Astrophysics	5
	B.Tech in Engineering Physics + M.Tech in Optical Engineering	4
	B.Tech in Engineering Physics + Master of Science in Solid State Physics	5
Master of Technology	Aerodynamics and Flight Mechanics	5
	Structures and Design	6
	Thermal and Propulsion	7
	Control Systems	8
	Digital Signal Processing	10
	Power Electronics	7
	RF and Microwave Engineering	8
	VLSI and Microsystems	6
	Materials Science and Technology	9
	Earth System Science	8
	Geoinformatics	7
	Machine Learning and Computing	8
	Optical Engineering	4
	Solid State Technology	1
Master of Science	Astronomy and Astrophysics	3
Doctor of Philosophy (PhD) Degree		38
Total		288

Students graduated in the last three years



3.6 Ph.D. thesis and the degree awarded

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

1. Elizabeth George (SC18D038) - Investigation of ON-to-ON Body and ON-to OFF Body Channel Characteristics in Static/Dynamic Human Body Model using High Gain Antennas - Dr Chinmoy Saha /Avionics / April 03, 2023.
2. Babitha George (SC17D014) - Predictability and Dynamics of Extreme Weather Events over the Indian Subcontinent using Ensemble Sensitivity Analysis in EnKF Data Assimilation System - Dr Govindankutty M / Earth and Space Sciences / April 12, 2023.
3. Pavanam Thomas (SC19D009) - Impact of Technical Barriers to Trade (TBT) on Seafood Exports of India: A Study of EU Approved Manufacturer Export Units in Kerala - Dr Shaijumon C S / Humanities / April 19, 2023.
4. Anupama S (SC16D003) - Nonlinear and Nonclassical Properties of Deformed Quantum States - Dr Sudheesh Chethil / Physics / April 27, 2023.
5. Janaki Raman Babu (SC16D036) - A Study on Subalgebras of Affine Fibrations Using Locally Nilpotent Derivations - Dr Prosenjit Das / Mathematics / May 31, 2023.
6. Monisha Mohan (SC16D025)- Kavu as a Cultural Imaginary: A Study on the Representation of Sacred Groves in Malayalam Cinema - Dr Gigy J Alex / Humanities / June 12, 2023.
7. Danish Handa (SC17D015)- Investigations on Eccentric Sleeve Grinding: An Intermittent-Progressive Machining Strategy for Fibre Reinforced Polymer Composites - Dr Sooraj V S / Aerospace Engineering / June 13, 2023.
8. Aswathy M (SC18D026) - Development of Novel Stochastic Meshless Methods for Linear and Nonlinear Problems in Structural Mechanics - Dr Arun C.O & Dr Praveenkrishna I R / Aerospace Engineering / June16, 2023.
9. Sajith V S (SC18D007) - Spin Dynamics at Fast MAS in 1H-14N Double Cross Polarization and TRAPDOR-HMQC Experiments Involving Spin 3/2 Nuclei - Dr S Jayanti / Physics/June 2023.
10. Risha Raju (SC16D037) - Experimental Studies of Selective Catalytic Reduction of NOx with NH3 on Cu-ZSM-5 Foam Catalysts - Dr. A. Salih & Dr. Kuruvilla Joseph / Aerospace Engineering/ June 23, 2023.
11. Arun B Nair (SC16D002) - Self-excited oscillations in low-density round and rectangular jets - Dr. Vinoth B R / Aerospace Engineering / June 26, 2023.
12. Meenakshi S (SC19D022) - Investigation of Generation Mechanisms of the Post-Midnight F-Region Irregularities - Dr J Soloman Ivan & Dr S Sridharan / Physics / June 27, 2023.
13. Thiruppathirajan S (SC13D010) - Enhanced Sparsity Order Estimation Techniques for Dynamic Compressed Sensing - Dr. Manoj B S, Dr.Lakshmi Narayanan R & Dr.Sreelal S/ Avionics/ July 05, 2023.
14. Sreelekshmi Mohan (SC18D032) - Protostellar jets: Numerical modeling and observational studies - Dr. Sarita Vig / Earth and Space Sciences / July05, 2023.
15. Nisha (SC19D037) - Investigating the Optical Properties of Tungsten Oxide Thin Films for Selective Hydrogen Gas and Sodium-Ion Sensing - Dr Palash Kumar Basu / Avionics / July12, 2023.
16. Rajesh N (SC16D008) - Effects of dilution on the Laminar Burning Characteristics of Oxy-Dodecane mixtures with and without Hydrogen blending and Oxy-methane mixtures at elevated operating conditions - Dr. Prathap. C / Aerospace Engineering / July 21, 2023.
17. Pammi Guru Krishna Thej (SC16D049) - Efficient Isolation of Exosomes and their Electric Field-Induced Lysis for Electrochemical Impedance Spectroscopy of released Biomarker:An approach towards Liquid Biopsy of Cancer - Dr. Palash Kumar Basu / Avionics / July 26, 2023.
18. Geethu Prabhakar (SC17D009) - Accretion Scenario of Black Hole X-ray Binaries During Outburst - Dr. Samir Mandal / Earth and Space Science /August 04, 2023.

19. Sarath K P (SC18D001) - Direct Numerical Simulation of Flow Instabilities in Variable Velocity Flows - Dr Manu K V / Aerospace Engineering / September 13, 2023.

20. Rakesh Krishnan P P (SC18D013) - Investigations on alumina ceramic forming using natural rubber latex as a binder - Prof. K Prabhakaran & Dr P Arun Kumar / Chemistry / September 21, 2023.

21. Vivekanand V (SC17D026) - A Theoretical Framework for Sparse Recovery Algorithm Design and Evaluation in Compressed Sensing Perspective - Prof. Deepak Mishra / Avionics / October 30, 2023.

22. Rekha Krishnan G (SC19D014) - Studies on adsorbents for Perchlorate Removal from Water - Prof. K Prabhakaran & Dr Benny K George (Retd) / Chemistry / November 16, 2023.

23. Sritam Hajra (SC18D019) - Investigations on Solar Wind-Magnetosphere-Ionosphere coupling during storms and supersubstorms - Prof. Solomon Ivan J & Dr Nirvikar Dashora / Physics /November 22, 2023.

24. Manu K Sukesan (SC19D029) - Investigations on Micronozzle for Satellite Propulsion and Gas Mixture Separation - Prof. Shine S R / Aerospace Engineering /November 24, 2023.

25. Renju Nandan (SC19D023) - Investigation on Aerosol -Cloud Interactions in Water Clouds Using Ground-Based, In-situ and Satellite-Based Observations - Dr Dinesh N Naik & Dr M Venkat Ratnam / Physics /November 29, 2023.

26. Varanasi Satya Sreekanth (SC18D018) - Dictionary Learning Approach To Lidar Sensing Of The Atmosphere - Prof. Deepak Mishra & Dr Raghunath / Avionics / December 01, 2023.

27. Abhirami A J (SC17D002) - Analysis of Failure Mechanisms and Mechanical Properties of Hierarchical Bio-inspired Composites - Prof. Anup S / Aerospace Engineering / December22, 2023.

28. Rachakonda Shri Rama Akshay (SC18D028) - On Improvement of Frequency Stability of Power Systems with Grid Following Converters - Dr Rajesh Joseph Abraham / Avionics /December 28, 2023.

29. Vidya V (SC18D027) - Integrated Battery Charging and Powertrain Schemes for All-Wheel Drive Electric Vehicles - Dr Sudarshan Kaarthick / Avionics / January 11, 2024.

30. Resmi V L (SC19D003) - Fractional Order Cardiovascular System Model with Baroreflex Control - An Optimization Approach - Prof. N Selvaganesan / Avionics / January22, 2024.

31. Anjuna Dileep (SC18D034) - Inverse Source Problems for the Damped Euler-Bernoulli Beam and Kirchhoff Plate Equations - Dr K Sakthivel / Mathematics / February 09, 2024.

32. Pramod Martha (SC18D046) - Suspended Gate Field Effect Transistor (SGFET)-based CMOS-MEMS Accelerometer - Dr Seena V / Avionics / February 09, 2024.

33. Athira T S (SC18D036) - Nonlinear phase accumulation of the resultant optical field for a linear phase delay between interfering fields - Dr Dinesh N Naik / Physics / February 14, 2024.

34. Lekshmi S R (SC18D042) - Investigations on Turbulence Impacted Structured Laser Beams for Free-Space Optical Communications - Prof. C S Narayanamurthy / Physics / March 15, 2024.

35. Rithwik N (SC16D034) - Optimal Mission Design to Lagrangian Points - Dr R Venkata Ramanan / Aerospace Engineering / March 19, 2024.

36. Anuja Vijayan (SC14D017) - Experimental Characterisation and Numerical Modelling of Planar Cavitating Venturis - Dr Pradeep Kumar P / Aerospace Engineering /March20, 2024.

37. Kavita Patnaik (SC19D019) - Hybrid Monte Carlo-Gear's Solver to Retrieve the Vertical Profiles of Minor Atmospheric Constituents for Cloud Microphysical Modelling - Prof A Chandrasekhar & Dr Amit P Kesarkar / Earth and Space Sciences / March 22, 2024.

38. Ramyakrishna Enugonda (SC19D027) - Signal Processing and Statistical Analysis of the Weather and Atmospheric Signals using Radar Observations - Prof. Basudeb Ghosh, IIST & Dr V K Anandan / Avionics / March 22, 2024.

3.7 Academic Honours

Mr Hritham Nath (SC19B017) of B.Tech, Aerospace Engineering is honoured with the prestigious Gold Medal for being the best academic performer across all undergraduate programs Mr Arun S (SC19B149) of Master of Science in Solid State Physics through the Dual Degree program, is awarded the Gold Medal for attaining the highest rank among all postgraduate programs. The excellence certificate and cash award for the student who has secured best academic score in Electronics and Communication Engineering (Avionics) is received by Mr Nirbhay Tyagi (SC19B091) and Mr Ayush Sharma (SC19B008) of B.Tech, Aerospace Engineering is selected as the all-rounder of the UG Programs.

The toppers of Aerospace Engineering and Electronics & Communication Engineering branches are now undertaking a sponsored Masters Program at California Institute of Technology (Caltech), USA, before joining ISRO. The 9-month program is financially supported under the Professor Satish Dhawan Endowment Fellowship established between Caltech and department of space (DoS).

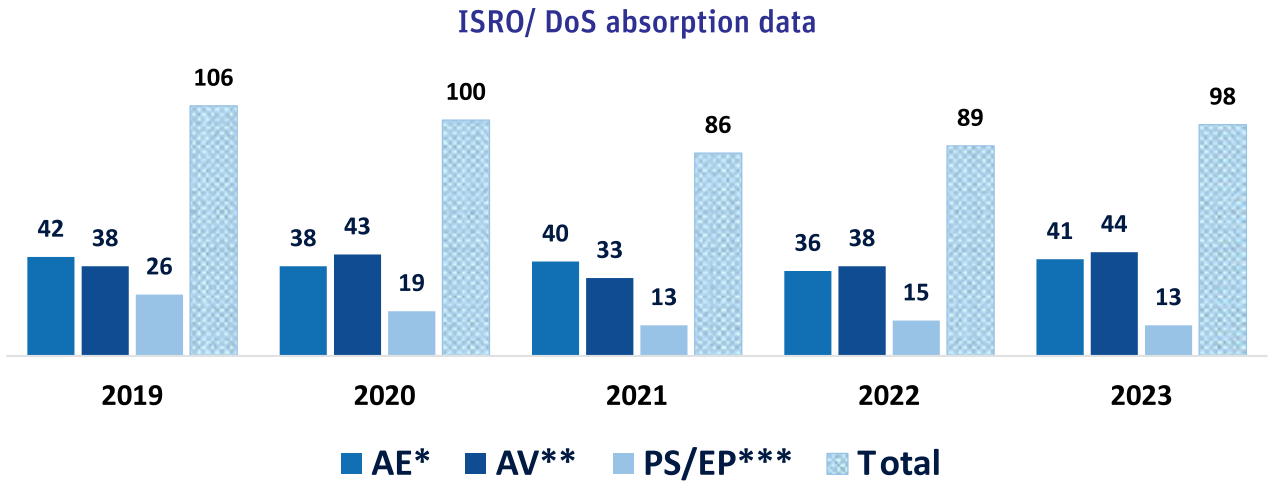
Gold medal for the topper of all B.Tech. branches	Gold medal for the Topper of all PG specializations	Best academic score in Aerospace Engineering	Best all-rounder and the best outgoing student
			
Mr. Hritham Nath (SC 19B017) B.Tech. Aerospace Engineering	**Mr. Arun S.** (SC19B149) Master of Science in Solid State Physics	**Mr. Nirbhay Tyagi** (SC19B091) B.Tech. Electronics and Communication Engineering (Avionics)	**Mr. Ayush Sharma** (SC19B008) B.Tech. Aerospace Engineering

Masters Programme at California Institute of Technology (Caltech), USA	
	
Mr. Hritham Nath (SC 19B017) B.Tech. Aerospace Engineering	**Mr. Nirbhay Tyagi** (SC19B091) B.Tech. Electronics and Communication Engineering (Avionics)

3.8 Placement

3.8.1 ISRO Placement for BTech Students

In 2023-24, the placement process in IIST was conducted during August 2023 and the allotment was made to different DoS centres based on the vacancy. Fourteen ISRO/DoS centres have participated in the process. The B.Tech. and dual degree graduates, who secured a CGPA of 7.5 and above are absorbed into the different centres of ISRO/ DoS. In 2023, 98 students were offered placement in ISRO. They are appointed as Scientist/ Engineer C (pay level 10). A total of 1329 graduates from the institute have joined ISRO so far.



AE: B.Tech Aerospace Engineering
***AV: B.Tech Avionics or B.Tech Electronics and Communication Engg.(Avionics)*
****PS/EP: B.Tech Physical Science, later changed to Dual degree curse with B.Tech in Engineering physics and Masters in Tech./ Master of science.*

3.8.2 Centre for Career Guidance and Placements (CCGP)

The Center for Career Guidance and Placements (CCGP) aims to train students and assist them in securing internships and placements in industries and R&D organisations. The CCGP steering committee is constituted with 9 members from various academic programmes. The current head is Dr. Jinesh K B, Professor Dept. of Physics and Dr. Immanuel Raja, Asso Professor, Dept. of Avionics is Dy. Head of CCGP. The CCGP steering committee was formed to train students and facilitate students 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 CCGP is ensuring student training, career guidance and 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 towards safe and secure future of students.

The CCGP steering committee is regularly meeting to discuss the following activities:

1. Training students on computer coding skills, soft skills, communication skills and conducting related workshops.
2. Increasing student participation in training activities.
3. Creating awareness about IIST to the top recruiting companies and expanding the number of companies visiting IIST for placements.
4. Improve the infrastructure of the CCGP.

In 2023-2024, a total of 95 Companies visited IIST for Placements. For M. Tech., about 59 companies have visited which includes EdgeQ Solutions, Daimler Truck, Marvell Technology, TCS, Robert Bosch, Agnikul Cosmos, Global Foundries, Bharat Electricals Ltd, Honeywell Technology Solution, ST Microelectronics, Intel

Technology, MTAR, Mercedes Benz, TATA Advanced Systems, Siemens Gamesa, Continental Automotive, Dhruva Space, Pramatra Space, Mahindra & Mahindra, Textron India, Unstring Tech Solutions, Infosys, SquareYard, BYJU's, Skyroot Aerospace, Standard Auxiliary Private Limited, Renesas Electronics, TATA Elxsi, Delta Electronics, C-DAC. The maximum package offered was 21.15 Lakh per annum (LPA) for M.Tech. students with Median CTC of 12 LPA. About 60 students had received the internship offers from various govt. and private organisations.

For B.Tech. students, Indian Space Research Organization (ISRO) has recruited all the students with a CGPA of 7.5/10 and above. In addition, to ISRO, 36 companies have visited IIST including companies like Accenture, Agnikul Cosmos, L&T Limited, Qspider, Stardour, Unistring Tech solutions, CDAC- TVM, DFY Graviti Technologies etc. The highest package offered for B.Tech. students was 11.5 LPA.

Internship Details M.Tech (2022-2024)

SL. NO.	STUDENT ID	NAME OF THE STUDENTS	COURSE	NAME OF THE COMPANY
1	SC22M044	Oindrila Biswas	Digital Signal Processing	M/s TCS
2	SC22M100	Rajas K. Dalvi	Quantum Technology	M/s TCS
3	SC22M101	V Abhijith Tej	Quantum Technology	M/s TCS
4	SC22M058	Shiva Prasad R	VLSI & Microsystems	M/s EdgeQ Solutions
5	SC22M013	Arjun Chandran	Structure & Design	M/s Vashishtha Research Pvt Ltd
6	SC22M013	Arjun Chandran	Structure & Design	M/s Textron India
7	SC22M120	Adithya K Rao	Structure & Design	M/s Textron India
8	SC22M115	Pooja Bhat	Structure & Design	M/s Altair India
9	SC22M005	Nouman Uddin	Aerodynamics & Flight Mechanics	M/s IISc Bangalore
10	SC22M111	Bala Pavan Kalyan Ravda	Structure & Design	M/s Textron India
11	SC22M044	Oindrila Biswas	Digital Signal Processing	M/s Skyroot Aerospace
12	SC22M105	Yogeshwaran B	Control Systems	M/s Skyroot Aerospace
13	SC22M118	Sankhodeep Mitra	Control Systems	M/s Abyom Space Tech
14	SC22M005	Nouman Uddin	Aerodynamics & Flight Mechanics	M/s IIT Kanpur
15	SC22M064	Ananthesh Kumar Y	Material Science & Technology	M/s TVS Motors
16	SC22M069	Kaustubh Manoj Kumar	Geoinformatics	M/s John Deer Pvt Ltd
17	SC22M134	Akash Chandran	VLSI & Microsystems	M/s Marvell India Pvt Ltd
18	SC22M042	Aswathy Jayaprakash	Digital Signal Processing	M/s Continental Automotives
19	SC22M113	Divya P	Digital Signal Processing	M/s Continental Automotives
20	SC22M043	Jishil Jinaraj	Digital Signal Processing	M/s Continental Automotives
21	SC22M093	Sudipta Santra	Machine Learning & Computing	M/s Continental Automotives
22	SC22M088	Prakash Babu K	Machine Learning & Computing	M/s Continental Automotives
23	SC22M056	Savio Sebastian	VLSI & Microsystems	M/s ST Microelectronics
24	SC22M083	Akash Lanjhi	Machine Learning & Computing	M/s Continental Automotives

25	SC22M084	Aritra Roy	Machine Learning & Computing	M/s Continental Automotives
26	SC22M044	Oindrila Biswas	Digital Signal Processing	M/s Continental Automotives
27	SC22M092	Sneha Tiwari	Machine Learning & Computing	M/s Continental Automotives
28	SC22M140	Jishnudev PG	Quantum Technology	M/s C DAC Hyderbad
29	SC22M090	Om Tiwari	Machine Learning & Computing	M/s C DAC Hyderbad
30	SC22M105	Yogeshwaran B	Control Systems	M/s Continental Automotives
31	SC22M062	Veena V	VLSI & Microsystems	M/s C DAC Bangalore
32	SC22M063	Vignesh M	VLSI & Microsystems	M/s C DAC Bangalore
33	SC22M119	Vivek Rakshit	Geoinformatics	M/s C DAC Bangalore
34	SC22M090	Om Tiwari	Machine Learning & Computing	M/s NRSC
35	SC22M092	Sneha Tiwari	Machine Learning & Computing	M/s Robert Bosch
36	SC22M094	Viswanathan Mukundan	Machine Learning & Computing	M/s Robert Bosch
37	SC22M062	Vignesh M	VLSI & Microsystems	M/s Robert Bosch
38	SC22M063	Veena V	VLSI & Microsystems	M/s Robert Bosch
39	SC22M060	SMG Amzad	VLSI & Microsystems	M/s Robert Bosch
40	SC22M112	Anshuman Mohanty	Power Electronics	M/s Robert Bosch
41	SC22M066	Yadukul Sankar	Material Science & Technology	M/s Hind High Vaccum
42	SC22M038	Manoj Kumar M	Control Systems	M/s VSSC
43	SC22M109	Aishwarya Vishwanath	Control Systems	M/s VSSC
44	SC22M059	Shreeranga R B	VLSI & Microsystems	M/s SAC
45	SC22M071	Rajkumar P	Geoinformatics	M/s Bhuhparamaan
46	SC22M108	Rathin Dey	RF & Microwave Engineering	M/s ISTRAC
47	SC22M122	Raj Karmakar	RF & Microwave Engineering	M/s ISTRAC
48	SC22M090	Om Tiwari	Machine Learning & Computing	M/s Continental Automotives
49	SC22M072	Shameela S F	Geoinformatics	M/s SAC
50	SC22M047	Prateek Singh	Power Electronics	M/s Volvo
51	SC22M070	Sriman P	Geoinformatics	M/s Aon Forecasting
52	SC22M050	Karthik Srivatsa MB	RF & Microwave Engineering	M/s Robert Bosch
53	SC22M052	Surabhi Gupta	RF & Microwave Engineering	M/s Robert Bosch
54	SC22M136	Princy	RF & Microwave Engineering	M/s Robert Bosch
55	SC22M125	Akhil Kumar	Material Science & Technology	M/s IIT BHU
56	SC22M053	Bhukya Bala Krishna	VLSI & Microsystems	M/s Robert Bosch
57	SC22M089	Neeraj Saini	Machine Learning & Computing	M/s Litmus 7
58	SC22M118	Sankhodeep Mitra	Control Systems	M/s Data Patterns
59	SC22M106	Deepak Kumar Singh	VLSI & Microsystems	M/s 3rditech Solution
60	SC22M140	Jishnudev PG	Quantum Technology	M/s Quanfluence Pvt Ltd

Placement Details

B. Tech 2020-2024 Batch and M. Tech 2022-2024 Batch

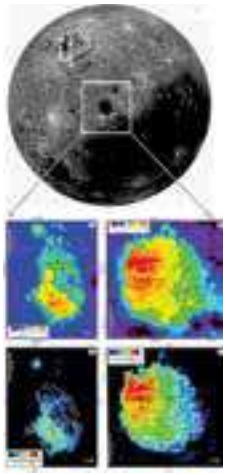
SL. NO.	NAME OF THE STUDENTS	COURSE	NAME OF THE COMPANY
		B.Tech	
1	Vishnu V	Aerospace Engineering	M/s Accenture
2	Gadamsetty Tejasri Venkat	Aerospace Engineering	M/s Agnikul Cosmos
3	Karthik Mishra	Aerospace Engineering	M/s L&T Limited
4	Nannapaneni Chetan Pavan Sai	Avionics	M/s QSpider
5	Shubham Tayade	Avionics	M/s QSpider
6	Vinay Bodalkar	Avionics	M/s QSpider
7	LAKSHYA JEENGAR	Avionics	M/s QSpider
8	Shobhit Gautam	Avionics	M/s QSpider
9	Akshay B Panicker	Avionics	M/s Stardour
10	Abin Antony M	Avionics	M/s Unistring Tech Solutions
11	Akshay B Panicker	Avionics	M/s CDAC- TVM
12	Niranjan R	Avionics	M/s CDAC- TVM
13	Shubham Tayade	Avionics	M/s DFY Graviti Technologies
		M.Tech	
14	Shiva Prasad R	VLSI and Microsystems	M/s EdgeQ Solutions
15	Akash Chandra	VLSI and Microsystems	M/s Marvell Technology
16	Akansha Varma	Aerodynamics & Flight Mechanics	M/s Agnikul Cosmos
17	Vibha Dhanaji Patil	Aerodynamics & Flight Mechanics	M/s Agnikul Cosmos
18	Sathis Kumar	Power Electronics	M/s Agnikul Cosmos
19	Sankhodeep Mitra	Control System	M/s L&T Limited
20	Alinda Sharma	Aerodynamics & Flight Mechanics	M/s L&T Limited
21	Mithuna L	Thermal & Propulsion	M/s L&T Limited
22	Nouman Uddin	Aerodynamics & Flight Mechanics	M/s L&T Limited
23	S Janani	Structure & Design	M/s L&T Limited
24	Pulkit Pandey	Aerodynamics & Flight Mechanics	M/s L&T Limited
25	Anjitha Vijayakumar	Control System	M/s L&T Limited
26	Sankhodeep Mitra	Control System	M/s Data Patterns
27	Mayuresh Mohan Hajare	Structure & Design	M/s Qsipder
28	Rahul Kumar	Thermal & Propulsion	M/s Stardour
29	Talari Murali Krishna	Thermal & Propulsion	M/s Stardour
30	Chirag Vijay Jha	Control System	M/s Data Patterns
31	Deepak Kumar Singh	VLSI and Microsystems	M/s 3rdiTech Solutions
32	Oindrila Biswas	Digital Signal Processing	M/s 3rdiTech Solutions
33	Tejo Sai Muneeshwar Kalahasti	Thermal & Propulsion	M/s Cyient
34	Gode Oasis Siddhardha	Structure & Design	M/s L&T Limited
35	TEJO SAI MUNEESHWAR KALAHASTI	Thermal & Propulsion	M/s L&T Limited
36	Rahul Prakash Munjoji	Structure & Design	M/s L&T Limited
37	Yogeshwaran B	Control System	M/s L&T Limited
38	Prateek Singh	Power Electronics	M/s Delta Electronics
39	Anshuman Mohanty	Power Electronics	M/s Delta Electronics
40	Vaddeboina Abhijith Tej	Quantum Technology	M/s CDAC - HYD
41	Soham Maiti	VLSI and Microsystems	M/s CDAC - HYD

42	Rajkumar P	Geoinformatics	M/s L&T Limited
43	Pooja Bhat	Structure & Design	M/s Grid Pro
44	Sri Sruthi T S	RF and Microwave Engineering	M/s Cyient
45	Shaik Hasmitha Mohisin	Control System	M/s MTAR
46	Aasiya Sameen	RF and Microwave Engineering	M/s Mercedes Benz
47	Yogeshwaran B	Control System	M/s Data Patterns
48	Tondup Dolkar	Aerodynamics & Flight Mechanics	M/s Dhruva Space
49	Divya P	Digital Signal Processing	M/s Pramatra Space
50	Yogeshwaran B	Control System	M/s Pramatra Space
51	Adithya K Rao	Structure & Design	M/s Textron India
52	Ravada Bala Pavan Kalyan	Structure & Design	M/s Textron India
53	Divya P	Digital Signal Processing	M/s Ananth Technologies
54	Shankar Waskle	VLSI and Microsystems	M/s Unstring Tech Solutions
55	Swetha Lakshmi S	Aerodynamics & Flight Mechanics	M/s Standard Auxiliary Private Limited
56	Kavyashree K	Aerodynamics & Flight Mechanics	M/s EtherealX
57	Aswathy Jayaprakash	Digital Signal Processing	M/s Mahindra & Mahindra
58	Anjitha Vijayakumar	Control System	M/s Mahindra & Mahindra
59	Pooja Bhat	Structure & Design	M/s Mahindra & Mahindra
60	Arjun Chandran	Structure & Design	M/s Vashishtha Research
61	Karthik Srivatsa MB	RF and Microwave Engineering	M/s Robert Bosch
62	Vignesh M	VLSI and Microsystems	M/s Robert Bosch
63	Surabhi Gupta	RF and Microwave Engineering	M/s Robert Bosch
64	Anshuman Mohanty	Power Electronics	M/s Robert Bosch
65	Manoj Kumar M	Control System	M/s Bharat Electricals Ltd
66	Chirag Vijay Jha	Control System	M/s Astrogate Labs
67	Patil Guruprasad Shahaji	Quantum Technology	M/s IIT Madras (Project Associate)
68	Anshuman Mohanty	Power Electronics	M/s Daimler Truck Innovation
69	Abhiram R	Thermal & Propulsion	M/s Honeywell Technology Solution
70	Savio Sebastian	VLSI and Microsystems	M/s C DAC TVM
71	Veena V	VLSI and Microsystems	M/s C DAC TVM
72	Sajid Momin	Thermal & Propulsion	M/s Skyroot Aerospace
73	Jishnudev	Quantum Technology	M/s Quanfluence
74	Oindrila Biswas	Digital Signal Processing	M/s Ananth Technologies
75	Neeraj Saini	Machine Learning and Computing	M/s Litmus7 Solutions
76	Ananthesh Kumar Y	Material Science and Technology	M/s Skyroot Aerospace
77	Mithuna L	Thermal & Propulsion	M/s Honeywell Technology Solution
78	Kishore S	Thermal & Propulsion	M/s Skyroot Aerospace
79	SMG Amzad	VLSI and Microsystems	M/s Elveego circuits
80	Rathin Dey	RF and Microwave Engineering	M/s Data Patterns
81	Sreya TJ	Power Electronics	M/s Inventronics SSL India Ltd

Research & Development

4. Research and Development

Indian Institute of Space Science and Technology (IIST), operating under the aegis of the Department of Space, Government of India, characterizes the vision for excellence in education and research in the domains of space science and technology. In addition to the vision of nurturing skilled human resources for Indian Space Research Organization and other related industries, IIST also offers an exclusive environment for research and development in the spheres of science and technology. The uniqueness of IIST is the platform for the faculty-student community to participate in space research and development, in collaboration with ISRO centres across the country.



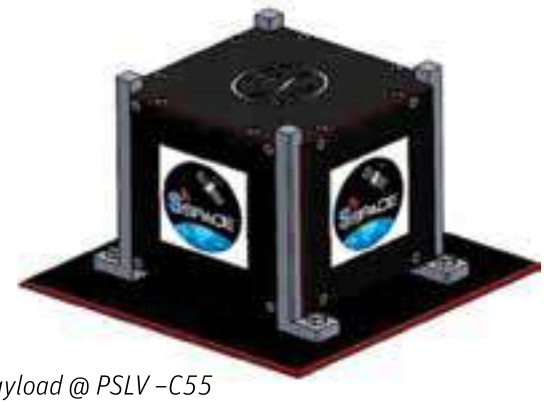
4.1 Contributions in Space Missions

The collaborative research efforts of IIST faculty along with ISRO scientists have provided unique opportunities for the students to participate in some of the space missions. PSLV-PS4- POEM platform based-microgravity experimentations and associated missions are some of typical examples, which makes IIST unique in our research efforts and contributions towards the Indian space program. The first student-built sounding rocket mission is also credited to IIST.

Following are the list of missions successfully accomplished by IIST faculty student-groups in close collaboration with ISRO centers during the period of reporting.

- ARIS 201F, a PS4 payload for LEO Ionosphere studies launched on the POEM2 platform of PSLV C55 in April 2023
- PILOT(Pslv-orbitaL Obc and Thermals), successfully launched in April 2024, where indigenously developed sub-systems at IIST such as OBC for the future missions such as AHAN (IIST student satellite) were tested in the PS4 stage.

IIST faculty-student team at SDRC, Sriharikota for the launch of PSLV-C55, with two POEM payloads from IIST



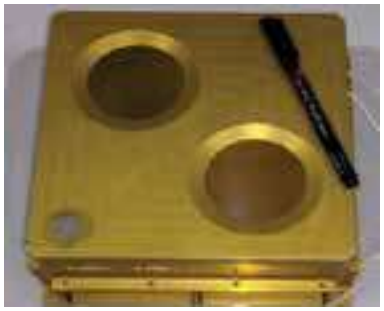
ARIS & PILOT Payload @ PSLV –C55

4.1.1 ARIS 201F payload from IIST @ PSLV C55

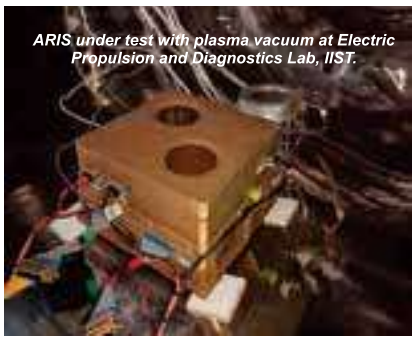
Advanced Retarding potential analyzer for Ionospheric Studies

Technical Specifications

- Orbit: 585 km
- Mass: 2.8 kg.
- Power: 7W.
- Sensor volume: 80 mm dia. x 40mm.
- Electronics box volume: 203mm x 203mm x 120mm
- Current resolution: 10 pA.
- Current accuracy: 1%.
- Dynamic range: 103
- Processing time: 10 ms.



ARIS (Advanced Retarding Potential Analyser for Ionospheric Studies) is an ionospheric plasma and electrostatic instrument developed by IIST for the structural and compositional studies of the ionosphere. Earth's ionosphere is a natural detector of terrestrial phenomena and solar activities. Small and difficult-to-detect geomagnetic variations can easily be sensed in the ionosphere, such measurements are predicted to precede imminent earthquakes by a few hours. Similarly, solar activity which is the main driver of the ionosphere can be studied in real-time by performing ion and electron density measurements in the ionosphere. Such measurements provide us with the warning of hazardous radiation effects on space assets, possible radiation exposure to aircraft crew and possible power grid disruptions. Therefore, real-time and constant monitoring of ionospheric behaviour is of great importance to humans in day-to-day life.



ARIS under test with plasma vacuum at Electric Propulsion and Diagnostics Lab, IIST.

ARIS 201F was successfully launched via the POEM platform of PSLV C55 on 22nd April 2023. ARIS 201F is an upgraded version of ARIS 101F which was flown to Earth's ionosphere in 2019 as part of the PSLV C45 mission. Upgradations include indigenous and in-house-built sensors with high sensitivity and high energy resolution and optimised operating parameters to receive more data in the energy range relevant to the Earth ionosphere (based on data received from ARIS 101F). The payload uses a Dual-Retarding Potential Analyser (RPA) configuration, Ion-mode RPA (I-RPA) and electron-mode RPA (E-RPA) along with four electronics cards (Pre-amplifier board, front-end electronics board, data acquisition board and power generation board).

4.1.2 PILOT Payload from IIST @ PSLV C55

Pslv-In-orbitaL Obc and Thermals

The PILOT is a technology demonstration student payload designed for PSLV Orbital Experimental Module (PEOM). The main mission objectives were the following.

- To demonstrate the 3D printed metal structure performance for satellite related applications designed by IIST and fabricated with the support of L&T Aerospace Pvt. Ltd., Coimbatore.
- To demonstrate the thermal simulation model with flight data acquired through sensors placed at strategic locations.
- 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.
- To demonstrate the indigenously developed RS485 telemetry communication with the POEM payload.

4.2 Satellite Ground Station

An indigenously developed ground station & first of its kind in academic community across the country

It is again 'unique' to specify the establishment of a Satellite Ground Station (probably one of its kind in academic community), which is successfully managing telecommand, telemetry, and data reception for various missions. It is used for IIST's own missions such as INSPIRESat-1 etc., as well as to support some of the external missions including some start-up initiatives. These achievements mark the unique performance of the IIST in its coveted area viz. Space Science and Technology. Equipped with UHF and S-band operations, IIST ground station handles telecommand and telemetry at 9.6 kbps, while the S-band is used for transmitting payload data at 2 Mbps. This facility development, includes the advanced separation systems and spacecraft integration processes, reflects IIST's hands-on approach to space missions. Students are actively involved in pre-launch documentation and spacecraft integration, gaining valuable practical experience that prepares them for industry roles and enhances their understanding of spacecraft operations.

The objective of IIST satellite ground 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 (Radiosonde 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 a 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 program mode.

A standalone VHF/UHF SDR ground station unit is also 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 the azimuth plane and 0-90- degree motion in the 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. The antenna systems, fixtures and related hardware, installation supports etc., were indigenously managed with the support of SSPACE and manufacturing lab facility of IIST. Sincere 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

4.3 IIST Ponmudi Climate Observatory

A high-altitude site for Atmospheric Science Study

The Ponmudi Climate Observatory of the Indian Institute of Space Science and Technology (IIST-PCO) is located at the confluence point of the Arabian Sea, Indian Ocean, and Bay of Bengal atop the southern end of Western Ghats (8.76Â°N, 77.12Â°E, 1.0 km, AMSL). The Western Ghats, extending along the western coast of India, acts as a barrier to the southwesterly winds of the south-west monsoon currents (June-September, while serves as the recipient of the north-east monsoon current (November-February). The IIST-PCO is primarily beneath the cloud layer influenced by the south-west and north-east monsoonal flows, serves as a natural laboratory for conducting high quality measurements of aerosol and cloud for an improved representation of aerosol-cloud interaction in climate models. A range of field instruments has been commissioned to measure aerosol and cloud microphysics, along with meteorological variables. Following rigorous quality checks, the data collected from these instruments can be disseminated to collaborating institutions, as well as national and international users, for climate studies. The observatory is also equipped with balloon launch facility for research in space science and technological demonstration.

4.4 SSPACE

Small-Spacecraft systems and PAyload CEntre

Small-Spacecraft Systems and Payload Centre (SSPACE) established at IIST is a central facility that fosters student-led small satellite projects with active involvement from IIST faculty, ISRO centers, startups and other R&D organizations. It promotes interdisciplinary collaboration, subsystem specialization, and hands-on training. Students are highly benefited from this unique platform of comprehensive learning experience that includes participation in space mission design contests and credit internships, which are integral to developing industry-ready skills and advancing space research.

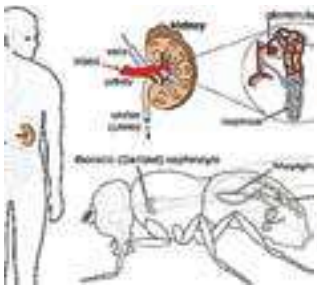
Some of the ongoing research and developmental activities under SSPACE in collaboration with ISRO centres and R&D labs include the following;

- The Integrated Diagnostics Module (IDM) payload for the upcoming electric propulsion satellite.
- Space Biology Payload to investigate Spaceflight induced changes in kidney stone formation of Drosophila (fruit) fly.
- Development of real time gas sensor for the crew module of GAGANYAAN flight.
- Development of a Hybrid Propulsion Experimental Rocket (HyPER-D), a sub orbital experimental student rocket.
- Droplet characterization tests of the Scramjet fuel injection struts of ISRO's Dual Fuel Scramjet (DFS) engine.

IDM-EPS payload

Astro-biology payload

InspireSat-3 project IIST



Space biology (Drosophila) Experiment

Hyper-D rocket

4.4.1 Space Eco System @ SSPACE

Academia-Industry- Start-up Collaboration for Space Missions

Initiatives have been made with Industries such as L&D for the combined development of a satellite and the ground station facilities. These are offered as per the norms of IIST for supporting startups such as Dhruva Space. In the PSLV C-58 XPoSat mission launched on the new year day, IIST played a pivotal role in extending telemetry and telecommand support to the space start-up Dhruva Space. The POEM orbiting platform of PSLV C58 has 9 payloads including LEAP-TD from Hyderabad based space start-up Dhruva Space.

Success of any satellite mission lies with the communication from ground for telemetry and telecommand. In this IIST played a pivotal role through Small-spacecraft Systems and PAyload CEntre (SSPACE), ground station tracking systems including antenna and RF systems for Telemetry and Telecommand operations round the clock. IIST has provided ground support to satellites including InspireSat1, InspireSat2, InspireSat4 and POEM payload on PSLV C55, and PSLV C58 mission.

With this, IIST has entered into the domain of services for reliable ground station tracking systems and small satellites providing opportunities for universities and space startups to utilize these facilities on a mutually agreeable basis. In today's world of rapidly advancing space technologies and aligning with the country's goal IIST has started collaborating with Universities and Industries in building small satellites and payloads using innovative technologies for miniaturizing systems, improving performance, reducing cost and rapid deployment of space assets in space.

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 a newly proposed L&T-IIST Satellite- LISAT).

4.4.2 Space Systems and Technology Development

One of the prime focuses of SSPACE is capacity building in the area of spacecraft engineering, and to 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 the 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 computerdeveloped 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-4).
- 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 is designed for subtractive manufacturing.
- Indigenous monolithic 3U Satellite structure is designed and developed using machining route.
- Indigenous monolithic 1U satellite structure is designed for additive manufacturing and developed 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.

4.4.3 Hybrid Rocket Development

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.

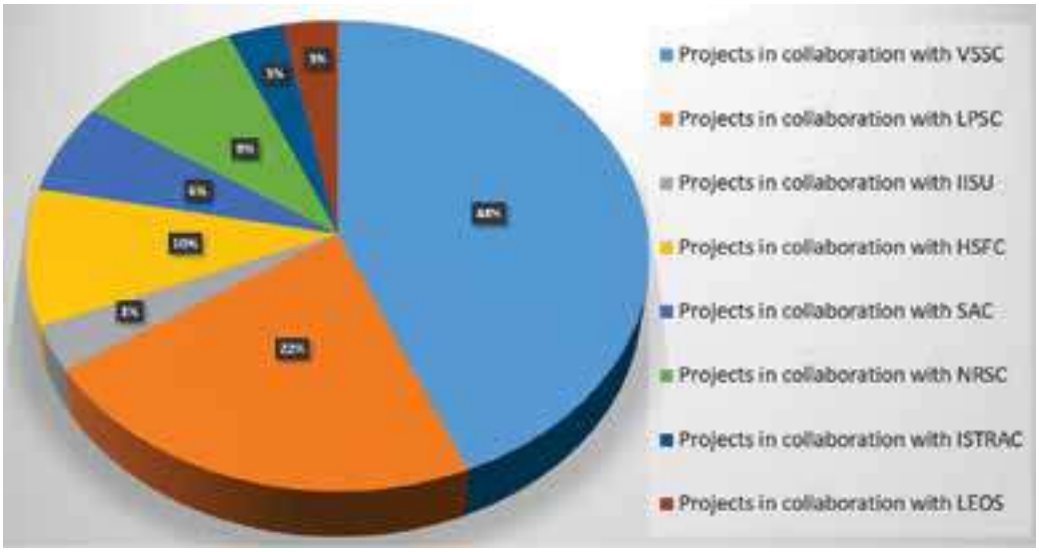
4.5 Advanced Space Research Group (ASRG)

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.

ASRG is headed by the Chief Technology Officer, IIST, with members from all the academic departments as well as a member from the Capacity Building Program Office (CBPO), ISRO HQ. ASRG 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.

The Empowered Overseeing Committee (EOC), which consists of members from all ISRO research centres, is the highest authority for ASRG in reviewing and making decisions on joint research activities. Each ISRO centre has an IIST Link Unit, led by the EOC representative from that centre and supported by a committee appointed by the centre Directors. These units serve as the primary contact points for coordinating joint research programs with IIST, ensuring effective collaboration.

Key highlight of many of these projects is the enrolment of PhD students, jointly guided by supervisors from ISRO Centres and IIST.



Total Number of ASRG Project	32
Projects in collaboration with VSSC	14
Projects in collaboration with LPSC	7
Projects in collaboration with IISU	1
Projects in collaboration with HSFC	3
Projects in collaboration with SAC	2
Projects in collaboration with NRSC	3
Projects in collaboration with ISTRAC	1
Projects in collaboration with LEOS	1

Sl. No	Title of Project	Project Identification No & Year of Commencement	Focal points (IIST & ISRO)	Budget (Lakhs)	Duration and Status
IIST- VSSC Projects (Ongoing)					
01	Investigations on Laser Based - Powder Feed Type-Direct Energy Deposition (LAM-DED) for Additive Manufacturing of Components in Space Applications.	IIST/VSSC/11/2022/31 June 2023	V S Sooraj, IIST Anilkumar, VSSC	29.85	3 Years Ongoing
02	Indian Space Program and its Impact on the Industrial sector of India.	IIST/VSSC/11/2022/32 June 2023	Lekshmi V Nair and Shaijumon C S, IIST Santhoshkumar, VSSC	7.64	2 Years Ongoing
03	Design of Multi-Channel Temperature Monitoring ASIC.	IIST/VSSC/11/2021/25	Immanuel Raja, IIST Deepu Roy, Padma kumar, VLDD/ FCG/AVN, VSSC	24.00	2 Years Ongoing
04	Nano structured high performance anode materials for high power, higher safety and fast charging Li-ion battery.	IIST/VSSC/03/2021/03 Dec 2024	Mary Gladis J., IIST Jalaja K, SVS Narayana Murty, Bibin John, Mercy TD, VSSC	11.64	2 Years Ongoing
05	High-Q dielectric thin films with tunablity in Microwave frequencies for Space applications.	IIST/VSSC/03/2021/04 Dec 2024	K. B. Jinesh, IIST K Ashok, VSSC	40.64	2 Years Ongoing
06	Development of Yttrium Iron Garnet (YIG) thin films for space applications and Dielectric Test setup for ceramics at high Electric field and temperatures.	IIST/VSSC/03/2021/04 Dec 2024	K. B. Jinesh, IIST K Ashok, VSSC	39.64	2 Years Ongoing
07	Design & Development of Magneto Dielectric Substrate/ Metamaterial based L- band Antenna.	IIST/VSSC/03/2021/06	Basudeb Ghosh, IIST K.Ashok and Femina Beegum S, VSSC	4.32	1 Year Ongoing

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08	Implicit large Eddy Simulation of Jets.	IIST/VSSC/03/2021/07	Manoj T Nair, IIST Sanjoy Kumar Saha, VSSC	13.52	3 Years Ongoing
09	Supersonic combustion of isrosene behind two strut configuration.	IIST/VSSC/03/2021/08	V Aravind (IIST), Desikan. SLN and B. Murugan (VSSC)		3 Years Ongoing
10	Development of Graphene based anticorrosion coating for stainless steel bipolar plates of PEM fuel cells.	IIST/VSSC/03/2021/09	K. Y. Sandhya, IIST Remyamol T, VSSC	54.64	2 Years Ongoing
11	Improved Silicon- graphene based composite as anode materials for lithium battery cells and exploring the possibility of other battery technologies.	IIST/VSSC/03/2021/10	K. Y. Sandhya, IIST S A Ilangovan and S Sujatha, VSSC	31.64	2 Years Ongoing
12	Graphene nano platelets incorporated zinc rich epoxy coating for corrosion protection of steel hardware.	IIST/VSSC/03/2021/11	Mary Gladis J. and Kuruvilla Joseph, IIST Anoop S, Venugopal A, Jalaja K, Narayanamurthy S V S, VSSC	18.64	2 Years Ongoing
IIST- LPSC Projects (Ongoing)					
13	Near and field diagnostics NET.	IIST/LPSC/03/2021/13	Umesh R Kadhane, IIST, Varaprasad Kella, LPSC	32.28	2 Years Ongoing
14	Development and implementation of LIF inversion algorithm for NET diagnostics at SEP facility in LPSC.	IIST/LPSC/03/2021/14	Umesh R Kadhane, IIST, Varaprasad Kella, LPSC	13.52	3 Years Ongoing
15	Life time predication of HET liner using simulations.	IIST/LPSC/03/2021/15	Umesh R Kadhane, IIST Pranav Nath, LPSC	4.32	1 Year Ongoing
16	Experimental and Numerical Investigation of Direct Contact Condensation of GCO2/ steam in LN2.	IIST/LPSC/03/2021/16	Prathap C and Manu K V, IIST Deepak Agarwal, Mr Anant Singhal	48.52	3 Years Ongoing
17	Performance and Instability Analysis of Methane- Oxygen Combustion using shear coaxial injectoron.	IIST/LPSC/03/2021/ 17	Aravind V, IIST Assiz. M. P, Muthukumaran CK, PRS LPSC	41.52	3 Years Ongoing
18	Three-dimensional DSMC (Direct simulation montecarIo) simuIation for satellite thrusters.	IIST/LPSC/03/2021/ 18	Shine S R, IIST Arun Kumar and Deepak Agarwal, LPSC Vinse Antro.W, IPRC	38.52	3 Years Ongoing
19	Cold Flow Characterization of a Dual Throat Nozzle (DTN) based Tri-Propellant Engine Propulsion System.	IIST/LPSC/11/2021/24	Deepu M., IIST Bijukumar K. S. LPSC	61.52	3 Years Ongoing

IIST- IISU Projects (Ongoing)					
20	High Performance SAR ADC with auto calibration and self-correction for sensor closed loop application.	IIST/IISU/03/2021/12	Immanuel Raja, IIST Raghunath K P and Rekha A R, ADC/APNTD/LVIS (IISU)	53.9	3 Years Ongoing
IIST- NRSC Projects (Ongoing)					
21	Cloud physical properties under Polluted and Unpolluted conditions for Climate Studies.	IIST/NRSC/11/2021/26	P R Sinha, IIST S.V.S. Sai Krishna and Shivali Verma, NRSC	60.04	3 Years Ongoing
22	Automatic labelling methods for development of machine learning applications for inventory of horticulture plantations.	IIST/NRSC/11/2021/27	A M Ramiya, Deepak Mishra, IIST R. Hebbar, Vinod P.V, NRSC	13.26	2 Years Ongoing
23	DEEP CLOUD: Deep learning-based system for time series Cloud detection using multi-sensor satellite Imagery.	IIST/NRSC/11/2021/28	N. Rama Rao, IIST T. Sai Kalpana, NRSC	33.52	3 Years Ongoing
IIST- SAC Projects (Ongoing)					
24	Machine learning driven Augmented Reality based Campus walkthrough.	IIST/SAC/11/2021/22	Deepak Mishra, A M Ramiya, IIST Jai G Singla SIPG, SAC	21.22	3 Years Ongoing
25	Interference analysis and co-existence studies between GSO and NGSO satellite systems.	IIST/SAC/11/2021/23	Vani Devi M, S. Chris Prema and Lakshminarayanan, IIST, S.C. Bera and Saket Buch SNPA, SAC	11.64	2 Years Ongoing
IIST- ISTRAC Projects (Ongoing)					
26	Tracking & Nowcasting of severe convective storms using deep learning (DL)/machine learning (ML) techniques.	IIST/ISTRAC/11/2021/29	Deepak Mishra, Sumitra, PR Sinha, and Govindan Kutty, IIST V.K. Anandan, Shivang Mishra, ISTRAC	27.52	3 Years Ongoing
IIST- LEOS Projects (Ongoing)					
27	Design and construction of MEMS-based portable Seismocardiogram for on-board Cardiac health monitoring of Astronauts.	IIST/LEOS/05/2022/30	K B. Jinesh, IIST Jiju John, LEOS	11.22	1 Year Ongoing

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IIST-HSFC Projects (Ongoing)					
28	Development of Real Time Gas Sensor Array to Monitor Critical Gases in Crew Module for Human Space Mission.	IIST/HSFC/03/2021/ 19	Palash Kumar Basu, IIST, Sreejith, HSFC	274.7	3 Years Ongoing
29	Spaceflight Induced changes in Kidney Stone formation in Drosophila Melanogaster Experimentation. Biology payload for GAGANYAN.	IIST/HSFC/03/2021/ 20	K G. Sreejalekshmi, IIST, Ravikumar Hosamani, Xavier Raja, HSFC	80.27	2 Years Ongoing
30	Development of Mathematical Human Thermal Behavior Model for a Reference Indian Subject linked to Human space flight program of HSFC. (Gaganyaan Projects)	IIST/HSFC/11/2021/21	Shine S R, IIST Chiranjivi, HSFC, Eswer and Jayanand B Sudhir, SCTIMST, Trivandrum.	36.52	3 Years Ongoing
New Initiatives (under final stages of discussion for MoU signing)					
31	Design and development of a bipedal humanoid robot with human like walking ability.	IIST/VSSC/06/2024/33	Sam. K. Zachariah, Deepak Mishra, Sam Noble, V. S. Sooraj, Shine S. R, Shine S R, Rajeevan P P, Sheeba Rani,IIST Biju Prasad, Sandeep, Aneesh Gopinath, Priya C Kurian, VSSC		3 Years

4.6 Highlights of Doctoral Research 2023-2024

❖ **Experimental Characterization and Numerical Modelling of Planar CavitatingVenturis**
[Dr.Anuja Vijayan, Dr. Pradeepkumar, Department of Aerospace, IIST]

A cavitating venturi is a passive device that uses hydrodynamic cavitating flow to anchor the mass flow rate. The inter-phase interactions impart inherent cavity oscillations in the venturi operation, presenting challenges in understanding its flow behaviour and developing reliable numerical models. Cavitating venturis are passive devices with no moving parts. This unique feature makes the device an excellent flow rate controller in various industrial applications. Systematic experiments conducted as a part of the project experimentally characterized the nature and dynamics of the cavitation zone in planar cavitating venturi. Predictability limits of the existing two-dimensional models have been assessed using scaling studies in axisymmetric and planar venturis. A simple one-dimensional model has been constituted to aid in the design and sizing of cavitating venturis. An App has been developed based on this model to aid the venturi sizing. The beta version on this App is being evaluated by LPSC, ISRO with the data available from their cavitating venturis in the fuel feed control lines of rocket engines.

❖ **Optimal Mission Design to Lagrangian Points**
[Dr. Rithwik, Dr. R V Ramanan, Department of Aerospace, IIST]

Scientific missions to Lagrangian points have the potential to enhance the understanding of the universe and to accelerate the exploration of space. A typical mission design to an orbit around the Lagrangian points from the Earth involves two steps. In the first step, an orbit with prescribed geometrical characteristics is designed and in the second step, an optimal transfer trajectory to the orbit from an Earth parking orbit is designed. In the conventional approach to generate the preliminary design, the model of Circular Restricted Three Body Problem (CRTBP) framework is adopted utilizing differential correction (DC) and the transfer trajectory design using manifold theory. In this research, the preliminary design of orbits and transfer to them from the Earth are proposed to be executed under the framework of Elliptic Restricted Three Body Problem (ERTBP) utilizing an evolutionary optimization technique called Differential Evolution (DE). Various periodic orbits and quasi-periodic orbits in the Sun-Earth-spacecraft and Earth-Moon-spacecraft restricted three body systems and transfer trajectories to them from the Earth are generated without leveraging the manifold theory. For the transfer trajectory design in the Earth-Moon system, the proposed two-impulse methodology avoids the bridge segment and generates optimal trajectories with significantly lower flight durations compared to the manifold theory. The preliminary numerical designs are extended to high fidelity ephemeris models. In the ephemeris model, the generated quasi-halo orbits in the Sun-Earth system do not need any theoretical design maneuvers for about five years. For the mission design in the Sun-Earth system, it is substantively concluded that preliminary design using the ERTBP framework does not provide significant advantages over the CRTBP framework due to the near-circular nature of the Earth's orbit around the Sun. The differential evolution technique is found to be very versatile in solving Lagrangian point mission design problems and avoids many complexities associated with the differential correction based technique. However, the DE based schemes are found to be computationally more intensive. The outcomes of this research can provide valuable methodologies and insights that can significantly enhance the effectiveness of future Lagrangian point missions, thus paving the way for further exploration and scientific discoveries in space.

❖ **On Improvement of Frequency Stability of Power Systems with Grid-Following Converters**
[Dr. Rachakonda Shri Rama Akshay, Dr. Rajesh Joseph Abraham,Department of Avionics, IIST]

Presented investigation of Automatic Generation Control (AGC) in a conventional regulated power system and a deregulated power system with the integration of Solar PV, Battery Energy Storage System (BESS), Super magnetic Energy Storage (SMES) and Static Synchronous Compensator (STATCOM). The linear time invariant models of Solar PV, BESS, SMES and STATCOM have been implemented in a two area power system for improving transient stability of the system. The average switching models of the active and reactive power devices have been presented to highlight the output current and power dynamics of the devices. With the availability of the active and reactive power compensation devices, the study extends to the optimal location and sizing of the devices which has not been attempted so far.

❖ **Aerosol, Cloud and Climate Interaction [Dr. Ranju Nandan, Dr. Dinesh N Naik, Department of Physics, IIST]**

Despite a large number of studies made using both observations and models, due to the inability to disentangle the meterological effects from the aerosol impacts in cloud radiative forcing and poor parameterization in the numerical simulations, the interaction mechanisms between aerosols and clouds remain among the most uncertain processes in the prediction of the global climate system.

❖ **Magnetospheric- Ionosphere coupling [Dr. Sritam Hajra, Dr. J. Solomon Ivan, Department of Physics, IIST]**

Quantitatively analysed the effects of solar wind-magnetosphere-ionosphere (SW-M-I) coupling on the near -Earth space environment and enhance the current understanding of both large and small-scale coupling processes and mechanisms in the SW-M-I system during extreme transient events of supersubstorm and geomagnetic storms. At the first, robust quantitative analyses with regard to the LI-point and network of magnetometer and radars are included in comparative assessments and investigations of different coupling functions and the most significant parameters known to define the SW-M-I coupling. The in situ observations from the MMS, cluster, and THEMIS missions are additionally used to investigate the ion and electron scale coupling during the geomagnetic storm of 31 December 2015.

❖ **Studies on Adsorbents for Perchlorate Removal from Water [Dr. Rekha Krishnan, Dr. Prabhakaran, Department of Chemistry IIST and Dr. Benny K George, VSSC]**

Perchlorate contamination in water due to industrial and space activities remains a serious problem as it seriously affects the function of thyroid glands. Various methods are being explored for the removal of perchlorate from the contaminated water. Among them, adsorption is a simple and cost-effective technique. The development of efficient adsorbent materials is the key to the success of the adsorption method of perchlorate removal. This thesis explores the synthesis of magnetically functionalized novel adsorbent materials from bio-waste such as eggshell and watermelon rind. Synthesis of N-doped activated carbon and Metal-Organic- Framework (MOF) based adsorbents are also explored. The perchlorate adsorption efficiency, adsorption mechanism, adsorption isotherm models, and adsorption kinetics are studied with the developed adsorbents. The regeneration of the spent adsorbents using suitable regents is also demonstrated for their reuse. The high perchlorate adsorption capacity of some of the adsorbents demonstrates their potential for practical applications.

❖ **Investigations on Alumina Ceramic Forming Using Natural Rubber Latex Binder [Dr. Rakesh Krishnan, Dr. Prabhakaran, Department of Chemistry IIST and Dr. Arunkumar, LPSC]**

Processing of powders to ceramic components uses a large number of interim additives such as solvents, binders, plasticizers, dispersants, lubricants, and coagulating agents. The majority of these processing additives are synthetically prepared from petroleum-based chemicals. Sustainable development necessitates the replacement of these synthetically prepared additives with naturally renewable materials. The thesis explores the use of natural rubber latex as a binder, gelling agent, and pore stabilizer for the preparation of dense and porous alumina ceramics. Powder pressing, tape casting, slip casting, and freeze-gel casting processes have been established for the preparation of dense and porous alumina ceramics using natural rubber latex binder for the first time.

❖ **Enhanced Sparsity Order EstimatioTechniques for Dynamic Compressed Sensing [Dr.Thiruppathirajan, Dr. B S Manoj,Department of Avionics IIST, Dr. Lakshmi ISRO]**

The work is on Dynamic Compressed Sensing (DCS) system for efficient acquisition and recovery of sparse and compressible time-varying signals. DCS has three key components to be addressed: Estimation of the Sparsity level, indices of those sparse basis functions and their amplitudes. Sparsity Order Estimation (SOE) algorithms based on both Bernoulli/Gaussian sensing matrices and optimal tracking algorithms such as the Kalman filter and Viterbi Algorithm were developed. The developed algorithms resulted in reducing the complexity of CS methods by 25-30 % taking them closer to practical realization.

❖ **Investigation of Generation mechanisms of the post-midnight F- Region Irregularities [Dr. Meenakshi, Dr. Solomon Ivan, Department of Physics, IIST]**

The work is a theoretical and numerical investigation of the spin- dynamics in two recently demonstrated experiments involving long periods of RF irradiation on the quadrupolar nuclei channel, the 1 H - 14N double

cross polarization (double CP) under fast MAS experiment by Carnevale et al. and the 1H - 35Cl TRAPDOR-HMQC experiment of Hung et al. Creation and evolution of various coherences generated in these proton-detected experiments are explored. To analyse the rich and complex spin dynamics due to the interference between the large time-dependent quadrupolar interaction and the radio-frequency (RF) field, an exact effective Hamiltonian is constructed numerically using the matrix logarithm approach. Structure of the effective Hamiltonian is connected with transfer amplitudes to various coherences, the output signal, etc. and, when possible, features of the spin dynamics are derived theoretically. The

Experiments probing correlations between spin-1/2 nuclei (I) and nuclear spins (S) with large anisotropic interactions (quadrupolar or chemical shift anisotropy) often offer valuable access routes to molecular structures and dynamics. In such experiments, development of efficient correlation schemes is not trivial and constitutes an ever-evolving theme of research. As these experiments are performed routinely under MAS, interference between the RF filed and the large time- dependent quadrupolar or chemical shift anisotropic interaction leads to complex spin dynamics, often leading to poor and orientation-dependent transfer efficiency.

❖ **Spin dynamics at fast MAS in ^{1}H -^{14}N double cross -polarization and TRAPDOR - HMQC experiments involving spin 3/2 nuclei [Dr. Sajith, Dr. Jayanthi, Department of Physics, IIST]**

Experiments probing correlations between spin-1/2 nuclei (I) and nuclear spins (S) with large anisotropic interactions (quadrupolar or chemical shift anisotropy) often offer valuable access routes to molecular structures and dynamics. In such experiments, development of efficient correlation schemes is not trivial and constitutes an ever-evolving theme of research. As these experiments are performed routinely under MAS, interference between the RF filed and the large time- dependent quadrupolar or chemical shift anisotropic interaction leads to complex spin dynamics, often leading to poor and orientation-dependent transfer efficiency.

❖ **Kavu as a Cultural Imaginary: A Study on the Representation of Sacred Groves in Malayalam Cinema [Dr. Monisha Mohan, Dr. Gigy J Alex, Department of HSS, IIST]**

The eco-cultural space Kavu (sacred groves) has been subjected to academic introspection from ecological, anthropological, historical and Folk Culture Studies perspectives. The thesis focuses on the representation of kavu in the popular discourse of Malayalam cinema. The primary objective of this thesis is to determine whether Malayalam films have addressed the heterogeneity of Kavu, while considering its diverse systems of worship, caste dynamics, gender equations and ecological diversity.

❖ **Nonlinear and non-classical properties of deformed quantum states [Dr. Anupama, Dr. Sudheesh Chethil, Department of Physics, IIST]**

The work started with the study of most general class of oscillators, called 'f-deformed oscillators' or 'f-oscillators'. The work defined the quadrature operator for the f-deformed algebra and hence obtain the deformed quadrature operator eigenstates. The work also derived a new set of polynomials and derived the deformed oscillator wavefunctions in terms of them. The position probability distribution for three different types of deformations are plotted, and each is compared with the corresponding non-deformed counterpart. The newly obtained quadrature operator eigenstates will be helpful for those who are working in the field of quantum state reconstruction and quantum information processing of deformed states.

❖ **Investigation of ON-to-ON Body and ON-to OFF Body Channel Characteristics in Static/Dynamic Human Body Model using High Gain Antennas [Dr. Elizabeth George, Dr. Chinmoy Saha, Department of Avionics, IIST]**

A systematic, extensive and in-depth study of channel characteristics for both static and dynamic human body model is reported in this thesis. The work involves design, fabrication and testing of various printed and dielectric antennas with very high gain for the proposed applications. A significant part of the thesis deals with human model which features the critical body segments such as head, shoulder, torso, upper arm, lower arm, thighs and calf for the study of double arm swing activity. Two cross-slot antennas (CSA) are designed and fabricated, for investigation of the double arm swing activity using the newly introduced twelve-cylinder body model. The same CSA is used for creeping wave analysis on cylindrical single layered phantom. Simulations are done in CST Microwave studio suite and experiments are carried out using container filled with distilled water as phantom.

❖ **Analysis of Failure Mechanisms and Mechanical Properties of Hierarchical Bio-inspired Composites**
[Dr. Abhirami, Dr. Anup S, Department of Aerospace, IIST]

Nacre, bone, spider silk, and antlers are some examples of biological composites that exhibit a great combination of mechanical properties such as high strength, stiffness, and toughness when compared to that of their constituents using which they are made up of. This has inspired many researchers to investigate bio-inspired composites to explore the possibilities of making synthetic composites with superior mechanical properties using relatively weaker constituents. There are many reasons behind the achievement of a biological composite's superior mechanical properties, which range from the selection of constituents to its final arrangement. The basic structure of the above-mentioned biological composites is a kind of brick-and-mortar structure in which platelets with a defined configuration are dispersed in a pool of matrix. Here, the parameters significantly influencing the final mechanical properties are Young's moduli ratio of platelet to the matrix, the platelet aspect ratio, and the arrangement of platelets, especially the hierarchy. The present study focuses on two staggering types found in nature, regular and stairwise, and conducts a failure analysis on one-hierarchical composites with these configurations. The inclusion of the first failure in the analysis is found to contribute to composite toughness significantly. Case studies using industry materials and recent research works support these findings. Analytical models are formulated for predicting the properties of non-self-similar two hierarchical composites, demonstrating good agreement with finite element analysis results. The generalized model aids in simplifying the design process, providing initial estimations of mechanical properties for hierarchical composites before full-scale fabrication and offering practical insights for future material design.

❖ **Investigations on Micronozzle for Satellite Propulsion and Gas Mixture Separation**
[Dr. Manu K Sukesan, Dr. Shine S R, Department of Aerospace, IIST]

Due to the increased use of cube- and nano-satellites, the demand for micro-propulsion systems has grown, necessitating the optimization of micronozzle design and efficiency. Research on the flow characteristics of micronozzles is currently centered around micro-thruster applications, with the primary objective of achieving uniformity in the flow structure to ensure optimal thruster performance. Conversely, the secondary application involves gas mixture separation, requiring a highly non-uniform species distribution in the flowing mixture. The flow through micronozzles can encompass multiple scales, including continuum, slip, transition, and rarefied gas regions due to their smaller dimensions. The current research commences with numerical studies related to the thruster applications of micronozzles, utilizing classical N-S with a linear slip model, DSMC method, and a hybrid N-S/DSMC based on the continuum breakdown concept. The impact of geometric factors such as the divergence half-angle, throat depth, and expansion ratio is thoroughly analyzed for planar micronozzles, along with considerations of wall temperature conditions. The work also explores the effects of micronozzle geometry and flow parameters on the aerodynamic species separation within a planar nozzle, incorporating linear, bell, and trumpet divergent sections under the presence of carrier gas and back pressure conditions. Subsequently, these studies are extended to include a curved nozzle. The results of this research are anticipated to contribute to the development of improved designs for micronozzles utilized in satellite propulsion and aerodynamic separation processes.

❖ **Direct numerical simulation of flow instabilities in variable velocity flows [Dr. Sarath, Dr. Manu KV, Department of Aerospace IIST]**

Transitional flows with an unsteady inflow play a vital role in a broad range of applications, including biological fluid transport to space applications. In such cases, the thickness of the boundary layer formed over the solid surface varies in both space and time, causing a high level of complexity in the path of vortical structures formed from the shear/boundary layer. Also, time and space-dependent shear stress exerted by the fluid, separation, and associated instability phenomena are to be better understood. In this work, direct numerical simulations (DNS) are performed to study the stability of vortical flow structures associated with an unsteady boundary layer under an adverse pressure gradient condition. A trapezoidal pulse of mean velocity, consisting of the acceleration phase from rest followed by the constant velocity phase and deceleration phase to rest, is imposed at the inlet of the computational domain. The impact of the spatial and temporal components on the evolution patterns of the shear-layer and three-dimensional

instabilities are examined in detail. By employing dynamic mode decomposition, some key features of the transitional flow and their time dynamics are extracted.

❖ **Accretion Scenario of Black Hole X-ray Binaries During Outburst [Dr. Geethu Prabhakar, Dr. Samir Mandal, Department of ESS, IIST]**

Black hole X-ray binaries (BH-XRBs) are gravitationally bound associations of a compact object (black hole) and a normal star. The compact object can `accrete' matter from the companion star forming an accretion disk which releases tremendous energy, predominantly in X-rays. The stages of sudden bursts of X-ray activity in these systems are commonly known as 'outbursts'. The present thesis endeavours to comprehend the accretion process underlying the exceptionally bright outbursts observed in the two galactic BH-XRB sources: MAXI J1820+070 and 4U 1543-47. The investigation utilizes a wideband spectro-temporal analysis, employing multi-instrument X-ray data. The findings of this study propose the presence of a complex corona geometry (extending both radially and vertically) for MAXI J1820+070 during the 2018 outburst. Additionally, our research reveals a remarkably strong and dynamic absorption feature between 8-11 keV in the 4U 1543-47 spectra. This detection represents the first occurrence of its kind in X-ray binaries. We hypothesize that this feature arises due to the absorption of accretion disk photons by a highly ionized, relativistic disk wind, which attains speeds up to 30% of the speed of light.

❖ **Effects of dilution on the Laminar Burning Characteristics of Oxy-Dodecane mixtures with and without Hydrogen blending and Oxy-Methane mixtures at elevated operating conditions [Dr. Rajesh, Dr. Prathap, Department of Aerospace IIST]**

N-Dodecane plays a crucial role in surrogate fuels for gasoline and jet fuels. Selecting the right surrogate fuel combination depends on the properties of its individual components. Precise reaction mechanisms are essential to predicting combustion characteristics, including laminar burning velocity and ignition delay times. Unfortunately, data for n-dodecane-air, oxy-n-dodecane with diluents like N2, CO2, H2O, and n-dodecane-H2-air are scarce in the literature. This study aims to bridge this gap. It measured unstretched laminar burning velocity under various conditions using a new cuboidal combustion chamber with optical access and a dedicated heating system. The study used the partial pressure method to prepare combustible mixtures, an electrical spark-ignition system for ignition, and high-speed shadowgraph imaging for flame propagation. A non-linear stretch extrapolation scheme determined unstretched flame speed, and the validation process compared the results with existing data. Finally, simulations using CHEMKIN provided insights into the unstretched laminar burning velocity.

❖ **Protostellar jets: Numerical modeling and observational studies [Dr. Sreelekshmi Mohan, Dr. Sarita Vig, Department of ESS, IIST]**

Protostellar jets are fossil records of the accretion history of protostars. Studying these jets opens up an indirect window of knowledge into the evolutionary stages and activities of the protostar, the direct study of which is difficult due to its highly embedded nature. The research highlights a theoretical and observational study of protostellar jets in radio and near-infrared wavelengths, respectively. The first part of the thesis describes a numerical model for radio jets from protostars, having simplistic geometry, which has been developed for the first time to explain the presence of thermal free-free and non-thermal synchrotron emission in these jets. The model has been successfully employed to estimate relevant physical and micro-physical parameters of protostellar jets for which observational data is available. The second part of the thesis covers a near-infrared investigation aimed at exploring the partially ionized and molecular regions of a massive protostellar jet, HH80-81, by utilizing molecular H2 and [FeII] emission lines as shock tracers. This is the first time detection of these emission lines towards the HH80-81 jet and following this, a qualitative and quantitative analysis of the jet has been carried out, enabling the identification of the nature of shocks and estimation of relevant physical parameters of the protostar and its jet.

❖ **Self-excited oscillations in low-density round and rectangular jets [Dr. Arun B Nair, Dr. Vinoth B R, Department of Aerospace IIST].**

The present study focuses on experimental techniques to understand the self-excited oscillation characteristics in low-density round for fully developed and turbulent flow conditions, as well as rectangular jets, and study the effects Reynolds number, momentum thickness, density ratio and aspect ratio on self-excited oscillation. Two global modes exist in low-density round jets. The results confirm that oscillations in low-density round jets are

axisymmetric irrespective of S and D/θ, and turbulent jets can exhibit self-excited oscillations for S ≤ 0.53. Studies on rectangular low-density jet reveal that the jet transitions from a stable to a self-excited state through subcritical and supercritical Hopf bifurcation. Only supercritical bifurcations are observed during transition when AR ≥ 12. For lower aspect ratios, the type of Hopf bifurcation is dependent on the density ratio. SPOD analysis of low AR rectangular jets (AR ≤6) show that the spatial structure of the oscillation is a symmetric mode. SPOD analysis reveals that the spatial structure of the oscillation in high AR rectangular jets (AR ≥ 12) consists of three modes: a symmetric mode, a flapping mode in the major dimension and a complex mode similar to the ce2 mode in elliptic jets.

❖ **Experimental Studies of Selective Catalytic Reduction of NOx with NH3 on Cu-ZSM-5 Foam Catalysts [Dr. Risha Raju, Dr. Salih, Department of Aerospace, IIST, and Dr. Kuruvilla Joseph, Department of Chemistry, IIST]**

Selective Catalytic Reduction (SCR) is one of the most promising technologies for reducing after-exhaust NOx emissions. Cu zeolites generally provide high SCR conversion rates at temperatures ≤ 350□C. The limitations associated with powdered catalysts, such as low mass diffusion and high pressure drop, can be minimized to a certain extent by replacing them with structured catalysts. The foam catalysts exhibit superior characteristics, such as a high surface-to-volume ratio, porosity, and tortuosity, which improve the mass diffusion and lower the pressure drop. In this study, α-alumina foam was prepared using a thermo-foaming technique. The procedure followed during this research for the preparation of the Cu-ZSM-5 zeolite coating over alumina foam through in situ hydrothermal and dip-coating methods is also presented in detail. A self-supporting foam catalyst of Cu-ZSM-5 is prepared using a freeze-casting emulsion method. A comprehensive experimental study was conducted to understand the mass transfer and pressure drop characteristics of the foam catalysts. Correlations for the mass transfer coefficient and friction factor were derived for the foam catalyst and validated against the available data in the literature reviewed. A detailed investigation of key SCR reactions, such as the standard SCR, fast SCR, slow SCR, NO oxidation, NH3 oxidation, and NO2 decomposition, was also carried out in this research. The inhibitory effects of the feed reactants were studied by varying the feed concentration. A detailed investigation of the impact of the inhibition effect of NO2 and NH3 on the SCR reaction at low temperatures is also presented.

❖ **Development of novel stochastic meshless methods for linear and nonlinear problems in structural mechanics [Dr. Aswathi, Dr. Arun C O, Department of Aerospace,IIST]**

The current work proposes novel stochastic meshless methods for the analysis of linear and nonlinear problems in structural mechanics which can take care of uncertainties in material property and loading when they appear as random variables or homogeneous random fields. The study suggests an improved response function based stochastic meshless method for the analysis of linear elastic problems. Further, the study also proposes a simple and efficient stochastic meshless method for the analysis of linear eigenvalue problems in structural mechanics. A high dimensional model representation based stochastic meshless technique is proposed in the current study for the analysis of geometric nonlinear problems in solid mechanics. A few numerical examples are solved to validate the proposed method by comparing the results with the direct Monte Carlo simulation or other existing methods. Further, the computational efficiency of the proposed methods is also established.

❖ **Investigations on Eccentric Sleeve Grinding: An Intermittent-Progressive Machining Strategy for Fibre Reinforced Polymer Composites [Dr. Danish Handa, Dr. V S Sooraj, Department of Aerospace, IIST]**

Defect free machining of Fibre Reinforced Polymer (FRP) Composites, crossing the challenges posed by anisotropic non-homogenous fibre-matrix system, is one of the important material processing requirements with a wide scope in industrial applications. Eccentric Sleeve Grinding (ESG) projected in this research is a unique strategy with progressive-intermittent cutting scheme for achieving minimal damage machined surfaces on FRPs. Progressively varying depth of engagement for active abrasive grains in the cutting zone with an intermittent and periodically repeating cutting pattern, achieved through precisely controlled eccentric rotation of grinding wheel is the key highlight of ESG. Through this step-by-step cutting methodology, significant reduction in average grinding force, surface defects and surface roughness have been achieved on Carbon Fibre Reinforced Polymer (CFRP) composites under varying cutting conditions. The thesis covers the geometric configurations, kinematics, coordination of work feed and wheel rotation to achieve scallop free surfaces during intermittent cutting, theoretical and experimental studies on mechanics and micro-mechanics of ESG, thermal aspects and other miscellaneous findings (theoretical and experimental) on ESG.

4.7 PATENTS

SL. No.	Title	Patent No.	Inventors	Granted No.	Granted Date
1	A system and method for acquisition of IRNSS signal having efficient architectures	201741041848	Mr. Jiljo K. Moncy Dr. Sheeba Rani J.	428714	11-Apr-23
2	IOT enabled biomedical wearable clothing system for healthcare assistance	202241038786	Dr. B. S. Manoj Dr. Prascilla K Mr. Sarath Babu Mr. Anantha Krishnan A.S	449773	06-Sep-23
3	Method and system for lensless digital holography of a light transmitting object	201741010417	Dr. Rakesh Kumar Singh Ms. Annie Varghese	451673	14-Sep-23
4	Closed loop in-plane movable suspended gate FET(CLIP-SGFET) based accelerometer and the fabrication method thereof.	202041048333	Dr.Seena V. Ms.Anju Sebastian Dr. Naveen Kadayinti	456720	04-Oct-23
5	Ultra lean non-premixed gaseous fuel burner	6632/CHE/2015	Dr. Rajesh Sadanandan	463657	30-Oct-23
6	A single shot jones element imager	201641007474	Dr. Rakesh Kumar Singh Mr. Niraj Kumar Soni	474129	29-Nov-23
7	Reconfigurable grinding wheel with in-built cooling and self-adaptable lubrication system via additive manufacturing	202341028469	Dr. Sooraj V S Mr. SarathBabu Thekkoot Surendran	502722	24-Jan-24
8	Flapping wing mechanism and the wing design of the bionic micro aerial vehicle.	201941026796	Dr. K. G. Sreejalekshmi Mr. Mrudul C Dr. Sam Noble	503237	25-Jan-24
9	Swirl stabilized liquid fuel burner with aerated injector.	202341028468	Dr. Rajesh Sadanandan Mr. Prakash R S	530958	28-Mar-24

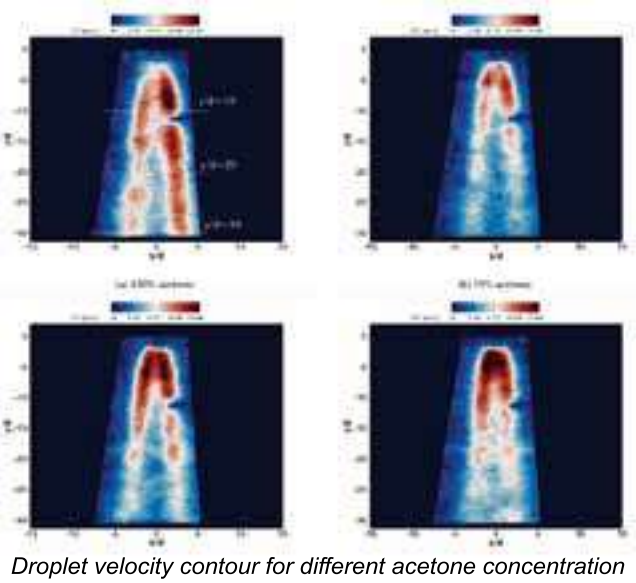
4.8 Centres of Excellence & related Facilities

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

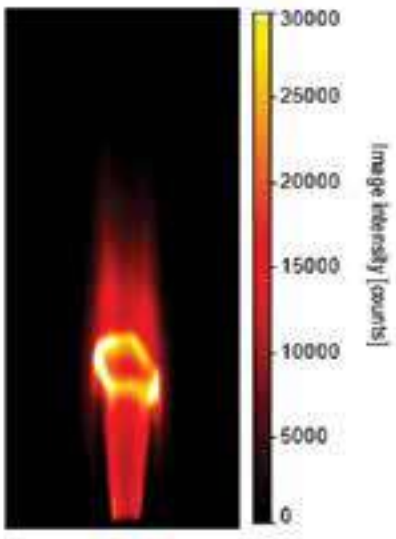
4.8.1 Advanced Propulsion and Laser Diagnostics Lab (APLD)

The Advanced Propulsion and Laser Diagnostics (APLD) facility is a leading research centre dedicated to advancing propulsion and aerospace technology. Utilizing cutting-edge optical and laser diagnostic techniques, APLD conducts comprehensive studies on various propulsion systems. The facility's state-of-the-art test setups, including those for injector characterization, combustion, and supersonic flow, provide a controlled environment for rigorous experimentation. APLD serves as a pivotal hub for academic research, national-level initiatives, and technological development within the aerospace industry. Key research areas encompass injector spray characterization, supersonic mixing and combustion, combustion dynamics of methane-oxygen diffusion flames, tunable diode laser absorption spectroscopy (TDLAS) and interferometric Rayleigh/Mie scattering, and vacuum ejector systems. These research activities are conducted in collaboration with both academic and industrial partners. The summer internship program at IIST extended opportunities to both internal and external students, with four students from outside institutions and three from IIST gaining valuable insights into various fields. Extensive B.Tech and M.Tech projects explored supersonic mixing in cavities, spray characterization of pintle injectors, and combustion instability studies. Doctoral research works on supersonic mixing and combustion, combustion instability in diffusion flames are actively investigated research areas. ISRO centres and private companies, such as EtherealX, are utilizing the spray characterization facility to conduct comprehensive testing of their injectors.

The APLD facility has made significant strides in recent years, expanding its research capabilities through innovative technological advancements. A fully 3D-printed test section was fabricated for supersonic vacuum ejector studies, offering reduced weight, cost, and manufacturing time. A high-speed intensifier (IRO) was acquired to investigate flame dynamics using OH and CH chemiluminescence imaging, demonstrating its potential to significantly enhance combustion research. In collaboration with Hathor Rockets, the spray characterization facility's flow lines were upgraded to a 2 kg/s flow rate. Additionally, the combustion test rig for igniter testing was fully automated, ensuring precise control and data acquisition. Droplet characterization tests of multiple Scramjet fuel injection struts of ISROs Dual Fuel Scramjet (DFS) engine were carried out at APLDs spray characterization setup to estimate the droplet size and velocity which is relevant for the scramjet injector. The facility has generated a significant number of publications in both national and international

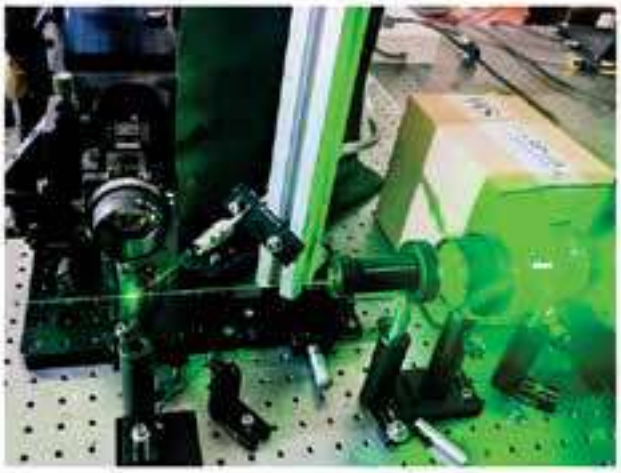


Droplet velocity contour for different acetone concentration



Instantaneous flame luminosity in a shear coaxial injector

conferences, as well as Scopus-indexed journals. Two startups incubated at the Space Technology Innovation and Incubation Centre (STIIC) of IIST are working in close collaboration with the APLD Lab- Specrule Scientific Pvt Ltd. and Hathor Rockets Pvt Ltd. Specrule Scientific is an R&D company working on the development of indigenous, laser-based, flow diagnostic systems. The current focus of the company is on techniques including tunable diode laser absorption spectroscopy (TDLAS) and interferometric Rayleigh/Mie scattering, which can be used for the measurement of flow parameters such as velocity and temperature in aerospace and combustion applications. Hathor Rockets aims to conduct thorough research and development on semi-cryogenic propellants, such as liquid oxygen (LOX) and highly refined aviation turbine fuel (ATF), to understand their characteristics and technical challenges. The focus will be on designing and optimizing a prototype engine of 5KN, conducting ground testing, and validating its performance under various operating conditions to conduct a hop test that will demonstrate critical throttling and soft landing capabilities needed for future larger vehicles.



Interferometric Scattering Experiment for velocity measurement in high speed flows

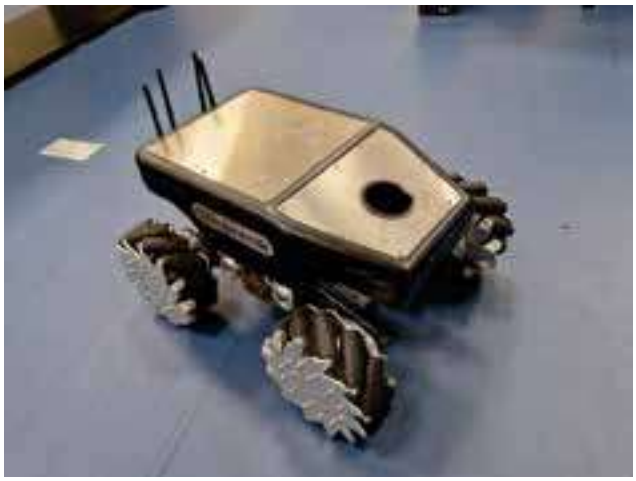
Shadowgraph image of Pintle Injector Spray

4.8.2 Nanoscience and Technology Centre

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.

4.8.3 Computer Vision and Virtual Reality Center

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.



4.9 Externally Funded Projects

In addition to ASRG projects, IIST encourages faculty members to write proposals in their fields of interest and work with external funding. A number of such research proposals have been accepted already, the details of which are shown below;

Sl. No	Title of Project	IIST Focal point	Funding Agency and Duration	Budget (Lakhs)
1	Development of a fast response TDLAS temperature sensor for high temperature applications	Rajesh S and Satheeh K	AR&DB, DRDO 3 Years	33.066
2	Flexible gear dynamics	Praveen Krishna along with Santhosh, Amrita Viswa Vidyapeetha, Coimbatore: Nonlinear Energy Harvester on DST -TARE scheme	DRDO-GTRE 3 years	61
3	Instrumentation and Signal Processing for Remote Monitoring of Bio-Parameters Based on Magneto-Plethysmographs	Anoop C S Vineeth B S V S Sooraj	KSCSTE, ETP 3 years	18.80
4	Design and Technology Development for Polymer MEMS Integrated FET Single Axis Accelerometer Platforms	Seena V	Kerala State Young Scientist Award Grant-KSCSTE	28

5	Fabrication of Polymer MEMS Broad Band Piezoelectric Vibration Energy Harvester (PVEH) Using Lead-Free Materials for Low-Frequency Applications	Seena V	MeitY	N/A (Idea to Innovation Scheme)
6	Polymer MEMS Ring-Flexure-Membrane movable gate FET array: A Multi-Gas Sensor Platform	Seena V	MeitY-IIT Bombay (INUP i2i Nanotech Hackathon 2022)	28 N/A (Idea to Innovation Scheme)
7	Fabrication of CMOS-MEMS Accelerometer with FET Based Transduction Technique	Seena V	INUP I2I, IITB, MeitY	28 N/A (Idea to Innovation Scheme)
8	Investigation, Design, and Implementation of Multifunctional 5G Antenna Systems for Cognitive Radio and mm-Wave Applications	Chinmoy Saha	DST-SERB	55.6
09	Architectures and Protocols for Integrated 6G-Satellite Networks	Manoj B S	DST-SERB	39.32
10	Influence of Massive stars on the surrounding interstellar medium	Sarita Vig	SERB	27
11	Implementation of Ensemble Forecast Sensitivity Approach to Estimate the Impact of Observations in IMD GFS forecast	Govindan Kutty	Ministry of Earth Science (MoES)	58
12	Improving the Prediction of Thunderstorms using Dual Resolution Hybrid Ensemble Variational Data Assimilation System in WRF model	Govindan Kutty	Ministry of Earth Science (MoES)	75
13	Structure of ultra-relativistic jets	Resmi L.	SERB Mathematical Research Impact Centric Support (MATRICS)	6
14	Searching for kilonova remnants in the Milky Way	Resmi L.	SERB International research experience (SIRE)	7.1

15	Constraining the Nature of Multi-messenger Transients with Coordinated Multi-wavelength Observations	Resmi along with Kuntal Misra, ARIES, Nainital	Dept. of Science and Technology, 5th BRICS international multilateral call	51
16	Max Planck Partner Group for Galactic Star Formation	Jagadheep D. Pandian	Max Planck Partner Group for Galactic Star Formation	45
17	Monitoring the health of mangroves of Maharashtra using near real time remote sensing data	L Gnanappazham	Mangrove Foundation, Government of Maharashtra	78.9
18	Vision Document for Geospatial technology based Market Intelligence System	L Gnanappazham	Department of Horticulture, Government of Karnataka	21
19	Lifeline of Remote India-A national study on Telemedicine	Shaijumon CS & Lekshmi V Nair	ICSSR, Govt. of India	13
20	Determination of geodetic parameter based on SLR observations	Rama Rao and S Subrahamanian Moosath	National Centre of Geodesy	140 Lakhs (for 5 years activity)
21	Machine Learning Framework for Analysis of Social Media Text using Graph Network Data Modelling and NLP Techniques	S. Sumitra along with A. M. Abirami, Thiagarjar College of Engineering (TCE), Madurai	SERB-TARE 3 Years	18.3
22	Parameter Identification for Diffuse Interface Models Describing Multiphase Fluid	Sakthivel K	National Board for Higher Mathematics/ DAE	16.19
23	R-forms of R [X]	Prosenjit Das	SERB MATRICS	19.4
24	Development of Novel Numerical Techniques for Miscible Displacement Problems in Porous Media	Sarvesh Kumar	SERB DST	19.4
25	Turbulent induced aberrated wavefront correction without adaptive optics	Narayanamurthy	SERB/DST	52
26	Adsorption of metal atoms on TMDs and Band engineering	Kuntala Bhattacharjee	DST Mobility Project	30
27	Elemental composition and band structure of stanene like 2D Sn on MoS2 or WS2 substrates	Kuntala Bhattacharjee	UGC-CSR Project	0.9
28	Design Development of Ferrite Dielectric Based - Microstrip Isolator for X band	Chinmoy Saha	ISRO S-TIC Cell, DOS	32.09

29	Development of Atomic Layer Deposition System	Jinesh K.B.	DST	120
30	Inegrated Battery Chargers for E-bikes and Cars	Sudharshan Kaarthik	KSCSTE	22.32
31	Applications of Fractional Order Calculus to Biomedical Signal Processing (SERB-DST)	N.Selvaganesan and S.Chris Prema	SERB-DST	32
32	Development of Fractional Chaotic Observer For Secure Communication	N.Selvaganesan	IIT Palakkad Technology IHub Foundation Fellowship	20 (Research fellowship)
33	Effect of Hydrogen blending in natural gas	Prathap C along with Senthil Murugan, IITG	Oil India Limited, Duliajan	18.66
34	Genesis of organic molecules in the extra-terrestrial environment: role of energetic radiation	Umesh Kadhane	DST, under Indo-Italian join call for research exchange proposal	12
35	Design and fabrication of hardware for carrying fruit flies in Gaganyaan-1	K. G. Sreejalekshmi	TIFR Mumbai	17.1
36	Now and Then: Women of Muziris	Babitha Justin	Muziris Heritage Project	10
37	Design of a Transmitter with Integrated Power Amplifier (PA) for Millimeter-wave 5G Bands in 65nm CMOS	Immauel Raja	SERB-SRG	30
38	Discontinuous virtual element approximation for non-stationary fluid flow problem	Sarvesh Kumar	SERB-DST	6.6
39	Numerical Approximation of Optimal Control Problems Using Virtual Element Method	Sarvesh Kumar and Anil Kumar, BITS-Goa Campus	SERB-DST	19.07
40	LOC approaches for Separation and analysis of Exosome Derived Biomarkers for Cancer Prognostics	Palash Kumar Basu and anne-marie Gue (LAAS,CNRS)	DST-CNRS	40
41	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	Palash Kumar Basu and Priyadarshanam	DBT-ATGC	50.25

4.10 Student Exchange Program between IIST and Niigata University, Japan

A formal Memorandum of Understanding (MoU) between the Indian Institute of Space Science and Technology (IIST) and Niigata University, Japan, was signed in December 2019. Students and researchers actively collaborate in this academic partnership, promoting joint research projects and knowledge exchange between the two institutions. Department of Earth and Space Sciences, IIST hosted a delegation of five students, an accompanying Associate Professor, and the Vice President of (Research) from Niigata University, Japan, from December 21-26, 2023. The program was titled 'Human Resources Development Program on Field Science Research in the Indo-Pacific Region.' The Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan, supported the project.

The exchange program included short lectures, demonstration sessions, laboratory visits, and fieldwork activities, allowing for meaningful knowledge exchange and collaborative engagement. The exchange emerged as a notable testament to the influence of international collaboration in academic and scientific realms. Throughout the visit, a diverse array of meticulously planned activities unfolded, ranging from intellectually stimulating lectures and captivating demonstrations to hands-on fieldwork experiences, each designed to foster a rich exchange of knowledge and ideas. Beyond the academic sphere, the program also served as a conduit for cultural immersion and exchange, facilitating lasting bonds and deepening understanding between the participating institutions.

A group photo at the Inaugural ceremony of the S-Earth Programme at Niigata University, Japan, during July 2023. This event was attended by three students from IIST.

4.11 Special ISRO Funded Projects

❖ **Electric Propulsion related research activities [In collaboration with LPSC]**

Electric propulsion is a technology aimed at achieving thrust with high exhaust velocities, which results in a reduction in the amount of propellant required for a given space mission compared to other conventional propulsion methods. Among the various types of electric propulsion systems, Hall Effect thrusters have gained prominence due to their unique operational characteristics and suitability for a range of space missions. Hall Effect Thrusters have become the propulsion system of choice for satellite station-keeping and orbit control, particularly in geostationary satellites. The ability of HETs to provide precise and continuous thrust allows for efficient maintenance of satellite positions, ensuring stable communication and observation capabilities.

Due to the complex nature of the plasma physics involved in the operation of Hall effect type of thruster, a thorough investigation of various physical processes is very much

necessary. The techniques used for such investigations require detailed understanding of the fundamental physics of the system. The probes for such measurements are generally not available off the shelf and are usually custom designed for a given system. Understanding plume characteristics is essential for optimizing thruster design, ensuring mission success, and mitigating potential negative impacts on the spacecraft. The plume which contains ions, electrons and neutrals itself is the first indication of thruster performance. Analyzing the plume will give an idea about efficiency of the ionization process, the directionality of the ion beam, and the potential for adverse interactions with the spacecraft. Understanding these characteristics allows for the refinement of thruster designs, leading to improved efficiency.

The operation of an HET and the characteristics of its plume are governed by four key plasma parameters: electron temperature, Ion energy distribution, electron density, and ion density. These parameters must be carefully monitored and analyzed to optimize thruster performance. However, due to the complex nature of plasma, these parameters cannot be obtained from a single diagnostic tool. Instead, a suite of specialized

Probe testing and calibration facility at IIST

sensors is employed to measure different aspects of the plasma profile. These sensors include the Retarding Potential Analyzer (RPA), Langmuir probe, Faraday probe, and E × B probe, each providing distinct and complementary data necessary for a comprehensive understanding of the plasma characteristics in HETs. These sensors will be combined together in the form of a probe housing and used for plasma profile measurement.

Electric Propulsion and Diagnostics Laboratory of IIST is being part of this diagnostics for more than ten years. Already we have supplied entire plasma diagnostics tools with its electronics and data acquisition system. We are part of the day today activities of LPSC , Valimala in electric propulsion complex for plasma profile measurement , data analysis etc.

❖ Development of surface discharge spark plugs [MoU with LPSC]

Surface discharge spark plugs have been identified as the next generation spark plugs, which have already identified their use in aircrafts and racing cars die to high plasma throughput and low power compared to the conventional spark plugs. Another remarkable thing about semiconductor spark plug 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

❖ Development of Laser Ignition System [MoU with LPSC]

An alternative to the conventional spark plug 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

4.12 New Research facilities / Updations

- The 5G Use case lab was awarded by the 100 5G Use case labs program of Government of India.
- Upgraded the vibration lab by augmenting the stepped sine module with the existing m+p system.
- Upgraded metal forming facility with two high rolling mill for thickness reduction.
- Flight mechanics lab has been upgraded with contemporary 2 flight simulators with yoke and throttle quadrant, which will help students understand the flying and handling qualities of the designed aerial vehicles in controlled environments
- Virtual processing and digital manufacturing lab-phase 1 was completed.
- The flame diagnostics lab is an experimental test facility for combustion research. The goal is to develop strategies for an energy transition towards renewable sources, significantly enhancing our fundamental understanding of the complex processes associated with such practical combustion systems. Current research focuses mainly on turbulent gaseous and liquid-fueled flames, and the topics investigated include the different combustion phenomena like flame stabilization, fuel flexibility, instability, pollutant emissions, and the development of new standard burners and injectors for combustion/propulsion applications. The highly resolved experimental database from this lab will be extremely valuable for developing reliable and predictive CFD-based design tools in the future. The lab can be used to develop advanced combustion and propulsion systems and for fundamental R&D in gaseous and liquid fuel systems. In addition to implementing the conventional measurement techniques, the lab also facilitates the employment of state-of-the-art optical and laser diagnostic measurement techniques to combustion studies in subscale and standard burner flames, thereby exploiting the research strengths of the IIST faculty in optical and laser-based diagnostics. Some of the measurement techniques that can be realized in this lab are Schlieren/shadowgraph density gradient visualization, atomization pattern between isothermal and reactive flow conditions, high-speed flame luminosity dynamic event capture, optical spray diagnostics drop size and velocity, planar velocity field measurements characterizing the 2D velocity field, flame chemiluminescence size and shape of the heat release zone, laser-induced fluorescence (LIF) measurements of flame radicals reactive species imaging and mixing studies, pollutant emission measurements and simultaneous diagnostic measurements. In the last year the diagnostic capability available in the lab is augmented, especially with the addition of the new stereoscopic PIV system. In addition, a new combustion instability setup is established to carry out fundamental investigations in to the combustion instabilities existing in gas turbine or rocket injectors.
- Laser absorption spectroscopy lab (being set up with funds from ongoing AR&DB project and from IIST)
- High speed flow lab and shock tunnel facility being set-up with IIST funding
- The intelligent robotics lab, with its advanced robotic systems, serves as a hub for innovation in robotics, fostering research that pushes the boundaries of what autonomous systems can achieve in real-world applications. The lab focuses on the development, integration, and application of advanced robotics technologies. The lab is equipped with state-of-the-art robotic systems, including the KINNOVA 7DOF(Degrees of Freedom) robotic arm and the Robotnik mobile robot. These systems are central to the lab's research in autonomous systems, human-robot interaction, and robotic manipulation.
- The KINNOVA 7DOF robotic arm is a versatile and highly flexible robotic manipulator. Its seven degrees of freedom allow for intricate and precise movements, making it ideal for tasks that require a high level of dexterity, such as assembly, material handling, and complex manipulation in confined spaces. The arm is equipped with advanced sensors and control algorithms that enable adaptive behavior, making it suitable for dynamic and unpredictable environments.
- The Robotnik mobile robot is a robust and adaptable platform designed for autonomous navigation and operation in various settings. It can be equipped with different sensors, such as LiDAR, cameras, and

GPS, to perform tasks like mapping, exploration, and transportation. The Robotnik platform supports research in mobile robotics, including path planning, obstacle avoidance, and multi-robot coordination.

- The combination of the KINNOVA robotic arm and the Robotnik mobile robot enables research in several cutting-edge areas, such as
  - Autonomous manipulation: Integrating the KINNOVA arm with the Robotnik mobile platform allows the lab to explore autonomous manipulation tasks in dynamic environments.
  - Human-robot collaboration: The lab studies how robots can work alongside humans in shared spaces, with a focus on safety and efficiency.
  - Robotic perception and learning: Advanced machine learning techniques are employed to enhance the robots' perception and decision-making capabilities.
- The ASIC characterization lab was upgraded with the following 2 equipment:
  - 44 GHz Vector signal generator. This equipment can generate all the needed modulated signals for 5G, 6G standards up to 44 GHz.
  - 2. 6 GHz Digital Storage Oscilloscope: This DSO provides the capability for time-domain measurements of up to 6 GHz. In addition it is also equipped with protocol decoding and mixed-signal options.
- Astrobiology facility setup which include a clean table, spectrophotometer, autoclave equipments. The key objective of this facility is to encourage and educate the students to work on interdisciplinary areas of space technology and biology. The first set of proposed experimental payload development is to study the growtn of bacterias in the microgravity environment. Due to the recent interests in the human space flight by all the space faring nations it has become imperative to study the effects of microgravity and radiation environment on the human body in the space. Human beings gut contain certain friendly bacterias like probiotics. It has been found that the mental health is directly related to the healthy gut. An increase in the probiotics will hence change the chemistry in the gut and lead to modified health conditions. Thus study of growth of probiotics was initiated to characterize the effects of micro gravity environment on these bacteria.
- The VCK5000 Versal development card used for high throughput signal processing compute performance and AI engine development
- Ultrasonic bath sonicator for cleaning using ultrasound and a liquid medium was procured.
- UAV Remote sensing facility equipped with multispectral and RGB camera
- The Multi parameter water quality meter, which can accurately and efficiently analyze water quality parameters such as pH, electrical conductivity (EC), total dissolved solids (TDS), dissolved oxygen (DO), salinity, and so on. The equipment has the potential to accurately measure these parameters, analyzing the physiochemical characteristics of the samples used in research and assisting with field measurements. The measurements have implications for understanding how water interacts with rocks, soil, and minerals in different geological environments.
- Because of metastable minerals, geological samples such as evaporite deposits and sediment cores are prone to mineralogical alteration. As a result, preserving these samples away from high temperatures and oxidative conditions is essential. The physiochemical properties of water samples such as pH, vary if they are not stored at low temperatures. To focus on metastable mineral and astrobiology research. A deep freezer unit that preserves the sample without any alterations has been added to the facility
- Added a Global Navigation Satellite System - Trimble R12T Pro-point HD GNSS. This is a multi-frequency GNSS, help us to survey in the remote areas and under forest canopy where single frequency receivers will fail to receive the signals. GNSS will be used in both academic and research activities mainly to establish the ground control points requirements of the PG projects, research activities of PhD scholars and research projects of faculties and also to explore the research on land dynamics through multisensor data.
- Augmented the facilities in audio visual lab and language lab procured 'Stata' Software.
- Enhanced recording capabilities in audio visual lab with with 3 video cameras and lens. Enhanced video capabilities: Newer video cameras often with cutting-edge features such as higher frame rates

(e.g., 4K, 6K, or 8K video recording), increased bit depth, and support for various video codecs. These capabilities allow for more flexibility in post-production, better slow-motion effects, and improved color grading possibilities, a wide range of manual controls, customizable settings, and artistic shooting modes.

- Installed a new dedicated workstation for audio-video editing in the AV lab offers superior performance, stability, multitasking abilities, optimized graphics performance, efficient storage solutions, colour accuracy, expandability, and additional support all of which significantly improve the editing process and the final output. While workstations may require a higher upfront investment compared to regular desktop computers, their benefits for professional audio-video editors outweigh the costs in the long run.
- Installed a teleprompter.
- Augmentation of Electronic Materials and Devices Laboratory (EMERALD) and Space Technology Innovation and Characterization (STIC) labs, which include the augmentation of scanning tunneling microscope (funded by DST) and atomic layer deposition system.
- Set up photo count experiments at IIST. This includes setting up of optical equivalent of the Stern-Gerlach experiment, photon diffraction experiment (wave particle duality), etc.
- Spatial Light Modulator(SLM), CMOS Camera were added to the optics lab facility.
- Installed PFS Storage for a parallel computing cluster, one GPU Server, and two CPU servers in the computing center.

ASIC Lab

VCK 5000 AIVersal AI development card with Dell Poweredge 750 Server

4.13 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 also, the institute has taken major strides by entering into collaborations with other universities/institutes / R&D organizations of eminence.

- National Institute of Technology, Calicut
- 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

4.14. STIIC- The Innovation Hub

Space Technology Innovation and Incubation Centre (STIIC), is the innovation hub of Indian Institute of Space Science and Technology (IIST) Thiruvananthapuram and acts as an umbrella for advancement of entrepreneurship and innovations at IIST. STIIC manages a business incubator which envisages to provide systematized scientific guidance and infrastructure support to young entrepreneurs within its campus.

In the report period, we have ten startup companies in STIIC, five companies in their incubation stage and the remaining in their preincubation stage. Apart from these companies, we have received several applications which are currently under review. The incubated companies include

1. Vashishtha Research Pvt. Ltd.

- Robotics and Machine Development
- Electronics and Embedded software
- Engineering software and 3D viewers

2.SPACETIME 4D printing solutions LLP :

- Developing 3D printers for 3D printing materials research.
- Direct printing from raw materials – customized printers.

3.Bhuh Pramaan Pvt. Ltd.

- Developing innovative solutions in satellite image & Geo-spatial data processing.

4.InterCosmos Space Exploration Technologies Pvt. Ltd :

- Developing innovative solutions in satellite image & Geo-spatial data processing.

5.SPECRULE Scientific Pvt. Ltd.

- Inhouse development of laser-based optical sensor systems for aerospace and combustion research.

PRE-INCUBATED COMPANIES

1. Spacecurve Technologies India Pvt . Ltd.

- Build customized and off-the-shelf components/ systems of launch vehicles and satellites.

2. Zeroing in Association

- Science podcast

3. FluxxEV Electric Pvt. Ltd.

- Electric bikes.

4. Hathor Rockets Pvt. Ltd.

- Semi-cryogenic and Cryogenic Liquid Propellant. Engines.
- Propulsion Modules and Subsystems.
- Reusable launch vehicles.

5.CloudOne AI Robotics Lab

- Drone technology

Interaction of STIIC startup companies with Sri. Rajeev Chandrasekhar, Hon. Minister of State for Skill Development and Entrepreneurship, Minister of State for Electronics and Information Technology and Minister of State for Ministry of Jal Shakti GoI, during VSSC-IIST meeting at Srinivasan Auditorium VSSC on March 6, 2024 .

Hon. Minister visited the exhibition stall and was greeted and briefed about the startup ecosystem in IIST by the faculty coordinator of Space Technology Innovation and Incubation Centre (STIIC). This was followed by the one to one introduction and short demonstration of their ideas/products by five startup companies – Specrule Scientific Pvt. Ltd., Vashishtha Research Pvt. Ltd., SPACETIME 4D printing solutions LLP, Hathor Rockets Pvt. Ltd. and FluxxEV Electric Pvt. Ltd. All the companies emphasized on their ultimate goal of indigenization of products and processes in the respective sectors and contributing to the 'Atmanirbhar Bharat.' Product demonstrations included a mini rocket thruster by Hathor Rockets Pvt Ltd and an electric bike by FluxxEV Electric Pvt. Ltd. Specrule Scientific Pvt. Ltd., Vashishtha Research Pvt. Ltd., SPACETIME 4D printing solutions LLP explained about their ambitious goals in the areas of Laser-based optical sensor systems for aerospace and combustion research, Robotics and machine development and 3D printers for 3D/4D printing materials research respectively. Honourable minister was highly impressed by the interactions and extended warm wishes to the start-up representatives.

Laser-based flow velocimetry system

Nimbus S: Autonomous Logistics Drone

Orbital Transfer Vehicle (OTV)

4.15. Special Facility Announcements by Govt of India

IIST Awarded Prestigious 5G Use Cases Labs

Indian Institute of Space Science and Technology (IIST), was awarded with the 5G use case Labs under the “100 5G use case labs Initiative" of Government of India. Prime Minister Shri Narendra Modi formally awarded the 5G use case labs during the inauguration of Indian Mobile Congress 2023 (IMC-2023) in New Delhi. This initiative aims to foster expertise and active participation in 5G and subsequent technologies among students, educators, researchers, and the startup ecosystem. 5G use case Labs programme will be overseen by the Department of Telecommunications (DoT), Government of India.

The state-of-the-art 5G use case labs will be equipped with 5G cellular infrastructure (mid-band) SA, 5G SIMs, dongles, IoT gateway, router, application server, and a comprehensive management dashboard. Engineering institutions in and around south India can collaborate with IIST in order to utilize the 5G use case labs for research and education. The 5G use case labs also promise to seamlessly integrate IIST Trivandrum into the expansive global digital development ecosystem.

The state-of-the-art 5G use case labs at IIST Trivandrum will be a beacon of technological excellence, featuring advanced 5G cellular infrastructure and tools. Importantly, IIST will retain full ownership of the Lab Assets.

Hon. Union Minister of State for Electronics and IT, Dr. Rajeev Chandrasekhar announced IIST as a potential candidate for the regional centre for Bharat Semiconductor Research Centre (BSRC), while addressing students, researchers, industry leaders and members from ISRO in Kerala today at the 4th Semicon India Future Design Roadshow. BSRC is envisaged as a global standard academia- government- private sector-start-up partnered establishment.

Key objectives of the initiative are:

*Foster expertise in 5G technologies within the academic community.

*Support undergraduate and postgraduate projects centered on 5G.

*Promote collaborations between academia and industry for 5G innovations.

*Provide startups and MSMEs nearby with a 5G testing environment.

*Equip the Indian academic and startup sectors for the upcoming 6G era.

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 advancement 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 and technology both nationally and on the global stage.

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5.2 Books Published

5.2.1 Avionics

- Raghavan, M., **Harsha Simha, M.S.,** & Ramaswamy, C.R., (2023). Elements of Indic knowledge systems & heritage. HTSR Institute, ISBN: 8196417608, 9788196417604.

5.2.2 Chemistry

- **Joseph, K.,** Wilson, R., George, G., & Appukuttan, S., (2023). Lignin-based materials: Health care and medical applications, Royal Society of Chemistry, ISBN: 9781839165351.
- **Joseph, K.,** Wilson, R., George, G., & Appukuttan, S., (2023). Zero dimensional carbon nanomaterials, Elsevier, ISBN: 9780323995351 & 9780323995368.

5.2.3 Humanities and Social Sciences

- **Babitha Marina Justin**, (2023). Kichangani: An Indo-African story, Illustration, National Book Trust, ISBN: 9357431764.
- **Babitha Marina Justin,** (2023). Forty five shades of brown. Paperwall Publishing. ISBN: 8196059272.

5.2.4 Mathematics

- **Raju K. George,** & Ajayakumar, A., (2023). A course in linear algebra, Springer Nature.

5.3 Book Chapters in edited volumes

5.3.1 Aerospace Engineering

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- Sukesan, M.K., Kumar, A., & **Shine, S.R.,** (2024). Effect of divergence angle, carrier gas, and back pressure on species separation using convergent-divergent micro-nozzle. Lecture Notes in Mechanical Engineering. Springer.
- **Sooraj, V.S.,** & Radhakrishnan, V., (2024). Elastically embedded abrasives for micro finishing: Theory and state-of-the-art. In P.K. Rakesh & J.P., Davim (Eds.), Innovative development in micromanufacturing processes (19th chapter, Manufacturing Design and Technology Series). CRC Press-Routledge-Taylor & Francis Group.

5.3.2 Avionics

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- Sathiskumar, P., & **Selvaganesan, N.,** (2023). Tuning of complex coefficient fractional complex order controllers for a generalized system structure: An optimization approach. In Optimization methods for product and system design (53-70). Springer.
- Vanchinathan, K., & **Selvaganesan, N.,** (2023). A review on intelligent optimization techniques based fault detection and diagnosis in power system applications. In Optimization methods for product and system design (71-88). Springer.

5.3.3 Chemistry

- Rajan, R., Asok, A.G., Lekshmi, S., Appukuttan, S., George, G., Wilson, R., & **Joseph, K.,** (2023). Heterostructures based on zero-dimensional carbon-based nanostructures. Nanoscale, Elsevier, 385.
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5.3.4 Earth and Space Sciences

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5.3.5 Humanities and Social Sciences

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- **Babitha Marina Justin,** (2024). Raining in the hills. Folio Books.
- **Gigy J. Alex,** (2023). Visual politics of the body in food representations in Malayalam film songs. In A. Kuriakose

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- **Gigy J. Alex,** (2023). Wild wild west wind, calm down. In V. Pou & P. B. Anderson (Eds.), TMYS review: Tribal literature and tribal representation in literature (64-72). Centre for Asia Pacific Initiatives, University of Victoria.
- Sihas, K.M., & **Nair, L.V.,** (2023). Beyond the screen: Indigenous women in Kerala and the impact of television. In Routledge handbook of gender, culture, and development in India (43-56). Routledge.

5.3.6 Mathematics

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5.4 Literary Publications

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- **Nikhil Eyeroor,** (2023). Understanding locus of control, Surabhi magazine, IIST Journal of Arts and Literature, 18(1), 6-8.
- **Nikhil Eyeroor,** (2023). Are you prone to being brainwashed, Surabhi magazine, IIST Journal of Arts and Literature, 18(2), 8-10.

5.5 Publications in Conference Proceedings

5.5.1 Aerospace Engineering

- Sekar, A., Krishna, Y., & **Vaidyanathan, A.,** (May 28–June 01, 2023). Atomization and mixing of liquid and aerated jet injected behind curved pylon in supersonic cross-flow. 25th AIAA International Space Planes and Hypersonic Systems and Technologies Conference, Bengaluru, Karnataka, India.
- Raju, M., Desikan, S.L.N., & **Vaidyanathan, A.,** (May 28–June 01, 2023). Investigation of the unsteadiness during starting transient operation of a zero secondary flow ejector. 25th AIAA International Space Planes and Hypersonic Systems and Technologies Conference, Bengaluru, Karnataka, India.
- Krishna, Y., Sekar, A., Magnotti, G., & **Vaidyanathan, A.,** (May 28–June 01, 2023). One-dimensional interferometric scattering velocimetry for high-speed flows. 25th AIAA International Space Planes and Hypersonic Systems and Technologies Conference, Bengaluru, Karnataka, India.
- Patial, S., Rai, A.K., Reddy, B.M., Goutham, C., Sojitra, D., Ayyappan, G., **Vaidyanathan, A.,** Bhalla, D., (May 28–June 01, 2023). Sub-scale experimental test of hybrid rocket engine using LOX and 3D printed fuel. 25th AIAA International Space Planes and Hypersonic Systems and Technologies Conference, Bengaluru, Karnataka, India.
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- Abhilash Narayan, Akhil Sivadas & **Deepu, M.,** (October 24–27, 2023). Investigations on the shear layer interactions in co-flowing convergent-divergent dual nozzle. 15th International Symposium on Experimental and Computational Aerothermodynamics of Internal Flows (ISAIF15), IIT Madras, Chennai, India.
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- Shekhar, S., Navaroj, K.M., Mahesh, S., & **Deepu, M.,** (October 24–27, 2023). Numerical simulation of shock wave-boundary layer interaction on a mass-evolving flat surface. 15th International Symposium on Experimental and Computational Aerothermodynamics of Internal Flows (ISAIF15), IIT Madras, Chennai, India.
- Maru, P., Mulani, F.O., & **Deepu, M.,** (December, 2023). Experimental and numerical investigations of Rayleigh-Bénard convection in a micro-particle laden liquid. 27th National and 5th International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTC 2023), IIT Patna.
- Rijin, K.V., Bijukumar, K.S., & **Deepu, M.,** (2024). Aspect ratio and curvature effects of regenerative channels on heat transfer in supercritical methane. International Conference on Advances in Aerospace and Energy Systems (IAES-2024), LPSC, Thiruvananthapuram. IAES 2024-253. (Won the best paper award for the oral presentation)
- Dinesh, D., Akhil Sivadas, & **Deepu, M.**, (2024). Experimental and numerical study on jet impingement cooling on a rotating disc with localized heating. International Conference on Advances in Aerospace and Energy Systems (IAES-2024), LPSC, Thiruvananthapuram. IAES 2024-525.
- Ramesh, M., Navaroj, K.M., & **Deepu, M.,** (2024). Numerical investigation of the effect of obstruction geometry on oscillating flow across a rectangular channel. International Conference on Advances in Aerospace and Energy Systems (IAES-2024), LPSC, Thiruvananthapuram. IAES 2024-673.
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- Abhilash Narayan, Akhil Sivadas, Bijukumar, K.S., & **Deepu, M.,** (2024). Numerical investigation on shear layer development in a dual-fuel model rocket nozzle. International Conference on Advances in Aerospace and Energy Systems (IAES-2024), LPSC, Thiruvananthapuram. IAES 2024-171.
- Navaroj, K.M., Akhil Sivadas & **Deepu, M.,** (2024). Analysis on the effect of heat release on supersonic shear layer. International Conference on Advances in Aerospace and Energy Systems (IAES-2024), LPSC, Thiruvananthapuram. IAES 2024-582.

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- Rishabh, L., **Sadanandan, R., & Praveen Krishna, I.R.,** (2023). Experimental investigation of the self-excited oscillations of swirl stabilized non-premixed flames. 27th National and 5th International ISHMT-ASTFE Heat and Mass Transfer Conference, December 14-17, 2023, IIT Patna, Bihar.
- Mahanti, A., Satheesh, K., Mishra, D., & **Sadanandan, R.,** (2023). Deep learning based absorption tomography for combustion diagnostics. In Proceedings of the 25th AIAA International Space Planes and Hypersonic Systems and Technologies Conference, Bengaluru, Karnataka, India.
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- Venkatesh, N., Agarwal, D.K., **Salih, A.,** & Kumar, S.S., (2023). Experimental investigation on the influence of thermophysical properties and coatings on cryogenic feed line chilldown performance. In Proceedings of the 27th National and 5th International ISHMT-ASTFE Heat and Mass Transfer Conference (poster presentation). IIT Patna. December 14-17.
- Priya, S., & **Sam Noble,** (2023). Paving the way for planetary terraforming: An innovative approach to sowing alfalfa seeds on the Red Planet. In Future Perspectives of Indian Space Technology & Ecosystem, ASET conference

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- Pao, J., & **Sam Noble,** (2023). Telescope deployment mechanism. In Pool C: Technical Hindi Seminar - 2023 (Organized by DoS/ISRO centres).
- Harikrishnan, R., Kalesh, A., Shreyas, C.S., Yadu Krishnan, R.B., & **Sam Noble,** (2023). Six linked telescope mirror deployment mechanism (SLTMD). In National Conference on Landing & Recovery Systems for Aerospace Vehicles, FAST-2023.
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- Vikas, J.S., & **Sam Noble,** (2023). Designing an autonomous satellite docking mechanism for refueling missions. In National Conference on Landing & Recovery Systems for Aerospace Vehicles, FAST-2023.
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- Vadlakunta, A.P., **Sooraj, V.S.,** Anil Kumar, V., Roy, A., Aravind, V., & Ayyappan, G., (2023). Generative design for additive manufacturing of sounding rocket crown: A case study. 9th International Conference on Product LifeCycle Modelling, Simulation and Synthesis (PLMSS-2023), India.
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- Thekkoot Surendran, S.B., & **Sooraj, V.S.,** (2024). Thermo-regulation in machining of Carbon Fibre Reinforced Polymer (CFRP) composites using specially designed grinding wheel via additive manufacturing. International Conference on Advances in Aerospace and Energy Systems (IAES), Trivandrum, India.
- Saha, D., Patel, A., Mayur, M., Verma, S., Jeyasingh, J.V., & **Sooraj, V.S.,** (2024). Design modification to avoid localized cracking of metallic isogrid panels for payload fairings in launch vehicles. International Conference on

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- Akhil, A.I., Reddy, D.R., Anilkumar, V., **Sooraj, V.S.,** & Roy, A., (2024). Redesigning a radiator component for aerospace applications using the DfAM approach. International Conference on Advances in Aerospace and Energy Systems (IAES), Trivandrum, India.
- Bharathi, G.R., & **Vinoth, B.R.,** (2023). Mutual synchronization of low-density jets. Perspectives in Nonlinear Dynamics, Paper ID 66. Presented at the 2023 Perspectives in Nonlinear Dynamics Conference, IIT Madras, India, August 1–4, 2023.

5.5.2 Avionics

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- Kapoor, H., K., Elangovan, & **Anoop, C.S.,** (2023). Charge-discharge-based digitizer for resistive displacement sensor. Proceedings of the 16th IEEE International Conference on Sensing Technology, December 2023. IEEE.
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- Majumder, C., **Basudev Majumder & Ghosh, B.,** (2023). A kW-range solid-state power amplifier design for OTH radar's transmitter application. Proceedings of the Microwaves, Antennas, and Propagation Conference (MAPCON), December 2023. IEEE.
- **Basudev Majumder**, Vinnakota, S.S., Sreekavya, M.K., & **Ghosh, B.,** (2023). Microstrip fed all metal lens antenna as a power transfer medium for 5G application. Proceedings of the Microwaves, Antennas, and Propagation Conference (MAPCON), December 2023. IEEE.

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- Goud, R.M., Kandasamy, K., & **Basudev Majumder,** (2023). Broadband linear to circular and multi-band cross polarization conversion reflective metasurface for Ku, K, and Ka band applications. Proceedings of the 11th Asia-Pacific Conference on Antennas and Propagation (APCAP), November 2023. IEEE.
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- Gautam, S.K., & **Dinesh N. Naik,** (2023). Deformation estimation along a desired direction using digital speckle correlation technique. Frontiers in Optics + Laser Science, Optica Publishing Group.
- Harikrishnan, P., Athira, T.S., & **Dinesh N. Naik,** (2023). Estimation of profile for a tilted surface starting with locally unambiguous and globally wrapped phases synthesized using tunable wavelength laser. Photonics, 2023, IISc, Bangalore.
- Haneen, V.N., & **Dinesh N. Naik,** (2023). Simulation of coherence vortices from spatially incoherent sources of distinct wavelengths. Photonics, 2023, IISc, Bangalore.
- Raj, D.R., Athira, T.S., Harikrishnan, P., & **Dinesh N. Naik,** (2023). Low-coherence profilometry of reflective surface using differential interference microscopy in a Sagnac setup. Photonics, 2023, IISc, Bangalore.
- Gautam, S.K., Vikas, Rajesh Kumar, Titus, S.S.K., Panchal, P., & **Dinesh N. Naik,** (2023). Effect of speckle size in edge point referencing for deformation measurement. Photonics, 2023, IISc, Bangalore.
- Panchal, P., **Dinesh N. Naik,** Athira, T.S., & Singh, R.K., (2023). Wide-field reflection phase microscopy with scalar optics using averaged speckle-illumination. Photonics, 2023, IISc, Bangalore.
- Athira, T.S., Krishnan, Y.K., & **Dinesh N. Naik,** (2023). Investigation of phase nonlinearity through computer-generated Fourier transform hologram. Photonics, 2023, IISc, Bangalore.
- Harikrishnan, P., & **Dinesh N. Naik,** (2023). Convergence criteria for recursive formula used in phase measurement of tilted surface using tunable wavelength interferometer. In International Conference on Optics, Photonics, and Quantum Information OPTIQ-2023. Cochin University of Science and Technology, Kochi.
- Panchal, P., Harikrishnan, P., & **Dinesh N. Naik,** (2023). Sensing wavefronts and relative phase of superimposed fields combining the intensity distributions in signal and frequency domains. In International Conference on Optics, Photonics, and Quantum Information OPTIQ-2023. Cochin University of Science and Technology, Kochi.
- Athira, T.S., & **Dinesh N. Naik,** (2023). Asymmetry in central wavelength shift curves due to material dispersion introduced in a spectral interferometer. In International Conference on Optics, Photonics, and Quantum Information OPTIQ-2023. Cochin University of Science and Technology, Kochi.
- Renjini, S.R., **Dinesh N. Naik,** & **Narayanamurthy, C.S.,** (2023). Holographic imaging through turbid media. In International Conference on Optics, Photonics, and Quantum Information OPTIQ-2023. Cochin University of Science and Technology, Kochi.
- Haneen, V.N., & **Dinesh N. Naik,** (2023). Phase modulation in spatial coherence by modulating intensity of incoherent source. In International Conference on Optics, Photonics, and Quantum Information OPTIQ-2023. Cochin University of Science and Technology, Kochi.
- Harikrishnan, P., & **Dinesh N. Naik,** (2023). Convergence criteria for recursive formula used in phase measurement of tilted surface using tunable wavelength interferometer. In UEC-SAARC Symposium on Emerging Technologies (USSET 2023). University of Electro-Communications, Tokyo, Japan.
- Haneen, V.N., & **Dinesh N. Naik,** (2024). Introducing phase variations in spatial coherence using dynamics of spatially incoherent source. In Women in Optics and Photonics in India. IIT Madras.
- Saini, S., **Kuntala Bhattacharjee**, & Gouda, G.M., (2024). Switching behavior of the composite low-dimensional structural hybrids of carbon after UV exposure. IOP Conference Series: Materials Science and Engineering, 1300, 012029.
- P.S.,Sachidanand, Mohan, M.,S,R., Viswan, G., & **Kuntala Bhattacharjee,** (2024). Electrical nature and surface enhanced Raman spectroscopy of Ag nanoparticles decorated graphene sheet. IOP Conference Series: Materials Science and Engineering, 1300, 012008.
- Bhanwala, J., Sadhukhan, S., Renjini, S., & **Narayanamurthy, C.S.,** (2023, April). Geometric phase shift in

Michelson interferometer with polarizing beam splitter. DAE-BRNS National Laser Symposium (NLS-31), Indian Institute of Technology Kharagpur, 31.

- Sadhukhan, S., Brundavanam, M.M., **Narayanamurthy, C.S.,** & Bhanwala, J., (2023, September). Geometric phase shift in Michelson interferometer with polarizing beam splitter. XLV Symposium of the Optical Society of India (COPAQ-2022), Indian Institute of Technology Roorkee.
- Jaduvanshi, D.K., **Narayanamurthy, C.S.**, & Biswajit Pathak (2024, January). Accurate phase reconstruction in digital holography microscopy using Fresnel biprism. Proceedings of SPIE, Photonics West - USA (Vol. 12852, 128520S). SPIE.
- Jaduvanshi, D.K., Pathak, B., & **Narayanamurthy, C.S.,** (2024, March). Accurate phase reconstruction in digital holography microscopy using Fresnel biprism. Quantitative Phase Imaging X Conference.

5.5.8 Administrative Wings

- Abhay Jain & **Abhilash, S.,** (2023), June. "अंतरिक्ष रोबोटिकी" in Hindi Technical Seminar (HTS) on अंतरिक्ष रोबोटिकी: भविष्य के अंतरिक्ष कार्यक्रमों में सही मायने में दिक् परिवर्तक held at IISU, Thiruvananthapuram.
- **Ancy Austin,** (2023), December. "दीर्घकालिक अंतरिक्ष मिशन के लिए मानव मनोविज्ञान: संक्षिप्त विवरण" in Inter Centre Hindi Technical Seminar (ICHTS) on 'समानव अंतरिक्ष अभियान की चुनौतियां, अनुप्रयोग तथा भावी संभावनाएं' held at DOS/ISRO HQ.
- **Mahima, S.,** (2023), December. "अंतरिक्ष अन्वेषण में कृत्रिम बुद्धि की झलक" in Inter Centre Hindi Technical Seminar (ICHTS) on 'समानव अंतरिक्ष अभियान की चुनौतियां, अनुप्रयोग तथा भावी संभावनाएं' held at DOS/ISRO HQ.
- **Sreeja, J.J.,** (2023), December. "अंतरिक्ष प्रणालियों में साइबर सुरक्षा - सबसे बड़ी चुनौती " in Inter Centre Hindi Technical Seminar (ICHTS) on 'समानव अंतरिक्ष अभियान की चुनौतियां, अनुप्रयोग तथा भावी संभावनाएं' held at DOS/ISRO HQ.

5.6 Patents

5.6.1 Aerospace Engineering

- Title: Swirl Stabilized Liquid Fuel Burner with Multi-Point Aerated Injector.
  Name of the Inventors: **Rajesh Sadanandan** & Prakash, R.S.
  Status: Granted
- Title: Ultra Lean Non-Premixed Gaseous Fuel Burner.
  Name of the Inventors**: Rajesh Sadanandan.**
  Status: Granted
- Title**:** Flapping wing mechanism for a bionic micro aerial vehicle.
  Name of the Inventors**:** Mrudul C, **Sam Noble,** & Sreejalekshmi, K.G.
  Status: Granted
- Title: Reconfigurable grinding wheel with in-built cooling and self-adaptable lubrication system via additive manufacturing.
  Name of the Inventors: **Sooraj V.S.,** & Thekkoot Surendran, S.B.
  Status: Granted.

5.6.2 Avionics

- Title: Digitizing Interface Circuit Topology and A Measurement Strategy for Grounded RC-Based Impedance Sensors.
  Name of the Inventors: **Anoop, C.S.,** & Elangovan, K.
  Status: Filed

- Title: Universal Linearization Method and Circuit Framework for Various Non-Linear Resistive-Sensor Bridge Topologies.
  Name of the Inventors: **Anoop, C.S.,** Vineeth, B.S., Mathew, T., & Nani, S.
  Status: Filed

- Title: Linearizing Demodulator and Front-end Circuit for Transformer-type Displacement Transducers.
  Name of the Inventors:**Anoop, C.S.,** Nehra, B.R.S., & Sharma, M.
  Status: Filed

- Title: IoT Enabled Biomedical Wearable Clothing System for Healthcare Assistance.
  Name of the Inventors: Prescilla Koshy, Ananthakrishnan, Sarath Babu & **Manoj, B.S.**
  Status: Granted

- Title: Room temperature Gas Sensor.
  Name of the Inventors: **Palash Kumar Basu**, L. Karthikeyan & Akshaya. M.V
  Status: Granted

- Title: Closed Loop In-Plane Movable Suspended Gate FET(CLIP-SGFET) based Accelerometer and The Fabrication Method.
  Name of the Inventors: **Seena, V.,** Anju Sebastian & K. Naveen
  Status: Granted

5.6.3 Chemistry

- Title: low-dielectric ceramic composition and a process of producing the same.
  Name of the Inventors: Basheer Masin, Karunanithi Ashok, **Prabhakaran, K.,** & Hariharan Sreemoolanadhan.
  Status: Granted
- Title: Biologic Cavity Viewer, Imaging capture and incorporated image processing measurement system.
  Name of the Inventors: Subin Sukesan, **Shaiju S. Nazeer,** Dr Anish Karimpannur John, Smita V, aravana Babu M. S, Nelsa Abraham, Sooraj A R, Govind U, Karthikeyan, Saikrishnan R, Ayush Arun, Krishna Sarma S, Arun Anirudhan V.
  Status: Filed
- Title: Fluorescence Mapping System for Optical Pathology.
  Name of the Inventors: Jayasree R S, **Shaiju S. Nazeer,** Jeena, R.S, Anish Karimpannur John, Bhadra Devi Nair S, Nandana V.L, Nayana V.L, Shreya R.S, Anantha Krishnan S, Sethulekshmi S, Sanil K Daniel, Arun Anirudhan.
  Status: Filed
- Title: Flapping wing mechanism for a bionic micro aerial vehicle.
  Name of the Inventors: Mrudul, C., Sam Noble & **Sreejalekshmi, K.G.**
  Status: Granted

- Title: Random Positioning Machine [RPM] with the tilt setup.
  Name of the Inventors: Srujana Juratagi & **Sreejalekshmi, K.G.**
  Status: Filed

5.6.4 Earth and Space Sciences

- **Title:** Geosemantic Point Cloud Enrichment (GPCE) for Spatio-Empirical Decision- Making.
  Name of the Inventors: Ramiya, A.M., & Jayati Vijaywargiya
  Status: Filed

5.6.5 Physics

- Title: A Method and Device for Zonal Wavefront Sensing via Sequential Spatially Shifted Grating Array Patterns.
  Name of the Inventors: **Biswajit Pathak,** Bosanta R. Boruah
  Status: Granted

5.7 Awards and Achievements

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

5.7.1 Aerospace Engineering

- **Chakravarthy, P.** - Reviewer Appreciation Certificate from the journal Transactions of Indian Institute of Metals.
- Sona Babu, under the guidence of **Girish, B.S.,** Third best paper award at ORSI-2023 & ICBAI-2023 conference, held at IISc Bangalore, from December 18-20, 2023.
- **Pradeep Kumar, P.**, Journal paper in Physics of Fluids was selected as Editor's Pick.
- **Prathap, C.**, P.V., Sai Hemant, N., Aditya, J., Kuniyil, & A., Sarkar, received Best Paper Award in the Student Category and a cash prize of 5000 INR at The International Symposium on Experimental and Computational Aerothermodynamics of Internal Flows at IIT Madras held from October 24-27, 2023.
- **Prathap, C.,** Best Paper Award at the 10th International and 50th National Conference on Fluid Mechanics and Fluid Power (FMFP) at IIT Jodhpur from 20-22 December 2023.
- **Salih, A.,** & Venkatesh, N., Best Poster Award at 27th National and 5th International ISHMT-ASTFE Heat and Mass Transfer Conference, held at IIT Patna, from December 14-17, 2023.
- **Shine, S.R.,** Associate editor of the ASME Journal of Engineering and Science in Medical Diagnostics and Therapy until 2027.
- **Shine, S.R.,** Guest Editor of Computational Thermal Sciences.
- **Shine, S.R.,** Guest Editor of Heat Pipe Science and Technology, An International Journal,
- **Shine, S.R.,** Guest Editor of Engineering Research Express
- **Shine, S.R.,** President of the ISHMT Regional Chapter Trivandrum.

5.7.2 Avionics

- **Anoop, C.S.,** received the IEEE Outstanding Reviewer Award in 2023.
- **Saha, C.,** nominated as the Chair of the SIGHT committee of IEEE Microwave Theory and Technology Society.
- Gopika R., under the guidance of **Saha, C.,** received the URSI (International Union of Radio Science) Young Scientist Award in 2023 and conferred with the award in Sapporo, Japan in September 2023.

- Chiranjit Majumder, MTech project student under of the guidance **Basudev Majumder** (2022-2024), secured a PhD position in 2024 at IIT Kanpur in the area of Microwave Circuits and Systems.
- T.S Sruthi, MTech project student under of the guidance **Basudev Mujumdar** student (2022-2024), secured an R&D Engineer job in the RFIC area at Cyient Technology.
- **Manoj, B.S.,** Notable Contributions for Engineering Profession during 2020-2022 award from IEEE
- **Manoj, B.S.,** Best Paper Award at IEEE Indiscon 2023, August 2023.
- **Seena, V.,** Tina B.S., Featured article in IEEE Sensors Journal.
- **Sheeba Rani, J.,** & Vijay Joshi., Received IEEE Circuits and Systems Student Travel grant fellowship to present their work at MWSCAS 2023 in Phoenix, Arizona, USA
- **Sheeba Rani, J.,** & Vijay Joshi., Received SERB international Travel Support to present their work at the International Symposium on Circuits and Systems, ISCAS'24.
- **Sooraj Ravindran,** Received the Best Poster Award for the paper presented at Photonics 2023, held at IISc Bangalore.
- **Sooraj Ravindran,** Received the Best Paper Award for the paper presented at OPTIQ, held at CUSAT, Kochi, in December 2023.
- **Kaarthik, R.S.-** Received the Best Paper Award in the IEEE International Conference on Transportation Electrification, iTEC 2023.
- **Kaarthik, R.S.-** Received an International Travel grant by KSCSTE as a part of the Kerala State Young Scientist Award.

5.7.3 Chemistry

- **Gomathi Nageswaran,** & Varsha M.V., Received International travel scheme, (ITS) the financial support by Science and Engineering Research Board and Electrochemical society (ECS) Travel Grant for the 243rd ECS Meeting and the 18th International Symposium on Solid Oxide Fuel Cells (2023) organized by the Electrochemical Society, Boston, U S A.
- **Joseph, K.**, Nominated as Fellow of Indian Analytical sciences (ASI)
- Sreekala, Ph.D scholar under the guidance of **Mary J. Gladis**- selected as a Future Research Talent (FRT) scholar as a part of the 2023 FRT program at the Australian National University (ANU).
- Govind Kumar Sharma & **Nirmala Rachel James**- Best oral presentation award,17th International conference on Polymer Science and Technology, SPSI-MACRO-2023, organized by IIT Guwahati, December 10-13th, 2023.
- **Sandhya, K.Y**., and S. Saisree., Nano Innovation Challenge Award 2023, M G University, for the work in electrochemical sensors.
- Chithra R. Nair & **Sreejalekshmi, K.G.,** Best poster award Polymer Processing Society-Asia-Australasia Regional Conference (PPS 2023), organized by Polymer Processing Academy, 29th November- 2nd December 2023.

5.7.4 Earth and Space Sciences

- Haritha. A., Research scholar under the guidance of **Rajesh, V.J.**- awarded best poster during the 2023 Annual Convention of International Association of Gondwana Research and the 20th International conference on Gondwana to Asia held in Niigata University, Japan during 7th-12th October 2023.
- **Ramiya, A.M.**- Senior IEEE member in 2023.

- **Ramiya, A.M**., received the KSCSTE Travel Grant Award in 2023 to attend the ISPRS Geospatial Week in Cairo, Egypt.
- Jayati Vijaywargiya, Research Scholar under the guidance of **Ramiya, A.M**., received ISPRS Congress Travel Grant in 2023.
- Jayati Vijaywargiya, Research Scholar under the guidance of **Ramiya, A.M**., a acieved 1st place in the Doctoral Colloquium at InGARSS 2023.
- Jayati Vijaywargiya, Research Scholar under the guidance of **Ramiya, A.M**., recieved IGARSS 2024 Travel Grant.
- Sam P. Raj and Mr. Aakash Kumar, under the guidance of **Sinha, P.R.**, have been awarded a full grant to participate in the Global Atmosphere Watch Training and Education Centre's 41st (GAWTEC-41) training course organized by the World Meteorological Organization (WMO) in Germany in October 2023.

5.7.5 Humanities and Social Sciences

- Shreya Parvathi, a PhD scholar under the supervision of **Babitha Marina Justin,** P.M Yuva Fellowship for 2024, which includes a book publication mentorship and a royalty of ₹3 Lakhs
- **Shaijumon, C.S.,** nominated to the International Program Committee of IAF Global Conference on Space Exploration (GLEX)
- **Shaijumon, C.S.,** Vice Chairman of the focus group on 'Education in Social Sciences' by the Government of Kerala for the revision of State School curriculum framework.
- **Shaijumon, C.S.,** Chairman of the Textbook Development Committee for Class 9 Social Science by the Government of Kerala.

5.7.6 Mathematics

- **Sabu, N.,** Outstanding Alumni award from St. Jude's College, Thoothoor, Kanyakumari Dist, Tamil Nadu.
- **Sakthivel, K.,** Received full travel grant award from the National Board for Higher Mathematics (NBHM)/DAE to deliver a talk at the International Congress of Industrial and Applied Mathematics (ICIAM) held in Tokyo, Japan, from August 20-25, 2023.
- **Sarvesh Kumar** Received a grant of INR 2,75,000 from the National Board for Higher Mathematics (NBHM) for participating in the International Congress on Industrial and Applied Mathematics held at Tokyo, Japan, from August 20-25, 2023.
- Amit Vishwakarma & **Subrahamanian Moosath K.S.,** received the Best Oral Presentation award for the paper titled "Statistical Divergence and Point Clouds Comparison" at the 36th Kerala Science Congress, held from February 8th to 11th 2024 at Govt. College, Kasaragod.
- **Sumitra, S.,** Membership at the Institute of Electrical and Electronics Engineers (IEEE) as a Senior Member.

5.7.7 Physics

- Best poster presentation award (second prize) to Priyanka, M., & **Ashok Kumar**, for the paper "Quantum Enhanced Nonlinear Optical Gyroscope", by Women in Optics and Photonics in India conference -2023 held at IIT Madras on January 2-3, 2024.
- **Biswajit Pathak** Ramanujan Fellowship by the Science and Engineering Research Board (SERB-DST), Government of India in 2023
- **Biswajit Pathak** Invited to serve as Guest Editor for the special issue on "Diffractive Optics - Current Trends and Future Advances" by Photonics Journal, MDPI Publication in 2023.

- **Biswajit Pathak**- Serving as an event officer for the Holography and Diffractive Optics technical group, OPTICA,
- **Dinesh N. Naik.,** & Athira, T.S., were awarded the Best Poster Award at Photonics 2023 held at IISc, Bangalore in July 2023.
- Vaishnavi M Rajesh under the supervision of **Jinesh, K.B.,** was awarded the Best Poster Award at the Advanced Functional Materials and Devices (AFMD-2024) conference held at SRMIST, Chennai in February 2024.
- **Narayanamurthy, C.S.,** elected Fellow of SPIE (International Society for Optics and Photonics), USA in 2023.
- **Ivan, J.S.,** Trusted reviewer certificate from IOP publishing for reviewing their journal papers.

5.8 Seminars/ Workshops/ Training Programmes Organized in IIST

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

Sl.No	Title	Organizers	Date
1	Workshop on National Education Policy	Deepu, M.	May 8, 2023
2	Two-week Young Talent Nurture (YTN) programme organized by Dept. of Mathematics	Deepak, T.G.	May 22 - June 3, 2023
3	Invited lecture to students of YUVIKA, organised by ISRO at IIST	Sarita Vig	May 23, 2023
4	Organised the NuMATS (Nurturing Mathematical Talents in Schools) camp of 5 days jointly with the State Council of Educational Research and Training (SCERT), Government of Kerala for +1 and +2 students.	Anil Kumar, C.V.	May 24 – 28, 2023
5	Space Operations and Spatial Technology Course (SOSTC) for 35 o□□cers from various organisation	Priyadarshnam	June 11-26, 2023
6	Invited lectures to students at ANVIKA	Sarita Vig	July, 16-22, 2023
7	Student Induction Program	Deepu, M.	July, 2023
8	Symposium on Computational Mechanics and Space Robotics	Deepu, M.	September 4, 2023
9	Organised networking event on Holography and Diffractive Optics Technical Group Networking Lunch at Frontiers in Optics + Laser Science conference	Biswajit Pathak	October 12, 2023
10	Seminar on AR&DB Structures and Panel Meeting	Rajesh Sadanandan	December 11, 2023
11	Three Day National Conference on Food and Cultural Studies in Association with Centre for Cultural Studies University of Kerala and Dept of Space	Gigy J. Alex	December 13-15, 2023
12	3 days symposium on the Topic Genesis and evolution of organics in space.	Umesh R. Kadhane	January 18-20, 2024
13	Organised workshop for MTech and PhD students on Academic writing.	Babita Justin	September 26 – October 20, 2023

5.9 Institute Talks Organized by Faculty Members

Sl No.	Title	Speaker	Date	Organizer
1	Practices in Space Borne Optical Remote Sensor	Dr. M Senthil Kumar, Senior Scientist and project director, Cartosat 3, SAC-ISRO	May 3, 2023	Dinesh N. Naik
2	How to write your first grant proposal	Saumik Paul, Newcastle University, UK, Dept of Humanities	May 11, 2023	Shaijumon, C.S.
3	National Technology Day 2023 Celebration' jointly Kerala State Council for Science, Technology, and Environments (KSCSTE)& Indian Institute of Space Science and Technology (IIST)	Dr. S. Pradeep Kumar, AM Member Secretary, KSCSTE, ,Dr. Sherin B. M., Scientist - B, KSCSTE, Prof. K. P. Sudheer, Executive Vice President, KSCSTE	May 11-12, 2023	Chinmoy Saha
4	Hydrovoltaic: new renewable energy sources	Prof. Sudip Batabyal, Professor at Amritha Viswa Vidyalaya, Coimbatore	July, 2023	Jinesh, K.B.
5	MLOps	Dr. Asif Salim, Technology Specialist in AI at Litmus7 Systems Pvt. Ltd,	August 24, 2023	Sumitra, S.
6	Computational Mechanics and Space Robotics	Prof. P. Seshu, IIT Bombay, Dr. B. Jagadeesh, Parabole.ai Prof. Anil Sahasrabudhe, Chairman NETF, Chairman EC-NAAC and NBA Prof. R. P. Shimpi, IIT Bombay Dr. Litesh, University of Glasgow, and Mrs. A. P. Beena, DD, VSSC	September 4, 2023	Praveen Krishna, I.R.
7	Science from Aditya-L1: The First Space Solar Observatory from Indian Soil to Explore the Sun	Dr. Satheesh Thampi Division Head, Planetary Science Branch of the Space Physics Laboratory, VSSC	September 7, 2023	Anand Narayanan
8	FPGAs for Embedded Applications	Dr. Kuruvilla Varghese, Chief Research Scientist, IISc Bangalore	September 7, 2023	Sudharshan Kaarthik
9	PSLV / ADITYA Mission: Overviews on the Launch Vehicle, Spacecraft, and Orbit Transfer Calculations	L. Sowmia Narayanan, Deputy Director, Control and Guidance Simulation Entity, VSSC	September 21, 2023	Anand Narayanan
10	Visiting Faculty Programme	Dr Wendy McBride, (University of Arkansas) deputed by RELO (American Consulate)	September 26 to October 20, 2023	Babitha Justin
11	Lecture series and workshop on Visual Art techniques	Dr Sambath Raj from TKM Engineering College	September and October 2023	Babitha Justin
12	Art and Healing, for Visual	Mr Jeetin Rangher	November 8, 2023	Babitha Justin

Sl No.	Title	Speaker	Date	Organizer
	Communication Students			
13	Mudras Across Spaces: A Dance Workshop	Methil Devika	November 8, 2023	Babitha Justin
14	Dance Workshop as part of Orientation course for 1st year students	Ms. Irena Mohini	November 9, 2023	Babitha Justin
15	Mechanisms in Chandrayaan,	Shri. UA Subramanian Group Director, Aerospace Mechanisms Group (ASMG), VSSC and President, INSARM Trivandrum chapter.	November 15, 2023	Sooraj, V.S., & Deepu, M.
16	Lecture in connection with National Mathematics Day	Dr. E. Krishnan, former HoD, Department of Mathematics, University College, TVM	November 26, 2023	Anil Kumar, C.V.
17	A simple range characterization for spherical mean transform of radial functions in odd dimensions and applications	Venky P. Krishnan, Associate Professor, TIFR Centre for Applicable Mathematics, Bangalore,	February 9, 2024	Sakthivel. K.
18	Optical Cryptography through Structured Light	Prof. Naveen K Nischal, Professor, Department of Physics, IIT Patna	February 15, 2024	Dinesh N. Naik
19	E□□cient Methods for the Analytical and Numerical Solutions of Time-Fractional advection-diffusion-reaction problems	Prof. Natesan Srinivasan, Dept. of Mathematics, IIT Guwahati	February 23, 2024	Kaushik Mukherjee
20	Multifunctional Metaoptics	Prof. Federico Capasso, Robert Wallace Professor of Applied Physics, Harvard University	March 8, 2024	Biswajit Pathak
21	Bio-polarization Imaging using RGB Snapshot Full Stokes Camera	Prof. Yukitoshi Otani, Professor and Director, CORE, Utsunomiya University, Japan	March 11, 2024	Dinesh N. Naik
22	Workshop on Academic Writing for staff	Wendy Mcbride	September 26 – October 20, 2023	Babitha Justin
23	Lecture on ADC testingInvited talk on “A Vision for India to Lead in Semiconductor R&D and Manufacturing (What, Why & How?)".	Prof. Mayank Srivasthav, IISc	March 13, 2024	Seena, V.

5.10. Conference/ Workshop/ FDP/ Seminar/Training programmes by faculty members / staff (as a resource person) outside IIST

5.10.1 Aerospace Engineering

- Workshop on UG Mechanical Curriculum, November 9, 2023 organized by TKM College of Engineering, Kollam – **Anup, S.**
- Faculty development programme on Advances in Manufacturing Technologies - Modeling of hot deformation processes, January 13, 2024 organized by College of Engineering Trivandrum – **Chakravarthy, P.**
- Training programme attended in a summer school on Hydrodynamic Instabilities- Theory and Practice. July 17 - 21, 2023 organised by IIT Kanpur- **Pradeep Kumar, P.**
- Participated in the Project progress presentation of Oil India project on August 29, 2023 organized by IIT Guwahati – **Prathap, C.**
- Presented a paper titled 'Effect of hydrogen addition on the Thermal performance of self-aspirating natural gas domestic burner' at the Proceedings of the 10th International and 50th National Conference on Fluid Mechanics and Fluid Power (FMFP), 20-22 December 2023 organized by IIT Jodhpur – **Prathap, C.**
- One lecture titled 'Nonlinear vibrational in the DST-SERB Sponsored Five-Day Online Workshop on Vehicular Vibrations Control with Modern Suspension System, August 21-25, 2023 organized by NIT Suratkal- **Praveen Krishna, I.R.**
- Invited lecture on Journey from Industry to Academics in the fifth edition of the coveted Industry-Academia Conclave 5.0 (IAC 2023), September 15-16, 2023 organized by IIT Palakkad - **Praveen Krishna, I.R.**
- Invited lecture delivered on 'Finite Element Analysis' under Visiting Faculty Scheme, March 19, 2024 organized by Govt College of Engineering, Barton Hill, Thiruvananthapuram – **Salih, A.**
- **Sam Noble** & Jorin Pao, 2023, June. "दूरदर्शी विस्तरण क्रियाविधि" in Hindi Technical Seminar (HTS) on अंतरिक्ष रोबोटिकी: भविष्य के अंतरिक्ष कार्यक्रमों में सही मायने में दिक् परिवर्तक held at IISU, Thiruvananthapuram.
- Invited talk titled Mathematical Modelling of Human Thermoregulation in Microgravity Environmental Symposium on Space Health and Medicine: Current Scenario and Future Research Trends, May 30, 2023 organized by Directorate of Human Space Programme, ISRO Headquarters, Bangalore – **Shine, S.R.**
- Invited talk at one-day Workshop, titled Indian Space Research Organisation, ISRO & IIST's initiatives towards the Indian Space Program, August 23, 2023 organised by Department of EEE and IEEE, Musaliar College of Engineering & Technology – **Shine, S.R.**
- Session Chair at 27th National and 5th International ISHMT-ASTFE Heat and Mass Transfer Conference at IHMTC 2023, December 12-13, 2023 organized by IIT Patna – **Shine, S.R.**
- Presented the following papers in the 27th National and 5th International ISHMT-ASTFE Heat and Mass Transfer Conference at IHMTC 2023, December 12-13, 2023, IIT Patna – **Shine, S.R.**
- Thermoregulatory Responses during Postmortem State and Hemorrhage – **Shine, S.R.**
- Numerical Investigation of wedge geometry effects on snow accumulation – **Shine, S.R.**
- Invited lecture/presentation on Micro- Nano Finishing using abrasives, January 12, 2024 organized by College of Engineering (CET), Trivandrum – **Sooraj, V.S.**

- Panel discussion on Strategy and Innovations to Strengthen Industry-Academia Collaborations and Improve Research Output, NITC MoU Partners Annual Summit, January 13, 2024 organized by NIT Calicut – **Sooraj, V.S.**
- Invited lecture/presentation on Subtractive process after Additive Manufacturing: Post Processing after Additive Manufacturing, January 15, 2024 organizied by National Institute of Technology (NIT), Calicut - **Sooraj, V.S.**

5.10.2 Avionics

- Spectrum of opportunities in IEEE MTT-S, IEEE AP-MTT Bangalore Chapter, Bangalore organized by – **Saha, C.**
- Microwave Wireless Power Transfer, European Microwave Week (EuMW), September 2023, Berlin, Germany -
- **Saha, C.**
- Multifunctional UWB Antennas for Versatile Applications, September 2023 organized by University de Aveiro, Portugal, Aveiro, Portugal - **Saha, C.**
- Spectrum of Opportunities for Antenna Engineers: Academic, Research and Leadership Perspectives IEEE AP, Nov 2023 organized by Society Annual General Meeting, Cochin, Kerala - **Saha, C.**
- Metamaterial and Metasurface: Evolution and Research Activities in Advance Microwave Lab of IIST: An overview and Future Directions, Feb 29, 2024 organized by NRSC Hyderabad - **Saha, C.**
- Research Activities in Advance Microwave Lab of IIST: An overview and Future Directions, March 01, 2024 organized by IIT Hyderabad - **Saha, C.**
- Cooperative Spectrum Sensing based Hybrid Machine Learning Techniques for Prediction of Secondary Users Cognitive Radio Networks", in SERB sponsored national seminar on machine learning techniques for spectrum prediction in CR networks, September 22-23, 2023 organized by RMK college of Engg and technology, Tamil Nadu, - **Chris Prema, S.**
- Resource Person in AICTE Training and Learning (ATAL) Academy Faculty Development Program on Challenges and opportunities for satellite navigtion system, 18-23 December, 2023 organized by the Studyworld College of Engineering - **Deepak Mishra**
- Invited talk on Multi-objective optimization in temple design in the Conclave on Reviving the practice of Indic Architecture, April 22- 23, 2023 organized by IIT Hyderabad - **Harsha Simha, M.S.**
- Invited talk on fractal geometry and dynamism in architecture, 19-20 August, 2023 organized by Chinmaya International Foundation - **Harsha Simha, M.S.**
- Invited talk on Small Spacecraft Subsystems: Design and Challenges, November 17, 2023 organized by Space Research Awareness Workshop at MBU, Tirupati - **Harsha Simha, M.S.**
- Invited talk on fractal geometry and dynamism in architecture as part of Master Trainers Faculty Training Program on IKS Central Sanskrit University Bhopal, February 29, 2024, organized by IKS division, Ministry of Education, Govt. Of India - **Harsha Simha, M.S.**
- Invited talk on fractal geometry and dynamism in architecture as part of Master Trainers Faculty Training Program on IKS at Central Sanskrit University Tirupati, March 21, 2024, organized by IKS division, Ministry of Education, Govt. Of India - **Harsha Simha, M.S.**
- Panel Moderator for the panel titled Brain-Computer Interface, Brainstorming Workshop on Future Technologies in Healthcare and Biomedical Devices 2023, July 11-12, 2023 organized by Sri Chitra Thirumal Institute of Medical Sciences and Technology, Trivandrum, - **Manoj, B.S.**

- Panel Member for the panel titled Artificial Intelligence in Healthcare,at Brainstorming Workshop on Future Technologies in Healthcare and Biomedical Devices 2023, July 11-12, 2023 organized by Sri Chitra Thirumal Institute of Medical Sciences and Technology, Trivandrum - **Manoj, B.S.**
- Invited technical talk titled AI-driven networking, July 15, 2023 organized by Amity University, New Delhi- **Manoj, B.S.**
- Invited technical talk titled G-Satellite Integration: Opportunities and Challenges at Advanced Workshop on RF, Microwave, and Antennas and Applications, August 19, 2023 organized by IEEE Multi-Society, Trivandrum, - **Manoj, B.S.**
- Keynote talk as part of National Science Day, February 28, 2024, organized by CDAC Trivandrum, Kerala - **Manoj, B.S.**
- Panel Member on an IHRD, Government of Kerala, Panel on Bridging the Gap: Fostering Research-Industry Synergy for Quality Publications, Trivandrum, Kerala, March 13, 2024, - **Manoj, B.S.**
- Invited talk on Enhancing Astronaut's Health in Microgravity: Biosensor multiplexing in Space Sectorial Expert Committee on Biomanufacturing meeting, August 19, 2023 organized by CSIR Science Center, Department of Biotechnology - **Palash Kumar Basu**
- Invited Lecture on Electric vehicles - Technologies and Challenges at Faculty Development Programme organied by Rajeev Gandhi Institute of Technology, Kottayam – **Rajeevan, P.P.**
- Invited Lecture on Multiphase Drives Faculty Development Programme organized by Government Engineering College, Kottayam – **Rajeevan, P.P.**
- Invited Lecture on Special Targeted Training on Balnce & Control in Legged Locomotion, 28-30 November, 2023 organized by R&DE (E), DRDO, Pune – **Sam K. Zachariah**
- Invited journal presentation of IEEE Sensors Journal on A Closed-Loop In-Plane Movable Suspended Gate FET (CLIP-SGFET) Sensor with a Dynamically Reconfigurable Charge Pump at IEEE Applied Sensing Conference (APSCON) on January 22-25, 2024 – **Seena, V.**
- MEMS Chips: The Microscale Machines- ATAL FDP VLSI Design and Modeling, January 2024 organized by Department of Electronics & Communication Engineering, LBSITW – **Seena, V.**
- Key note address on Fractional Order CVS Model with Baroreflex Control at International Conference on Latest Advances, Contributions & Applications in Nonlinear Analysis (LACANA), March 15, 2024 organized by GVP College of Engineering, Visakhapatnam – **Selvaganesan, N.**
- Hardware architectures for signal processing, International conference on Cognitive computing and AI, ICCAI-2024, March 7, 2024 organized by Sathyabama institute of Science and Technology Chennai - **Sheeba Rani, J.**
- Deep Learning Algorithms and Architectures, School of Computing, March 8, 2024 organized by Veltech Rangarajan Dr. Sagnthala R & D institute of science and Technology Chennai - **Sheeba Rani, J.**
- Sustainable Engineering, National Conference on sustainable Engineering and Management, March 15, 2024 organized by Sivaji College of Engineering and Technology, Kanyakumari - **Sheeba Rani, J.**
- Workshop at 2nd National Workshop on Electric Aircraft and Allied Technologies, April 27-28, 2023 organized by CSIR-NAL, Bangalore - **Kaarthik, R.S.**
- Conference IEEE 49th Annual Conference of the IEEE Industrial Electronics Society, October 16-19, 2023 at Singapore - **Kaarthik, R.S.**

- Workshop on Advanced Propulsion Technologies for 2047, Oct 30, 2023 organized by IIT Bombay - **Kaarthik, R.S.**
- FDP: Graphical Programming for Power Electronics and Drives, IIT Dharwad, December 4-8, 2023 - **Kaarthik, R.S.**
- IEEE International Conference on Transportation Electrification (iTEC 2023), December 12-15, 2023 Chennai – **Kaarthik, R.S.**
- Conference: IEEE Power Electronics, Smart Grid and Renewable Energy (PESGRE 2023), Trivandrum 17-20 Dec 2023 - **Kaarthik, R.S.**
- Lecture on Introduction to Artificial Intelligence and Machine Learning, September 2023 organized by VSSC Central School – **Vineeth, B.S.**
- Lecture on Mathematics for Machine Learning, February 2024 organized by Space Physics Laboratory (VSSC), - **Vineeth, B.S.**

5.10.3 Chemistry

- Highly Emissive CdTe Quantum Dots Passivated with Novel Branched Ligands as Fluorescent Sensors, presented in 243rd ECS Meeting and 18th International Symposium on Solid Oxide Fuel Cells (SOFC-XVIII) held in Boston, MA, United States of America, during 28th May 2023 to 2nd June 2023 (Invited Talk) - **Gomathi Nageswaran,** & Yogesh S. Choudhary,
- Bimetallic Metal-Organic Framework Composites for Carbon Dioxide Capture, presented in 243rd ECS Meeting and 18th International Symposium on Solid Oxide Fuel Cells (SOFC-XVIII) held in Boston, MA, United States of America, during 28th May 2023 to 2nd June 2023 (Oral presentation) - M Shashank Rao and **Gomathi Nageswaran**
- 'Raman Spectroscopy' Recent trends in advanced materials and characterisation techniques, RTAMC 2033, Govt College, Nedumangadu, 12 October 2023- **Jobin Cyriac**
- 'Mass spectrometry', Govt. Arts & Science College, Kozhikode, 15 Nov 2023 - **Jobin Cyriac**
- 'Mass Spectrometry in Materials Science', National Workshop on Advanced Materials Characterization; Govt. College Nattakom, Kottayam, 18, 19 January 2024 - **Jobin Cyriac**
- Invited as Plenary Speaker in Second International Conference on Science and Technology of Advanced Materials-STAM 23 at Mar Athanasius College (Autonomous), Kothamangalam, Kerala, 2023 - **Joseph, K.**
- Invited as Resource person in Seminar on "Sustainable Innovations in Material Science 2023" (SIMS-23), at St. Hindu College, Nagercoil, Tamilnadu, April 10, 2023 - **Joseph, K.**
- Invited as Speaker in Workshop on Recent Development in Addittive manufacturing of Bioimplant Materials and its performance& Applications at NMAM Institute of Technology, Udupi, Karnataka on July 15, 2023 - **Joseph, K.**
- Invited as Keynote Speaker in International Conference on Advances in Material Science and Chemsitry (ICAMSC-2023) at Amrita Vishwa Vidyapeetham, Kollam on November 4, 2023 - **Joseph, K.**
- Invited as Resource person in Lecture for Science & Technology: Global Developments and Perspectives in NIAS-DST training programme at Banglore on 24 November, 2023 - **Joseph, K.**
- Invited as Distinguished speaker in International Conference on Molecular Matter (ICMM)- Emerging Directions for Sustainability" at IIT Madras on December 17, 2023 - **Joseph, K.**
- Invited as Plenary Lecturer in International Conference on International Confernece on Nanotechmology and material science at Mar Ivanios College, Nalanchira, Thiruvananthapuram on December 19, 2023 - **Joseph, K.**

- Invited lecture: Functionalized carbon materials for advanced electrochemical energy storage devices, J. Mary Gladis International Conference on Women in Electrochemistry, ICWEC 2023, Organized by The Electrochemical Society of India, held at Indian Institute of Science, Bengaluru on April 7-8th, 2023 - **Mary J. Gladis**
- Papers presented in conferences: Lithium Lanthanum Titanate-Graphene Nano Composites as a Synergistic Polysulfide Anchor for highly efficient Lithium-Sulphur Batteries," Krishnendu K S, Sreekala K, Jithu Joseph, Mary Gladis J., International Conference on Women in Electrochemistry (ICWEC-2023) 7-8 April 2023 organized by The Electro Chemical Society of India (ECSI), IISc., Bengaluru (oral)- **Mary J. Gladis**
- High performance supercapacitors using gel and ionic liquid electrolytes. Jithu Joseph, Sreekala K, Mary Gladis J., J. MRSI Annual Technical Meet -2023. May 20, 2023 at Kerala University, Kariavattom - **Mary J. Gladis**
- Redox-polymer gel electrolytes for Zn-ion storage applications, Jithu Joseph, J. Mary Gladis, Polymer Processing Society (PPS), Asia-Australasia Regional Conference organised by Polymer Processing Academy, Mumbai in association with Vikram Sarabhai Space Centre and Indian Institute of Space Science & Technology, Thiruvananthapuram during 29 Nov. -02 Dec.,2023 (Poster) - **Mary J. Gladis**
- Effect of transition metal salt electrolyte additives for high- performance Zn-ion batteries, Jithu Joseph, J. Mary Gladis, Twenty Third National Convention of Electrochemists (NCE 2023) at SRM Institute for Science and Technology, Chennai on January 4-5,2024 organised by Society for Advanced Electrochemical Science and Technology(SAEST), India (Poster)- **Mary J. Gladis**
- Electrode Coatings/ functionalisation and their Impact on Li-S Battery Performance Twenty Third National Convention of Electrochemists (NCE 2023) organised by Society for Advanced Electrochemical Science and Technology(SAEST)CSIR- CECRI, Karaikudi, held at SRM Institute for Science and Technology, Chennai on January 4-5, 2024 - **Mary J. Gladis**
- Invited lecture on a Two dimensional Nanostructures and its Potential in Water Remediation Applications, for the conference, Materials Chemistry for Energy & Environmental Applications 2023 by Madanapalle Institute of Technology and Science, Aug 7, 2023- **Sandhya, K.Y.**
- Ground based facilities and experiments to assist gravitational biology research, International Conference on Translational Research in Drug Discovery and Development for Sustainable Healthcare organized by Centre for Drug Discovery and Development, Sathyabama Institute of Science and Technology, Chennai during 3-5 May, 2023 – **Sreejalekshmi, K.G.**
- **Sreejalekshmi, K.G.,** & Bilga Bhuvan, 2023, June. "हाइड्रोजैल मृदु रोबोटिकी : पॉलीमेरिक जैल की 3डी प्रिंटिंग के लिए मापदंडों का इष्टतमीकरण" in Hindi Technical Seminar (HTS) on अंतरिक्ष रोबोटिकी: भविष्य के अंतरिक्ष कार्यक्रमों में सही मायने में दिक् परिवर्तक held at IISU, Thiruvananthapuram.
- Hydrogel Soft Robotics: Optimizing the parameters for 3D Printing of Polymeric Gels, International Seminar on Recent Advances in Chemical Science (RACS- 2023) organised by the Department of Chemistry, Baby John Memorial Government College, Chavara during 8-10 November 2023 – **Sreejalekshmi, K.G.**
- Astrobiology- A Design-Build-Test- Learn Platform, DST Funded Astrobiology Karyashala at Indian Institute of Technology, Mandi (HP) between October 30, 2023 and November 4, 2023 – **Sreejalekshmi, K.G.**
- Introduction to Astrobiology - Lecture (online) delivered to MSc Astrobiology and Space Science students, Amity Centre of Excellence in Astrobiology, Mumbai on 6th December 2023 – **Sreejalekshmi, K.G.**
- **Sreejalekshmi, K.G.,** 2023, December. "अंतरिक्ष उड़ान में ड्रोसोफिला जीव विज्ञान प्रयोग के लिए हार्डवेयर का डिजाइन " in Inter Centre Hindi Technical Seminar (ICHTS) on 'समानव अंतरिक्ष अभियान की चुनौतियां, अनुप्रयोग तथा भावी संभावनाएं' held at DOS/ISRO HQ.

5.10.4 Earth and Space Sciences

- Our Universe in Three Dimension, Invited Talk, Department of Physics, National Institute of Technology, Calicut, October 10, 2023 - **Anand Narayanan**
- The Large Scale Structure of the Universe, Invited Talk, Science Conclave, University of Kerala, Thiruvananthapuram, November 6, 2023 - **Anand Narayanan**
- Probing Planetary Atmospheres, Invited Colloquium, IIT Kanpur, 9 November 2023 – **Tej, A.**
- Attended National Space Sciences Symposium NSSS 2024 at Goa (Feb 26-1 March 2024) – **Chandrasekar, A.**
- Geosptial Tools for Natural Resources Management, GeoVista 2023: Geographical View in Sustainable Technologies and Applications, 6-7 July 2023 at Central University of Tamil Nadu, Thiruvarur– **Gnanappazham, L.**
- Geosptial Tools for mangrove forest and Ecosystem, Department of Civil Engineering, SRM University, Chennai, 21 September 2023 – **Gnanappazham, L.**
- Review of Climate Change & Ecosystem Studies Division (Remote Sensing and Agro meteorological projects, RUBBER RESEARCH INSTITUTE OF INDIA, Rubber Board, Ministry of Commerce & Industry, Kottayam, 25 March 2024 – **Gnanappazham, L.**
- "Physics of high-mass star formation: Fragmentation of ATLASGAL clumps", Invited talk at the national conference "Star formation studies in India" at S. N. Bose National Centre for Basic Sciences, Kolkata on 9/1/2024 – **Jagadheep D. Pandian**
- "Studying high-mass star formation using submm", Invited talk at the Submillimeter Workshop as part of the meeting "Astronomical Society of India 2024" at IISc, Bengaluru on 31/1/2024 – **Jagadheep D. Pandian**
- A recording on the topic Invest in our Planet was delivered on Regional Radio channel on April 22, 2023 as part of Earth Day Celebration - **Rajesh, V.J.**
- Invited lecture on Astrobiology and analogue sites for the Indian Space programmes was delivered at IIT Mandi, Himachal Pradesh, A DST funded High-End Joint Workshop named KARYASHALA during Oct 30-Nov 4, 2023 – **Rajesh, V.J.**
- Invited Talk titled "Role of Geology in Planetary Exploration" in the National Seminar "Recent trends in Geosciences" conducted by Maharajas college, Ernakulam on December13, 2023. - **Rajesh, V.J.**
- Invited Lecture on "Terrestrial Analogue Sites in India: A Review" in the first Vikram Discussions (VD-I) on Astrobiology & Astrochemistry at PRL from January 5-6, 2024 - **Rajesh, V.J.**
- Invited lecture on "The Astrobiological significance of Hydrous sulfate Minerals on Mars: Insights from Terrestrial Analogues" in the Ist Symposium on Genesis and Evolution of Organics in Space, January 18-20, 2024 – **Rajesh, V.J.**
- "LiDAR Remote Sensing: Revolutionising Urban Planning and Development" FDP on LiDAR Applications in Advanced Surveying, Mar Baselios College of Engineering, January 8-12, 2024 – **Ramiya, A.M.**
- "UAV Remote Sensing for urban planning" Emerging trends in UAV and practical applications The National Institute of Engineering, Mysuru 16 "20 January 2024 – **Ramiya, A.M.**
- Geospatial AI, FDP on Spatial Data Analytics for GIS and Remote Sensing applications" Government Engineering College, Barton Hill, February 1, 2024 – **Ramiya, A.M.**
- Geospatial AI, Sona Engineering College, Salem, March 20,2024 – **Ramiya, A.M.**
- "Geospatial Image Processing". High End Workshop on Image Processing and its Applications using VLSI Architectures (Under the KARYASHALA Scheme "A SERB initiative) 3 - 8 July 2023, DA-IICT Gandhinagar, Gujarat,

India – **Ramiya, A.M.**

- "Geospatial Intelligence through machine learning"Advancing Opportunities in Geoscience and Remote Sensing: Fostering Gender Equality in Technology, Careers and Research, IEEE GRSS 2023, Boston Analytics, Technopark, Thiruvananthapuram, July 22,2023 – **Ramiya, A.M.**
- "Advanced Geosptail Technology for Agriculture and Forestry: A focus on Hyperspectral and LiDAR remote Sensing" Artificial Intelligence, IOT & Sensors for Agriculture, Forestry and Environmental Conservation, Under the KARYASHALA Scheme "A SERB initiative) 24 to 30 July 2023, NIT Calicut, India – **Ramiya, A.M.**
- Oral presentation on an overview of outbursting black hole X-ray binaries in the conference on Recent trends in the study of compact objects: Theory and Observation (RETCO-V) at the Kodaikanal Solar Observatory, IIA on 3 April 2023 - **Samir Mandal**
- Oral presentation on Modeling Requirements to Interpret XPoSat Data at XpoSat User Meet, ISRO HQ on 25 May 2023 - **Samir Mandal**
- Seminar on Pulsar Timing and Nano Gravity Research at the IIST Astro Club on 21 September 2023 - **Samir Mandal**
- Invited talk on Accretion Flows Around Black Holes: Unveiling the Cosmic Powerhouses, in the conference on Advances in Relativistic Astrophysics at Ayabhatta Research Institute of Observational SciencES (ARIES), Nainital on 2 November 2023 - **Samir Mandal**
- Seminar on Spectral, Timing and Polarization properties of black hole X-ray binaries, IISER Kolkata, 4 January 2024 - **Samir Mandal**
- Oral presentation on Exploring Transient X-ray Binaries: A Multi-Wavelength Perspective, Workshop 5, 42 ASI, IISC Bangalore, 30 January, 2024 - **Samir Mandal**
- Invited lecture on Spectro-Polarimetry Studies of X-ray binaries, SAC Ahmedabad, 15 February, 2024 - **Samir Mandal**
- Brainstorming session on X-ray Polarization, SAC Ahmedabad, 15 February, 2024 - **Samir Mandal**
- Invited talk on Polarization Studies of Black Hole X-ray Binaries, First Biennial Conference on Astronomy, Astrophysics and Space Science - Exploring the Universe: from Near to Far, ICSP, Kolkata, 17 February, 2024 - **Samir Mandal**
- Stars and Stellar evolution, Resource person - gave 4 lectures at NRC-IUCAA lectures for teacher training at Central University of Himachal Pradesh, Online, 1 - 15 April 2023 - **Vig, S.**
- Finding our place among stars, Invited public lecture at Sree Chithra Engineering College, 30 May 2023 - **Vig, S.**
- Non thermal emission from massive protostellar jets, Invited Colloqium at TIFR, Mumbai, 02 May 2023 – **Vig, S.**
- Orientation cum Selection Camp for Astronomy Olympiad, Invited lecture and resource person, HBCSE-TIFR, Mumbai 01 - 02 May 2023 - **Vig, S.**
- Research Career development for Women in Physics, Organiser and Resource person, Workshop Vigyan Vidushi - Physics 2023, Tata Institute of Fundamental Research, 15 - 16 June 2023 - **Vig, S.**
- Presentation skills for Career Development, lecture at workshop in International Conference for Women in Physics (ICWIP), Online, 11 July 2023 - **Vig, S.**
- Finding our place among Stars, Public outreach lecture to students of SRM University, Chennai, on occasion of World Space Week, 10 Oct 2023 - **Vig, S.**
- Non thermal emission from massive protostellar jets, Invited Colloqium at IISc, Bangalore, 05 Nov 2023 - **Vig, S.**

- Expert for space science at the NCERT-CAG: Science meeting at NCERT, New Delhi, 21-23 Nov, 2023 - **Vig, S.**
- Non thermal emission from massive protostellar jets, Invited talk in the conference Star formation studies in India, S N Bose National Centre for Basic Sciences, Kolkata, 8-11 Jan 2024 - **Vig, S.**
- 42nd Annual meeting of Astronomical Society of India (ASI) - Organiser, IISc, Bangalore, 01-05 Feb 2024 - **Vig, S.**
- Our Cosmic Neighbours, Invited talk at CET Trivandrum, as part of Global Science Festival Kerala - Outreach program, 07 Feb 2024 - **Vig, S.**
- Career development of aspiring women scientists (weCOS), Resource person and invited talk, IIT-Indore, Indore, 15 March 2024 - **Vig, S.**

5.10.5 Humanities and Social Sciences

- Communication Etiquettes HRRD Training at Vikram Sarabhai Space Centre, Thiruvananthapuram. 29th May 2023 - **Babitha Marina Justin**
- Gender and Visuality. Benares Hindu University. Two-week Workshop on Emerging trends in Interdisciplinary Studies. 8th July 2023 - **Babitha Marina Justin**
- An August Quintet: A Poet's Meet in All Saints College Thiruvananthapuram. Resource Person. 3rd August 2023 - **Babitha Marina Justin**
- Resource Person. Orientation Course, Mar Ivanios Induction Programme. 21st August. 2023 - **Babitha Marina Justin**
- 11th Susan Thomas Lecture. Where have all the Women Artists Gone? A Resource Person.UC College Aluva, 5th September, 2023 - **Babitha Marina Justin**
- Meet The Writer. Wordsmith's Lounge. Mar Gregorious College of Law. Thiruvananthapuram. Resource Person. 20th November 2023 - **Babitha Marina Justin**
- Resource Person. Gender Inclusivity in academic Institutions: A Lok at Campus Environments Today. A One-Day National Seminar (Online) on Breaking Barriers: Promoting Gender Inclusivity in Learner-Centered Education. Vellore Institute of Technology, Chennai. 1st March 2024 - **Babitha Marina Justin**
- Technical Session. Sociological Look into Prison Narratives Prison Literature: Narratives Unchained. St Mary's College and Home Science College, Thoothukkudi. 14th March 2024 - **Babitha Marina Justin**
- Resource Person. Gender and Hisory: A Peep into Kerala's Ignored and Silent Women. Short Term Course in Gender Studies. MMTTC. UGC-HRDC, Kannur University. 20.03.2024 – **Babitha Marina Justin**
- Resource Person. Changing Patterns in Gender Equality. Government College Nedumangad 30th November, 2023 - **Babitha Marina Justin**
- Resource Person for the online Webinar on Research Article Writing: Basics and Structure, on 04-05-23 at VIT Vellore – **Gigy J. Alex**
- Resource Person for the online Webinar on Review of Literature: Strategies and Steps, on 08-06-23 at VIT Vellore – **Gigy J. Alex**
- Resource person for Bread Stories: An Indo-Bulgarian Cross Cultural Workshop conducted at Mar Ivanios College by TES Academy on 18-10-23 – **Gigy J. Alex**
- Resource person for the webinar series LITERATI: The Literary Exploration, Summer Cycle 2024 held on February 20, 2024 on Culinary Studies and the Digital Media– **Gigy J. Alex**

- Resource person for the Endowment Lecture on Culinary Exodus: Understanding Our Platter held at St Joseph's College, Irinjalakkuda, Thrissur on 23-02-24 – **Gigy J. Alex**
- Plenary Speaker at the One Day National Conference at Women's Christian College, Nagercoil on 19-03-24 – **Gigy J. Alex**
- Chaired the Plenary Session IV Space Exploration and Earthly Challenges: Opportunities and Impediments, 48th All India Sociological Conference scheduled from 28th-30th December 2023 at Vellore Institute of Technology (VIT), Vellore, Tamil Nadu, India - **Nair, L.V.**
- Resource person on "Quantitative & Qualitative Methods of Social Science Research" in the Higher Secondary School Teachers Transformation programme, Sree Sankara University, Kalady Campus, 24th February 2024 – **Nair, L.V.**
- Expert - FYUGP- Residential Workshop, Loyola College of Soacial Sciences, 19th March to 23rd March, 2024 – **Nair, L.V.**
- Invited talk delivered online on 13th March 2024 on topic AHP and ANP methodologies for decision making to 5 Days FDP on Concept of Pure and Applied Mathematics organized by Parul University, Gujarat – **Ravi, V.**
- **Shaijumon, C.S.,** Promotion of Demand Generation and Create Awareness: Role of Space Economy, in the INSpace Brainstorming Session on Decadal Vision and Strategy for Development of Indian Space Ecosystem on 25th July 2023 at NIAS Bengaluru.
- Chaired the Session on Economic and social upgrading for sustainable Catch-up: trade policies, FDI, value chains and innovation networks in a knowledge-driven economy at the Globelics International Conference, Gulati Institute of Finance and Taxation, 13th October 2023 – **Shaijumon, C.S.**
- **Shaijumon C.S.,** Indian Space Economy; Growth, Structure & Components, in the session on From Theory to Practice: Fostering Skill and Capacity Development for Space Workforce Indian Space Conclave, New Delhi, 9-11 October 2023
- **Shaijumon, C.S.,** G20 declaration and India, invited lecture at the international summit on Multilateralism Beyond G20 India Summit 2023, Jointly organized by Somaya University and Kerala International Centre, Muscat Hotel, 22nd October 2023
- **Shaijumon, C.S.,** Space Technology and Sustainable Risk Management: Case of Telemedicine in India International Conference on environmental pollution and health; Governance for a sustainable future Dept of environmental sciences, University of Kerala, 23rd November 2023

5.10.6 Mathematics

- Chaired the session, Transonic, Supersonic and Hypersonic flows in the 15th International Symposium on Experimental and Computational Aerothermodynamics of Internal Flows (ISAIF 15) at IIT Madras, 24 - 27 Oct 2023 - **Anil Kumar, C.V.**
- Invited talk on Scaling behaviour on the measure of complexities of local and global dynamics of Total Electron Content, 8th International Conference on Statistics for Twnety-first Century (ICSTC), 16-19, December 2023, organised by the International Statistics Fraternity(ISF), Department of Statistics, University of Kerala - **Anil Kumar, C.V.**
- Invited Lecture on Solutions of ODEs: A Geometrical Approach as part of Prof. S Abraham Endowment Lecture and Scholar in Residence '' program conducted at St. Berchmans College, Changanasseri, 10 January 2024 - **Anil Kumar, C.V.**

- Invited Lecture on "Solutions of ODEs: A geometrical analysis," as part of the Alumni Lecture Series conducted by the Department of Mathematics, Mahatma Gandhi College, Thiruvananthapuram, on 09/02/2024 - **Anil Kumar, C.V.**
- Measure theoretic approach to probability / Refresher Course in Mathematical Science /UGC-Human Resource Development Centre, University of Calicut, Calicut during 28 September-12 October 2023- Resource person – **Deepak, T.G.**
- Markov Chain and Its Matrix Representation / Two Day National Seminar on Linear Algebra and Its Applications/ postgraduate department of Mathematics, KKTM Government College, Pullut, Kodungallur during 2-3 November 2023-Invited talk – **Deepak, T.G.**
- Probability Theory and Applications/ Two Day National Seminar on Recent Trends in Mathematics/ Postgraduate department of Mathematics, Baby john MemorialGovernment College, Chavara, Kollam during 28-29 November 2023-Invited talk – **Deepak, T.G.**
- From Exponential to Matrix Exponential Distributions, Conditional Expectation; A Linear Algebraic Approach/ National Seminar on Stochastic Modeling and Applications/Postgraduate and research department of Mathematics, Panampilly Memorial Government College, Chalakudy during 30 November-1 December 2023 -Two invited talks – **Deepak, T.G.**
- Stochastic processes/ 7-Day High-End SERB-Karyashala Workshop on Real-Life Data Modeling via Statistical and Machine Learning Tools/ School of data Science, IISER Thiruvananthapram during 8-14 January 2024-Resource person – **Deepak, T.G.**
- M/M/1/N Queues with Energy Required Service and Phase-type Vacation Time / International Conference on Advances in Applied Probability and Stochastic Processes/ Dept. of Mathematics, St.Aloysius College, Elthuruth, Thrissur, in association with Indian Society for Probability and Statistics/ during 18-20 January 2024-Invited talk – **Deepak, T.G.**
- Delivered Invited Talk in 21st IMACS WORLD CONGRESSâ (IMACS2023), held at University of Rome 'La Sapienza, Italy, during September 11-15, 2023 - **Mukherjee, K.**
- Delivered Invited Talk in 38th Ramanujan Mathematical Society (RMS) annual conference, held at IIT Guwahati, during December 22-24, 2023 – **Mukherjee, K.**
- Delivered Invited Talk on Differential equations and applications in the International Seminar entitled Albertian Knowledge Summit 2024, organized by The Department of Mathematics and Statistics, St. Albert's College (Autonomous), Ernakulam, February 02, 2024 - **Mukherjee, K.**
- Workshop on Finite element method: Theory, Computation and Applications December 4-8, 2023, NIT, Trichy – **Natarajan, E.**
- A Criterion to Determine Residual Coordinates of A2-fibrations, 38th RMS Annual Conference, IIT Guwahati, 22-24 December 2023 - **Prosenjit Das**
- International Conference on Control, Communication and Computing (ICCC 2023) Invited Talk: Mathematics of Machine Learning College of Engineering Trivandrum (19/05/2023 to 21/07/2023) – **Raju K. George**
- Invited Talk on Applications of Mathematics in Engineering Lurde Matha College, Trivandrum (26/07/2023)– **Raju K. George**
- National Conference on Recent Advances in Industrial and Applied Mathematics, Invited Talk: Applications of Fixed Point Theorems to Solvability and Controllability, Periyar University, Salem (28/07/2023 to 29/07/2023)

– **Raju K. George**

- Invited Talk on National Mathematics Day Lecture Title: Mathematical Modelling using Differential Equations, Govt. Women's College, Trivandrum (22/12/2023) - **Raju K. George**
- 89th Annual Conference of Indian Mathematical Society an International Meet. Invited Talk: Controllability of Linear Time Invariant (LTI) Network Systems, BITS Pilani, Hyderabad Campus (22/12/2023 to 25/12/2023) - **Raju K. George**
- National Mathematics Day Celebration Invited Talk on Mathematical Modelling, Mar Ivanious College, Trivandrum (19/01/2024) - **Raju K. George**
- International Conference on Applied Analysis and Discrete Mathematics (ICAADM) Invited Talk: Controllability and observability of Networked Systems with non-uniform Node DimensiOs and Different Inner- Coupling Matrices, GRI, Gandhigramm, Dindigual (22/01/2024 to 24/01/2024) – **Raju K. George**
- International Conference on Engineering Frontiers in Nonlinear Complex Systems, Computational Intelligence and their applications Invited Talk: Controllability of Nonlinear Networked Systems VIT, Chennai (07/02/2024 to 09/02/2024) – **Raju K. George**
- Two Days National Seminars on Applications of Linear Algebra in Machine Learning, Invited Talk: Mathematics for Machine Learning, St. Johns College, Anchal (27/02/2024 to 28/02/2024) – **Raju K. George**
- Gave a series of lectures on Optimization at CET Trivandrum – **Sabu, N.**
- Regularizing Effect of Damping Terms in Inverse Problems for the Euler-Bernoulli Beam, National Conference on Recent Advances in Industrial and Applied Mathematics, Periyar University, Salem, July 27-28, 2023- **Sakthivel, K.**
- Regularizing Effect of Damping Mechanisms in Inverse Problems of Evolution Equations, International Congress on Industrial and Applied Mathematics (ICIAM 2023), Waseda University, Tokyo, Japan, August 20-25, 2023.- **Sakthivel, K.**
- Given two lectures on "Interpolation and system of linear equations" to Commandant at Indian Naval Academy, 21 Septmber, 2023 - **Sarvesh Kumar**
- Numerical treatment of initial and boundary value problems, Gautam Budha University, Noida, Institute-Level Talk, 08 December 2023 - **Sarvesh Kumar**
- On "Virtual element methods for linear elliptic and parabolic problems", International Workshop on Virtual Element Analysis:Scientific Computation and Applications, VIT Vellore, 11-12 January 2024 - **Sarvesh Kumar**
- Three and four field mixed formulations in poroelasticity, Int. Symposium on Recent Trends in Numerical Methods for CDR Models, Fluids and Allied Topics Jan 20-21, 2024, IIT Kanpur - **Sarvesh Kumar**
- Frechet Derivative, University Research Fest, University of Kerala, Thiruvananthapuram, 19-06-2023 - **Subrahamanian Moosath, K.S.**
- Metric Spaces, YTN program, IIST, Thiruvananthapuram, 22nd May to 3rd June 2023- **Subrahamanian Moosath, K.S.**
- Complex Analysis, Mathematics Department seminar, University of Calicut, 23-7-2023 and 24-7-2023, Two lectures - **Subrahamanian Moosath, K.S.**
- Conformal Submersion with Horizontal Distribution and Geodesics, International Conference-GSI'23, Saint-Malo, France, 30-08-2023 - **Subrahamanian Moosath, K.S.**

- Geometric Approach in Mathematics, National Workshop on Fundamentals in Mathematics, MMS College Malayankeezhu, 13-9-2023 - **Subrahamanian Moosath, K.S**.
- Non-Euclidean Geometry, invited talk in the refresher course at University of Calicut, 4-10-2023 - **Subrahamanian Moosath, K.S.**
- Non-Euclidean Geometry, invited talk in the bridge course at the department of Mathematics, University of Calicut, 6-10-2023 - **Subrahamanian Moosath, K.S.**
- Tangent Spaces, invited talk in the bridge course at the department of Mathematics, University of Calicut, 7-10-2023 - **Subrahamanian Moosath, K.S.**
- Statistical Manifolds, invited lecture in the International Conference on Statistics for Twenty First Centaury, University of Kerala, 18-12-2023 - **Subrahamanian Moosath, K.S.**
- Riemannian Conjugate Gradient Method, invited lecture in the national seminar on glimpses of Analysis and Geometry-II at university of Calicut on 27-2-2024 -**Subrahamanian Moosath, K.S.**
- Introduction to Statistical Modeling: Talk delivered at the "Two-day National Workshop on Research Issues and Challenges in Statistical Modeling and Analysis", Organized by the School of Computer Science and Engineering, Vellore Institute of Science and Technology, Chennai on May 12, 2023 – **Sumitra, S.**
- Learning with Data: Talk delivered at "NuMaTs“ Nurturing Mathematics Talent in Students", organized by SCERT Kerala, on May 27, 2023 – **Sumitra, S.**
- Introduction to Machine Learning: Talk delivered at the "Online International workshop on Computational Intelligence 2023 (IWCI 23)", Organized by the Amrita School of AI, Amrita Vishwa Vidyapeetham, Coimbatore, on August 08, 2023 – **Sumitra, S.**
- Fundamentals of Machine Learning: Talk organized by the IEEE Education Society Student Branch Chapter IIST, on September 25, 2023 – **Sumitra, S.**
- Introductory Concepts of Machine Learning: Talk delivered at the "Berchmans Lecture Series in Mathematics (BLSM 2024)", Organized by the Department of Mathematics, St Berchmans College, Changanassery, Kerala, on January 31, 2024 – **Sumitra, S.**
- Supervised and Unsupervised Machine Learning Algorithms: Talk delivered at the "3 Day Workshop on Foundations of Machine Learning", Organized by the Space Physics Laboratory, VSSC & IIST, February 15, 2024– **Sumitra, S.**
- Machine Learning Algorithms: Talk delivered at the "2 Day Seminar on Applications of Linear Algebra in Machine Learning", Organized by the Department of Mathematics, Anchal, Kollam, on February 27, 2024 – **Sumitra, S.**
- Kernel collaborative online algorithms for multi-task learning: Keynote speech delivered at the International Conference on Computations and Data Sciences (CoDS-2024), March 08-10, 2024, Organized by the Department of Mathematics, IIT Roorkee, in collaboration with iHUB DivyaSampark, IIT Roorkee, India, on March 10, 2024 – **Sumitra, S.**

5.10.7 Physics

- International conference on Quantum Information and Quantum Technology (QIQT)" organized by IISER Kolkata, during May 8-June 15, 2023: An invited talk on a topic Encoding information in spatial correlations of bright entangled light beams (Online)- **Ashok Kumar**
- All Kerala Student's Congress 2023, AKSC23 organized by TKM College of Engineering Kollam in association with

IEEE on Sept 17, 2023: An invited talk on a topic Quantum Technology for Remote Sensing - **Ashok Kumar**

- Student Conference on Optics and Photonics- SCOP 2023 organized by Physical Research Laboratory, Ahmedabad on Sept 26-30, 2023: An invited talk on a topic Information encoding in spatial correlations of macroscopically entangled light- **Ashok Kumar**
- Invited talk on topic Quantum Technologies with Bright Squeezed Light, November 17, 2023 organized by IIT Madras - **Ashok Kumar**
- Invited talk at International Conference on Optics, Photonics and Quantum Information: OPTIQ -2023, December 11-13, 2023 organized by Cochin University of Science and Technology, Kochi - **Ashok Kumar**
- Invited talk on Quantum-Enhanced Sensing with Squeezed Light at ISAMP's 9th Topical conference on Ultrafast Photonics and Quantum Science, Feb 15-17, 2024 organized by Physical Research Laboratory, Ahmedabad - **Ashok Kumar**
- Invited talk on Quantum Sources at Structured Training Program on Quantum Technology & Communication, March 18-22, 2024 organized by Space Application Center, Ahmedabad - **Ashok Kumar**
- Invited talk on a topic Engineered Spatial Quantum Correlations for Information Encoding at 4th Workshop of International Network in Space Quantum Technology (INSQT), March 20-22, 2024 jointly organised by University of Strathclyde (UK) and Physical Research Laboratory, Ahmedabad - **Ashok Kumar**
- Invited to review for the prestigious Siegman International School on Lasers, June 8-24 2023 organised by Optica and hosted by Dublin City University, Ireland - **Biswajit Pathak**
- Invited talk on Basics of Adaptive Optics and Wavefront Shaping, September, 2023 organized by Department of Physics, Himachal Pradesh University, Shimla, (had to cancel due to landslide and flood) - **Biswajit Pathak**
- Surface Profilometry using Wavelength-tunable Digital Holographic Interferometry 1 at UEC-SAARC Symposium on Emerging Technologies (USSET 2023), December 2023 organized bt the University of Electro-Communications, Tokyo, Japan – **Dinesh N. Naik**
- Cross Polarization from Dipolar-Order under Magic Angle Spinning at 29th Annual Meeting of National Magnetic Resonance Society and Special Symposium on Clinical Applications of NMR/MRI, February 2-5, 2024 organized by CBMR, Lucknow – **Jayanthi, S.**
- Materials for future brain-inspired memory and computing at ICAFMC, February 16, 2024 organized by MES College, Ponnani – **Jinesh, K.B.**
- Janus like SnWS structure and hybridized in-gap states, at National Conference on Electron Spectroscopy (NCES) 2023, November 15-17, 2023 Gopalpur India - **Kuntala Bhattacharjee**
- Invited Lecture on Local electronic states of Sn doped WS2 surface, at Frontier Symposium - Physics 2024, January 19-2, 2024 organized by IISER Thiruvananthapuram - **Kuntala Bhattacharjee**
- Delivered 12 lectures on Special and General Theory of Relativity and Tensors at the Science Academies Refresher Course on Theoretical Physics, June 26 to July 1 organized by Bishop Moore College, Mavelikkara - **Murugesh, S.**
- Invited lecture on Spin based batteries and memory, July 27, organized by St. Berchman's College - **Murugesh, S.**
- Invited talk on Non-Linear Optic" at the Complexity and Nonlinear Dynamics in STEM, Conference in memory of late Prof. K. Porsezian on his 60th Birth Anniversary, June 5-7 2023 organized by IIT Hyderabad, Hyderabad – **Narayanamurthy, C.S.**
- Invited talk on Time average digital holographic interferometry for metrology at the International Conference on

Trends in Optics and Photonics, November 24- 25, 2023 organized by University of Calcutta, Kolkata – **Narayanamurthy, C.S.**

- Invited talk on Investigations on turbulence impacted light beams for free-space optical communications at OPTIQ-2023, International Conference on Optics, Photonics and Quantum Information, at CUSAT, KOCHI, 11-13 December, 2023 – **Narayanamurthy, C.S.**
- Invited Talk on Turbulence impacted wavefront correction without adaptive optics techniques at one-day seminar on Optics and Photonics, March 20, 2024 organized by IIT Hyderabad - **Narayanamurthy, C.S.**
- Invited Talk on Dynamical freezing and Floquet transitions in Su-Schrieffer-Heeger model at Excursions in Condensed Matter Physics, January 12, 2024 orgaized by IISc Bangalore - **Naveen Surendran**
- Invited Talk on Dynamical freezing and Floquet transitions in Su-Schrieffer-Heeger model at Third Frontier Symposium in Physics 2024 (FS-PHY 2024), January 20, 2024 organized by IISER Trivandrum - **Naveen Surendran**
- Invited talk titled Quantum illumination with classical light at QIQT 2023 International Conference, May 30, 2023 organized by IISER Kolkata - **Ivan, J.S.**

5.10.8 Library

- Invited Talk on "AI Tools to Revolutionise Library Services" at Refresher Course in Library and Information Science, organised by UGC-Malaviya Mission Teacher Training Centre, University of Kerala, December 11, 2023 – **Abdunnasar, A.**
- Invited Talk on AI Challenges and Opportunities for Information Professionals at International Conference on "Libraries Beyond Libraries: Innovation, Integration and Inclusion" organized by the C H Mohammed Koya Library, University of Calicut, February 22-24, 2024 – **Abdunnasar, A.**

5.11 Conference/ Workshop/ Training programmes participated by faculty members (not as a resource person) outside IIST

5.11.1 Aerospace Engineering

- 15th International Symposium on Experimental Computational Aerothermodynamics of Internal Flows, October 24-27, 2023, organized by IIT-Madras- **Deepu, M.**
- 10th International and 50th National Conference on Fluid Mechanics and Fluid Power (FMFP), December 20-22, 2023, organized by IIT Jodhpur- **Prathap, C.**
- 27th National and 5th International ISHMT - ASTFE Heat and Mass Transfer Conference, December 14-17, 2023, organized by IIT Patna. - **Sadanandan, R.**
- NITC MoU Partners Annual Summit, January 13, 2024, organized by NIT Calicut – **Sooraj, V.S.**
- Advanced Entrepreneurship Skill Development Programme (AESDP), January 15, 2024, organized by NIT Calicut – **Sooraj, V.S.**
- Indian Human Space Missions, Challenges, March 23, 2024, organized by Indian Institute of Metals, Trivandrum Chapter – **Sooraj, V.S.**
- Healthy Longevity- Myth and Reality, March 30, 2024, organized by Indian Institute of Metals, Trivandrum Chapter – **Sooraj, V.S.**

5.11.2 Avionics

- Train the Trainers" program focused on the National Credit Framework (NCrF), September 22, 2023, organized by AICTE and NCVET- **Harsha Simha, M.S.**
- IEEE MAPCON 2023, Ahmedabad, India, December 11-13, 2023- **Manoj, B.S.**
- COSPAR 2023, Singapore, April 16-21, 2023- **Priyadarshnam Hari**
- Structure Training Program, PRL Ahmedabad, September 25-29, 2023 - **Priyadarshnam Hari**
- IEEE Applied Sensing Conference, IEEE- **Seena, V.**
- Conference on Future Perspectives of Indian Space Technology & Ecosystem, ASeT 2023, May 12-13, 2023, Vikram Sarabhai Space Centre, Thiruvanthapuram - **Sheeba Rani, J.**
- 20th IEEE Asia Pacific Conference on Circuits and Systems (APCASS), November 19-22, 2023, IEEE Hyderabad section- **Sheeba Rani, J.**
- Photonics 2023, July 2023, IISc Bangalore – **Sooraj Ravindran**
- OPTIQ, December 2023, CUSAT, Kochi- **Sooraj Ravindran**
- Workshop: Powertrain Design of Electric Vehicle, July 20-23, 2023, IISc Bangalore- **Kaarthik, R.S.**

5.11.3 Chemistry

- Chairman, organizing committee, DPM-2023 - **Joseph, K.**
- International Conference on Women in Electrochemistry (ICWEC-2023), April 7-8, 2023, IISc., Bengaluru- **Mary J. Gladis**
- Twenty Third National Convention of Electrochemists (NCE 2023), January 4-5, 2024, SRM Institute for Science and Technology, Chennai- **Mary J. Gladis**
- Asia-Australasia Polymer processing conference PPM 2023 with Polymer Processing Society (PPS), November 29 - December 2, 2023, Kovalam, Thiruvananthapuram- **Sandhya, K.Y.**
- TRIMA 2023, May 18-19, 2023, organized by Trivandrum Management Association - **Sreejalekshmi, K.G.**
- Frontiers of Aerospace Systems and Technologies (FAST 2023), June 30-July 1, 2023, organized by VSSC – **Sreejalekshmi, K.G.**
- Economic mission from the Netherlands to Bengaluru, September 11, 2023, organized by the Consulate-General of the Kingdom of the Netherlands – **Sreejalekshmi, K.G.**

5.11.4 Earth and Space Sciences

- National Space Science Symposium NSSS 2024, February 26 - March 1, 2024, at Goa- **Chandrasekar, A.**
- ISRO Structured Training Programme (STP) on Space Based Inputs for governance with specific emphasis to NE States, August 7-11, 2023, at NESAC- **Rajesh, V.J.**
- International Society for Photogrammetry and Remote Sensing (ISPRS) Geospatial Week 2023, in Cairo, Egypt InGARSS 2023- **Ramiya, A.M.**
- IEEE India Geoscience and Remote Sensing Symposium (InGARSS 2023), December 2023, Bangalore- **Ramiya, A.M.**

- Recent trends in the study of compact objects: Theory and Observation (RETCO-V), April 3-5, 2023, at Kodaikanal Solar Observatory- **Samir Mandal**
- Advances in Relativistic Astrophysics, November 2-4, 2023, at ARIES- **Samir Mandal**
- Biennial Conference on Astronomy, Astrophysics and Space Science, February 16-21, 2024, at Indian Centre for Space Physics, Kolkata- **Samir Mandal**
- Meeting of all NCERT-CAGs, December 1, 2023, at Shiksha Bhavan, Ahmedabad- **Vig, S.**

5.11.5 Humanities and Social Sciences

- National Seminar on Food and Nutrition Security in the Context of Climate Change, April 10-11, 2023, organized by Hume Centre for Ecology and Wild Life Biology and Kerala – **Gigy J. Alex**
- International Annual Conference of the Faculty of Foreign Languages and Literatures Workshop: Critical Approaches to Food and Drinks in Literature, November 24-25, 2023, University of Bucharest (Online) – **Gigy J. Alex**
- 48th All India Sociological Conference, December 28-30, 2023, at Vellore Institute of Technology (VIT), Vellore, Tamil Nadu, India – **Nair, L.V.**

5.11.6 Mathematics

- International Congress on Industrial and Applied Mathematics (ICIAM 2023), August 20-25, 2023, at Tokyo, Japan - **Sarvesh Kumar**
- 6th International Conference on Geometric Science of Information (GSI 2023), 30th August to 1st September, 2023 at Saint-Malo, France - **Subrahamanian Moosath, K.S.**

5.11.7 Physics

- International Conference on Optics, Photonics and Quantum Information (OPTIQ), December 11-13, 2023, Kerala, India- **Biswajit Pathak**
- SPIE Photonics West – 2024, January 27-February 1, 2024, California, USA (attended online)- **Biswajit Pathak**

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 programs designed to inspire the next generation of scientists and engineers, ensuring that the institution's impact reverberates far beyond its academic boundaries.

Students Activity Board

Sub - Committee

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

The Dean of Student Activities and Student Welfare chairs the Student Activity Board (SAB), with the Registrar of IIST, Associate Deans(SA & OR;SW),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 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.

6.1 Events & Activities under SAB

6.1.1 Annual Sports Meet 2024

The Annual Sports Meet for the academic year 2023-24 was inaugurated on January 29, 2024, at Magudagiri Ground by Smt. Leena A., Sports Council Secretary & Joint Secretary, Government of Kerala. The inaugural ceremony was presided over by Dr. Prof. Kuruvilla Joseph, Registrar and Dean of Student Activities at IIST. The Chief Guest officially inaugurated the sports meet by hoisting the IIST flag and lighting the torch. Following the inauguration, the finals of several track and field events were conducted. Students enthusiastically participated in various sports events, representing the five houses: Akashganga, Devyani, Kritika, Saptarshi, and Sharmista.

6.1.2 Annual Sports Meet 2023

The Annual Sports Meet 2023 of IIST took place on April 13, 2023, at the Magudagiri ground. The event was inaugurated by Shri U. Sharaf Ali, President of the Kerala State Sports Council. The day featured the finals of various track and field events, with students showing great enthusiasm as they competed under the banners of the institute's five houses: Akashganga, Devyani, Kritika, Saptrishi, and Sharmista. The atmosphere was electric, with athletes displaying their skills and team spirit. Prof. Kuruvilla Joseph, Dean of Student Activities and Prof. N. Sabu, Chairman of the IIST Sports Committee spoke during the occasion.

The prize distribution ceremony of IIST Annual Sports Meet-2023 was conducted on May 3, 2023. Director Dr. S. Unnikrishnan Nair distributed the certificates and medals to the winners. The house 'Akashganga' won the overall championship, and the runner-up was the 'Saptarshi' house.

6.1.3 Conscientia 2023

Conscientia 2023 was organized from September 22-25, 2023. Shri. Padmakumar E.S, Director, ISRO Inertial Systems Unit (IISU), and Dr. Radha R.K., Senior Scientist, Jawaharlal Nehru Tropical Botanical Garden and Research Institute, Palode, graced the occasion as the chief guest and the guest of honour, respectively.

From captivating tech talks to fierce competitions, Conscientia 2024 witnessed incredible 3 days of innovation and inspiration. Technical talks and workshops were another much sought after features of Conscientia. Technical talks were delivered by Dr Shyam Mohan, the former Programme Director of Advanced Technology Programmes at VSSC, ISRO, on “RLV systems” and Dr. Bijukumar K S, Project Director, Cryogenic Stage, C25, ISRO, on “Propulsion System challenges in Chandrayaan 3”. Conscientia 2023 also teamed up with Pacelab (@pace.lab) for an incredible workshop journey through Cybersecurity, Google Flutter, and Full Stack Web Development.

Conscientia- 2023 featured 35 events organized under Robotics, Astronomy, Tech, Gaming, and Theme categories.

6.1.4 Dhanak

'Dhanak, the three-day cultural extravaganza, held from March 17-20,2024, witnessed a massive turnout of 1030 students from various colleges and universities. Smt. Merin Joseph IPS, Police Commissioner, Kollam, inaugurated the event while Mr Mohan Raghavan, Head of Heritage, Science and Technology, IIT Hyderabad served as the Guest of Honour.

The program spanning four days, had 33 engaging events that kept participants captivated throughout. The highlights included the group dance competition, battle of the bands, solo singing and dancing contests, treasure hunt, and fashion show, all of which drew large crowds. A standout moment was the Street Play, which tackled the serious issue of drug abuse in a way that was both entertaining and impactful. The workshops at schools were highly informative, offering students a valuable opportunity to learn and develop new skills.

The organizers ensured the event ran seamlessly, from the registration process to stage setups and food stalls. The friendly and helpful staff and volunteers contributed significantly to the overall positive experience.

6.1.5 Konchords

Konchords is the vibrant intra-collegiate cultural evening at IIST, where students come together to celebrate creativity and talent across various art forms. This eagerly anticipated event showcases a rich array of performances, including music, dance, drama, and more, providing a platform for students to express their artistic flair. The atmosphere was charged with enthusiasm as students from different batches and disciplines united in a spirit of camaraderie, making Konchords not just a display of talent but a celebration of the diverse cultural tapestry within IIST. The evening served as a testament to the creativity and unity that define the student community at IIST.

6.1.6 MUN

The Model United Nations (MUN) is a simulated conference where students take on the roles of diplomats, representing various nations to discuss issues of international significance. The 11th edition of MUN was inaugurated by Dr. S. Unnikrishnan Nair, Director of IIST and VSSC, who highlighted the importance of such events in educational institutions, particularly in light of India's growing influence on the global stage. He emphasized the need for dialogue, especially in the fields of Space Technology and Space Law, as the future will undoubtedly belong to those nations that establish a strong presence in outer space.

The guest of honor, Smt. Jeeva Maria Joy, IFS, shared similar views, briefly discussing India's current role in global diplomacy and deliberations. She reinforced the belief that the responsibility of leading the world forward in the coming years lies with India and its citizens. With these inspiring remarks, the event was officially inaugurated.

This iteration of IIST-MUN featured three councils: i. The United Nations General Assembly (UNGA) ii. The United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) iii. The Group of Twenty (G20).

6.1.7 Induction Programme

The Induction Program for the 2023 incoming batch of B.Tech students at IIST took place from October 31 to November 4, 2023 and was inaugurated by Dr. S. Unnikrishnan Nair, Director of IIST. The program aimed to provide essential information and support to help new students transition smoothly into life at IIST, while fostering both academic and personal success. A variety of sessions were conducted by the Registrar, Deans, and the seven academic departments, as well as various units of IIST. In addition to academic guidance, the program included workshops on soft skills, life skills, and yoga.

6.1.8 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.

6.1.9 Freshers' Day celebrations

The Freshers' Day celebrations at IIST was a vibrant and energetic affair, welcoming the new batch of students into the IIST family. The event featured an array of cultural performances, including music, dance, and skits, all showcasing the immense talent and creativity of the students. Senior students organized engaging activities and ice-breaking sessions, ensuring that the freshers felt at ease in their new environment and marking the beginning of an exciting journey for the freshers at IIST.

6.2 Outreach Programmes

6.2.1 Science Camps - 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 Idinjar Tribal School and Karipoor Government Higher Secondary school. This camps organized from July 2023 - April 2024 was an attempt to transform a routine curriculum subject into a lifelong passion among the school students

Through the different classes, the vounteers 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 volunteers started by teaching English greetings and sentence structure, laying the foundation for effective communication. The highlight was the hands-on experiment with Newtonian and Non-Newtonian fluids using cornstarch and water, sparking curiosity and wonder among the students. The sessions included the theory of buoyancy, followed by an engaging game where students crafted floating dishes and boats, adding coins until they sank. Career guidance sessions broadened students' horizons, covering diverse fields like science, research, medicine, engineering, civil services, armed forces, business management, commerce, arts, and culture. Sessions were also held on the fascinating concept of multiple reflections, discussing the principles of Kaleidoscopes and periscopes, gliders and aeroplanes, explaining their mechanics through presentations and models. Students enthusiastically crafted their own paper gliders and witnessed their flight firsthand.

6.2.2 Anti- Drug Abuse Campaign

On November 9, 2023, Prahasana, the Drama Club of IIST, performed a powerful street play at Mar Ivanios College, Trivandrum, focusing on the critical issues surrounding drug abuse and the need for greater awareness. Through the performances and engaging storytelling, the play highlighted the devastating consequences of substance abuse, while also urging the audience to take collective responsibility in combating the issue. The performance, held in a public space, attracted a large and diverse crowd, fostering dialogue on the importance of prevention, support systems, and education in addressing this growing social concern.

6.2.3 GIS Day – Outreach

The annual event GIS Day and its Outreach programme was conducted for the year 2023 during November 2023. It includes delivering an awareness lecture in the field of GIS and Remote sensing and conducting Quiz competition at three Government schools near IIST: 1. Karippoor Government School, 2. Tholicode Government School, 3. Idinjar Tribal School. The winners of the quiz competition are awarded with book coupons.

One day Demonstration on UAV Based Survey in Azheekkal Mangroves, Kollam was organized by the Department of Earth and Space Sciences, IIST jointly with IEEE Geoscience Remote Sensing Society, Kerala Chapter on February 17, 2024.

GIS Day Lecture and Quiz

Azheekkal Drone Survey

6.2.4 Chadrayaan Utsav –Outreach

As part of the Chandrayaan Utsav celebrations, IIST organized a talk by Dr. Rajesh VJ, Professor in the Department of Earth and Space Sciences, on the exploration of Earth's Moon and ISRO's Chandrayaan Mission and "Chandrayaan Odyssey," a quiz programme for school students, organized by IIST's Quiz Club."Moon Photography" competition for school and college students, sparking excitement and creativity among young space enthusiasts. The event aimed to engage students on the wonders of space exploration while fostering a deeper connection with India's Chandrayaan-3 mission. In addition to the competition, students of NIRMAAN club conducted a series of lectures at government and tribal schools, introducing students to the mission's significance and spreading its message of scientific discovery and national pride. These initiatives were designed to inspire the next generation to explore the possibilities of space research.

6.2.5 NuMaTs

The department of Mathematics conducted the second edition of the five day camp, NuMaTS (Nurturing Mathematical Talents in Schools) in IIST with the financial support of the State Council of Educational Research and Training (SCERT), Govt. of Kerala and academic support of faculty members of IIST and other centres of higher education. NuMaTS is probably the first of its kind in India, aimed at identifying exceptionally talented school students in Mathematics. The essential objective of the camp is not just training, but to make them realize the beauty of Mathematics and its applications. The participants were school students who have completed 10, 11 & 12 standards of their studies at school level in 2022-23 and has attended all the residential camps conducted previously for the students in their school levels from 6th to 9th standards.

Dr. Unnikrishnan Nair S, Director, IIST/VSSC inaugurated the camp on May 24, 2023 . Dr Jayaprakash R K, Director, SCERT, Kerala, Dr YVN Krishna Murthy, Registrar, IIST also addressed the students.

6.2.6 Young Talent Nurture (YTN) Workshop

Department of Mathematics organized a two-week "Young Talent Nurture (YTN)-2023" program from May 22 to June 3, 2023. One of the main objectives of this program was to nurture young mathematical talents by promoting their logical reasoning, analytical thinking, and problem-solving skills to help them prepare themselves to meet big challenges occurring in higher levels of mathematics and its application areas.

YTN 2023 hosted selected students of B.Sc./B.Tech/Integrated BS-MS/Integrated M.Sc. with Mathematics as one of the courses of their study. Classes/ Lectures were offered on the topics of Differential Equations, Complex Analysis, Abstract Algebra, Calculus (Multivariable) & Metric Spaces

Dr. Unnikrishnan Nair S, Director, IIST/VSSC inaugurated the camp on May 24, 2023 . Dr Jayaprakash R K, Director, SCERT, Kerala, Dr YVN Krishna Murthy, Registrar, IIST also addressed the students.

6.2.7 Workshop on Space Operations and Spatial Technology

Small-Spacecraft Systems and Payload Centre (SSPACE), IIST conducted a 8-day workshop between from September 28 - October 2, 2023 for the candidates from MILIT, Pune on "Space Operations and Spatial Technology Course (SOSTC)". The topics introduced the candidates to Space Science & Space Technology mainly in the areas of space mission design, launch vehicles and satellites. The lectures were delivered by eminent experts from NIAS, ISRO and IIST. 26 candidates attended the course. The participants visited various ISRO Centres such as VSSC, ADRIN, ISTRAC and NRSC.

6.2.8 English Language Support Programme

In continuation with the Joint Collaboration with IIST and RELO (American Consulate), Wendy McBride, (Coordinator/Instructor at the University of Arkansas (Fayetteville),) visted IIST and delivered both online and offline sessions from September 26 to October 20, 2023. Her programme launched a writing assistance programme for the research scholars of the science and technology streams. She observed and participated in the undergraduate General Communication classes and also delivered seminars and sessions for research scholars and M. Tech students on academic writing and publishing. She also gave a session for faculty and officers on academic writing.

6.2.9 Programmes against Drug Abuse

A Special Awareness Programme in Hindi against 'Drug Abuse' was organized for the students of the institute on the occasion of Independence Day Celebrations – 2023. As part of this awareness programme, Poster Making and Slogan Writing Competitions in Hindi were conducted on August 9-10, 2023. Certificates to the prize winners and certificate of appreciation to the participants were awarded by the Director, IIST during the prize distribution function held in the Multi-Purpose Hall on August 15, 2023. Posters and slogans were displayed during the function. The program aims in educating students about the dangers of drug abuse and empowering them to live a healthy life.

6.2.10 Anvika

IIST organized a six-day workshop Anvika (Antariksh Vigyan Karyashala) on Advances in space sciences and technology" during July 17 - 22, 2023. In total 50 students who were moving or have recently moved to Classes X, XI and XII were hosted at the IIST campus.

It is often found that the students appearing for such competitive examinations find very limited time to understand and appreciate various domains of science and technology to make a very conscious and educated choice of careers. Hence a short term workshop was organized to improve the scientific exposure and awareness among young and potential students before they make their career choices.

The programs included day long classroom activities, tutorials, laboratory visits, demonstration of experiments and hands on training. Faculty members from science and engineering departments of IIST delivered lectures and training to students in frontier areas of space science and technology.

6.2.11 Schools @ IIST

1. On the Occasion of the 75th Republic Day, Nirmaan-IIST organised a campus visit for the student's of Government Tribal School, Idinjar. As a part of this visit the student's participanted in the Republic Day celebrations at Indian Institute of Space Science and Technology. Later the students visit the Library and Labs in IIST such as Aerodynamics Lab, Advance Optics lab, Geology and Earth Sciences lab. An insightful visit to the Small-Spacecraft Systems and Payload Centre | SSPACE - IIST-ISRO lab and Ground station was undertaken. This visit not only provided them the exposure in various fields of science and space science but also inspired them to be a responsible citizen of the nation and contribute towards the development of the country

2. Kumari Aruvial Perumai (KAP), an NGO dedicated to inspiring students in the field of space science and technology, organized a visit to the IISTand its facilities on February 7, 2024. A group of 81 students, accompanied by 13 mentors, participated in this enriching experience. Dr. Unnikrishnan Nair, Director of IIST/VSSC, warmly welcomed the students and delivered an insightful talk on space programs via an online platform. Dr. Raju K. George, Dean (SA, SW&O), engaged with the students, addressing their questions and sparking further curiosity. Additionally, Dr. L. Gnanappazham, Professor in the Department of Earth Science Studies, gave an informative lecture on the "Application of Remote Sensing."

3. A group of students and teachers from the Kendriya Vidyalaya SAP, Peroorkada, Thiruvananthapuram, visited IIST on April 21, 2024. Prof. Kuruvilla Joseph, Registrar / Dean (Academic) addressed the students. Students visited various labs and interacted with the faculty from Engineering and Science Departments.

4. Students and faculty from the Central School, VSSC, visited IIST on December 6, 2023. Prof. Kuruvilla Joseph, Registrar & Dean (SA, SW&OR), welcomed the visitors and interacted with the students. Students visited the Flight Mechanics Labs, Ground Station Facility, Small Spacecraft Systems and PAyload Centre, Electric Propulsion Diagnostics Lab, Thermal and Propulsion Lab and the Library.

5. Tenth standard students and teachers from the Kendriya Vidyalaya AFS, Akkulam, Thiruvananthapuram, visited IIST on March 22, 2024,visited labs and interacted with faculty and students.

6. A group of students and teachers from the Kendriya Vidyalaya SAP, Peroorkada, Thiruvananthapuram, visited IIST and its labs on March 21, 2024.

6.2.12 IIST@ Schools

IIST@Schools is an outreach program offered by Indian Institute of Space Science and Technology (IIST) to accelerate the underlying and innate capacity of the school students to scale ever higher levels of scientific achievements.

1. A new episode of IIST@Schools, the outreach program of Indian Institute of Space Science and Technology (IIST) for school students, was organized from October 18-20, 2023. Hosted by Amrita Kairali Vidya Bhavan (AKVB), IIST@Schools 2023 brought together selected high school students (classes 8 & 9) from different schools under Nedumangad Educational Sub-district. Dr. Unnikrishnana Nair. S., Director, IIST/ VSSC inaugurated the program. The inaugural program was followed by classes and lectures, by the faculty members and students of IIST

2. An yet another episode of IIST@Schools was organized from Jan 5-6, 2024 as part of Promotion of Excellence among Gifted Students, a program for children of grades VIIIth and IXth standard from all the districts of Kerala. An initiative of Department of Education, Government of Kerala, this programme seeks to integrate mathematics, science (Physics, Chemistry & Biology), English, information technology and counseling using a hands-on approach and thus create a social and cultural awareness coupled with science temper. The students from the different schools of Kerala through several sessions were provided a platform for building a new academic discipline, sustainability science, which can point the way to a sustainable global society.

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 IEEE Industrial Applications Society Student Branch Chapter (IIST IEEE IAS SBC) is a dynamic community dedicated to advancing knowledge and fostering innovation in industrial applications. Our chapter aims to provide a platform for students interested in fields such as electrical engineering, automation, power systems, and manufacturing to explore their passions, and develop practical skills. Through a diverse range of activities including technical seminars, workshops, and distinguished lectures, we strive to create opportunities for learning, networking, and personal growth. Our leadership team, comprised of enthusiastic students and guided by experienced mentors, works diligently to organize engaging events and initiatives that benefit our members and contribute to the broader academic and industrial community.

Major Events conducted by the IIST IEEE IAS Chapter

Hands-on workshop on "Introduction to MATLAB"

IEEE IAS Student branch chapter, IIST in association with IEEE Student Branch IIST and Conscientia organized the hands-on workshop on September 3, 2023.

Expert talk on "FPGA for embedded applications."

IEEE IAS Student branch chapter in association with IIST, IEEE Student branch IIST, IEEE IA/IE/PELS Jt. chapter Kerala section successfully organised an expert talk on FPGA for embedded applications on September 7, 2023. The expert talk was given by Dr Kuruvilla Varghese, Chief Scientist, DESE, IISC Bangalore.

6.3.2 Rocketry Club

Vihaan stands as the official rocketry club of the Indian Institute of Space Science and Technology (IIST), uniting students who share an unwavering passion for model rocketry.

The journey began with the fundamentals—experimenting with sugar rocket motors. Driven by a desire to understand the performance of these motors, the club developed a static motor test stand to measure and analyze thrust. This hands-on, trial-and-error approach forms the bedrock of our research methodology.

Applying the foundational principles learned in the Aerospace Engineering courses, the club continuously refined our motor compositions and nozzle designs. This iterative process led to the generation of thrust curves across various motor parameters, such as nozzle diameter, providing us with valuable insights. They also developed a preliminary flight computer capable of recording and logging flight data onto an SD card, marking a significant step in the technical capabilities of the club members.

This year, VIHAAN has registered for the INSPACe ASI Model Rocketry and CANSAT competitions, which will be held in April 2025. The club is currently in the early design phase, with the goal of submitting the Preliminary Design Document by September 30, 2024.

6.3.3 Aero club

The AeroClub in 2023 launched an exciting initiative for aerospace enthusiasts – a fortnightly aerospace quiz called "AEROTRIVIA", exclusively for the club's followers. Designed to engage and challenge participants' knowledge of the aerospace field, the quiz is a fun way to dive deeper into the world of flight.

Every 15 days, participants are tested on a wide range of topics, from the history of space exploration to the latest advancements in aircraft technology. The quiz is more than just a test of knowledge; it fosters a sense of community among club members who share a passion for aerospace. It's a space where enthusiasts, be they seasoned pilots, aspiring engineers, or curious learners, can connect, exchange experiences, and broaden their understanding of the industry.

The aim of "AEROTRIVIA" is to encourage participants to explore new technologies, think beyond academics, and discover interesting facts in the aerospace world. This initiative creates an engaging learning experience, pushing participants to research and explore new ideas in a fun and competitive format. The following were the activities undertaken by the club in the reporting period

2-Day Glider Workshop IIST

A 2-day glider workshop-cum-competition was organized at IIST, attracting over 70 participants on March 9 - 10,2024. The event was designed to engage students in the principles of aircraft design, particularly focusing on the unique challenges of glider development.

To deepen their understanding, participants were introduced to basic design calculations, such as estimating the optimal wing loading and determining the aspect ratio of the wings to maximize glide performance. This was followed by fabricating their gliders. Once fabrication was complete, the gliders were put to the test in a competition, where students competed against each other to see whose glider could achieve the greatest range and longest flight time. This blend of theory, hands-on design, and friendly competition provided an immersive learning experience, helping students grasp the complexities of aircraft design while fostering creativity and teamwork.

Workshop on UAV design

In the workshop at VSSC school, students were introduced to the fundamentals of UAV (Unmanned Aerial Vehicle) design, starting with the basics of aerodynamics. The session on March 24, 2024 began by explaining key aerodynamic principles such as lift, drag, thrust, and weight, which govern the flight of any aerial vehicle. These forces were discussed in the context of how they work together to achieve and maintain steady flight.

A live demonstration of a UAV was conducted, allowing students to observe the key concepts in action. The demonstration included take-off, controlled flight maneuvers, and landing, showing the students how theoretical principles are applied in real-world UAV operations.

The students were then guided through the process of designing and building their own gliders. Using Depron sheets they applied aerodynamic principles in a practical setting. Each student experimented with different design elements, such as wing shape, body balance, and overall structure, to create stable flying gliders.

After constructing their gliders, the students tested their designs by flying them, observing how the different configurations affected flight performance. This activity helped solidify their understanding of how aerodynamic principles influence flight and encouraged creativity and problem-solving.

6.3.4 ANANTA : YOGA CLUB OF IIST

108 Suryanamaskar Challenge

The Yoga Club held an 18-day "Suryanamaskar Challenge" with over 45 participants. Through out the 18 days, they were trained for achieving perfect asana postures by Sri. AnandNarayan (Ayush & NSDC Cer tified Yoga Trainer). On the final day, all completed the challenge and were awarded certificates by the Registrar, IIST, celebrating their dedication and achievement in this sportive event.

Visit to the Ar t of Living International center,Banglore

The second event was a visit to the Art of Living International Center in Bangalore, where around 30 IISTians participated in a 1.5-day program. They engaged in yoga, meditation, and service activities, and had the opportunity to meet the founder, Padma Vibhushan Gurudev Sri Sri Ravishankar ji, asking questions on stress management, lifestyle, and spirituality.

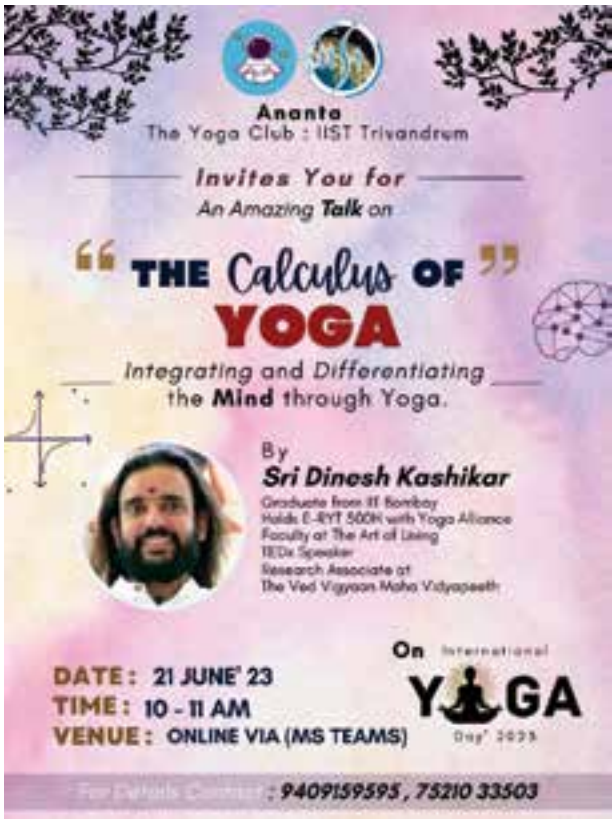
Yoga Mahotsav

On the initiative of the Morarji Desai National Institute of Yoga under the Ministry of AYUSH, New Delhi, IIST, in association with the Art of Living Foundation, conducted Yoga Mahotsav on April 8, 2023. The event commemorated the 75 days countdown to the International Day of Yoga this year. The program was inaugurated by the Registrar of IIST Dr. Y. V. N. Krishnamoorthy. The yoga sessions were handled by Sri. Anand Narayan and Smt.Rajalekshmi, Ministry of AYUSH, and NSDC certified trainers from the Ar t of Living Foundation. About 160 participants, including students, staff, and CISF personnel of IIST, VSSC, and LPSC Valiamala took part. This was followed by lectures and practical sessions on Ayurveda by Dr. Aparna K (Poornayu Ayurveda Niketanam), on the synergy between dance and yoga by Smt.

Sobha Antherjanam (Lalitodayam Nrithalaya) and guided Heartfulness Meditation led by Sri. UA Subramanian (VSSC) & Dr.Ajeya Ayipuzha (Heartfulness Institute). The participants included students, and staff of IIST, VSSC, and LPSC Valiamala.

Yoga Day 2023

On Yoga Day 2023, the Yoga Club organized a sunrise yoga session for 50 students and 30 CISF officers, led by IIST student instructors. The session was quite energetic and refreshing. Later, Sri Dinesh Kashikar delivered an enlightening talk on the "The Calculus of Yoga," offering participants profound insights into the scientific and philosophical aspects of yoga.



Online Yoga Star Competition

The Yoga Club organized an "Online Yoga Star" competition, where students performed yoga asanas and shared their posts on social media. The winner was determined based on a combination of the perfection of the posture and the level of likes and engagement the post received, encouraging both skill and participation within the community.

Induction Yoga – Batch of 2023

The Yoga Club of IIST, organized a 5-day induction yoga program for the incoming B.Tech and M.Tech batch of 2023, entirely led by students. The program offered a well -rounded introduction to yoga, combining daily sessions of yoga asanas, meditation, and pranayama, along with insightful discussions on the philosophy and benefits of yoga. Additionally, fun activities and interactive games were included to keep the atmosphere lively and engaging. This initiative not only introduced students to the practice of yoga but also acted as a fantastic icebreaker, fostering bonds and easing the new students into the campus community in a relaxed and welcoming environment.

Full Moon Meditations

The Yoga Club conducted around six Full Moon Meditation sessions, held almost every two months, where students gathered to meditate under the calming light of the full moon. Many participants shared refreshing and rejuvenating experiences, describing the sessions as deeply peaceful and a unique opportunity to connect with nature and themselves.

YES!+ Programme (Multiple Batches)

The YES!+ program, offered by The Art of Living, is the world's most renowned stress management program for college students. Conducted in multiple batches in April, September, October, and February, over 140 students participated in a span of one year. Students learned the Sudarshan Kriya, a powerful breathing technique, and reported significant improvements in mental health, particularly those experiencing anxiety and stress. Additionally, participants gained valuable skills to enhance concentration, manage relationships, and improve communication skills, equipping them with tools for a more balanced life.

Sunday Followups and Daily Group Practice

Nearly 20 days each month, students practice yogic techniques together in the Yoga room, fostering a supportive community. Every Sunday, a trainer conducts follow-up sessions, guiding students through their practices. These sessions provide an opportunity for participants to refine their skills, receive personalized feedback, and re-energize for the upcoming week, promoting overall well-being.

Yoga for school students

In collaboration with Nirman and IEEE-Edsoc, the Yoga Club of IIST organized free yoga sessions for underprivileged students from nearby government schools. Club members took the initiative to lead these sessions, guiding the school students through warm-ups, asanas, and meditation practices. This initiative aimed to promote physical and mental well-being among the young participants, fostering a sense of community and empowerment.

ViBES EduYouth Summit:

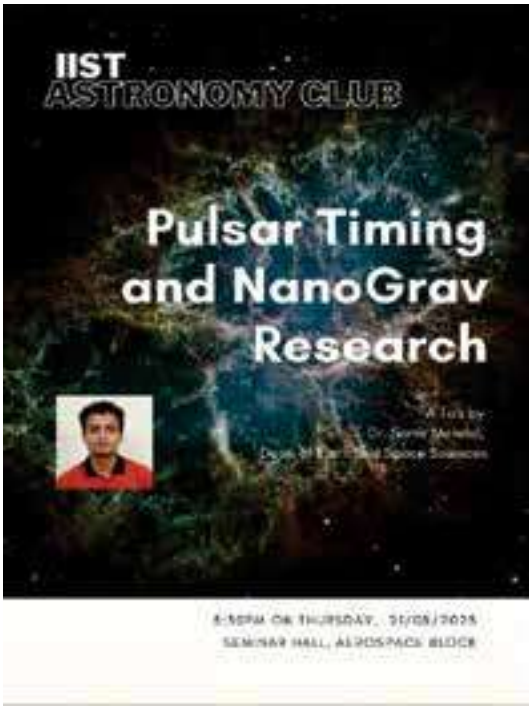
IIST Yoga Club attended the Vibes : EduYouth Summit . The event was organised in support of the State Government's Anti-Drug Campaign and the Government of India's Nasha Mukt Bharat Abhiyan by the Art of Living Youth Trainers and Volunteers on February 16,2024. The IIST Yoga Club attended with 130 students, who participated in the event and took a pledge for a Drug-Free India and a Drug-Free Kerala. This initiative aimed to foster awareness and encourage a healthy, drug-free lifestyle among young people. The students of the club also participated in the beach cleaning drive in line with the same event at the Shanghumugam beach in Trivandrum.

6.3.5 Astronomy Club (Celestials)

The Astronomy Club of IIST, Celestials, had an exciting and productive year from 1st April 2023 to 31st March 2024. The club organized lectures, participated in international scientific campaigns, and conducted outreach activities for school and college students, along with regular astronomical observation events. Below is a detailed report of the major activities.

Lecture by Prof. Dr. Samir Mandal

Dr. Samir Mandal delivered an insightful lecture on stellar astrophysics on August 21,2023 focussing on the life cycle of stars and the dynamic processes driving stellar evolution. The talk was well attended by students and faculty members, sparking engaging discussions about current developments in astrophysical research.



Lecture by Prof. Dr. Anand Narayanan

Prof. Dr. Anand Narayanan, an expert in extragalactic astrophysics, delivered a lecture on October 11, 2023 on cosmic structures, galaxy formation, and the large-scale structure of the universe. The event highlighted recent discoveries in the field and the importance of multi-wavelength observations.

International Asteroid Search Campaign

The Astronomy Club participated in the International Asteroid Search Campaign from January 5- 30, 2024. In a thrilling achievement, the club made 7 discoveries out of 70 worldwide, with these 7 accounting for half of all asteroid discoveries made in India during the campaign as of January 28, 2024. This success showcases the technical expertise and dedication of the club members.

Night Sky Telescope Observation at Manvila

On February 29,2024, the club members organized a night sky observation session at Manvila, Thiruvananthapuram, for 7th-grade students. The event allowed the young students to observe the night sky through telescopes and learn about celestial objects, sparking curiosity and enthusiasm for astronomy.

Solar Observation at Nedumangad College

On March 14, 2024, the club hosted a solar observation session at a college in Nedumangad. Students and faculty had the opportunity to observe solar phenomena using specialized filters and equipment.

School Workshop at VSSC Central School

On March 23, 2024, the club conducted a hands-on solar observation workshop at VSSC Central School in Trivandrum. Using handheld spectrographs, students learned about star spectra and solar composition. The workshop also included lectures on stellar evolution and spectroscopy.

Documentary screening at OAT

Throughout the year, the club held astronomy documentary screenings at OAT.

Weekly Night Sky Photography Sessions

Throughout the year, the club held weekly night sky photography sessions, capturing stunning images of astronomical events. These sessions allowed members to practice astrophotography techniques and document celestial phenomena like lunar eclipses, planetary conjunctions, and meteor showers.

Antares close to the Moon:

6.3.6 Neptunes Music Club

The Neptunes Music Club has had a vibrant and dynamic year, filled with multiple events and performances that showcased the talent, passion, and dedication of its members. From organizing in-house events to competing at the national level, the club has continued to uphold its tradition of musical excellence and foster a sense of community among music enthusiasts.

Battle of Bands at NIT Suratkal

The Neptunes Music Club of IIST proudly participated in the Cultural Fest of NIT Suratkal on March 01, 2024 with two bands, Rockstrom and Aaroh. Rockstrom showcased their exceptional talent and secured second place in the Rock genre Battle of Bands Competition.

Battle of Bands at Dhanak 2024

During our very own cultural fest, Dhanak, the Neptunes Music Club organized three key events on March 16, 2024 with the Battle of Bands being the highlight. This mainstream event involved not only the organization by Neptunes members but also their enthusiastic participation. Bands from several colleges joined the competition, with a total of 5-6 teams competing. In Dhanak 2024, both Aaroh and Neptunes bands secured the second position in the Battle of Bands.

Konchords Musical Nights

The even-semester had the highly anticipated Konchords Cultural Nights, on April 15, 2023 an in-house cultural extravaganza, jointly organized by the various cultural clubs of IIST, with the music club playing a pivotal role, featuring diverse performances by members across all branches in the B. Tech, M. Tech and PhD courses in IIST. This event witnessed active participation and enthusiastic responses from the audience, setting a high note for the rest of the year.

Dhun Online Music Competition

The club organized Dhun on July 2023, an online music competition that invited entries from participants across the nation. This virtual event allowed students to showcase their musical talents through a variety of genres, maintaining the momentum of creativity even during the summer break.

Cultural Participation

The Music Club contributed to the patriotic fervor of the Independence Day celebrations by performing a series of inspiring musical pieces, evoking a deep sense of national pride among the audience. As part of the college's Onam festivities, the club delivered a special performance that blended traditional and contemporary music, adding to the joy and cultural richness of the celebration. Once again, the club took part in the Republic Day celebrations by performing patriotic songs and instrumental pieces, contributing to the college's tribute to the nation.

Induction Program for Juniors

The Music Club contributed extraordinary performances in the Induction Program for Juniors, welcoming new students to the club. This event not only introduced the juniors to the club's culture but also inspired them to explore their musical interests.

Jamming Sessions and more

Beyond the formal events, music enthusiasts in the institute frequently meet in the music room for informal jamming sessions. These sessions are a space for music lovers to come together, create melodious music, and enjoy the art of making music for pure enjoyment.

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.

6.3.8 Mathematics Club

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

6.3.9 Debate Club

The Debate Club of IIST successfully conducted the 11th edition of the IIST Model United Nations (MUN) from March 2-3, 2024, with a total of 59 participants. This year's agenda focussed on discussing strategies to foster inclusive and sustainable economic growth to ensure financial stability, with a particular emphasis on addressing the growing intolerance toward various minority groups, including racial, gender, and socioeconomic minorities. In addition, delegates deliberated on pressing global issues such as space debris and sustainability, space security and militarization, cyber-security and digital rights, and global health security with a focus on pandemic preparedness. The event provided a dynamic platform for participants to engage in thoughtful discourse and propose solutions to critical global challenges.

6.3.10 Drama Club

The Drama Club of IIST, Prahasna, has etched its name in history with a resounding victory by securing first position at Street Play competition hosted at the fest of NIT Surathkal. Their debut performance captivated the audience at NITK Surathkal, earning accolades for its emotional depth and impeccable realism. This triumph not only showcases the talent and dedication of the club members but also sets a new standard for excellence in dramatic arts.

They also organized a poster-making competition on the theme of "Drug Awareness," encouraging students to

creatively express the importance of combating drug abuse. The competition aimed to raise awareness within the campus community about the harmful effects of drugs and foster a sense of responsibility toward creating a healthier, safer environment for all.

6.3.11 Literary Club

Sarovar, the Literature Club of IIST, was inaugurated on February 27, 2024 in the Admin Council Hall. Ms. Juana Adcock, distinguished Scottish poet and translator, , was the Chief Guest. She also led an engaging workshop, enriching the literary skills of participants. Her presence added a significant dimension, as she offered valuable guidance and inspiration to all budding writers and literary enthusiasts. The activities of the club included book discussions, writing workshops, literary Games, themed reading, literary filed visits, book swaps, guest lectures etc

6.3.12 Money Minds Club

The Money Minds Club was inaugurated on November 15, 2023, by Prof. Kuruvilla Joseph, Registrar-IIST. During the reporting period Money Minds Club conducted two offline sessions and one webinar workshop in collaboration with Dhanak 2024. The first session of the Money Minds Club, titled "Fundamentals of Stock Market, "held on February 3, 2024, at the interdisciplinary block (C-109) at IIST aimed to enhance financial awareness among students. The second session of the Money Minds Club, "Mastering Stock Selection," organized on February 28, 2024 focussed on teaching students strategies for selecting stocks for short, mid, and long-term investments. On February 25, 2024, the Money Minds Club conducted an online webinar workshop in collaboration with Dhanak 2024, open to both IIST students and external participants. The session covered a wide range of topics, including the basics of the stock market, fundamental analysis, stock selection techniques, technical analysis, entry and exit strategies, and risk management.

6.3.13 Dance Club

The Dance Club of IIST is a vibrant and dynamic group that brings energy and creativity to various events both on and off campus. Their activities which included flash mobs during the World Space Week celebrations at Mall of Travancore and Kanakakunnu Palace, added excitement and engagement to the festivities, spreading awareness about the event among the common people. The club also played a key role in national celebrations, performing during Independence Day and Republic Day events, showcasing their talent and patriotic spirit. Additionally, they were a highlight of IIST's annual cultural fest, Dhanak, where they delivered stunning performances. The Dance Club has also represented IIST at various intercollegiate events, earning recognition for their talent and dedication.

6.3.13 Quiz Club

The IIST Quiz Club aims to create a thriving quizzing culture on campus by engaging students in intellectually stimulating and competitive quizzes. The club's activities during the academic year focused on enhancing knowledge, fostering collaboration, and encouraging participation across various themes. The main activities conducted include the following:

❖ ***Joint Quiz with IISER***

The club hosted a joint quiz on August 20, 2023with the Quizzing Society of IISER Thiruvananthapuram at the MPH, IIST, themed around Independence Day.

❖ ***Chandrayaan Space Odyssey Quiz***

To educate and excite students about India's space exploration achievements, particularly the Chandrayaan missions, the club organized a quiz program on September 14, 2023 themed entirely around space exploration, ISRO's achievements, and global space missions.. The event saw enthusiastic participation from students, who appreciated the opportunity to delve deeper into space science.

❖ ***Joint Quiz with IISER***

The second collaborative quiz with IISER Thiruvananthapuram was hosted on November 04, 2023 at IISER, continuing the partnership and providing students with a broad and engaging quiz experience. The quiz featured a general theme covering various topics like science, literature, current affairs, and pop culture.

❖ ***InQUIZition Series***

To offer a consistent quizzing experience and engage students in regular weekend quizzes a series of five online quizzes was conducted during January - March 2024 on the UNSTOP platform. Each session featured different themes with a mix of general knowledge and current affairs. The format allowed participants to join remotely, making it accessible to a broader audience. Over 150 students participated from all across the nation across the series, making it one of the most attended online quiz initiatives of the year. The InQUIZition series was instrumental in keeping the quizzing spirit alive during weekends.

❖ ***Swatchatta Quiz***

A Quiz program was organized on February 7, 2024 to promote the values of cleanliness and sustainability as part of the Swachh Bharat Abhiyan and encourage students to adopt responsible habits. Hosted at Seminar Hall D4, the quiz included questions on environmental policies, waste management, and sustainable practices. The quiz effectively raised awareness about cleanliness and environmental conservation among students. It reinforced the importance of the Swachh Bharat mission in a fun and engaging way

❖ ***Quizzitch***

The club organized a large-scale competitive quiz on March 17, 2024 as part of Dhanak 2024, inviting participation from prestigious institutions and providing a platform for high-level quizzing. Conducted by renowned quizmaster John Sebastian, this event was the highlight of the year. It featured a mix of challenging rounds, including visuals, and audio clues, designed to test the depth and breadth of participants' knowledge. Quizzitch attracted several teams from top colleges across Kerala, making it the flagship event of the year.

❖ ***M.E.L.A.S Quiz***

To explore the rich domains of Music, Entertainment, Literature, Art, and Science an engaging quiz program was conducted on March 17, 2024. The M.E.L.A.S Quiz combined various cultural and scientific topics into an exciting format, with visual and audio rounds that captivated the audience. It was designed to appeal to a wide range of interests, encouraging creative and analytical thinking. The quiz attracted many teams from different colleges, showcasing diverse talents and knowledge areas.

❖ ***Other fortnightly quizzed***

Conducted with the objective to maintain regular engagement with club members and provide continuous learning opportunities throughout the semester, the quizzes covered a range of topics, from current affairs to pop culture, encouraging students to stay updated and sharp in their quizzing skills. These regular sessions helped build a strong community of quizzers within IIST, fostering a sense of togetherness and keeping the club active throughout the year.


The IIST Quiz Club successfully conducted a diverse array of quizzes that not only promoted learning but also strengthened bonds within and beyond the campus. The club looks forward to expanding its initiatives and enhancing its role in the academic and cultural landscape of IIST in the coming year.

6.3.14 Robotics Club

JeevYantra, the Robotics Club at IIST, blends 'Jeev' (life) and 'Yantra' (machine) to symbolize the fusion of life and technology. Here, technology isn't just something we study—it's a part of who we are. Located in a dynamic corner of our campus, the club focus on hands-on learning, from coding marathons to deep discussions on emerging tech.

At JeevYantra, ideas are converted into real-world innovations. With a flexible schedule and a collaborative spirit, the club fosters continuous learning, idea exchange, and creative problem-solving.

Invited Talks

On March 14, 2024, a talk was organized on "Technological Challenges in Legged Robots" by Dr Kiran Akella, Scientist G and Group Head of Systems and Technologies for Advanced Robotics at DRDO. The event was attended by over 60 students and faculty members.


Regular Learning Sessions

The club consistently organizes weekly learning sessions, open to all enthusiasts. These sessions cover a broad spectrum of robotics topics, including microprocessor and micro-controller programming, motor control, robot dynamics, and using tools like Mujoco Physics Engine.

The summary of the sessions held were:

- April 2023: Pratham, Dwitiya, Tritiya
- May 2023: Chaturth
- October 2023: Alpha
- November 2023: Beta
- December 2023: Online sessions on ARM based microcontrollers
- January 2024: Pancham, Sastha
- February 2024: Embedded Systems

These sessions were conducted by senior club members for juniors and other interested students, focussing on robotics, microprocessor and micro-controller programming (Arduino, STM32, Raspberry Pi, etc), sensors, actuators and interface electronics, and basics of robotics.

Events

During Conscientia 2023, the technical fest of IIST held in September, JeevYantra hosted several competitions, attracting participants from institutions across the nation. The events organized by the Robotics Club included Arduino Hackathon, Line Follower, Maze Solver, and Battle of Bots.

Workshops

The club established Vidhya, a dedicated group within JeevYantra, to conduct free workshops in schools and colleges. Through this outreach wing, they organized Sensory Spark, a workshop on Arduino in collaboration with IEEE EdSoc at Government High School, Karipoor, Nedumangadu, Thiruvananthapuram, in October 2023. In March 2024, the club followed up with a workshop at Government Polytechnic College, Nedumangad, specifically aimed at enhancing technological access and knowledge for students. The goal of Vidhya is to bridge the technological gap, ensuring that students, regardless of their school's resources, are equipped to thrive in an increasingly tech-driven world.

Additionally, in collaboration with Conscientia 2k23 and Dhanak 2k24, the club hosted workshops at several schools, including Loyola School, St. Thomas School, St. John's Model Higher Secondary School, Madhuvan Sai Vidyashram School, VSSC Central School, and others. These workshops played a crucial role in generating revenue for the technical and cultural fests of IIST.

Activities

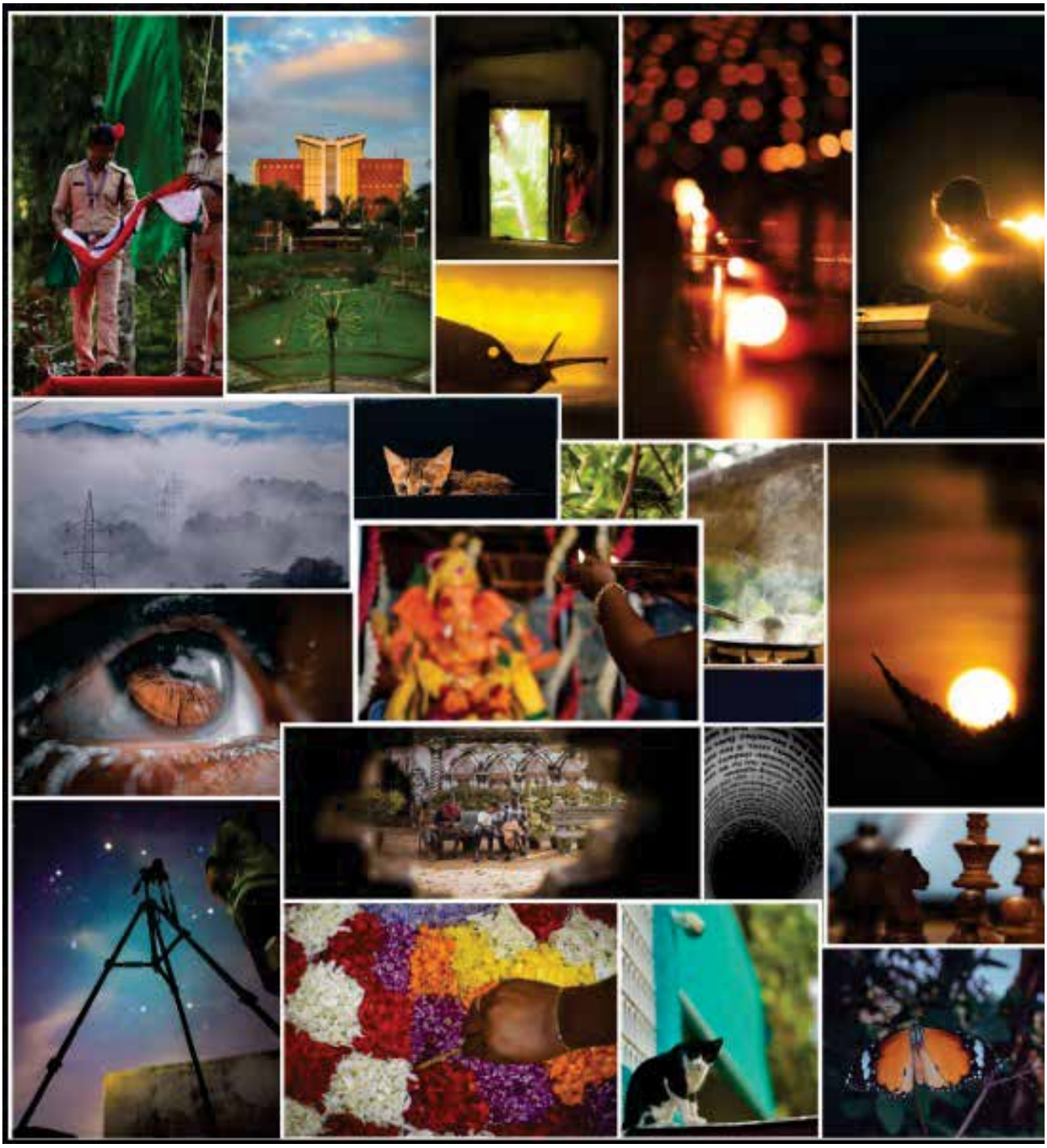
The club works on various projects were carried out in the assigned room, R131, in the Avionics Block. Some of the projects involved included Line Follower, Object Avoidance, Maze Solver Bots, a Remote-Controlled Car, and RoboSoccer. These activities allow the members to explore the different aspects of robotics in a hands-on environment.

Achievements

In arduino Hackathon conducted by Conscinetia 2023, a team representing the club secured 2nd position where they made a prototype for a controller for automatic switching of DC fan based on temperature threshold.

6.3.15 Photography Club

The Photography Club of IIST plays a vital role in capturing the essence of campus life and documenting key moments. The club was actively involved in covering all major events, including cultural festivals, academic conferences, and institutional ceremonies. In addition to event coverage, the club members contributed significantly to the preparation of the IIST annual report by providing high-quality photographs that highlight the achievements and milestones of the institute. Furthermore, the club supported NAAC-related activities by ensuring proper documentation of various events and initiatives, thus aiding in the accreditation process with well-curated visual records. Beyond photography, the club has expanded its scope by creating engaging videos which was screened during the visits of prominent dignitaries, like Dr. Jaishankar, the External Affairs Minister, providing a lasting visual record of IIST for them.



6.3.16 NIRMAAN – The social outreach club of IIST

1. Science camps / Remedial Classes at Schools

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 Idinjar Tribal School and Karipoor Government Higher Secondary school. This camps organized from January- April 2024 was an attempt to transform a routine curriculum subject into a lifelong passion among the school students

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.

2. Session on origin and geology of the Moon

High school students received an additional session focusing on the origin and geology of the Moon, led by Prof. Rajesh V J and his research scholars where they shared intriguing insights about its formation and structure. To spark further

curiosity, we showcased two rock samples resembling the lunar surface, captivating the students' imaginations and igniting their passion for space exploration.

3. Visit of Students from Idinjar Tribal School

On the Occasion of the 75th Republic Day, Nirmaan-IIST organised a campus visit for the student's of Government Tribal School, Idinjar. As a part of this visit the student's participated in the Republic Day celebrations at Indian Institute of Space Science and Technology. During the campus visit, students ventured to the SSPACE lab, Ground station, Geology Lab and witnessed a live 3D printing process. At the Ground Station, they learned the basics of satellite communication, witnessing first hand how communication with satellites occurs.

4. Blood donation Camp

A blood donation camp was organized at IIST by the Social Outreach Club in collaboration with the VSSC Blood Donors Forum and the Regional Cancer Centre (RCC). The event saw enthusiastic participation from students, faculty, and staff, who came forward to donate blood and support this noble cause. The camp aimed to raise awareness about the importance of regular blood donation in saving lives, particularly for cancer patients and those in need of critical care. With the combined efforts of the organizing teams, the event was a success, fostering a sense of community and social responsibility among the participants.

5. Ek Tareek Ek Ghanta

As part of Ek Tareek Ek Ghanta, a cleaning drive was organised by IIST at Government LPS, Chellamcode along with Haritha Karma Sena, Nedumangad Municipality. Team NIRMAAN and Yoga club took the initiative from IIST.

6.4 Visit to other ISRO centers / Industries

6.4.1. Aircraft Training College at the Southern Naval Command in Kochi

As part of the VI semester course on Air Breathing Propulsion, students from the B.Tech Aerospace Engineering program, along with a few faculty members, visited the Aircraft Training College at the Southern Naval Command in Kochi on the of March 3-4, 2023. The facility houses various cut-sections and a wide array of components from aircraft and helicopter engines used for training purposes. During the visit, the students gained valuable insights into the arrangement of turbine and compressor blade cascades, the flow paths of primary and secondary air in combustors, and the configuration of different engine components. They also had the opportunity to observe a variety of aircraft and helicopters, which significantly enhanced their understanding and complemented their learning in the air-breathing propulsion course.

6.4.2. Visit to IISU for the Navigation System and sensors Course

As part of the course "Navigation Systems and Sensors" the students were taken on a visit to ISRO Inertial Systems Unit for providing an exposure to the students on the industrial practices on the development of inertial sensors. 50 students participated in the activity. The visit included a half day lecture session by experts in the area of sensor calibration, accelerometer and gyroscope engineers. Further another half day was spent in visiting various laboratories of the organisation involved in the calibration and development of inertial systems.

6.4.3. Visit to VSSC for the payload calibration

As part of the development of the PILOT, 10 students visited VSSC for the assembly, integration and testing of the payload. The students directly participated in the assembly and integration of the PILOT payload which was indigenously developed. Further the environment tests including thermovac, vibration and EMI/EMC were carried out by the students in the various laboratories of the VSSC.

6.4.4. Visit to SHAR for the payload integration on the Launch Vehicle

As part of the launch related activity for the indigenously developed payload PILOT around 7 students visited SHAR for the electrical tests with the launch vehicle equipment bay and mechanical integration on to the launch vehicle.

6.4.5. Visit and One Week Training for Students of IIST at the Rajiv Gandhi Center for Biotechnology

Three undergraduate students of IIST visited Rajiv Gandhi Centre for Biotechnology (RGCB) from May 20 - 27, 2023 to gain hands-on experience in microbiology experiments and familiarize themselves with the associated protocols. The primary objective of this training was to equip the students with the necessary knowledge and skills to contribute to the development of the space biology payload being created by the SSPACE lab. During the training, the students learned how to grow, preserve, and retrieve E. coli under laboratory conditions. This experience at RGCB was crucial in ensuring that the students could effectively apply microbiological techniques in the context of space biology research.

6.4.6. Visit to LEOS, URSC, IIA and Vainnu Bappu Observatory

The students of DD M. Tech Optical Engineering (2020 batch), MS DD-Solid State Physics (2020 batch) and M. Tech Optical Engineering (2023 batch) visited LEOS, URSC, IIA and Vainnu Bappu Observatory from 16.05.2024 to 20.05.2024. The academic visit was very fruitful as the students got an opportunity to visualize and learn more thoroughly about different instruments and techniques which they have studied in their courses. They learnt about many advanced instruments and techniques in their courses, such as, adaptive optics, optical testing and fabrication, optical system design and analysis, semiconductor physics, quantum communication, experimental physics, etc., which are being used and applied for design and fabrication at facilities under ISRO. Visiting ISRO centers such as UESC and LEOS gave them an understanding about the technology that has gone through in developing the systems and payloads, challenges faced and the methods of mitigation. Moreover, interaction with the scientists/engineers helped the students understand practical use of different concepts and techniques.

Total 16 students visited the mentioned centers and in each of the centers the following techniques/facilities were explored:

Laboratory for Electro-Optics Systems (LEOS)

1. Optical systems for remote sensing and metrological payloads
2. Optical hardware, opto-mechanical design analysis
3. Electro-optics sensors (sun sensor, earth magnetic field)
4. Lens fabrication, testing and coating facilities

U R Rao Satellite Centre (URSC)

1. Satellite integration and test facilities (only partially)
2. Clean room facilities
3. Space science division

Centre for Research and Education in Science and Technology (CREST, IIA)

1. Fabrication and testing of optical components
2. Mirror and telescope fabrication facilities
3. Optical polishing and grinding facilities

Vainu Bappu Observatory (IIA)

1. 2.3 meter telescope
2. Overview of other observatories operated by IIA

Events & Visits @ IIST

7. EVENTS and VISITS @ IIST

The year 2023-24 saw a remarkable journey of events, celebrations, and visits that have enriched the campus and the academic community of IIST . From cultural festivals like Onam, 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 Distinguished Guests @IIST

7.1.1 Dr. S. Jaishankar, Honourable Minister for External Affairs, Govt. of India

In the academic year 2023-24, IIST had the distinct honour of hosting esteemed dignitaries, including Dr. S. Jaishankar, the Honourable Minister for External Affairs who visited IIST on September 17, 2023, as part of the *"Development Dialogue in Campuses of Higher Education Institutions"*. Dr. S.Unnikrishnan Nair, Director, Indian Institute of Space Science and Technology(IIST)/Vikram Sarabhai Space Centre (VSSC) welcomed the Honourable Minister, the dignitaries, the guests and the gathering. Dr. Jaishankar talked on " G20 and Vikasit Bharat ", deliberated upon the transformational changes that has to form the foundation of Vikasit Bharat by 2047 and interacted with the student community of IIST. Dr. V. Narayanan, Director, Liquid Propulsion Systems Centre (LPSC), Dr. Kuruvilla Joseph, Dean, Academics and Registrar were among those present. Dr. S. Jaishankar lauded the exemplary practices of IIST in his subsequent engagements abroad, which we consider a testament to the institution's relentless pursuit of excellence.




7.1.2 Shri. Rajeev Chandrasekhar, Honourable Minister of State Electronics and Information Technology Govt. of India

Indian Institute of Space Science and Technology organized the 4th Semicon India Road show in collaboration with ISRO on March 6, 2024 at Dr Srinivasan Auditorium. VSSC. Shri Rajeev Chandrasekhar, Honourable Minister of State for Electronics and Information Technology, Minister of State for Skill Development and Entrepreneurship, and Minister of State for the Ministry of Jal Shakti inaugurated the programme. Dr. S.Unnikrishnan Nair, Director, Indian Institute of Space Science and Technology(IIST)/Vikram Sarabhai Space Centre (VSSC) welcomed the Minister and dignitaries. Dr. V. Narayanan, Director, Liquid Propulsion Systems Centre (LPSC), Dr. Kuruvilla Joseph, Dean, Academics and Registrar, IIST; Shri. Sandip Patel, Managing Director and General Manager (India), IBM; Smt. Malini Narayanamoorthy, Electronics Country Head, Renesas Technology; Shri. Navin Bishnoi, Country Head, Marvell Technology; Shri. Vishal Dhupar, Managing Director (South Asia),NVIDIA; Shri. Jayashankar Narayanankutty, Group Director, Cadence Design Systems also talked during the program.

The Semicon India Future Design is an initiative of Ministry of Electronics and Information Technology (MeitY), with CDAC as Nodal Agency for implementation of the DLI Scheme to incentivize entrepreneurs in the creation and development of intricate semiconductor IPs, System on Chip (SoC), and products, thereby to attain self-sufficiency and to position India as a significant contributor to the global semiconductor supply chains. At the 4th FutureDesign Roadshow, the Honourable Minister announced that the upcoming Bharat Semiconductor Research Centre (BSRC) will have a regional centre at IIST, Thiruvananthapuram, catalysing the city's start-ups and tech ecosystem. The proposed centre will be a “comparable institution” to its esteemed counterparts such as the Belgium-based Interuniversity Microelectronics Centre (IMEC), the renowned Massachusetts Institute of Technology (MIT) in the U.S., and Taiwan's Industrial Technology Research Institute (ITRI).

7.1.3 Dr. S. Somanath, Secretary, DoS/ President, Governing Body, IIST

Dr. S. Somanath, Secretary, DoS and President, Governing Body, IIST, visited IIST on March 4, 2024 and addressed the student community and later the faculty members of IIST. He was joined on the dais by Dr. S. Unnikrishnan Nair, Director of IIST/VSSC, and Dr. Kuruvilla Joseph, Registrar of IIST.

In his address to students, Dr. S. Somanath underscored the importance of developing expertise in individual fields while also acquiring a broad set of skills and the ability to work collaboratively within teams. He stressed that academic institutions are not just centers for acquiring knowledge but also for learning methodologies that students should carry forward into their professional lives.

7.2 Events

7.2.1 Soft Landing of Chandrayaan 3

The year 2024 has been truly extraordinary for IIST, marking a milestone that will forever be etched in the hearts of our community. The successful soft landing of Chandrayaan-3 on the lunar surface has not only exemplified India's prowess in space exploration but also fostered an unparalleled sense of pride within the walls of IIST. The event was even more special for IIST with Dr Unnikrishnan Nair S, Director, IIST playing the leading role in this landmark mission, The pride of IIST was further magnified by the involvement of many of our distinguished alumni, whose contributions to the mission showcased the legacy of excellence that our institution fosters.

The entire IIST community gathered to witness this historic moment on the giant screens of OAT, on August 23, 2023 from 5 PM. The atmosphere was electrifying - each heartbeat syncing with the mission's progress. The joy, anticipation, and emotions that surged as Chandrayaan-3 touched down on the moon are memories that all IISTians will cherish for a lifetime. The celebrations that followed were a testament to the unity and spirit of IIST.

7.2.2 Award of 5G Use Case Labs

Indian Institute of Space Science and Technology was conferred the distinguished 5G Use Cases Labs award by the Hon'ble Prime Minister Shri Narendra Modi on October 27, 2023 as part of the Government of India's "100 5G Use Cases Labs Initiative." This initiative is designed to nurture expertise and encourage active engagement in 5G and future technologies among students, educators, researchers, and the emerging startup community. This visionary 5G Use Cases Labs program, introduced in the 2023-24 national budget, will be supervised by the Department of Telecommunications (DoT), Government of India.

The state-of-the-art 5G Use Cases Labs at IIST Trivandrum will be a beacon of technological excellence, featuring advanced 5G cellular infrastructure and tools. Key Objectives of the Initiative in IIST will be:

- Foster expertise in 5G technologies within the academic community.
- Promote collaborations between academia and industry for 5G innovations.
- Provide startups and MSMEs nearby with a 5G testing environment.
- Equip the Indian academic and startup sectors for the upcoming 6G era.

7.2.3 IIST Foundation day and Chandrayaan Utsav

IIST celebrated its 17th Foundation Day on September 14, 2023. This year's celebration carried profound significance on multiple fronts. It coincided with a historic juncture in India's space exploration journey—the monumental Chandrayaan 3 Mission; Dr. S. Unnikrishnan Nair, Director, IIST, being a key individual behind the success of this remarkable mission; IIST alumni playing crucial roles in the mission and the culmination of IIST's 15th-anniversary celebrations, amplifying the importance of this occasion. In the light of all these, IIST chose to dedicate this year's Foundation Day celebration to honor the triumphant Chandrayaan 3 mission.

Dr. S. Unnikrishnan Nair, Director, IIST delivered a special address, while Dr. P. Veeramuthuvel, the Project Director, and Smt. Kalpana K, the Associate Project Director of the Chandrayaan-3 mission, were the esteemed chief guests for the day. The Foundation Day celebrations at IIST commenced with a talk by Dr. Rajesh VJ, Professor in the Department of Earth and Space Sciences, on the exploration of Earth's Moon and ISRO's Chandrayaan Mission. This was followed by the "Chandrayaan Odyssey," an engaging session for school students, organized by IIST's Quiz Club. Our alumni also shared their experiences of working in Chandrayaan mission with our students. As part of our efforts to reach out to the society, students from the nearby schools were also invited for the celebrations.

IIST also organized a "Moon Photography" competition for school and college students. while NIRMAAN club conducted a series of lectures at government and tribal schools.

7.2.4 Interactive Session on Aditya L1

IIST, in association with the Aditya L1 Outreach Cell, and the Kerala State Science & Technology Museum, organised for the general public an interactive session with scientists/engineers from ISRO who contributed to different aspects of the Aditya L1 mission on September 16, 2023. The panel included Dr. Satheesh Thampi, Head of the Planetary Science Branch at Space Physics Laboratory at the Vikram Sarabhai Space Centre (VSSC), Dr. U P Rajeev, Head Mission Synthesis and Simulation Group, VSSC, Shri. V. Rajasekhar, Head Launch Vehicle Mechanical Integration Group, and Shri Kiran Mohan Deputy Project Director, Liquid Propulsion Systems Centre. The session was moderated by Dr. Anand Narayanan of IIST. The event was organised in joint collaboration with the Global Science Festival of Kerala, and the amateur astronomer's organisation of Kerala.

IIST along with Aditya L1 Outreach Cell organised two talks on the Aditya L1 mission for the students and faculty members. On September 7, 2023, Dr. R. Satheesh Thampi, Division Head, Planetary Science Branch of the Space Physics Laboratory, VSSC spoke on the science goals of the mission, and the different payloads with emphasis on PAPA. On September 21, 2023, Shri. L. Sowmia Narayanan, Deputy Director, Control and Guidance Simulation Entity, VSSC spoke on the key aspects of the PSLV, the design of Aditya L1 spacecraft, and the complex orbital calculations to L1.

7.2.5 Annual Food Fests

Annual Food Fest, CRAVE was organized by the student community of IIST on September 5, 2024 as part of Teachers Day Celebrations

7.2.6 Workshop on "National Education Policy and Implementation in IIST

IIST organized a Workshop on "National Education Policy and Implementation in IIST" on May 8, 2023 at Multipurpose Hall. The objective of the workshop was to understand the principles of National Education Policy (NEP) comprehensively and gain awareness of the challenges and opportunities while implementing the same. Hon. Chancellor Dr. B.N. Suresh gave an overview of NEP and presented some adopted models. Chief guest Prof. Indranil Manna, Vice-Chancellor, BIT Mesra, President INAE, gave an expert talk on "Important Features of National Education Policy and Challenges in its Implementation". Prof. S. M. Sameer, Dean of Academics, NIT Calicut, gave an overview of curricular modifications needed to implement NEP by citing his experience at NIT Calicut.

Dr. S. Unnikrishnan Nair, Director of IIST/VSSC and Dr. Y.V.N. Krishna Murthy, Registrar, IIST spoke during the function. Prof. Deepu M., Chairman of the NEP task team at IIST, presented the progress of NEP-related activities at IIST. A major highlight of the event was an interactive panel discussion on various aspects of NEP implementation.

7.2.7 Swachhta Pakhwada 2023

IIST commenced Swachhata Pakhwada 2024 with a series of impactful activities aimed at promoting cleanliness and environmental responsibility. The initiative began with the Mass Pledge taken by various sections of the institute, including employees, students, and community members, reaffirming their commitment to a cleaner environment. The event also featured Cleanliness Awareness Lectures to educate and inspire participants about the importance of hygiene and sustainable practices. In addition, the institute organized cleaning drives and plogging activities, encouraging the community to actively contribute to maintaining cleanliness in and around the campus.

7.2.8 Ek Tareek Ek Ghanta

As part of Ek Tareek Ek Ghanta cleaning drive was organised by IIST at Government LPS, Cellamcode along with Haritha Karma Sena, Nedumangad Municipality. Team NIRMAAN and Yoga club took the initiative from IIST.

7.2.9 Fit India Swachhata Freedom Run

The Fit India Freedom Run was started in 2020 to mark two days of national importance, namely, Independence Day and Gandhi Jayanti. This run aimed to inculcate the habit of walking and running in people in the quest for better health and fitness. IIST organized the "Fit India Swachhata Freedom Run " on October 28, 2023, as part of its efforts to promote fitness, cleanliness, and national unity. The event saw enthusiastic participation from students, faculty, and staff, who ran together to emphasize the importance of a healthy lifestyle and a clean environment.

7.2.10 Dance Demonstration and Workshop - Hasthas Across

Supported by the Department of Humanities and Social Sciences, the Cultural Committee, and the IQAC, Dr. Methil Devika conducted an engaging Dance Demonstration and Workshop titled " Hasthas Across Space " on November 8, 2023. The workshop focused on the intricate use of hand gestures (hasthas) in classical dance, exploring their significance in conveying emotions and stories across different spaces and cultures and using modern technology like AI. The event was a blend of theory and practice, allowing participants to actively engage with the nuances of classical dance.

7.2.11 Live Streaming of inauguration of 'Viksit Bharat@2047'

IIST faculty, students and staff, watched the the inauguration of 'Viksit Bharat@2047' on December 11, 2023 which was live streamed at MPH, SAC buildings. Faculty members and students listened to the virtual address by Prime Minister Honorable Prime Minister Shri Narendra Modi emphasizing the crucial role of semiconductor industries in fostering Viksit Bharat. As part of it, IIST hosted a seminar, "India's Techade - Chips for Viksit Bharat" on March 13, 2024, marking the inauguration of India's First Semiconductor Fabrication Facilities by our Honorable Prime Minister Shri Narendra Modi.

Dr. Unnikrishnan Nair, Director, IIST/VSSC delivered the inaugural address. He shared his thoughts on the importance of Semiconductor ecosystem in the country and how IIST can also contribute to this national mission. Prof. Mayank Shrivastava, Department of Electronics Systems Engineering, IISc, Bangalore delivered a talk on "A Vision for India to Lead in Semiconductor R&D and Manufacturing (What, Why & How?)". His talk explored critical facets of India's journey towards semiconductor excellence, addressing the urgent need for innovation, strategic investment in R&D, industry-academia partnership in India, and the creation of a skilled workforce tailored for the semiconductor industry.

The seminar was attended by many students, faculty members and staff of IIST and the seminar was instrumental in exploring the opportunities and challenges in semiconductor manufacturing in India and the importance of innovations in this field.

7.2.12 Book Fests

IIST hosted a Book Fest from July 4-10, 2023, bringing together a wide range of literary works and enthusiasts from across the campus. The fest featured an extensive collection of books, covering diverse genres such as science, technology, literature, and the arts, offering something for every reader.

7.2.13 Film Screening and Discussions

Department of Humanities and Social Sciences, IIST hosted a live streaming and discussion of The Motherland, a documentary that explores the social issues surrounding land acquisition and protest in Jagatsinghpur, Odisha. The film provides a poignant look into the struggles faced by local communities as they resist large-scale land acquisition projects that threaten their livelihoods and heritage. Through the screening, students and faculty engaged in a meaningful dialogue about the complex dynamics of development, displacement, and resistance, reflecting on the broader implications for social justice and environmental sustainability.

7.3 Inauguration

7.3.1 Football and basketball facilities

On January 24, 2024, Dr. S. Unnikrishnan Nair, Director, IIST, officially inaugurated the campus's new football and basketball facilities. The event was attended by Prof. Kuruvilla Joseph, Registrar, IIST along with Deans, Associate Deans, Heads of Departments, faculty members, students, and staff.

7.3.2 Agastya – the biodiversity Park

Agasthya - the Bio-Diversity Park was inaugurated by Dr. S. Unnikrishnan Nair, Director, IIST on March 14, 2024. This park serves as a sanctuary for a diverse range of flora and fauna native to the region. It symbolizes IIST's commitment to sustainability and provides an open space for discussions, and relaxation, offering students and faculty a living laboratory to explore the wonders of nature while promoting conservation and environmental responsibility. This initiative aligns with the institute's vision of integrating ecological balance with scientific innovation.

7.3.3 New Gate and Security Complex

The new Gate Complex and Security Complex at IIST was inaugurated by Dr. S. Somanath, Secretary, DoS and President, Governing Body, IIST, in the presence of Dr. S. Unnikrishnan Nair, Director of IIST. This state-of-the-art facility is designed to streamline campus security while offering a modern and welcoming entrance that reflects the institution's stature.

7.4 Festivals

IIST celebrated the vibrant festival of Onam on August 25, 2023. The event titled Shraavanam '23, united the entire IIST community in a spirit of togetherness and joy. The festivities began with the Athapoo competition, showcasing beautiful floral arrangements, followed by an energetic Onam procession. Shri Prasanth Nair, Special Secretary, Government of Kerala, delivered the Onam message, setting the tone for a day followed by cultural performances, a grand Onam feast, and traditional Onam games. Participants enthusiastically competed in events such as tug-of-war, Uriyadi, and pillow fights.

In addition to Onam, other festivals like Pongal, Ugadi, Ganeshotsav, Deepavali, Navarathri, and Holi were celebrated at IIST with equal fervor and grandeur.

7.5 Celebration of Days of Importance

7.5.1 Birth Anniversary of Dr. B. R. Ambedkar

IIST celebrated the 132nd Birth Anniversary of 'Bharat Ratna' Dr. B. R. Ambedkar on April 26, 2023. The event was graced by Dr. Sindhu Thulaseedharan, Associate Professor, Department of Law, University of Kerala who served as the Chief Guest. In her address, Dr. Sindhu reflected on the thoughts and vision of Dr. B. R. Ambedkar and delivered a comprehensive presentation on his life and legacy. As part of the tribute, IIST officials offered floral tributes to honor the memory of this great leader.

7.5.2 International Day of Yoga

Ananta, the Yoga Club of IIST organized The International Yoga Day on June 21, 2023, to provide participants a holistic experience that would nourish their mind, body, and spirit. With a captivating Sunrise Yoga session led by the dedicated students of the club, the celebrations concluded with an enlightening Talk on "The Calculus of Yoga : Integrating & Differentiating the Mind through Yoga" by the esteemed guest speaker, Sri. Dinesh Kashikar.

Sri. Dinesh Kashikar took the stage in Hybrid mode to delve into the intricacies of "The Calculus of Yoga." His insightful talk explored the profound benefits of yoga, extending beyond the physical realm and encompassing mental, emotional, and spiritual well-being. In addition to the yoga session and the talk, the Yoga Club of IIST also organized an exciting online challenge called "Mr & Ms. Yoga Star Challenge." This unique competition provided an opportunity for participants to showcase their yoga skills and win recognition for their dedication to the practice.

7.5.3 Independence Day Celebrations

IIST celebrated the 77th Independence Day with a series of vibrant events and activities. Dr. Unnikrishnan Nair S, Director of IIST, hoisted the National Flag in front of the administration building, after which he inspected the Guard of Honour and delivered the Independence Day address. Director urged the faculty members, staff and students to work for the betterment of the institute in particular and the country at large. He also presented awards to the winners of various competitions held as part of the celebrations.

The day continued with a captivating skill demonstration by the CISF, followed by a series of cultural performances organized by the IIST Cultural Committee and the IIST Music Club, adding a lively and patriotic spirit to the occasion.

7.5.4 Vigilance Awareness Week

Every year, Vigilance Awareness Week (VAW) is observed in IIST during the week in which the birthday of Sardar Vallabhbhai Patel (October 31) falls. IIST celebrated vigilance awareness week by taking pledge to promote integrity and transparency within the institution and eliminate corruption. This year, the theme, "Say No to Corruption, Commit to the Nation," underscores the collective responsibility of students, faculty, and staff to uphold ethical values in both personal and professional spheres.

7.5.5 International Women's Day

International Women's Day was celebrated in IIST on March 14, 2024, at the Multipurpose Hall of the Student Activity Centre (SAC).Dr. Nigar Shaji, Project Director of the Aditya-L1 Mission at URSC, was invited as the Chief Guest of the day. Dr. Unnikrishnana Nair, Director, IIST and Dr Kuruvilla Joseph, Registrar, IIST were also present. She shared her personal experiences and delivered a technical presentation on the Aditya-L1 mission, a significant milestone for ISRO as it marks the organization's first venture to the L1 point. The event offered students a valuable opportunity to interact with the Project Director of this pioneering mission.
Additionally, an exhibition and sale of handicrafts by IIST staff, including paper crafts and hand-crafted jewelry, were showcased outside the Multipurpose Hall.

7.5.6 Samvidhan Diwas (Constitution Day) Celebration

November 26 is observed as Samvidhan Diwas (Constitution Day) to honour the adoption of the Constitution of India by the Constituent Assembly. As part of the celebrations, Prof. A. Chandrasekar, Dean of Academic & Continuing Education, IIST, led the "Reading of the Preamble" in the Library foyer. Staff and officers from various departments, including Administration, Accounts, Purchase, Academics, CMD, Hindi Section, CSG, SSG, Library, Placement, and the offices of the Director, Registrar, and Deans, actively participated in the event. Faculty and students organized similar programs within their respective departments.

7.5.7 Republic Day Celebrations

IIST celebrated the 75th Republic Day with great enthusiasm and patriotism, commemorating the occasion with a series of activities and events. Dr. Unnikrishnan Nair S, Director, IIST, unfurled the national flag. Prof. Kuruvilla Joseph, Registrar, Deans, faculty, students, staff, and family gathered to witness the ceremony, with students and teachers from the Government Tribal School, Idinjar, attending this year's celebration as special guests.

During the event, Director delivered a comprehensive speech highlighting the institute's achievements over the last year, outlining future programs and initiatives. He highlighted the promising developments in the space domain, expressing optimism about the opportunities awaiting IIST in the upcoming year. Following his speech, the CISF provided a demonstration on the importance of security in the office environment. A skit highlighting unity among people was performed, and prizes were awarded to winners of various competitions, including those held for the children of CISF personnel.

Dazzling cultural programs by the student community, comprising music, dance, and drama, were organized in the SAC, conveying messages of unity, equality and patriotism.

7.5.8 GIS day celebrations

The Department of Earth and Space Sciences celebrated GIS Day 2023 by hosting a special lecture on "Geospatial Technologies for Natural Resources Conservation" on December 18, 2023. The event aimed to highlight the critical role of geospatial technologies in managing and conserving natural resources. Prof. S. Aavudai Anandhi, Florida Agricultural and Mechanical University, Tallahassee, Florida shared insights into the latest advancements and applications of GIS tools for sustainable resource management, fostering a deeper understanding of their importance in addressing environmental challenges.

Institute Facilities, Infrastructure & Other units of IIST

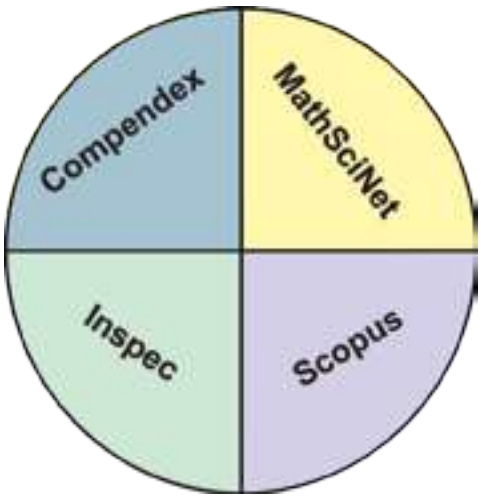
8. Institute Facilities, Infrastructure & Other units of IIST

8.1 Institute Library

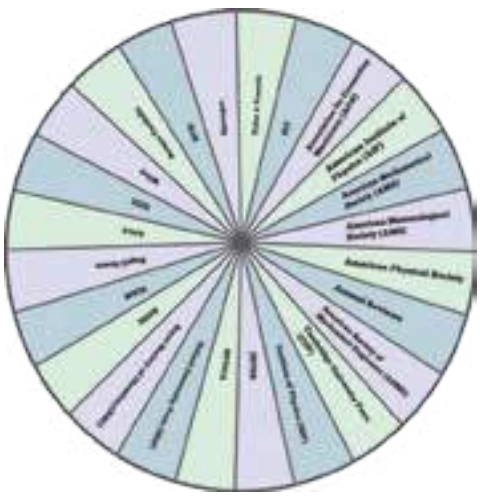
The library played a crucial role in supporting the institute's academic and research activities by developing a balanced hybrid collection of print and digital information resources and offering various information services. Library collections suitable for the academic and research programmes were meticulously developed after getting suggestions from the faculty and subject experts. All the library's housekeeping operations are fully automated using the Koha–ILMS, and complete catalogue of the library holdings has been made available on the campus network.

Details of library collection during 2023-24 are given below:

Sl No	Type of Resource	New Additions	Amount Spent (₹) (Lakh)	Status as on 31st March 2024
1	Books	993	36.49	36431
2	E-Books	2272	7.67	8875
3	Journals (Print)	1	4.84	146
4	Online Full-Text Journal Databases		212.29	20 (6000+ Online Journals)
5	Individual Online Journal	2	17.65	10
6	Online Bibliographic / Citation Databases	3	0.83	4
7	Bound Volumes	103		1494
8	CD / DVD	14		1067
9	Maps			122
10	Reports	275		1597



(a)Electronic Resources



(b) Citation / Bibliographic Databases

Library & Information Services: Library provides the following services for the user community:

Sl No	Library & Information Service	
1.	IIST Virtual Library (IVL)	This service provides a single portal for users to access all the e-resources subscribed by the library from and off campus. This helps to provide secured *access* to subscribed e-resources to users anywhere at any time.
2.	Front Desk Service	The circulation desk of the library acts as the front desk of the library for users to interact, membership registration, and book issue/return.
3.	Online Public Access Catalogue (OPAC)	OPAC helps users check the availability of particular titles. It is designed to be searched by title, author, subject, keyword, etc., in a user-friendly interface. It also helps users to suggest books for purchase, renew the issued books from the library, and reserve books.
4.	Similarity Checking Service	Library subscribes to the Turnitin software, and campus-wide access is provided for users to check similarities and avoid plagiarism in publications. During the period, the library has generated 1316 reports on request
5.	Current Awarenes Service	Users are intimated as and when new books, journal issues, etc, are added to the collection. Details of new books/chapters/articles published by the faculty/student are displayed in the library.
6.	Books on Call Service	Service offered to faculty to get the library books ready at the front desk when they reach the library
7.	Resource Awareness Programmes (REAP)	Library conducts REAP on various services library offered and tools and resrouces subscribed. Library has conducted.4REAPs during the reporting period.
8.	Documentation Service	Library acts as the central documentation facility of the IIST
9.	Resoruce Sharing	Library has inter library loan facility with all ISRO/DoS libraries. The Antariksh Gyaan Consortium facilitate resource sharing among these libraries.
10.	Alert Servcies	A mail alert system is in place for books issued/returned, due date reminders, and the arrival of suggested books.
11.	Library Orientation	Library orientation is provided to each batch of B.Tech/M.Tech/PhD students at the beginning of the academic session to make them familiarise with the library resources, services, and procedures

12.	IIST-IRINS	Library manages the INFLIBNET-IRINS portal of IIST by updating the information. https://iist.irins.org/
13.	Institutional Membership	IIST has taken membership of libraries of other institutes. This helps the academic community of IIST to use the resources of other libraries.
14.	Reference Service	Library provides reference services on demands for the academic and administrative community.
15.	Library Portal	Library portal showcases all the subscribed resources by the library. It also provides information about the library's services and procedures.
16.	Shodhganga Co-ordination	Library is the nodal agency to upload the e-theses from IIST to the Shodhganga repository. During the reporting period, 28 theses were uploaded to the Shodhganga, making the total IIST theses in Shodhganga 164. https://shodhganga.inflibnet.ac.in/handle/10603/187485
17.	National Digital Library	Library is the nodal office to register the students to the National Digital Library maintained by IITKGP
18.	IIST Social Media Management	Library manages the social media pages of the institute, such as facebook, LinkedIN, YouTube Channel, X platform, and Instagram (i) https://www.facebook.com/IIST.Trivandrum (ii) https://www.linkedin.com/company/indian-institute-of-space-science-and-technology-iist/?viewAsMember=true (iii) https://youtube.com/@indianinstituteofspacescie8522?feature=shared (iv) https://x.com/IIST_Trivandrum?t=QyywjCSQcOGVERwV6_UI1Q&s=09 (v) https://www.instagram.com/iist_trivandrum/
19.	Text Book Bank	The book bank facility ensures the availability of basic textbooks for B.Tech students. Required books for a particular semester are issued to the students at the beginning of the semester. 91 titles and 8089 volumes were issued to students during 23-24.

20.	Book Grant Facility	A software (Book Grant Management System - BGMS) was developed to process the book grant for the B.Tech students (up to the 2020 year batch students). Students can upload the bill and other details to the BGMS portal to process and reimburse the amount spent for book grant books. During the period, students purchased 685 books. An amount of ₹ 3.09 lakh rupees was used for the purchase of technical books and ₹1.31 lakh for general books.
21.	Archiving Service	Library collects and archives photographs of important events organised in the institute.

The library is housed in a six-floor building with a sprawling space of about 4371.51 sq. meters. The building is centrally air-conditioned and provided with Wi-Fi facilities. The designated areas for different sections and facilities provide the right ambiance for reading and other purposes.

Sl No	Facility	
1.	Reading Halls	Library has reading halls having a total seating capacity of 230 numbers.
2.	Multimedia Library	This facility is used to access multimedia resources, lectures, MOOCs, etc. Some academic software are also installed on the computers and made available for students.
3.	Mini Conference Hall	The mini-conference hall with a 50 seating capacity is used for important meetings, library programmes, and other events organised in the institute.
4.	Graphic Design Facility	This is a central facility that meets the institute's graphic design requirements. Newsletters, magazines, posters of academic and administrative events, etc., are designed in this facility.
5.	Photocopy / Printing Facility	Photocopying and bulk printing of the academic and administrative community are met by this facility. Newsletters, magazines, posters, ID cards for events, etc., are made using this facility. This facility has one heavy-duty production printing machine to carry out the jobs. During the period, 1.97 lakh copies were taken, ₹ 3.37 lakh was collected for providing the service for personal use, and ₹ 6.94 lakh worth of copies were taken for official purposes.

6.	Binding Facility	This central facility offers different types of bindings, such as hard binding, soft binding, calico binding, section stiched binding, and spiral binding. This facility is being used to make institute documents, bound volumes, notepads for events, project reports, and theses. The facility can be used for personal purposes on a payment basis. During the period, ₹ 78460/- was collected for providing the service for personal use, and ₹ 32775/- worth of copies were taken for official purposes. The generated Graphic Design Facility, Printing Facility, and Binding Facility help the library acts as the publishing house of the institute
7.	Scanning Facility	This facility can be used to scan users' documents. A flatbed scanner is available for this purpose. A heavy-duty machine at the printing facility is being used to scan large volumes of documents.
8.	Book Exhibition Facility	Book exhibitions are organised in this facility to select and suggest books for library purchases. In addition, book displays will also be arranged in connection with the seminars, conferences, and day celebrations
9.	Mini Space Museum	A mini space museum is established in the library with the models of rockets, satellites and other components pertaining to space science.

Programmes / Events Organised

- "Webinar on Turnitin – Plagiarism Detecting Tool" on 6.12.2023
- "Workshop on Academic Writing" , on 18.10.2023, in association with the Dept. of Humanities.
- Book Exhibition : Library organised 3 book exhibitions during the reporting period to enhance the book collection.
- Professional Internship Programme : Library trained 7 professionals from the University of Kerala during the reporting period

Library Visitors

Library has been a centre of attraction for other academic institutions and organisations. During the period, the library witnessed around 868 visitors from various institutes.

8.2 Multi-Disciplinary Computing Centre (MCC)

Multidisciplinary Computing Centre (MCC) was established to provide various computer solutions for research problems and to facilitate and support the institute's essential teaching and academic goals.It aims to become a center of excellence in computational techniques and computer simulations for science and engineering and provide expertise in Big Data Analysis, Climate Modelling, Computational Fluid Dynamics, Computational Structural Mechanics, Computation-Assisted Materials Science, Computer Vision, and Virtual Reality, Machine Learning, Network Science and Engineering, Nonlinear Dynamics, Optimization, Geoinformatics, Monte Carlo Simulations. Two parallel computing clusters run in the Center with a total computational power of 120 teraflops with parallel file system. The center has 40 high-end Xeon workstations with multiple configurations. Most workstations have over 128 GB RAM, ten cores, and dedicated GPU cards. It also has four high-end GPU Servers, storage servers and license servers. Faculty members, Research Scholars, project staff and final year undergraduate and Postgraduate students get access to these systems by applying online.

8.3 Computer System Group (CSG)

CSG operates and maintains computer systems, networks, communication and audio-visual infrastructure in order to facilitate IT, IT-allied and communication services in IIST.

The services are made available in all academic blocks, residential hostel buildings, library, student-activities centre, administrative offices and service facilities in the institution.

IT Systems & Services

1. server and storage infrastructure
2. web and mail servers
3. software and cloud licenses
4. network infrastructure – local area networks and wireless networks.
5. information security systems for computers and networks.

Servers and Storage Infrastructure

Computer Servers (Rack, Blade Servers & Server Cluster for Virtual Servers) and Storage are hosted and maintained in IIST Server Room in Aerospace Block. Existing Virtual Server Infrastructure is being augmented with procurement of 4 more high-end hypervisors with linear cold-migration capability and storage.

Web and Mail Servers

Internet web sites, in-campus web applications and mail services are operated and maintained in servers hosted on-premises in the Server Room.

Upgradation of existing web & mail server systems are proposed to be completed in 2024-25.

Computer Systems & Database Software : Open Source system software and databases remain in predominant use for server systems maintained in IIST. Software License subscriptions are also maintained for Windows Server and Redhat Linux operating systems. Microsoft Campus Software and Microsoft 365 Licensing Agreement continues to be renewed. Free-for-university license of AUTOCAD software have been subscribed from Autodesk and remain in use.

Campus Network Infrastructure: Core dual-redundant Network Switches hosted in IIST's Network Operating Centre (NOC) in Aerospace Building links all buildings in Valiamala Campus through Distribution Switches and multiple optical-fiber backbone (OFC) links to operate the Campus Network.

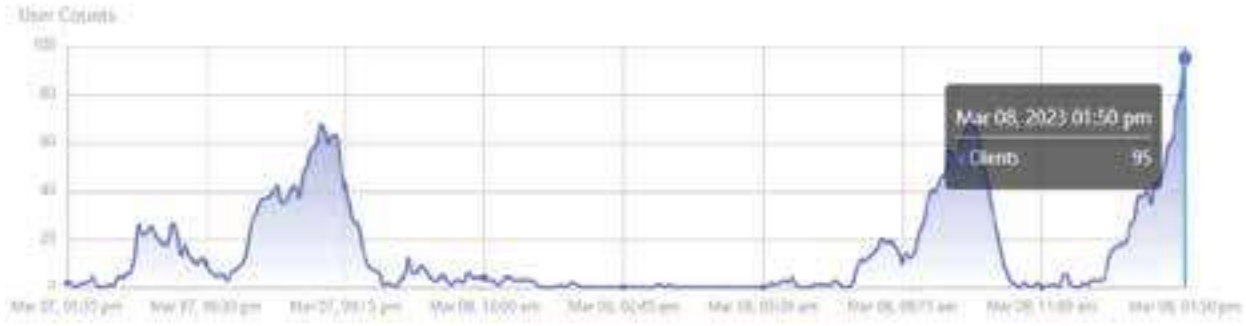
More than ~ 250 nos. of Access Switches and ~200 nos. of 802.11b/g/n based Wireless Access Points facilitate multiple LANs and Virtual VLANs to provide 24x7 network services to all staff, students and facilities.

Augmentation of Wired Network Infrastructure in Campus Buildings

Major augmentation of wired network infrastructure in Avionics Engineering and Multi-Disciplinary blocks are in progress to functionally separate and secure networks and meet long term requirements.

Upgrade of Wireless Internet Services in Student Hostels and Student Activity Centre

Wireless Internet Services in student hostels were upgraded with 176 nos. of new 24x7 dual-band 2.4GHz / 5 GHz 802.11 b/g/n/ac. Wireless Access Points provided in all the 11 residential hostels. This serves up to 3000 BYOD clients at up to 200Mbps wireless bandwidth, totaling downloads up to 4TB per day.



Peak Client Access Graph for 24 hours in Student Mess

Internet-based video calls were enabled through this infrastructure. New IIST-STUDENT-MOBILE SSID introduced to enable multiple student mobile devices to connect WiFi with ease.

New high-bandwidth WiFi6 Wireless Internet services were setup in Student Activity Centre (Mess, Gym and Multi-Purpose Hall), as well as in outdoor Student Cafeteria that enables concurrent connectivity up to 250 mobile devices at each location.

Setup and Integration of WAN connectivity to Ponmudi Hills Observatory Campus

IT and IT-allied services and communication facilities have been extended from IIST Valiamala to IIST's Ponmudi Hills Campus ~35km away by integrating the network infrastructure over a 100Mbps WAN link leased from BSNL.

Services include Internet communication services, 'Voice-over-IP' Telephone Communication Services and Video Surveillance Cameras for Entry Gates. All services are monitored remotely at Valiamala Campus.

Personal Computers & Printers

659 desktop PCs are under Annual Maintenance Contract out of ~1200 currently in operation. Four service engineers are deployed onsite to provide technical support for users of all PCs and workstations, and update system software and security in all PCs, at an annual cost of Rs.17.65L.

Printing facilities in major academic blocks have been upgraded with new economic Ink-Tank based Multi-Function Color Network Printers, while those in administrative offices have been upgraded with new Monochrome NW MFPs.

Personal Desktop Printers of members of faculty and officers have also been upgraded by replacing old/faulty ones with New Ink-Tank-based Multi-Function Desktop Printers.

Information Security Management

Unified Threat Management systems were upgraded to latest versions and maintained in multiple networks for protection against malwares, malicious attacks and intrusions. Mobile Token-based Multi-Factor Authentication (MFA) is introduced for improved network access security. Single Sign On (SSO) implementation is planned for all users.

DoS/ISRO's directives on improving cyber-security of information systems and networks are also being implemented in IIST as part of the IT & ITeS Implementation Programme (IIIP) of DoS/ISRO. IIST's ISO participated as member of DoS/ISRO Inter-Centre Security Audit Team to conduct IT Security Audit of Computers Systems and Networks of LPSC, URSC & IPRC under DoS/ISRO. SSL security certificates are renewed and maintained for iist.ac.in & iist.org.in Top Level Domains of IIST. Plan for Application Security Audit of all Internet & Intranet Web Applications proposed to be conducted by CERT-IN empaneled TPAs.

Communication & IT Allied Systems & Services

1. communication infrastructure, connectivity and gateway.
2. room-conferencing and web-conferencing systems.
3. audio-video and multi-media display systems in rooms/halls.
4. audio-visual systems in class rooms and outdoor events.
5. identity based access control systems for physical-security.
6. identity based attendance systems for classrooms and offices .

7 video surveillance systems.

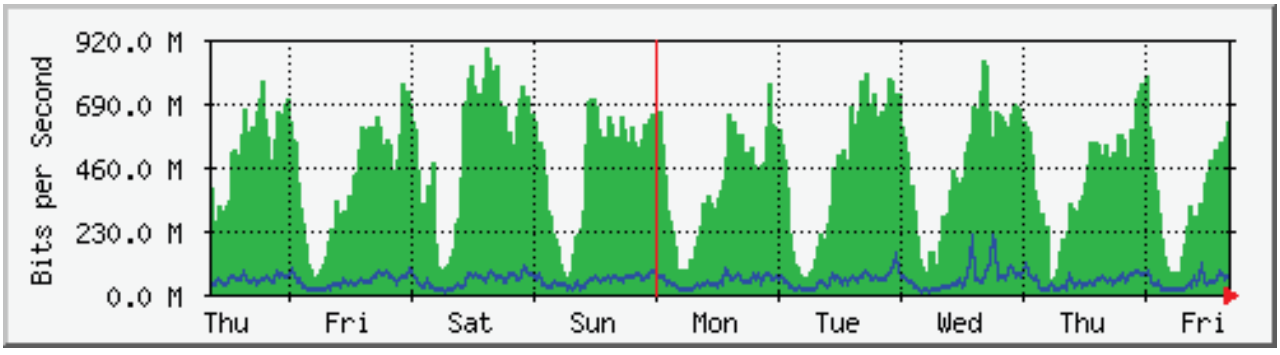
8. consumables - cables, toner-cartridges & batteries.

Communication Infrastructure, Connectivity & Gateway Services

Communication Infrastructure consisting of CENTREX Telephone Exchange, 3G Cellular Telecom systems and OFC Terminal MUXes are hosted by IIST inside campus and maintained by BSNL exclusively to facilitate communication services in IIST.

Optical Fibre Cable communication links are laid in redundant ring topology mode by service providers. 323 DID telephone connections are in operation for all offices, facilities and members of faculty. Upgradation of existing 3G Mobile Services to 4G by BSNL is in progress.

Institution is connected to the Internet over 1Gbps of Internet Bandwidth on NKN link and 100 Mbps on BSNL link. Internet services are made available 24x7 at all offices, academic facilities and student hostels in the campus since 2011.



SMS Gateway Services

IISSAT, IISSTT, IISTAC, IISTOF and IISTSV are SMS IDs of IIST that have been registered under of BSNLs SMS Gateway services. Software integration of OTP-based multi-factor authentication and transaction notification services are in progress.

Digital Payment Gateway Services

SBI ePay gateway services have been integrated with IIST payment transaction systems in addition to existing PayGov services to enable digital payments.

Room-Conferencing and WEB-Conferencing

IP-based point-to-point/multipoint Room-based Video Conferencing Systems are setup in in two conference rooms for conferences with other organisations. These systems are also linked to the secure SPACENET Video-Conferencing Systems of DoS/ISRO.

Events supported include:

- On-line PG (MTech/MS & PhD) Admission Interviews 2023-24
- ISRO Placement Counselling 2023
- Academic Lectures & Seminars

Audio-Video and Multi-Media Display Systems in Rooms/Halls

MMAV facilities augmented in Admin Council Hall and Aerospace Conference Hall.

Council Room in Aerospace block has been augmented with 96" Interactive display.

Modern audio facilities implemented in the 600-seater Open-Air Amphi-Theatre and 200-seater Multi-Purpose Hall.

Events supported include:

- Prime Minister's 5G LAB Award Ceremony 2023
- Prime Minister's Vikasit Bharath
- Union External Affairs Minister's Visit 2023
- Union Information Technology Minister's Visit 2024

Audio-Visual Systems in Class Rooms and Outdoor Events

Audio-Visual and Multi-Media systems are operated and maintained in 33 classrooms for conduct of lectures.

Phased replacement of old LCD Projectors with 500 lumens Laser Projectors completed in 2 classrooms. Lapel Mics replaced with new high-gain noise-cancellation lapel mics in all classrooms.

Outdoor Events supported include:

- Independence Day Celebrations 2023
- Republic Day Celebrations 2024
- Convocation 2023

Live display and web streaming of academic procession and operation of audio-visual services at Pearl Auditorium in LPSC in collaboration with AV teams of LPSC, VSSC and other AV teams.

Biometric Identity Based Physical Access Control Systems for Entry Gates, Laboratories & Research Facilities

BACS has been integrated for management of staff and student attendance.

25 nos. of new fingerprint-based and 7nos. Face-Recognition based Attendance Systems have been deployed for class rooms for the purpose.

Video Surveillance Systems

141 network cameras for surveillance of entrances, stairs, elevators, corridors and outdoors of all buildings are currently in operation. Classrooms and 24x7 labs/facilities in IIST have been additionally included for video-surveillance.

Video Surveillance Cameras have been commissioned at remote Ponmudi Hills Campus and are deployed in strategic locations.

Residential CCTV Systems consisting of 165 cameras and 11 video recorders for 11 Student Hostels in IIST is ready for implementation.

8.4 Software Support Group

Software Support Group (SSG), led by a team of IT professionals, provides various software services and technical assistance in the institute .

SSG implements software support and services to the various departments such as Academics, Administration, Transport, Canteen, Purchase, Stores, Accounts and Placement. SSG has designed, implemented, customized, tailored and updated many web applications quickly without compromising accuracy. SSG plays a vital role in providing software solutions based on Institute demand. Our activities ensure that software runs smoothly, issues are promptly addressed, and users have a positive experience.

SSG Activities – A quick walkthrough

During the reporting year, the significant accomplishments of SSG include the release of software, namely, Digital Data Portal, Article Processing Charge Management System, Student Leave Management, Overdue Management System, Asset Management System, Committee Data Collection Portal. Conference websites with online registration and payment were enabled for various departments in IIST.

Digital Data Portal - To collect and preserve data pertaining to Institute activities for document preparations like Annual Report, NAAC, NIRF etc.

Article Processing Charge Management System – To submit and process the article processing charge request for the faculty and scholars.

Student Leave Management - To review, approve and track student leave.

Overdue Management System- To enable and keep track of overdue details.

Asset Management System - To record and keep track of all assets.

Committee Data Collection –To collect the committee details associated with an employee.

a.Software hosted for various activities in the Institute:

Analysis, Design, Coding, Implementation, Maintenance and Enhancement

1. Leave Management System – Manages employee leave requests.
2. GTE - PLR Data Management System – Role-based portal for GTE-PLR submission and approval.
3. Article Submission and Review Portal – Submit articles online for review and acceptance.
4. Ph.D. Admission Requirement Collection – Captures and consolidates the upcoming PhD requirement.
5. Attendance Management System- Automated the attendance processing of manpower contract personnel using biometric data to ease salary computation.
6. UG, PG and PhD Admission Portal – Automated the entire admission process.
7. Book Grant Management System - Automated the book grant submission and approval process.
8. Canteen Booking System – Allows online booking and cancellation of breakfast/lunch/dinner services with an online payment mechanism.
9. Thesis Submission and Evaluation Portal – To submit thesis files for review and evaluation.
10. Online Counselling Software – For U.G. and P.G. admissions.
11. iCampus – Manages academic functions in the IIST campus.
12. Academic Portal – Student portal for viewing their academic records.
13. Online Student Feedback System – To record course feedback from students.
14. ISRO Absorption Counselling Software – For ISRO placement.
15. Convocation Portal – For registration and posting convocation-related information.
16. Online Application Submission for Recruitment- Apply online for the recruitment process.
17. Material Management System – For Stores, Construction and Maintenance Division.
18. Access Control System – For tracking biometric access details.
19. CHSS Card Printing System – For generating CHSS cards.
20. Student Activity Board – Best performer evaluation system.
21. Card Generation System – Printing identity cards for students and employees.
22. Payment Information System – For tracking budget details.
23. Student/Staff Directory – Information system of students and staff.

b. Customized Applications:

Implementation, Maintenance and Enhancement

1. COWAA IIST MIS
2. Canteen Akshayapatra – Stock Management
3. Canteen Credit Bill Software
4. TOMD for Transport
5. Stock Disposal Software
6. 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

8.5 Construction and Maintenance Division CMD

The capital work completed by CMD, IIST during the period are:

Construction of Gate complex in IIST
Completion Cost : Rs. 89.08 Lakhs
Plinth Area : 192 Sq.m.


Security Building


Front gate

The minor works completed by CMD, IIST during the period were:

Facilities in Interdisciplinary Block:

Minor works for setting up of Programming lab in Interdisciplinary Block
Completion Cost : Rs. 5.13 Lakhs

Design, Fabrication, Supply, Installation, Testing and Commissioning of 544kg capacity (8 person) lift in Interdisciplinary Block

Completion Cost : Rs. 16.65 Lakhs

Facilities in Science Block:

Minor works for establishing space Biology lab in Science Block

Completion Cost : Rs. 2.18 Lakhs

Modification works at Nano Science Laboratory in Science Block

Completion Cost : Rs. 3.58 Lakhs

Facilities in Avionics Block:

Minor works at RF and Micro wave lab in Avionics Block

Completion Cost : Rs. 1.71 Lakhs

Minor works at Advanced communication lab in Avionics Block

Completion Cost : Rs. 2.77 Lakhs

Minor works at Instrumentation lab in Avionics Block

Completion Cost : Rs. 1.76 Lakhs

Minor works at Advanced Microwave lab in Avionics Block

Completion Cost : Rs. 4.83 Lakhs

Minor works at Systems and Network lab in Avionics Block

Completion Cost : Rs. 11.22 Lakhs

Design, Fabrication, Supply, Installation, Testing and Commissioning of 544kg capacity (8 person) lift in Avionics Block

Completion Cost : Rs. 16.43Lakhs

Facilities in Hostel areas

Providing cloth drying shed for boys behind hostel Dhanishta

Completion Cost : Rs. 8.63 Lakhs

Construction of New playcourt near old security gate

Completion Cost : Rs.9.94 Lakhs

8.6 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

- Amphitheatre with seating capacity of 820

- Kitchen and mess hall with seating capacity of 450

- 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.

IIST offers a structured programme designed to train students in various sports and fitness activities, overseen by qualified physical education instructors. Students are body is organized into different houses, and throughout the year, IIST hosts intramural competitions featuring various sports events, culminating in annual sports day. Furthermore, IIST participates in a range of inter-university events, including cricket, basketball, volleyball, chess, football, and badminton. 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 & Squash court

In addition, IIST also has outdoor facilities such as

- Basketball court • Volleyball court • Outdoor gym • Cricket net pitch area • Cricket/Football ground


SPIRIT

8.7 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 is available round the clock to meet emergency situations. The students 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 2023-24, a total of 9721 patients were attended to by IIST medical services. All emergency medicines are in stock for the benefit of students and staff.

In addition, all permanent staff are covered under Contributory Health Service Scheme (CHSS) of Department of Space.

8.8 Sameeksha : Counselling Services

IIST is equipped with facility for scientific counseling that involves face-to-face consultation, and 24*7 telecounseling. This helps to prevent development of stress, vulnerability, and nourishes a healthy academic life along with personality development. Apart from developing technically proficient individuals, their grooming as good human beings with impeccable integrity and social consciousness is given emphasis.

Some of the salient contributions include;

Counseling, career plan development, educating on psychological skills (psychoeducation), and development of customized healing (treatment) plan based on the nature of life experiences, personality predisposition, and unique situation of the individual. Individuals referred by respective mentors were assessed & understood prior to counseling and/or therapy.

Alumni students were also supported to cope with their challenges and family situations, over telephone, whatsapp and Google meet.

Researcher scholars having time overrun or those who have difficulty in maintaining a positive working relationship with guide, emotional problems, and difficulties in career planning have been provided psychological help to resolve these issues. In the past one year (financial year) around 104 counseling sessions for PhD scholars were done.

As part of helping students who underperform during exams, such students were identified and their personal study habits were examined, and the presence of other distractions were addressed.

Apart from a total number of 685 psychological counseling sessions done during the last financial year, counseling help was done telephonically (emergency calls outside the consultation hours) and also through online/google meet (outside the consultation hours) also.

Support for students who underwent psychiatric consultation, support to students staying outside with parent due to psychiatric treatment, consultation with parents, and maintaining records of all counseling sessions and consultations were some of the extended activities done by counseling services at IIST.

Counseling of students who underwent disciplinary processes and guidance to their parents were also done by counseling services.

Creating awareness of the importance of psychological well-being and mental health among new students was done during the induction programme for newcomers on 29/7/24.

Participated in the discussion meetings with students belonging to minority or socioeconomically backward strata of society to improve their belongingness, adjustment, thriving in academic performance.

He has delivered talks on Personality Development, Ego defense mechanisms, and also in Stress manangement to students of BTech (ECE).

8.9 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.

Institute has a Resident Faculty Warden. Council of Wardens has two faculty members assigned to each hostel. They attend to all matters pertaining to students residing in their respective hostels. Complaints raised by students are immediately attended to through communication via Whatsapp groups where members from all the services are included.

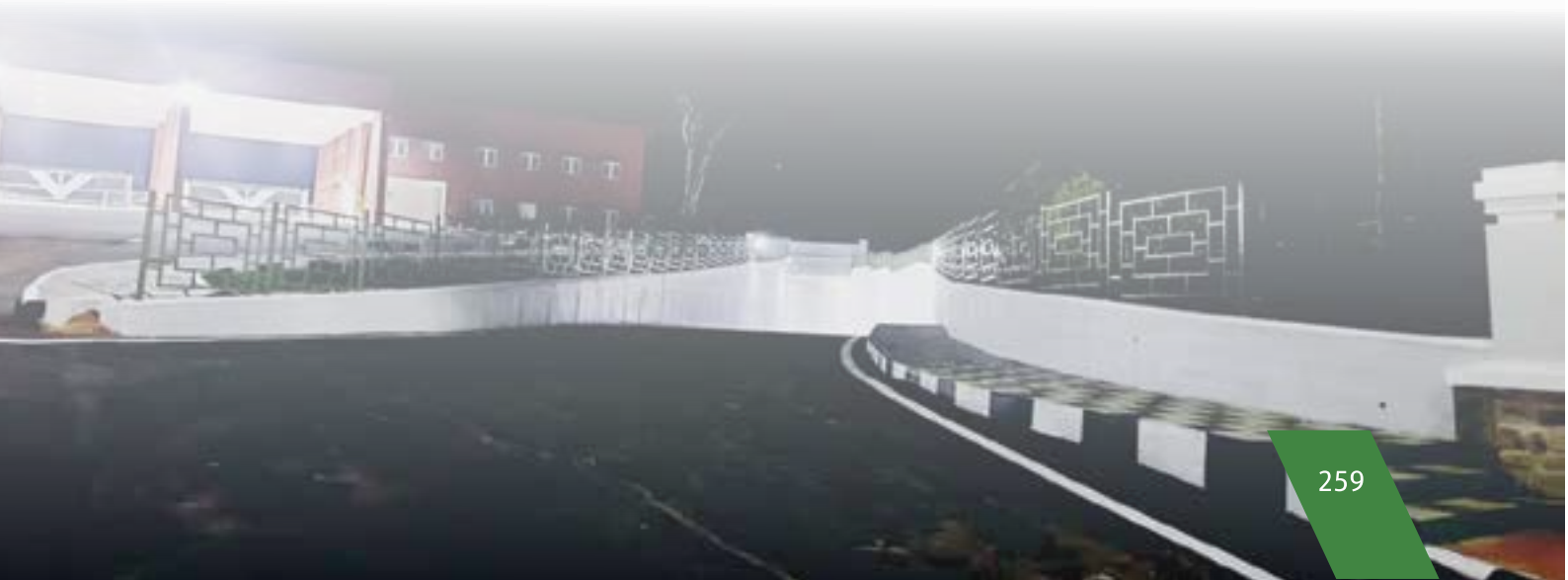
8.10 Canteen Services

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 is mandatory for faculty members, officers, staff and students.

8.11 Purchase and Stores Division

IIST Purchase and Stores Division is working based on General Financial Rules (GFR) of Government of India, DOS Purchase Manual, guidelines of Central Vigilance Commission, Government e-Market place (GeM) and Public Procurement Policy. The Government e-Market Place (GeM) is extensively utilized for Institute procurements to encourage Small and Medium Industries, Start-ups and Indian Manufacturers.

During the year 2023-24, IIST procured equipment, machinery and other items required for different Academic Department through 1839 Purchase Orders worth Rs.38.02 crores including 903 GeM P.Os worth Rs.11.75 crores. The major equipment procured during this period are Scanning Electron Microscope (SEM) worth Rs.3.75 crores, High Pressure Air Systems worth Rs.1.67 crores and X-ray Diffractometer (XRD) worth Rs.1.59 crores. Stores Section timely followed the POs and executed maximum orders on time.



8.12 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. The primary objective of TOMD is to provide daily conveyance to faculty members, officers and staff. 11 light vehicles and 5 route buses are being used for such official transportation. 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 support to medical services, offering conveyance for official guests, and facilitating activities at Ponmudi Hills. During this period, 01 Mini Bus, 02 Electric Scooters, 03 Cars and 01 Pickup Van were procured as replacement against condemnation to meet the transportation requirements of IIST.

8.13 Bank/ Financial Services

An exclusive branch of Union Bank of India along with its ATM, caters to the banking needs of students and staff.

8.14 Security Services

Campus security is entrusted to CISF personnel. Janitorial staffs cater to the security of all academic blocks, administrative block, library and hostels.

8.15 Other Units

8.15.1 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.

IQAC conducted regular meetings during the reporting period. Annual Quality Assurance Report (AQAR) for the year 2022-2023 was submitted. Data collection and compilation for submitting Self Study Report (SSR)is underway.

8.15.2 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, Rules made there under 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 were conducted on June 22, 2023 for the Executives, on August 23, 2023 for the faculty members on December 19, 2023 for the Employees of Administrative areas and on March 20, 2024 for the Employees and officers of Technical areas.

Apart from these, Hindi software training programs were organized for the employees of the institute on September 22,2023 and September 25, 2023.

- **Meetings of the Official Language Implementation Committee**

Four Quarterly meetings of the OLIC were conducted on (June 23, 2023, September 27, 2023, December 27, 2023 & March 25, 2024) 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.

- **Independence Day Celebrations – 2023**

Drug addiction has become a pervasive issue affecting individuals of all ages. Hence, a Special Awareness Programme in Hindi against 'Drug Abuse' was organized for the students of the institute on the occasion of Independence Day Celebrations – 2023. As part of this awareness programme, Poster Making and Slogan Writing Competitions in Hindi were conducted on August 9-10, 2023. Certificates to the prize winners and certificate of appreciation to the participants were awarded by the Director, IIST during the prize distribution function on August 15, 2023. Posters and Slogans were displayed during the function. The program aimed in educating students about the dangers of drug abuse and empowering them to live a healthy life. This was followed by the cultural programmes by IIST students. The programme was attended by faculty, students, officers, staff and family members.

- **Hindi Fortnight Celebrations – 2023**

Every year in the month of September, official language Hindi is promoted through various programs. Hindi Day for the year 2023 was inaugurated in Pune, Maharashtra on September 14, 2023 under the chairmanship of Hon'ble Minister of Home Affairs & Co-operation along with the third All India Official Language Conference during September 14-15 2023. Hindi Fortnight was celebrated in the institute from September 19 to October 04, 2023. Quotes on Hindi by eminent personalities were displayed on every day. On the occasion of Hindi Fortnight Celebrations – 2023, Hindi competitions were organized for the employees of the institute on September 19 and 20, 2023 and for students on September 26 and 29, October 04, 2023. Hindi Quiz Competition was organized on October 4, 2024, followed by the Prize distribution function in which certificates were given to the winners. Software Training Programme were also conducted for the Employees of Administrative areas and Officers / Assistants of Technical areas.

- **In-service Hindi training**

Dr. Vani Devi M, Assistant Professor, Dept. of Avionics passed the Hindi Prabodh examination and Dr. Manoj BS, Professor, Dept. of Avionics and Dr. A M Ramiya, Associate Professor, Dept. of ESS passed the Hindi Praveen examination conducted by Hindi Teaching Scheme of Department of Official Language in November 2022 at RBI, Thiruvananthapuram.

- **Annual Inspection**

As per the inspection schedule for the year 2022-2023, Registrar IIST inspected SDSC SHAR Center on September 12, 2023. Controller, URSC inspected IIST on November 24, 2023.

- **World Hindi Day or Vishwa Hindi Diwas**

World Hindi Day or Vishwa Hindi Diwasis observed annually on January 10. It is celebrated with the objective of raising awareness about Hindi as an International Language and to promote its use across the world. In this connection, a special talk in Hindi was organized in our Institute by the Hindi Section on January 10, 2024. The talk was delivered by Dr. Umesh R. Kadhane, Assoc. Dean & Professor, Dept. of Physics on the topic ग़ालिब से गैलीलियो तक :दार्शनिक अभिव्यक्तियाँ . Various Hindi competitions like 'Hindi typing', 'Pick and speak', 'What does the picture say' competitions were conducted on January 11-12, 2024 for the employees of the institute and 'Story writing, Hindi patriotic song and Translation of Scientific/ Technical matter' were conducted for the students on January 16- 18, 2024. Cash prizes and certificates were awarded to the winners of Hindi competitions at the prize distribution ceremony held during the Republic Day celebrations on January 26, 2024.




- **Hindi House Journal of IIST 'Antarish Dhaaraayen' – Release of sixth issue**

The sixth issue of Hindi House Journal of IIST named 'Antarish Dhaaraayen' was released during the Dhanak Festival held on March 2024. The magazine contains articles, poems, and creative works of as well as the technical articles in Hindi sent by the employees and students of IIST .

- IIST News Letter

  The institute's half-yearly newsletter is partly bilingual. The official language related activities of the institute are published in Hindi

- Participation in Hindi Technical Seminar and Inter Centre Hindi Technical Seminar

  Three officials from IIST presented papers at the Hindi Technical Seminar 2023 organized by IISU (POOL C) on June 2, 2023 on Space Robotics: A true game changer in future space programs.

  Four officials from IIST participated in the Inter Centre Hindi Technical Seminar – 2023 organized by DOS/ISRO HQ on December 21 –22, 2023 on **समानव अंतरिक्ष अभियान की चुनौतियां अनुप्रयोग तथा भावी संभावनाएं'** at Bangalore.

- 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. As per the Annual Hindi Inspection Program of the Institute – 2023, the inspecting officers of the Internal Official Language Inspection Committee inspected the General Administration, Review, Establishment Section, IIST on 07.09.2023.
- 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 2022-2023 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 2023 organized under the auspices of the TOLIC.

- **Town Official Language Implementation Committee (TOLIC) RAJBHASHA AWARDS 2022-2023**

  IIST, Valiamala 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 - II) . The Hindi House Journal of IIST 'Antariksh Dhaaraayein' was awarded the third prize for the best Hindi Journals.

  Winners of the Joint Rajbhasha Utsav 2022 - 2023 were also awarded prizes in this function.

  Dr. Ravi V, Professor, Professor, Dept. of Humanities received the third prize for Hindi Essay Writing competition and Dr. Deepak Mishra, Professor, Dept. of Avionics received the consolation prize for Hindi Extempore competition.

  Awards were received from Shri. S. Sunil Raj, Principal Accountant General (Audit – I), Kerala and Chairman TOLIC, Thiruvananthapuram (Office - 2) on July 02, 2024.

8.15.3 Gender Sensitization and Internal Complaints Committee

The Gender Sensitization Cell at IIST serves as a crucial institutional mechanism dedicated to fostering a gender inclusive and equitable environment within the academic community. The Committee aims to bring about a perceptible change and positive shift towards greater empowerment of women in various domains. 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 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.

The Gender Sensitization Cell at IIST was reconstituted on February14, 2024.

International Women's Day was celebrated March 08, 2024. Ms. Nigar Shaji, Project Director - Aditya-L1 Mission URSC was invited as the Chief Guest for the function who shared her personal experiences and made a technical presentation regarding the mission. On this occasion, an exhibition cum sale of handicrafts by the staff of IIST such as paper-crafts, hand-crafted jewellery was also on display. This was a platform to the staff who were interested in demonstrating their handiwork and showcasing their talent.

The cell also co-opted members from the Student community ie., a male and a female coordinator from B. Tech, M. Tech and Ph D who actively participates in the activities of the cell.

8.15.4 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 132nd Dr. B. R. Ambedkar's birth anniversary. Dr Sindhu Thulaseedharan, Associate Professor & HoD, Department of Law, University of Kerala was invited for a talk in connection with Dr. B. R. Ambedkar's birth anniversary celebrations on April 26, 2023 at Multi Purpose Hall, SAC Building. A lunch was also arranged for students on April 17, 2023 and for all employees on April 26, 2023.

8.15.5 Anti-Ragging Cell

The Anti-Ragging Cell of the Institute 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. An anti-ragging squad comprising of faculty members and staff is also formed as per UGC guidelines.

8.15.6 Grievance Redressal Cell

The Faculty and Staff Grievance Redressal Committee is headed by the Director with All the Deans and Heads of Departments as its members. Registrar is the Member Secretary. The Committee addresses student grievances and recommends suitable action for the approval of Director, IIST. During the period, two grievances were received and both were settled.

8.15.7 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
63	63	07	07	Nil

Vigilance Status

Vigilance cases pending and disposed off in the year 2023-2024 - Nil.

8.16 Facilities for Persons with Disability

IIST admits PwD students to UG & PG programmes as per Government of India guidelines with 5% reservation on horizontal level. In the 2023 UG admission, 8 seats were reserved out of the total of 168 seats and PG Admission 11 seats were reserved out of total 244 seats.

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.

Ramp

Lift

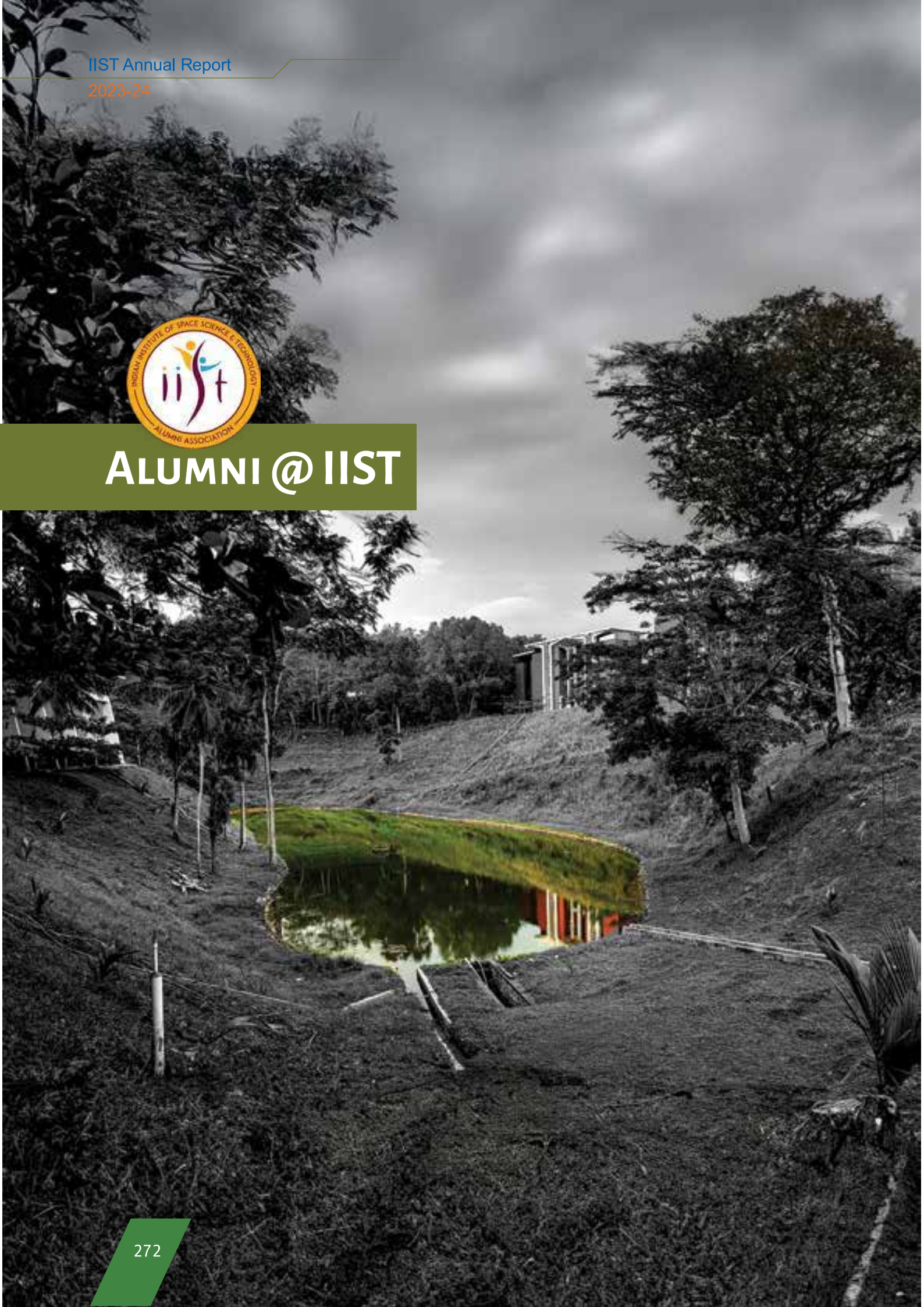
Disabled friendly accessible toilet

8.17 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 published its 19th volume 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 personnel of IIST as well as the technical articles in Hindi sent by the employees of various centre/ units of DOS/ ISRO. The sixth issues was published during the period.

IIST News Letter brings out the latest developments in the institute. It covers the whole spectrum of activities in the institute.



Alumni @ IIST

9. Alumni @ IIST

The IIST Alumni Association serves as a vibrant community connecting graduates of the Indian Institute of Space Science and Technology (IIST). Established to foster lifelong relationships among alumni, the association provides a platform for networking, professional growth, and collaborative opportunities. It aims to support and celebrate the achievements of its members, while also contributing to the institute's mission of advancing space science and technology. Through various events, mentorship programs, and industry collaborations, the IIST Alumni Association not only strengthens ties among alumni but also encourages them to play an active role in supporting the next generation of IIST students and enhancing the institute's legacy.

Advancing the Spirit of IIST – Contributions to Chandrayaan 3

More than 70 Alumni from IIST played a crucial part in the recent success of the TV-D1 mission, a major milestone in the Gaganyaan programme (India's human spaceflight programme). IISTians from various ISRO centres contributed to different aspects of the mission, spanning across the launch vehicle, crew module, crew escape system, launch services, range safety, trajectory design, tracking, parachute systems, crew module recovery, etc.

Orientation Programme

Led by Trivandrum and Mahendrigiri chapter, IISTAA and freshers of the BTech program had an engaging interaction session on July 31, 2023 as part of the orientation week activities. The alumni members shared interesting ideas and answered the queries of the students. The session was highly productive and insightful for the students.

Ignite

Connecting students looking to work in the space sector with leading NewSpace entities, providing an interface for fostering collaboration between academia and industry pioneers.

IISTAA conducted the first Ignite session on 17th January 2024, featuring Parth Sharma (Director, SatSure) and Akash Yalagach (CTO, KaleidEO). Their presentations offered key insights into satellite data applications and manufacturing in India's space sector

IISTAA conducted its second iGNITE session, featuring Gowtham Sivaraman from Pixxel, on exciting opportunities for students to scout for internship and job opportunities at Pixxel, and make connections with the leaders of the emerging NewSpace ecosystem in India.

The third session of the Ignite series was successfully conducted by IISTAA on 23rd March 2024. The event featured Rohan M Ganapathy, CEO & CTO of Bellatrix Aerospace, and Gaurav Seth, CEO & Co-founder of PierSight Space, who delivered insightful presentations on advanced propulsion system designs and SAR-based remote sensing solutions for maritime surveillance.

Advance

Advance is an initiative to provide guidance and mentorship to alumni who are aiming for career transition / progress through higher education.

The first session of the Advance series was successfully held on March 8, 2024. Delivered by Nitish Shrimal, a Chevening Scholar and MSc graduate in Satellite Communication Engineering from the University of Surrey, the session was aimed at IIST alumni interested in pursuing higher education abroad, particularly in the UK. During the session, the application process for MSc programs at UK universities was discussed in detail, along with guidance on applying for the fully funded Chevening Scholarship.

Stellar Achievements

IISTAA is delighted to announce that Sanjeev Kumar Meena, a 2016-2020 B.Tech Aerospace Engineering alumnus, has achieved an impressive AIR 78 in the UPSC CAPF (ACs) Exam 2023, earning the post of Assistant Commandant in the Central Armed Police Forces.

Dr. Yashwanth Nakka, an esteemed alumnus from the 2011 Aerospace batch and a Ph.D. graduate from Caltech, is starting his new position as a Tenure Track Assistant Professor in the Aerospace Engineering department at Georgia Tech. He will also be setting up his own research lab.

IISTAA congratulates Nimai Chand Das Adhikari, an MTech alumnus from the 2014-2016 batch, for receiving the 40 Under 40 Data Scientists Awards 2024. His work has been recognized in major conferences like MSJAR and MLAD.

IISTAA congratulates Sourajit Debnath, a 2015 Avionics alumnus, for being part of the winning team in The University Challenge, one of the toughest quiz shows. Sourajit, who completed his MSc from Imperial College London, showcased exceptional quizzing skills honed since his IIST Quiz Club days. We extend our best wishes to him and his team for this remarkable achievement and their future endeavors.

Audit Report 2023-2024

ARSB & ASSOCIATES
Chartered Accountants

INDEPENDENT AUDITOR'S REPORT

To the Governing Body
Indian Institute of Space Science and Technology
(Autonomous Institute under the Department of Space,
Government of India.)
Valiamala P O
Thiruvananthapuram-695022
Kerala

Report on the Audit of the Financial Statements

We have audited the accompanying financial statements of **Indian Institute of Space Science and Technology (IIST)**, which comprise the Balance Sheet as at **31st March 2024**, the Income and Expenditure Statement for the year then ended, and a summary of significant accounting policies and other explanatory information.

Qualified Opinion

In our opinion, and to the best of our information and according to the explanations given to us, except for the effects of the matter described in the "Basis for Qualified Opinion" section of our report, the accompanying financial statements give a true and fair view in conformity with the accounting principles generally accepted in India of the state of affairs of **Indian Institute of Space Science and Technology** as at **31st March 2024**, and its deficit for the year ended on that date.

Basis for Qualified Opinion

We conducted our audit in accordance with the Standards on Auditing ("SA"s) issued by the Institute of Chartered Accountants of India. Our responsibilities under those Standards are further described in the Auditors Responsibilities for the Audit of the Financial Statements section of our report. We are independent of the Institute (IIST) in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India ("ICAI") and we have fulfilled our other ethical responsibilities in accordance with these requirements and the Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our Opinion.

ARSB & ASSOCIATES FRN: 009803S Chartered Accountants

Add : Balanilayam | Opp. Hindi Prachar Sabha | AIR Road | Vazhuthacaud | Thiruvananthapuram | Kerala | India | 695014
Tel : +91 471 4014014 | 2326855 Email : info@arsb.in Web : www.arsb.in

We draw attention to the following:

1. Fixed Assets Register is not being maintained by the Institute.
2. The balances of Sundry Creditors, Loans, Advances, and Other Personal Accounts are subject to confirmation and reconciliation by the respective counterparties.

These matters were the subject of our qualified opinion.

Other matters

The Institute has procured security services from the Central Industrial Security Force (CISF), which is subject to Goods and Services Tax (GST) under the Reverse Charge Mechanism (RCM) as per our Opinion. The Institute being an autonomous body operating under the Department of Space (DOS) is of the view that RCM may not be applicable to its transactions. The Institute is currently consulting with the relevant authorities to obtain clarity on the applicability of RCM in this context. Should it be determined that GST under RCM is applicable, the Institute has expressed its readiness to fulfil any GST obligations that may arise. As of the date of this report, the financial impact of potential GST liability under RCM has not been recognized or disclosed in the financial statements, due to lack of clarity on the said issue.

Responsibilities of Management and Those Charged with Governance for the Financial Statements

The management of the Institute is responsible for the preparation of the financial statements that give a true and fair view of the financial position and financial performance of the Institute in accordance with the accounting principles generally accepted in India including Accounting Standards issued by ICAI. This responsibility includes the design, implementation, and maintenance of internal controls relevant to the preparation and presentation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Institute's ability to continue as a going concern, disclosing, as applicable, matters related to going concern, and using the going concern basis of accounting unless the management either intends to liquidate the Institute or cease operations.

Those charged with governance are responsible for overseeing the Institute's financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but it is not a guarantee that an audit conducted in accordance with Standards on Auditing will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with SAs, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the standalone financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Institute's internal control.

- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Society's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Society to cease to continue as a going concern.

- Evaluate the overall presentation, structure and content of the Financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Report on Other Legal and Regulatory Requirements

(a) We have sought and obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit.

(b) In our opinion, proper books of account as required by law have been kept by the Institute so far as it appears from our examination of those books.

(c) The Balance Sheet and the Income and Expenditure Account dealt with by this report are in agreement with the relevant books of account.

(d) The Institute has procured security services from the Central Industrial Security Force (CISF), which is subject to Goods and Services Tax (GST) under the Reverse Charge Mechanism (RCM). The Institute, as an autonomous body operating under the Department of Space (DOS) and recognized as a Public Sector Institution, is of the view that RCM may not be applicable to its transactions.

The Institute is currently consulting with the relevant authorities to obtain clarity on the applicability of RCM in this context. Should it be determined that GST under RCM is applicable, the Institute has expressed its readiness to fulfil any GST obligations that may arise.

As of the date of this report, the financial impact of potential GST liability under RCM has not been recognized or disclosed in the financial statements.

For ARSB & ASSOCIATES
Chartered Accountants
Firm Registration No: 009803S

Place: Trivandrum
Date: 12/11/2024

CA. P. Ananthakrishnan
Partner
Membership No. 201711
UDIN: 24201711BKAIZR6717

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

BALANCE SHEET AS AT 31ST MARCH, 2024

(Amount in Rs.)

	Schedule	As at 31.03.2024	As at 31.03.2023
CORPUS/CAPITAL FUND AND LIABILITIES			
Corpus / Capital Fund	1		
Net Grant		5,37,19,40,496	5,14,49,80,545
Add : Surplus / Deficit from I & E		(3,20,82,25,988)	(3,24,07,81,854)
Add : Capital Reserve		2	2
Total		2,16,37,14,510	1,90,41,98,693
Earmarked Funds / Endowment Funds	2	9,71,62,955	4,39,07,552
Long Term Liabilities and Provisions	3	7,67,16,899	31,11,17,265
Current Liabilities and Provisions	4	36,55,94,532	35,59,93,091
TOTAL		**2,70,31,88,896**	**2,61,52,16,601**
ASSETS			
Fixed Assets	5		
Gross Block		4,60,24,46,933	4,30,35,43,535
Less : Depreciation		(2,96,72,95,223)	(2,70,46,32,003)
Net Block		1,63,51,51,710	1,59,89,11,532
Add : Capital Work in Progress		9,39,93,282	16,43,93,345
Total		1,72,91,44,992	1,76,33,04,877
Long Term Assets, Loans, Advances etc	6	14,02,94,643	14,13,77,027
Current Assets, Loans, Advances etc	7	83,37,49,261	71,05,34,697
TOTAL		**2,70,31,88,896**	**2,61,52,16,601**
Significant Accounting Policies, Notes on Accounts & Contingent Liabilities	19		

As per our report of even date attached.

For ARSB & Associates
Chartered Accountants
FRN : 009803S

CA. P Ananthakrishnan
(Partner, Mem No. 201711)

Place : Thiruvananthapuram
Date : 12th November, 2024
UDIN : 24201711BKAIZR6717

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Prof. Dipankar Banerjee
Director

R. Hari Prasad
Finance Officer

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2024

(Amount in Rs.)

	Schedule	2023-24	2022-23
INCOME			
Grants / Subsidies	8	92,42,74,932	72,76,48,790
Fees / Subscriptions	9	8,61,36,206	8,07,53,467
Interest Income of IIST	10	1,72,20,944	95,41,761
Interest Earned on Grant & Retirement Funds	11	2,51,62,985	1,82,35,587
Gross Surplus of Canteen Operations		16,98,527	-
Other Income	12	53,75,100	40,54,054
TOTAL (A)		**1,05,98,68,694**	**84,02,33,659**
EXPENDITURE			
Establishment Expenses - Regular	13	46,98,93,152	39,53,85,382
CISF Salary & Other Expenses	14	9,74,78,422	8,64,22,948
Establishment Expenses - Support Services	15	9,30,10,336	9,29,92,208
Academic & Other Student Expenses	16	15,68,37,046	14,00,40,867
Other Administrative Expenses	17	15,72,95,375	12,82,67,939
Interest Refundable by IIST	18	2,51,62,985	1,82,35,587
Gross Deficit of Canteen Operations		-	11,76,089
Depreciation	5	24,64,85,608	24,13,99,391
TOTAL (B)		**1,24,61,62,925**	**1,10,39,20,411**
Excess of Income over Expenditure (A-B)		(18,62,94,231)	(26,36,86,752)
Less : Prior Period Items		1,62,08,090	(50,99,880)
Balance being Surplus/(Deficit) carried over to Corpus/Capital Fund		**(20,25,02,321)**	**(25,85,86,872)**
Significant Accounting Policies, Notes on Accounts & Contingent Liabilities	19		

As per our report of even date attached.

For ARSB & Associates
Chartered Accountants
FRN : 009803S

CA. P.Ananthakrishnan
(Partner, Mem No. 201711)

Place : Thiruvananthapuram
Date : 12th November, 2024
UDIN : 24201711BKAIZR6717

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Prof. Dipankar Banerjee
Director

R. Hari Prasad
Finance Officer

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

(Amount in Rs.)

	As at 31.03.2024	As at 31.03.2023
Schedule 1 :: CORPUS / CAPITAL FUND		
Total Grant Received - Capital and Revenue (A)		
Opening Balance of Total Grant Received	11,76,26,66,777	11,06,63,09,987
Add : Grant received during the year	1,20,35,00,000	73,11,00,000
Less : Grant returned [TSA]	5,03,62,672	34,28,210
Less : Grant refundable [Sch Commerical Bank]	19,70,445	3,13,15,000
	12,91,38,33,660	11,76,26,66,777
LESS : Total transfer to Revenue Grant (B)		
Opening Balance of amount transferred to Revenue Grant	6,61,76,86,232	5,89,00,37,442
Add : Transfer to Revenue Grant of 2023-24	92,42,74,932	-
Less : Reversal from Revenue Grant [Prior period]	68,000	-
Add : Transfer to Revenue Grant of 2022-23	-	72,76,48,790
	7,54,18,93,164	6,61,76,86,232
NET GRANT (C) = (A - B)	**5,37,19,40,496**	**5,14,49,80,545**
ADD : Surplus / Deficit transferred from Income & Expenditure Account (D)		
Opening Balance of net income / (expenditure)	(3,24,07,81,854)	(2,98,21,94,982)
Add : Reversal of Provision for Retirement Benefits Fund	23,50,58,187	-
Add/Deduct : - Current Year Surplus / (Deficit)	(20,25,02,321)	(25,85,86,872)
	(3,20,82,25,988)	(3,24,07,81,854)
ADD : Capital Reserve (E)	2	2
Balance at the year end (C + D + E)	**2,16,37,14,510**	**1,90,41,98,693**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

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	-2,33,31,494	-31,52,868	2,39,168	20,07,563	1,83,528	1,04,676	97,235
b) Additions to the Fund							
i) Donation/Grants	0	0	0	0	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)	-2,33,31,494	-31,52,868	2,39,168	20,07,563	1,83,528	1,04,676	97,235
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	3,51,480	3,60,733	0	2,30,000	0	0	0
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	5,686	2,775	0	0	0	0	0
Sub Total	3,57,166	3,63,508	0	2,30,000	0	0	0
iii) Fund Returned to the Funding Agency	0	0	0	0	1,83,528	0	0
Total (c)	3,57,166	3,63,508	0	2,30,000	1,83,528	0	0
Net Balance payable as at the year-end (a+b-c)	**0**	**0**	**2,39,168**	**17,77,563**	**0**	**1,04,676**	**97,235**
Net Balance receivable as at the year-end (c-a-b)	**2,36,88,660**	**35,16,376**	**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, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	8	9	10	11	12	13	14
	IPRC - Dr. Palash - 2018 - Hydrogen Sensor	ISRO-GBP - ABLN & C Project	ISRO -Dr. K G Sreejalekshmi - Gaganyaan	ISRO - MOM - Dr. Rajesh VJ	LPSC - Dr Dinesh N Naik	LPSC - Dr.Jinesh K B - Laser Ignition System	LPSC - Dr. Jinesh K B - SDS
a) Opening balance of the funds	-44,820	7,23,170	17,13,086	6,16,323	-19,34,826	3,77,025	3,96,062
b) Additions to the Fund							
i) Donation/Grants	0	0	0	0	0	0	66,000
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)	-44,820	7,23,170	17,13,086	6,16,323	-19,34,826	3,77,025	4,62,062
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	2,36,207	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	2,36,207	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	4,15,714	0	0	0	0
- Rent/Consumables	0	0	1,64,720	0	0	1,50,000	0
- Other Administrative Expenses	0	0	0	0	0	0	0
Sub Total	0	0	5,80,434	0	0	1,50,000	0
iii) Fund Returned to the Funding Agency	0	0	0	6,16,323	0	0	0
Total (c)	0	0	8,16,641	6,16,323	0	1,50,000	0
Net Balance payable as at the year-end (a+b-c)	**0**	**7,23,170**	**8,96,445**	**0**	**0**	**2,27,025**	**4,62,062**
Net Balance receivable as at the year-end (c-a-b)	**44,820**	**0**	**0**	**0**	**19,34,826**	**0**	**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, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	15 LPSC - Dr. Umesh K - Monte Carlo Model	16 LPSC - Dr. Umesh Kadhane	17 LPSC Dr. Umesh K - Plasma Thruster	18 LPSC - High Thrust EPS - Dr. Umesh K	19 NRSC - P R Sinha - Balloon Launching	20 DAE - 2022 - Dr. Sakthivel - NBHM Multiphase	21 DBT - Dr. Palash - 2017- Liquid Biopsy for Cancer
a) Opening balance of the funds	18,084	2,92,830	-1,13,754	-1,53,768	-4,291	3,90,197	-5,58,074
b) Additions to the Fund							
i) Donation/Grants	0	0	0	0	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)	18,084	2,92,830	-1,13,754	-1,53,768	-4,291	3,90,197	-5,58,074
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	3,10,000	0
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	0	0	0	0	0	40,758	0
Sub Total	0	0	0	0	0	3,50,758	0
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	0	0	0	0	0	3,50,758	0
Net Balance payable as at the year-end (a+b-c)	**18,084**	**2,92,830**	**0**	**0**	**0**	**39,439**	**0**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**1,13,754**	**1,53,768**	**4,291**	**0**	**5,58,074**

Note : Classified under Current Assets under Sch 7

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	22 DBT - Dr. Palash - Green House Gases	23 DBT - Dr. Shaiju - Ramalingaswami Fellowship	24 DBT-RamaRao (Rural Urban Interface)	25 DOH - Dr.Gnanappazham L - 2023 - Market	26 DRDO - ARDB - Sudharshan Kaarthik 2023 - Ele HANSA	27 DRDO - DR.Praveen Krishna IR-2022- Gas	28 DRDO - Dr. Rajesh S. - 2022 - TDLAS Temp Sensor
a) Opening balance of the funds	-8,08,439	3,33,487	-2,71,792	10,27,000	0	33,20,000	23,45,145
b) Additions to the Fund							
i) Donation/Grants	0	21,39,435	0	10,27,000	2,91,65,460	0	0
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	48,897
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	-8,08,439	24,72,922	-2,71,792	20,54,000	2,91,65,460	33,20,000	23,94,042
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	4,77,900	0	0	0	5,00,000	11,82,193
- Others	0	0	0	18,41,980	0	0	0
Sub Total	0	4,77,900	0	18,41,980	0	5,00,000	11,82,193
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	14,22,000	6,55,553	0	0	3,99,747	2,75,000
- Rent/Consumables	0	61,803	0	0	0	0	5,91,808
- Other Administrative Expenses	0	4,85,940	72,133	1,50,000	28,218	3,737	38,537
Sub Total	0	19,69,743	9,27,686	1,50,000	28,218	4,03,484	9,05,345
iii) Fund Returned to the Funding Agency	0	6,482	0	0	0	0	60,331
Total (c)	0	24,54,125	9,27,686	19,91,980	28,218	9,03,484	21,47,869
Net Balance payable as at the year-end (a+b-c)	**0**	**18,797**	**0**	**62,020**	**2,91,37,242**	**24,16,516**	**2,46,173**
Net Balance receivable as at the year-end (c-a-b)	**8,08,439**	**0**	**11,99,478**	**0**	**0**	**0**	**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, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	29 DRDO - Sam Zachariah - Robots - 2024	30 DRDO - SASE - Dr. Govindankutty M	31 DST - 2023 - Dr. Rajesh S - Indo German - Nox	32 DST - 2023 - Dr. Ramarao - HSI Sensor	33 DST - Dr. Rama Rao N	34 DST - CNRS - Dr. Palash Basu - 2020 - Biomarker	35 DST-Dr Jinesh KB- Atomic Layer Deposition
a) Opening balance of the funds	0	1,60,490	0	0	52,757	9,75,302	18,13,684
b) Additions to the Fund							
i) Donation/Grants	22,00,000	0	4,10,000	22,18,277	1,53,415	0	0
ii) Income from Investment made on account of Funds	0	0	0	0	0	53,990	0
iii) Other additions	2,50,000	0	0	0	0	0	0
Total (a + b)	24,50,000	1,60,490	4,10,000	22,18,277	2,06,172	10,29,292	18,13,684
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	1,75,000	8,80,615
- Rent/Consumables	0	0	0	0	0	0	3,776
- Other Administrative Expenses	21,475	0	0	0	0	27,711	1,75,472
Sub Total	21,475	0	0	0	0	2,02,711	10,59,863
iii) Fund Returned to the Funding Agency	0	0	0	0	0	8,26,581	19,37,719
Total (c)	21,475	0	0	0	0	10,29,292	29,97,582
Net Balance payable as at the year-end (a+b-c)	**24,28,525**	**1,60,490**	**4,10,000**	**22,18,277**	**2,06,172**	**0**	**0**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**0**	**11,83,898**

Note : Classified under Current Assets under Sch 7

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	36 DST - KIRAN - WOS(A) - Pushpa K - Quantum	37 DST - NGP - A.M Ramiya - Smart Cities 3D	38 DST - NRDMS - Dr.Ramarao - 2022 - Geodesy	39 DST - Umesh R Kadhane - Genisis of Organic	40 ICMR - DHR- Dr.Deepak Mishra - 2023 - 3rd Trimester	41 ICSSR - Dr. Shaijumon - 2020 - Tele Medicine Units	42 IITG - Dr.Prathap - 2022 - Hydrogen
a) Opening balance of the funds	0	-1,45,214	20,23,481	0	0	1,60,915	10,10,750
b) Additions to the Fund							
i) Donation/Grants	9,03,866	0	0	4,00,000	22,39,688	0	0
ii) Income from Investment made on account of Funds	0	0	45,716	0	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	9,03,866	-1,45,214	20,69,197	4,00,000	22,39,688	1,60,915	10,10,750
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	0	0	1,68,740
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	0	0	0	1,68,740
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	15,02,387	0	7,11,259	0	0	0	96,983
- Rent/Consumables	4,345	0	0	0	0	0	1,98,468
- Other Administrative Expenses	94,518	0	67,154	3,57,666	0	1,14,286	33,383
Sub Total	16,01,250	0	7,78,413	3,57,666	0	1,14,286	3,28,834
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	16,01,250	0	7,78,413	3,57,666	0	1,14,286	4,97,574
Net Balance payable as at the year-end (a+b-c)	**0**	**0**	**12,90,784**	**42,334**	**22,39,688**	**46,629**	**5,13,176**
Net Balance receivable as at the year-end (c-a-b)	**6,97,384**	**1,45,214**	**0**	**0**	**0**	**0**	**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, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	43 INAE - Dr. Palash - 2022 - Abdul Kalam Fellowship	44 IPTIF - Dr. Vineeth B S - 2024	45 IPTIF - Prof.Deepak Mishra - 2024	46 KSCSTE - Dr.Anoop C.S - 2022 - Magneto -	47 KSCSTE - Dr. Seena V - 2023 - Polymer	48 KSCSTE -R Sudharshan Kaarthik - Electric Cars-	49 Max-Planck - Dr. Jagadheep - 2017
a) Opening balance of the funds	15,78,266	0	0	9,58,600	0	0	13,85,959
b) Additions to the Fund							
i) Donation/Grants	9,81,872	1,41,000	1,61,160	0	18,50,000	5,44,000	0
ii) Income from Investment made on account of Funds	0	42	0	0	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	25,60,138	1,41,042	1,61,160	9,58,600	18,50,000	5,44,000	13,85,959
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	2,92,859	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	2,92,859	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	7,06,000	0	0	71,742	0	0	8,33,558
- Rent/Consumables	0	0	0	78,824	66,091	0	0
- Other Administrative Expenses	3,37,338	0	0	5,686	0	0	4,33,722
Sub Total	10,43,338	0	0	1,56,252	66,091	0	12,67,280
iii) Fund Returned to the Funding Agency	24,406	0	0	0	0	0	0
Total (c)	10,67,744	0	0	4,49,111	66,091	0	12,67,280
Net Balance payable as at the year-end (a+b-c)	**14,92,394**	**1,41,042**	**1,61,160**	**5,09,489**	**17,83,909**	**5,44,000**	**1,18,679**
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

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	50 MoES - Dr. Govindankutty - Thunderstorm	51 MoES - 2023 - Dr Govindankutty - Monsoon	52 SERB - Dr. Ashok - Quantum Communicatio	53 SERB - Dr. C S Narayanamurthy - Wavefront	54 SERB - Dr. Immanuel R - 5G Bands	55 SERB - Dr.Biswajit Pathak - Ramanujan	56 SERB - Dr. Chinmoy Saha - 2020 - 5G Antenna
a) Opening balance of the funds	-24,076	0	1,42,703	5,86,593	5,71,645	0	4,33,902
b) Additions to the Fund							
i) Donation/Grants	11,63,040	16,95,520	0	0	0	19,84,000	10,00,000
ii) Income from Investment made on account of Funds	0	0	0	0	0	26,551	3,198
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	11,38,964	16,95,520	1,42,703	5,86,593	5,71,645	20,10,551	14,37,100
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	6,99,125	0	1,18,465	90,880
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	6,99,125	0	1,18,465	90,880
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	10,47,674	1,80,857	0	4,02,657	0	12,15,000	2,36,467
- Rent/Consumables	0	0	0	4,228	9,90,000	1,09,262	0
- Other Administrative Expenses	92,945	50,000	0	96,433	0	1,35,847	5,20,291
Sub Total	11,40,619	2,30,857	0	5,03,318	9,90,000	14,60,109	7,56,758
iii) Fund Returned to the Funding Agency	0	0	1,31,111	0	76,645	0	5,89,462
Total (c)	11,40,619	2,30,857	1,31,111	12,02,443	10,66,645	15,78,574	14,37,100
Net Balance payable as at the year-end (a+b-c)	**0**	**14,64,663**	**11,592**	**0**	**0**	**4,31,977**	**0**
Net Balance receivable as at the year-end (c-a-b)	**1,655**	**0**	**0**	**6,15,850**	**4,95,000**	**0**	**0**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	57 SERB - Dr.Natarajan E - Navier Stokes	58 SERB - Dr.Prosenjit Das - R-Forms of R(X) - 2023	59 SERB - Dr Rajesh S - Variation in Biogas Fuel	60 SERB - Dr. Resmi L - 2017 - Gamma Rays	61 SERB - Dr Resmi L - Ultra Relativistic	62 SERB - Dr. Sarita Vig - 2019 - Young Massive Stars	63 SERB - Dr. Sarvesh - 2020 - Virtual Element
a) Opening balance of the funds	0	2,21,343	30,57,072	6,10,500	23,863	1,19,787	28,165
b) Additions to the Fund							
i) Donation/Grants	2,20,000	0	6,50,000	0	1,80,000	3,00,000	0
ii) Income from Investment made on account of Funds	810	3,100	76,803	0	1,091	772	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	2,20,810	2,24,443	37,83,875	6,10,500	2,04,954	4,20,559	28,165
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	2,00,000	27,33,371	0	1,55,536	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	2,00,000	27,33,371	0	1,55,536	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	3,72,000	0	0	1,91,380	0
- Rent/Consumables	0	0	10,576	0	17,128	0	0
- Other Administrative Expenses	0	29,999	1,76,114	0	53,773	10,000	0
Sub Total	0	29,999	5,58,690	0	70,901	2,01,380	0
iii) Fund Returned to the Funding Agency	0	0	0	6,10,500	0	1,93,699	28,165
Total (c)	0	2,29,999	32,92,061	6,10,500	2,26,437	3,95,079	28,165
Net Balance payable as at the year-end (a+b-c)	**2,20,810**	**0**	**4,91,814**	**0**	**0**	**25,480**	**0**
Net Balance receivable as at the year-end (c-a-b)	**0**	**5,556**	**0**	**0**	**21,483**	**0**	**0**

Note : Classified under Current Assets under Sch-7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	64 SERB - Dr Sarvesh K - Novel Numerical	65 SERB- Dr.Sourav Bhowmick - Secure	66 SERB - 2018 - Dr. Umesh K. - PAH	67 SERB - Prof.Manoj B S - 6G Satellite	68 SERB - Prof.Selvaganesan N - Biomedical	69 SERB - Dr. Seena V	70 SERB- Umesh Kadhane - Symposium on Genesis
a) Opening balance of the funds	6,68,669	0	63,206	17,27,490	18,28,000	-8,981	0
b) Additions to the Fund							
i) Donation/Grants	0	6,39,501	0	0	0	0	5,00,000
ii) Income from Investment made on account of Funds	10,198	0	0	54,111	61,231	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	6,78,867	6,39,501	63,206	17,81,601	18,89,231	-8,981	5,00,000
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	1,40,000	10,997	0	4,93,154	2,27,500	0	0
- Others	0	0	0	0	0	0	0
Sub Total	1,40,000	10,997	0	4,93,154	2,27,500	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	2,94,245	0	0	2,51,720	0	0	0
- Rent/Consumables	8,799	0	0	0	0	0	0
- Other Administrative Expenses	1,59,752	65,870	0	1,19,170	94,600	0	2,91,534
Sub Total	4,62,796	65,870	0	3,70,890	94,600	0	2,91,534
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	6,02,796	76,867	0	8,64,044	3,22,100	0	2,91,534
Net Balance payable as at the year-end (a+b-c)	**76,071**	**5,62,634**	**63,206**	**9,17,557**	**15,67,131**	**0**	**2,08,466**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**8,981**	**0**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	71 TIFR - Gaganyaan-I - Sreejalekshmi K G	72 UGC - DAE - Dr. Kuntala B	73 DST Inspire - Dr. Mahesh S	74 DST Inspire - Dr. Basudev M	75 DST - Dr. Vikram Khaire	76 IPRC-Dr. Kuruvilla- Novel N2O4	77 03-2021-03-VSSC- J Mary Gladis - NanoStructure
a) Opening balance of the funds	10,00,000	49,400	27,059	0	6,61,134	1,965	0
b) Additions to the Fund							
i) Donation/Grants	0	0	0	7,00,000	8,39,821	0	7,32,000
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)	10,00,000	49,400	27,059	7,00,000	15,00,955	1,965	7,32,000
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	0	0	0	9,91,983	0	1,91,666
- Rent/Consumables	0	0	0	0	0	0	2,59,197
- Other Administrative Expenses	0	0	0	0	1,84,845	0	0
Sub Total	0	0	0	0	11,76,828	0	4,50,863
iii) Fund Returned to the Funding Agency	0	0	0	0	2,02,876	0	0
Total (c)	0	0	0	0	13,79,704	0	4,50,863
Net Balance payable as at the year-end (a+b-c)	**10,00,000**	**49,400**	**27,059**	**7,00,000**	**1,21,251**	**1,965**	**2,81,137**
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, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	78 03-2021-04-VSSC-Dr.Jinesh KB-High-Q	79 03-2021-05-VSSC-Dr.Jinesh K B - Yttrium Iron	80 03-2021-08-VSSC-Aravind V--Supersonic Combution	81 03-2021-09-VSSC-Sandhya K Y - PEM Fuel	82 03-2021-10-VSSC-Sandhya K Y - Silicon	83 03-2021-11-VSSC-Dr. J Mary Gladis - Graphene	84 03-2021-13-LPSC-Dr.Umesh R Kadhane-
a) Opening balance of the funds	0	0	0	0	0	0	0
b) Additions to the Fund							
i) Donation/Grants	35,32,000	5,32,000	11,00,000	10,32,000	27,32,000	14,32,000	18,64,000
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)	35,32,000	5,32,000	11,00,000	10,32,000	27,32,000	14,32,000	18,64,000
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	0	0	1,90,134	1,81,749	1,84,767	1,90,133
- Rent/Consumables	0	0	0	0	34,279	4,65,999	0
- Other Administrative Expenses	0	0	0	0	0	9,165	0
Sub Total	0	0	0	1,90,134	2,16,028	6,59,931	1,90,133
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	0	0	0	1,90,134	2,16,028	6,59,931	1,90,133
Net Balance payable as at the year-end (a+b-c)	**35,32,000**	**5,32,000**	**11,00,000**	**8,41,866**	**25,15,972**	**7,72,069**	**16,73,867**
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, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	85 03-2021-15 - LPSC-Umesh R Kadhane-Prediction of	86 03-2021-16-LPSC-Dr.Prathap C-Condensation	87 03-2021-18-LPSC-Dr. Shine SR - Thruster	88 05-2022-30-LEOS-Dr. Jinesh KB - Seismocardiog	89 11-2021-23-SAC-Dr.Vani Devi M-Interface	90 11-2021-24 - LPSC-Dr.Deepu M-Dual Throat	91 11-2022-31-VSSC-Dr.Sooraj V S - Laser Based
a) Opening balance of the funds	0	23,00,000	16,00,000	11,22,000	0	0	0
b) Additions to the Fund							
i) Donation/Grants	4,32,000	7,00,000	9,00,000	0	8,64,000	45,00,000	4,99,966
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)	4,32,000	30,00,000	25,00,000	11,22,000	8,64,000	45,00,000	4,99,966
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	5,88,740	0	0	16,31,788	4,99,966
- Others	0	0	0	0	0	0	0
Sub Total	0	0	5,88,740	0	0	16,31,788	4,99,966
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	1,85,534	0	0	2,05,890	93,484	0	0
- Rent/Consumables	0	87,735	0	0	0	0	0
- Other Administrative Expenses	0	0	0	3,137	0	0	0
Sub Total	1,85,534	87,735	0	2,09,027	93,484	0	0
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	1,85,534	87,735	5,88,740	2,09,027	93,484	16,31,788	4,99,966
Net Balance payable as at the year-end (a+b-c)	**2,46,466**	**29,12,265**	**19,11,260**	**9,12,973**	**7,70,516**	**28,68,212**	**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, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	92 IISU-Dr. Immanuel-High Performance	93 AICTE - INAE - Aswathy RV - 2017	94 AICTE - INAE - 2018 Batch	95 AICTE - INAE - 2019 - Nisha	96 DRDO - ARDB - UG,PG Girl Students	97 ICSSR - PDF - Dr. Aswathy VK - 2022	98 KSCSTE - PDF - Dr. Prescilla - 2018
a) Opening balance of the funds	8,45,000	44,677	69,563	9,744	0	17,019	8,191
b) Additions to the Fund							
i) Donation/Grants	0	0	0	0	6,00,000	0	0
ii) Income from Investment made on account of Funds	35,216	0	0	0	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	8,80,216	44,677	69,563	9,744	6,00,000	17,019	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	0	0
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	0	0	0	0	6,00,000	0	0
Sub Total	0	0	0	0	6,00,000	0	0
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	0	0	0	0	6,00,000	0	0
Net Balance payable as at the year-end (a+b-c)	**8,80,216**	**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 'A'

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	99 KSCSTE - PhD - Haritha A - 2018	100 KSCSTE - PhD - Sanah Rahman K - 2021	101 SERB - TARE - Dr. Abirami A M - 2023	102 SERB - TARE - Dr. Santhosh B	103 Tribal Affairs - Scholarship for ST Students	104 DST -NGP -Dr A M Ramiya-Geospatial	105 DST - NGP - RamaRao-Geospatial
a) Opening balance of the funds	20,000	15,281	0	1,22,802	0	-60,453	4,42,408
b) Additions to the Fund							
i) Donation/Grants	0	0	3,35,000	0	68,400	0	0
ii) Income from Investment made on account of Funds	0	0	7,491	1,735	0	0	37,316
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	20,000	15,281	3,42,491	1,24,537	68,400	-60,453	4,79,724
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	2,01,500	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	2,01,500	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	24,600
- Other Administrative Expenses	0	9,807	25,000	0	67,900	0	5,35,079
Sub Total	0	9,807	25,000	0	67,900	0	5,59,679
iii) Fund Returned to the Funding Agency	0	0	0	1,24,537	500	0	0
Total (c)	0	9,807	2,26,500	1,24,537	68,400	0	5,59,679
Net Balance payable as at the year-end (a+b-c)	**20,000**	**5,474**	**1,15,991**	**0**	**0**	**0**	**0**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**60,453**	**79,955**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	106 Hindi Technical Seminar - 2022	107 Antrix Corporation - Colloquium Sponsorship	108 SERB - Travel - Dr. Resmi L - 2022	109 DAE - NBHM ICIAM - Sarvesh Kumar - Travel	110 DAE - NBHM ICIAM - Travel - Sakthivel - 2023	111 KSCSTE - Dr.A.M.Ramiya - Travel - 2023	112 KSCSTE - Dr.R Sudharshan Kaarthik-
a) Opening balance of the funds	5,58,678	4,626	6,00,284	0	0	0	0
b) Additions to the Fund							
i) Donation/Grants	0	0	0	2,75,000	2,75,000	1,64,653	1,19,894
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)	5,58,678	4,626	6,00,284	2,75,000	2,75,000	1,64,653	1,19,894
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	5,58,678	4,626	0	2,57,763	2,59,229	1,64,653	1,19,894
Sub Total	5,58,678	4,626	0	2,57,763	2,59,229	1,64,653	1,19,894
iii) Fund Returned to the Funding Agency	0	0	0	17,237	15,771	0	0
Total (c)	5,58,678	4,626	0	2,75,000	2,75,000	1,64,653	1,19,894
Net Balance payable as at the year-end (a+b-c)	**0**	**0**	**6,00,284**	**0**	**0**	**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, 2024

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	113 SERB- Travel - Manohar Kumar - 2024	114 SERB- Travel - Varsha M V - 2024	115 JEST 2024	TOTAL 2023-24 *	TOTAL 2022-23 *
a) Opening balance of the funds	0	0	0	1,32,94,703	1,62,41,765
b) Additions to the Fund				-	
i) Donation/Grants	1,95,682	1,47,153	0	7,75,05,803	3,92,46,430
ii) Income from Investment made on account of Funds	0	0	0	4,68,268	7,52,232
iii) Other additions	0	0	1,78,73,137	1,81,23,137	-
Total (a + b)	1,95,682	1,47,153	1,78,73,137	10,93,91,910	5,62,40,427
c) Utilisation/Expenditure towards objective of funds					
i) Capital Expenditure					
- Fixed Assets	0	0	0	1,06,48,921	1,72,24,207
- Others	0	0	0	18,41,980	6,09,095
Sub Total	0	0	0	1,24,90,901	1,78,33,302
ii) Revenue Expenditure					
- Salaries, Wages & Allowance	0	0	0	1,62,05,111	1,19,59,879
- Rent/Consumables	0	0	0	33,31,638	14,30,391
- Other Administrative Expenses	1,95,682	1,47,153	23,58,213	98,93,347	47,94,934
Sub Total	1,95,682	1,47,153	23,58,213	2,94,30,096	1,81,85,204
iii) Fund Returned to the Funding Agency	0	0	0	56,45,873	69,27,219
Total (c)	1,95,682	1,47,153	23,58,213	4,75,66,870	4,29,45,725
Net Balance payable as at the year-end (a+b-c)	**0**	**0**	**1,55,14,924**	**9,71,62,955**	**4,39,07,552**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**3,53,37,915**	**3,06,12,850**
Note : Classified under Current Assets under Sch 7					

* Institute has earmarked funds against said liabilities which are provided in Schedule 7 [read along with Point No. 11 of Notes to Accounts]

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

(Amount in Rs.)

	As at 31.03.2024	As at 31.03.2023
Schedule 3 :: LONG TERM LIABILITIES AND PROVISIONS		
a) Employee Provident Funds and Retirement Benefits *		
- General Provident Fund	5,71,78,584	5,72,49,536
- Contributory Provident Fund	1,18,87,104	1,05,87,229
- New Pension Scheme	-	13,787
- Retirement Benefits - Provision	-	23,50,58,187
Sub Total (a)	**6,90,65,688**	**30,29,08,739**
b) Caution Deposit		
- Caution Deposit from Students	76,51,211	82,08,526
Sub Total (b)	**76,51,211**	**82,08,526**
TOTAL	**7,67,16,899**	**31,11,17,265**
Schedule 4 :: CURRENT LIABILITIES AND PROVISIONS		
a) Current Liabilities		
1. Sundry Creditors		
- For Goods		
Capital Goods	1,21,73,653	69,38,082
Revenue Expenditure	-	-
- For Services	2,78,29,168	2,12,85,389
2. Statutory Liabilities		
- Overdue	-	-
- Others	45,46,507	23,14,302
3. Other Current Liabilities		
- Department of Space [against invoked Bank Guarantee] *	27,26,24,760	25,47,91,585
- Department of Space	2,44,17,777	4,98,15,780
- Income Received in Advance	2,01,52,175	1,72,43,175
- Security Deposits	31,20,883	29,68,695
- Others	7,29,608	6,36,083
Sub Total (a)	**36,55,94,532**	**35,59,93,091**
TOTAL	**36,55,94,532**	**35,59,93,091**

* Institute has earmarked funds against said liabilities which are provided in Schedule 7 [read along with Point No. 4 and 17 of Notes to Accounts]

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

(Amount in Rs.)

Schedule 5 :: FIXED ASSETS

Particulars	Gross Block (at cost) as at 01.04.2023	Additions		Transfer to Installed from Uninstalled	Deletions	Gross Block (at cost) as at 31.03.2024	Rate of Deprec-iation	Depreciation					Net Block as at 31.03.2024	Net Block as at 31.03.2023
		Installed	Under Installation					As at 01.04.2023	For the year	Prior Period	Deletions	As at 31.03.2024		
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	2,26,05,88,810	7,89,52,516	0	0	1,74,26,584	2,32,21,14,742	10.00%	1,28,03,72,583	10,25,91,033	1,58,31,845	0	1,39,87,95,461	92,33,19,281	98,02,16,227
Plant & Machinery	1,29,22,20,944	18,05,59,483	0	0	0	1,47,27,80,427	15.00%	86,74,07,671	9,07,54,048	3,45,766	0	95,85,07,485	51,42,72,942	42,48,13,273
Furniture & Fittings	20,40,81,459	53,54,343	0	0	0	20,94,35,802	10.00%	12,82,67,366	81,16,842	0	0	13,63,84,208	7,30,51,594	7,58,14,093
Ambulance	6,80,644	0	0	0	0	6,80,644	15.00%	7,33,274	22,106	0	0	7,55,380	1,25,264	1,47,370
Motor Cars & Bikes	1,78,25,589	71,29,866	0	0	0	2,49,55,455	15.00%	1,35,18,716	16,83,624	0	0	1,52,02,340	97,53,115	43,06,873
Motor Buses & Truck	1,58,81,323	30,05,602	0	0	0	1,88,86,925	15.00%	97,79,016	13,66,186	0	0	1,11,45,202	77,41,723	61,02,307
Computers	20,49,47,154	1,42,86,695	0	0	0	21,92,33,849	40.00%	15,92,28,168	2,40,02,272	0	0	18,32,30,440	3,60,03,409	4,57,18,986
Software	12,64,64,614	95,14,409	0	0	0	13,59,79,023	40.00%	10,91,72,825	1,11,56,731	0	0	12,03,29,556	1,56,49,467	1,72,91,789
Library Books	7,11,91,215	35,90,075	0	0	0	7,47,81,290	60.00%	6,87,92,555	35,93,241	0	0	7,23,85,796	23,95,494	23,98,660
Campus networking	5,02,19,158	31,59,188	0	0	0	5,33,78,346	40.00%	4,85,36,133	19,36,886	0	0	5,04,73,019	29,05,327	16,83,025
Canteen Equipments	2,42,62,589	19,35,681	0	0	0	2,61,98,270	15.00%	1,77,80,673	12,62,640	0	0	1,90,43,313	71,54,957	64,81,916
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	88,42,124	0	0	95,27,135	0.00%	0	0	0	0	0	95,27,135	6,85,011
Vehicles	0	0	0	0	0	0	0.00%	0	0	0	0	0	0	0
Computers	0	0	0	0	0	0	0.00%	0	0	0	0	0	0	0
TOTAL	**4,30,35,43,535**	**30,74,87,868**	**88,42,124**	**0**	**1,74,26,584**	**4,60,24,46,933**		**2,70,46,32,003**	**24,64,85,608**	**1,61,77,611**	**0**	**2,96,72,95,223**	**1,63,51,51,710**	**1,59,89,11,532**
Previous Year	**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**
Capital Work in progress	**16,43,93,345**	**0**	**3,31,63,109**	**10,35,63,172**	**0**	**9,39,93,282**		**0**	**0**	**0**	**0**	**0**	**9,39,93,282**	**16,43,93,345**
TOTAL	**4,46,79,36,880**												**1,72,91,44,992**	**1,76,33,04,877**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2024

(Amount in Rs.)

	As at 31.03.2024	As at 31.03.2023
Schedule 6 :: LONG TERM ASSETS, LOANS, ADVANCES ETC		
a) Loans		
- Staff	94,10,405	1,05,87,069
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	65,84,238	64,89,958
TOTAL	**14,02,94,643**	**14,13,77,027**
Schedule 7 :: CURRENT ASSETS, LOANS, ADVANCES ETC		
a) Current Assets		
1. Inventories		
- Canteen inventories	8,76,062	13,08,040
2. Sundry Debtors		
- Debtors outstanding for a period exceeding six months	-	-
- Others	-	-
3. Cash Balances in hand (including cheques/drafts and imprest)	2,31,893	2,00,835
4. Bank Balances		
a) Earmarked Funds		
- Invoked BG Fund [Shapoorji Pallonji & Company P Ltd]	27,00,55,426	25,42,19,289
- Externally Funded Projects and Others	9,47,24,995	3,85,75,935
- Retirement Funds	6,49,53,578	6,49,67,521
- ISAT Funds	10,06,73,575	9,43,16,981
- Corpus Fund [UGC Prescribed]	5,63,48,662	5,36,89,836
Total	58,67,56,236	50,57,69,562
b) Others	17,76,94,174	14,41,84,521
Sub Total (a)	**76,55,58,365**	**65,14,62,959**
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	16,12,991	10,37,675
- Prepayments	1,96,63,429	1,86,67,498
- Others	4,40,60,009	3,84,79,297
2. Income Accrued		
- On Bank Deposits	26,63,746	7,68,274
- On Other Deposits	1,90,721	1,18,995
Sub Total (b)	**6,81,90,896**	**5,90,71,739**
TOTAL (a+b)	**83,37,49,261**	**71,05,34,697**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2024

(Amount in Rs.)

	2023-24	2022-23
Schedule 8 :: GRANTS / SUBSIDIES		
(irrevocable Grants & Subsidies Recovered)		
1. Central Government	92,42,74,932	72,76,48,790
TOTAL	**92,42,74,932**	**72,76,48,790**
Schedule 9 :: FEES / SUBSCRIPTIONS		
1. Entrance Fees	56,12,450	36,01,085
2. Annual Fees/Subscriptions	8,05,23,756	7,71,52,382
TOTAL	**8,61,36,206**	**8,07,53,467**
Schedule 10 :: INTEREST INCOME OF IIST		
1. On Term Deposit		
a) With Scheduled Banks	1,66,56,534	91,62,696
2. On Loans / Advances		
a) Employee/Staff	2,17,457	38,287
3. Others		
a) Interest on IT Refund	1,16,567	1,82,118
b) Interest Received - KSEB Caution Deposit	2,30,386	1,58,660
TOTAL	**1,72,20,944**	**95,41,761**
Schedule 11 :: INTEREST EARNED ON GRANT & RETIREMENT FUNDS		
1. On Term Deposit		
a) With Scheduled Banks	2,51,62,985	1,82,35,587
b) Others	-	-
TOTAL	**2,51,62,985**	**1,82,35,587**
Schedule 12 :: OTHER INCOME		
1. Rent Receipts	3,36,771	3,56,671
2. Sale of Tender Forms	-	7,500
3. Sale of Scrap / Vehicles / Trees	8,64,215	2,45,685
4. Income from Earmarked Funds	19,07,445	13,52,931
5. Miscellaneous Income	22,66,669	20,91,267
TOTAL	**53,75,100**	**40,54,054**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2024

(Amount in Rs.)

	2023-24	2022-23
Schedule 13 :: ESTABLISHMENT EXPENSES - REGULAR		
1. Salaries & Allowances	41,89,53,329	34,36,94,278
2. Contribution to NPS	3,41,36,728	3,09,09,705
3. Contribution to CPF	2,68,920	2,68,920
4. Medical Expense- Staff	35,14,719	37,45,654
5. Expense on Employees Retirement & Terminal Benefits	1,21,34,904	1,55,82,640
6. Interest on PF Contribution	8,50,173	11,73,745
7. Staff Training Expense	34,379	10,440
TOTAL	**46,98,93,152**	**39,53,85,382**
Schedule 14 :: CISF SALARY & OTHER EXPENSES		
1. CISF Expenses	9,74,78,422	8,64,22,948
TOTAL	**9,74,78,422**	**8,64,22,948**
Schedule 15 :: ESTABLISHMENT EXPENSES - SUPPORT SERVICES		
1. Consultancy & Manpower Charges	8,80,37,644	8,78,78,465
2. Remuneration to Contract Employees	49,72,692	51,13,743
TOTAL	**9,30,10,336**	**9,29,92,208**
Schedule 16 :: ACADEMIC & OTHER STUDENT EXPENSES		
1. Admission Expense	50,21,439	45,71,355
2. Assistanceship to Students	1,98,16,864	3,26,92,637
3. Library Services	2,29,44,688	2,18,90,722
4. Academic Expense	7,07,63,487	4,56,85,960
5. Supplies & Materials	3,64,02,710	3,34,34,777
6. Student Activities Expense	18,87,858	17,65,416
TOTAL	**15,68,37,046**	**14,00,40,867**
Schedule 17 :: OTHER ADMINISTRATIVE EXPENSES		
1. Maintenance & Upkeep		
Repairs & Maintenance - CMD	4,84,94,357	3,57,87,973
Repairs & Maintenance - Labs & Others	2,17,73,779	2,23,45,351
House Keeping Expense	7,54,959	8,57,027
Sub Total (a)	**7,10,23,095**	**5,89,90,351**
2. Professional Charges		
Audit Fees	1,75,400	1,25,400
Legal Expense	7,26,533	1,57,641
Sub Total (b)	**9,01,933**	**2,83,041**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2024

(Amount in Rs.)

	2023-24	2022-23
3. Administrative Expenses - Others		
Vehicle Operating Expense	1,25,95,382	1,49,77,832
Electricity & Water Charges	2,84,20,186	2,24,82,781
Travelling Expense	53,09,495	31,52,290
Research & Development Expense	1,91,91,084	1,39,71,272
Expenditure on Earmarked Funds	40,000	-
Printing & Stationery	45,47,031	28,29,465
Advertisement & Publicity	9,28,856	2,94,924
Hospitality Expense	25,76,302	19,90,635
Telephone & Internet Expense	32,53,626	40,25,388
Office and other Miscellaneous Expense	59,24,939	36,98,971
Recruitment & Review Expense	11,34,970	5,93,164
CEP & IPR Expenses	88,790	-
Compensation Paid	13,15,011	8,61,208
Bank Charges	44,676	1,16,617
Sub Total (c)	**8,53,70,347**	**6,89,94,547**
TOTAL	**15,72,95,375**	**12,82,67,939**

Schedule 18 :: INTEREST REFUNDABLE BY IIST		
Interest on External Funds [Expense]	4,68,268	-
Interest to CPF Fund [Expense]	6,34,374	4,85,167
Interest to DOS [Expense]	29,46,552	61,33,755
Interest to DOS [Expense] - SPCL BG	1,78,33,175	89,73,105
Interest to GPF Fund [Expense]	32,80,616	26,43,560
TOTAL	**2,51,62,985**	**1,82,35,587**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 19 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2024

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 31.03.2024.
   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 receipt basis. Grant is received under three major heads – General, Salaries and Capital. Capital Grant forms part of the Corpus Fund and General and Salaries are treated as Revenue Grant for the year. Grant remaining unutilized as on 31st March is returned to Department of Space on 31st March itself and net Grant after refund is recognized as grant for the year.
   b. Tuition fees, fines and other recoveries from underperforming students (as per the policy of the institute) are accounted on cash basis.
   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 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.

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 19 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2024 (contd)

b. Building –Construction of buildings has been completed in 2020-21. Capitalization has been done to the extent of accepted 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 31.03.2024 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.

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.

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 19 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2024 (contd)

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.
      - During 2023-24, an amount of Rs. 120.35 crores was received as Grant of which Rs.5.04 crores was returned at the end of March 2024. Net Revenue Grant for 2023-24 after return was Rs. 92.42 crores and Capital Grant was Rs. 22.89 crores.
      - Grant balance pertaining to the period prior to 01.04.2023 amounting to Rs. 19.70 lakhs is refundable to DOS.
   b. Interest earned (actually received) on funds from grant-in-aid maintained in deposits is refundable to DOS. Interest of Rs. 1,03,07,426/- (excluding the interest received on the Provident Fund Accounts and Earmarked Funds) has been actually received on deposits during 2023-24 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 was not recognized as income and was 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" was to be remitted back to Government Account. The last batch of students falling under this category passed out in 2023.
   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.

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 19 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2024 (contd)

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 service tax of Rs. 7,73,61,215/-. Appropriation to fixed assets is on hold as appeal for refund of service tax is pending before the Commissioner of Central Excise [Appeals].
   c. An amount of Rs. 95,27,135/- pertaining to assets that have been delivered to IIST before 31.03.2024 but under installation as on 31.03.2024 have been accounted as fixed assets & depreciation has not been charged on the same. This amount includes Office Equipment worth Rs. 6,85,011/- procured from CMS computers which has been uninstalled for 10 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.
   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 till 2022-23 has been made by assuming a 10% hike in previous year service cost. In 2023-24, Provision for Retirement Benefits Rs. 23,50,58,187/- has been reversed. This is based on DOS instructions whereby 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. 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 from previous employers towards their share of retirement benefits contribution has been transferred to Department of Space as advised by them.
   c. An amount of Rs. 41.12 lakhs pertaining to interest shortfall and TDS on interest income is to be transferred from IIST's bank account to Retirement funds bank accounts.

5. Prior Period Item
   Details of prior period items are as given below :-

Details	Prior period expenses
Student fees refund	2,20,650
Supplies & Materials	41,300
Repairs & Maintenance – CMD	2,47,800
Revenue Grant refundable	68,000
Depreciation	1,61,77,611
Total (A)	**1,67,55,361**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 19 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2024 (contd)

Details	Prior period income
Earmarked / Endowment funds adjustments [Net]	5,41,375
Sundry Creditors w/off	113
BTech fees	3,000
Miscellaneous Income	2,783
Total (B)	**5,47,271**

Net prior period expense (A-B) = Rs. 1,62,08,090/-

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.

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.During 2023-24, an amount of Rs. 1,98,16,864/- was disbursed as assistanceship (inclusive of book grant).

9. Supplies and Materials
Supplies and Materials mostly consist of lab consumables.

10. Salary
Salary cost for the month of March 2024 has not been taken into the books of accounts for 2023-24 as March salary for a particular year for central government employees is released in April of that year only. Expenditure for March 2023 to February 2024 has been shown in 2023-24.

11. Earmarked / Endowment Funds
    a. An amount of Rs. 24.38 lakhs pertaining to expenditure for Externally Funded projects that are running on a deficit has been met from Externally funded projects bank accounts and is to be transferred from IIST funds to Earmarked Funds bank accounts.
    b. As on 31.03.2024, assets amounting to Rs. 12.77 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.

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 19 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2024 (contd)

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. 18.46 lakhs (credit balances) relates to balances that have been outstanding from prior to 01.04.2023.

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.
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 met at the time of the claim based on the deposit rates prevailing during the period of holding of the respective Fund
b. In the case of buildings / structures completed by SPCL, only 90% has been paid by IIST. The balance 10% (approximately Rs. 22.01 crores) has been billed but not settled as the contract settlement is sub-judicious.

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.

Department of Space had 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.

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 19 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2024 (contd)

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 alongwith interest earned on the same till 31.03.2024. An amount of Rs. 25.69 lakhs pertaining to TDS on interest income is to be transferred from IIST's bank account to the deposits held for this purpose.

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.

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 ARSB & Associates
Chartered Accountants
FRN : 009803S

CA. P.Ananthakrishnan
(Proprietor, Mem No. 201711)

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Prof. Dipankar Banerjee
Director

R. Hari Prasad
Finance Officer

Place : Thiruvananthapuram
Date : 12th November, 2024
UDIN : 24201711BKAIZR6717

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2024

(Amount in Rs.)

Receipts	2023-24	2022-23	Payments	2023-24	2022-23
I. Opening Balance			**I. Expenses**		
a.Cash in hand	2,00,835	1,26,678	**a. Establishment Expenses - Regular**		
b.Bank Balances			Salaries & Allowances (admin & faculty)	41,82,10,081	34,44,15,642
a) Earmarked Funds	50,57,69,562	47,67,10,262	Contribution to NPS	3,41,36,728	3,09,09,705
b) Others	14,41,84,521	39,02,69,115	Contribution to CPF	2,68,920	2,68,920
			Medical Expense- Staff	33,77,667	40,64,881
II.Grants Received			Employees Retirement Benefits	1,21,34,904	55,37,486
a.From Government of India	1,15,31,37,328	72,76,71,790	Interest on PF Contribution	8,50,173	11,73,745
			Staff Training Expenses	34,379	(14,560)
III. Interest Received					
a. On Bank Deposits	1,48,56,874	98,03,005	**b. CISF Salary & Other Expenses**		
b. On Other Deposits	2,30,386	1,58,660	CISF Expenses	9,61,94,869	8,53,39,246
c. Loans, Advances etc	2,17,457	38,287			
d. Others	1,16,567	1,82,118	**c. Establishment Expenses - Support Services**		
			Consultancy & Manpower Charges	8,80,95,685	8,83,07,743
IV. Other Income			Remuneration to Contract Employees	49,73,692	51,34,743
a. Entrance Fees	56,12,450	36,01,085			
b. Annual Fees/Subscriptions	8,32,15,106	8,18,10,007	**d. Academic & Other Student Expenses**		
c. Other Income	53,77,885	40,54,054	Admission Expense	50,21,439	45,71,355
			Assistanceship to Students	1,98,16,864	3,28,03,041
V. Any other receipts			Library Services	2,37,10,057	2,25,07,776
a. MCF Hassan - ISRO			Academic Expense	7,08,05,426	4,55,28,813
b. Security Deposits received	1,29,211	5,48,418	Supplies & Materials	3,68,47,260	3,35,00,623
c. Earnest Money Deposits received	1,87,062	2,60,880	Student Activities Expense	18,87,858	17,70,844
d. Performance Guarantee received	2,42,342	2,12,635			
e. Advance for Research, Seminars etc	9,60,97,208	3,99,98,662	**e. Other Administrative Expenses**		
f. BTech Fees refundable to DOS	-	1,45,600	Repairs & Maintenance	2,13,92,159	2,07,12,130
g. Caution Deposit from Students	28,30,000	26,55,000	Repairs & Maintenance - CMD	4,50,92,625	3,05,00,147
h. Bond Amount received [Btech]	10,00,000	21,50,000	House Keeping Expense	7,23,546	8,26,645
i. Stale cheques	33,005	44,894	Audit Fees	1,75,400	1,25,400
j. Canteen Accounting Committee	2,87,67,576	2,36,62,304	Legal Expense	7,05,557	1,85,125
k. Interest received and payable to DOS	30,12,565	72,49,304	Vehicle Operating Expense	1,26,12,740	1,48,46,279
l. Net addition to Statutory Liabilities(Staff)	12,15,144	84,08,260	Electricity & Water Charges	2,79,67,043	2,20,43,059
m. Unexplained credits - Banks	74,706	4,150	Travelling Expense	56,16,122	26,83,403

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2024

(Amount in Rs.)

Receipts	2023-24	2022-23	Payments	2023-24	2022-23
n. Recovery of loans to staff	11,76,664	8,90,038	Research & Development Expense	1,92,82,503	1,40,13,937
o. Decrease in Contingency advance	-	1,57,603	Printing & Stationery	45,62,031	30,37,878
p. Increase in TDS, GST & Labour Cess	22,32,205	-	Advertisement & Publicity	4,82,323	2,94,924
q. TDS/TCS refund from IT Department	29,14,223	36,87,692	Hospitality Expense	26,75,289	18,59,681
r. SPCL-BG Interest transferable to DOS	1,75,99,520	90,86,585	Telephone & Internet Expense	41,82,932	40,17,602
s. Sundry Creditors - Others - Net	1,13,090	-	Office Expense	59,70,146	36,68,163
t. Security Deposit (Asset) received	60,000	34,000	Recruitment & Review Expense	11,34,970	5,93,164
			CEP & IPR Expenses	8,450	-
			Compensation Paid	13,15,011	8,61,208
			Bank Charges	44,676	1,16,617
			GST - Input Tax Credit Utilized	-	(2,53,798)
			Expenditure on Earmarked Funds	40,000	-
			II. Payments made against funds for various projects		
			DOS - Dr. Palash - HSP - Real TIme Gas Sensor	4,21,216	1,35,47,917
			DOS - MOM2 - RPA - Dr. Ambili KM	3,63,508	4,98,670
			DOS - Dr. Umesh - Planetary Exploration	2,30,000	3,63,317
			DOS - Dr. Rajesh V J (Spectral)	1,83,528	7,000
			ISRO -Dr. K G Sreejalekshmi -Gaganyaan	7,47,765	1,15,565
			ISRO - MOM - Dr. Rajesh VJ	6,16,323	-
			LPSC - Dr.Jinesh K B - Laser Ignition System	1,46,186	6,247
			DAE - 2022 - Dr. Sakthivel - NBHM Multiphase Fluids	3,53,553	2,09,355
			DBT - Dr. Shaiju - Ramalingaswami Fellowship	19,60,535	21,60,850
			DBT-RamaRao (Rural Urban Interface) Phase-II	9,27,686	52,11,658
			DOH - Dr.Gnanappazham L - 2023 - Market Intelligence	19,91,980	-
			DRDO - ARDB - Sudharshan Kaarthik 2023 - Ele HANS	16,218	-
			DRDO - DR.Praveen Krishna IR- 2022- Gas Turbine	9,03,484	52,000
			DRDO - Dr. Rajesh S. - 2022 - TDLAS Temp Sensor	21,24,777	1,43,957
			DRDO - Sam Zachariah - Robots - 2024	9,115	-
			DST - CNRS - Dr. Palash Basu - 2020 - Biomarker	10,29,292	5,09,755
			DST-Dr Jinesh KB- Atomic Layer Deposition System	29,94,824	15,58,201
			DST - KIRAN - WOS(A) - Pushpa K - Quantum Mech	15,96,905	1,54,106
			DST - NRDMS - Dr.Ramarao - 2022 -Geodesy	7,32,196	92,967
			DST - Umesh R Kadhane - Genisis of Organic Molecule	3,57,668	-

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2024

(Amount in Rs.)

Receipts	2023-24	2022-23	Payments	2023-24	2022-23
			ICSSR - Dr. Shajumon - 2020 - Tele Medicine Units	1,14,286	2,13,707
			IITG - Dr.Prathap - 2022 - Hydrogen Blending	5,54,464	3,21,122
			INAE - Dr. Palash - 2022 - Abdul Kalam Fellowship	10,67,744	3,40,518
			KSCSTE - Dr.Anoop C.S - 2022 - Magneto - Plethysmo	4,47,800	-
			KSCSTE - Dr. Seena V - 2023 - Polymer MEMS	66,091	-
			Max-Planck - Dr. Jagadheep - 2017	12,79,228	4,45,288
			MoES - Dr. Govindankutty - Thunderstorms	11,40,619	13,36,003
			MoES - 2023 - Dr Govindankutty - Monsoon MissionIII	2,30,857	-
			SERB - Dr. Ashok - Quantum Communication	1,31,111	91,516
			SERB - Dr. C S Narayanamurthy - Wavefront	11,89,460	32,12,294
			SERB - Dr. Immanuel R - 5G Bands	76,645	11,98,866
			SERB - Dr.Biswajit Pathak - Ramanujan Fellowship 23	15,75,796	-
			SERB - Dr. Chinmoy Saha - 2020 - 5G Antenna	14,37,100	7,70,395
			SERB - Dr.Prosenjit Das - R-Forms of R(X) - 2023	2,19,915	-
			SERB - Dr Rajesh S - Variation in Biogas Fuel	10,00,301	5,11,704
			SERB - Dr. Resmi L - 2017 - Gamma Rays	6,10,500	-
			SERB - Dr Resmi L - Ultra Relativistic Jets	2,44,155	1,79,312
			SERB - Dr. Sarita Vig - 2019 - Young Massive Stars	3,96,188	4,91,983
			SERB - Dr. Sarvesh - 2020 - Virtual Element Approx.	31,542	1,82,541
			SERB - Dr Sarvesh K - Novel Numerical Tech	6,07,389	1,33,504
			SERB- Dr.Sourav Bhowmick - Secure Control - 2022	68,849	-
			SERB - Prof.Manoj B S - 6G Satellite Networks	8,64,044	-
			SERB - Prof.Selvaganesan N - Biomedical Signal-2023	3,22,100	-
			SERB- Umesh Kadhane - Symposium on Genesis	2,12,262	-
			DST - Dr. Vikram Khaire	13,69,859	24,88,740
			03-2021-03- VSSC- J Mary Gladis - NanoStructured	4,50,863	-
			03-2021-09- VSSC- Sandhya K Y - PEM Fuel Cells	1,90,134	-
			03-2021-10-VSSC- Sandhya K Y - Silicon Graphene	2,16,028	-
			03-2021-11- VSSC-Dr. J Mary Gladis - Graphene Nano	6,59,931	-
			03-2021-13-LPSC- Dr.Umesh R Kadhane- Diagnostic H	1,90,133	-
			03-2021-15 -LPSC-Umesh R Kadhane- Prediction of HE	1,85,534	-
			03-2021-16-LPSC- Dr.Prathap C- Condensation of GCC	87,735	-
			03-2021-18-LPSC-Dr. Shine SR - Thruster Plume	5,73,772	-
			05-2022-30-LEOS-Dr. Jinesh KB - Seismocardiogram	2,09,027	-
			11-2021-23-SAC-Dr.Vani Devi M-Interface Analysis	93,484	-

INDIAN INSTITUTE OF SPACE SCIENCE & TECHNOLOGY * THIRUVANANTHAPURAM * Govt. of India Dept. of Space

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2024

(Amount in Rs.)

Receipts	2023-24	2022-23	Payments	2023-24	2022-23
			11-2021-24 - LPSC- Dr.Deepu M-Dual Throat Nozzle	15,92,099	-
			11-2022-31-VSSC-Dr.Sooraj V S - Laser Based Powder	4,87,255	-
			DRDO - ARDB - UG,PG Girl Students	6,00,000	6,00,000
			KSCSTE - PhD - Sanah Rahman K - 2021	9,807	6,36,079
			SERB - TARE - Dr. Abirami A M - 2023	2,21,377	-
			SERB - TARE - Dr. Santhosh B	1,24,537	2,33,339
			Tribal Affairs - Scholarship for ST Students	68,400	9,000
			DST - NGP - RamaRao- Geospatial	7,13,971	3,300
			Hindi Technical Seminar - 2022	-	3,822
			Antrix Corporation - Colloquium Sponsorship	-	-
			DAE - NBHM ICIAM - Sarvesh Kumar - Travel - 2023	2,75,000	-
			DAE - NBHM ICIAM - Travel - Sakthivel - 2023	2,75,000	-
			KSCSTE - Dr.A.M.Ramiya - Travel - 2023	1,64,653	-
			KSCSTE - Dr.R Sudharshan Kaarthik- Travel - 2024	1,19,894	-
			SERB- Travel - Manohar Kumar - 2024	1,95,682	-
			SERB- Travel - Varsha M V - 2024	1,47,153	-
			JEST 2024	14,14,203	-
			IISU - Perf. of Ball Bearings - Dr. Jinesh KB	-	1,54,631
			NRSC - P R Sinha - Balloon Launching	-	4,291
			DBT - Dr. Palash - Green House Gases	-	6,53,831
			DRDO - ARMREB - Dr. K. Prabhakaran	-	1,34,512
			DST - NGP - A.M Ramiya - Smart Cities 3D	-	2,95,755
			MeitY SAMEER - Dr. Priyadarshnam	-	5,50,684
			Mangrove Cell - Dr. Gnanappazham - 2018	-	1,87,089
			SERB - Dr. Seena V - Nanomechanical Sensor	-	7,29,488
			SERB - 2018 - Dr. Umesh K. - PAH	-	55,687
			SERB - 2019 - Dr. Vineeth B S - Wireless ReLod	-	61,610
			DST Inspire - Dr. Basudev M	-	7,00,000
			IPRC-Dr. Kuruvilla-Novel N2O4	-	1,84,000
			ICSSR - PDF - Dr. Aswathy VK - 2022	-	1,81,481
			KSCSTE - PhD - Elizabeth George - 2018	-	8,023
			KSCSTE - PhD - Haritha A - 2018	-	4,80,387
			SERB - PDF - Dr. Krishnaswamy R - 2017	-	1,86,299
			AICTE - ATAL - Dr.Rama Rao	-	93,000
			DST -NGP -Dr A M Ramiya-Geospatial	-	2,67,246

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2024

(Amount in Rs.)

Receipts	2023-24	2022-23	Payments	2023-24	2022-23
			SERB - Travel - Aswathy M (PhD) - 2022	-	2,10,253
			SERB - Travel - Babitha George - 2023	-	1,30,958
			LPSC - High Thrust EPS - Dr. Umesh K	-	3,786
			DST - Dr. Rama Rao N	-	8,809
			SERB - PDF Priyanka	-	11,980
			SERB - Dr. Seena V	-	19,621
			SERB - Dr. Jayanthi	-	30,450
			IPRC-Dr. Palash Basu	7,455	-
			III. Expenditure on Fixed Assets & Capital Work-in-Progress		
			a.Purchase of Fixed Assets	21,80,29,438	20,25,73,126
			b.Expenditure on Capital Work-in-progress	84,89,538	2,41,94,683
			IV. Other Payments		
			Security Deposits (Asset) paid	1,54,280	9,30,999
			Security Deposits repaid to Contractors	75,691	4,15,727
			Earnest Money Deposits repaid	1,89,020	5,58,171
			Performance Guarantee repaid	1,41,716	48,962
			Loans to staff	-	1,00,000
			Increase in Contingency Advance	25,397	-
			Canteen Accounting Committee	2,66,36,976	2,52,71,400
			Charges recoverable from banks	3,555	5,151
			Stale Cheques - paid	-	48,000
			Decrease in TDS, GST & Labour Cess	-	11,00,748
			TDS / TCS [from IIST]	42,30,173	28,98,801
			Btech Fees refunded to DOS	-	17,17,275
			Interest refunded to DOS	-	1,06,43,696
			MCF Hassan - ISRO - net	6,53,530	5,34,948
			Caution Deposit repaid to Students	33,87,315	28,59,000
			Sundry Debtors - Others - Net	1,847	10,028
			Sundry Creditors - Others - Net	-	2,25,417
			Net decrease in Statutory Liabilities (Staff)	-	-
			Grant refunded to DOS	3,13,15,000	-

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2024

(Amount in Rs.)

Receipts	2023-24	2022-23	Payments	2023-24	2022-23
			V. Closing Balances		
			a.Cash in hand	2,31,893	2,00,835
			b.Bank Balances		
			a) Earmarked Funds	58,67,56,236	50,57,69,562
			b) Others	17,76,94,174	14,41,84,521
Total	2,07,06,03,492	1,79,36,21,086	Total	2,07,06,03,492	1,79,36,21,086

Significant Accounting Policies,
Notes on Accounts & Contingent Liabilities 19

As per our report of even date attached.

For ARSB & Associates
Chartered Accountants
FRN : 009803S

CA. P.Ananthakrishnan
(Partner, Mem No. 201711)

Place : Thiruvananthapuram
Date : 12th November, 2024
UDIN : 24201711BKAIZR6717

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Prof. Dipankar Banerjee
Director

R. Hari Prasad
Finance Officer

IIST-171-IP-E-10-2024

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
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