आज़ादी का अमृत महोत्सव

Annual Report

2021-22

Indian Institute of Space Science and Technology

Annual Report - 2021-22

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

(1931 - 2015)

Founder Chancellor, IIST

Vision & Mission

Vision

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

Mission

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

Key Functionaries

Chancellor

Dr. B. N. Suresh

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

Shri. S. Somanath
(from 14.01.2022)

Dr. K. Sivan
(till 14.01.2022)

Director, IIST
Chairman, Board of Management

Dr. D. Sam Dayala Dev
(from 20.01.2022)

Shri. S. Somanath
(24.07.2021 - 20.01.2022)

Dr. Vinay Kumar Dadhwal
(till 24.07.2021)

Registrar

Dr. Y. V. N. Krishna Murthy

Deans

Dr. A. Chandrasekar
(Academic and Continuing Education)

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

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

Contents

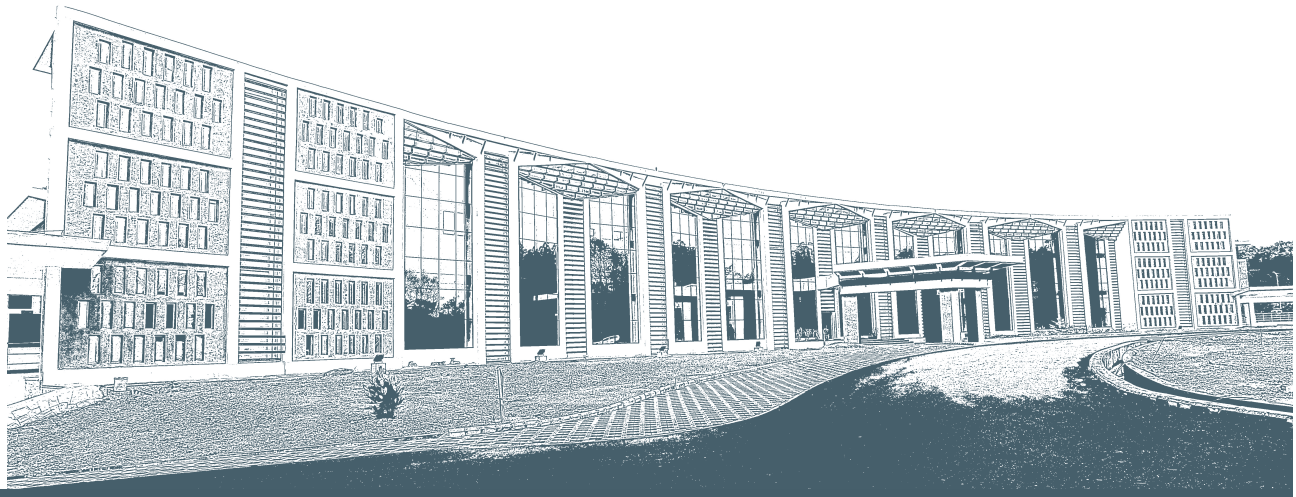
From Director's Desk

FOREWORD

IIST is celebrating its Crystal anniversary in 2022. It was a long and satisfied journey which started way back in 2007 from the temporary campus at VSSC to the lush green, vibrant, permanent campus at Valiamala. Along with the whole world, the Institute also has emerged out of the Covid-19 induced restrictions and regular academic activities are back in the campus. The state-of-the-art facilities, airy green spaces and the serene ambience of the IIST campus opened up to offline classes from March 2022 onwards. It needs to be emphasized that even the pandemic could not stop the academic and research activities of the institute and the activities were in full swing making use of the best of online facilities. Words are inadequate to express the resilience and dedication shown by both students and faculty members to tide over the difficulties posed by the pandemic.

The year 2022 was remarkable for the institute in terms of many of its achievements. INSPIRESat-1 (the first student satellite developed by the Small-spacecraft Systems and Payload Centre (SSPACE) at IIST, in collaboration with LASP, Univesrity of Colarado; Nanyang Technological University, Singapore and National Central University, Taiwan was launched on February 14, 2022. The activities on payloads for the Venus and Gaganyaan missions are in advanced stages of realisation. The collaborative work with ISRO on electric propulsion system development is progressing steadily and the institute is eagerly looking forward to the launch of TDS-01 satellite where the system will be flight demonstrated.

In order to give more thrust to nucleation of new ides in aerospace arena, a Space Technology Innovation and Incubation Cell (STIIC) was created in the Institute in the current year. As of now, IIST has 5 start up initiatives and more



numbers are in the pipe line. Also, the institute is engrossed in modifying the academic curriculum absorbing the requirements of the new National Education Policy.

In the 9th Convocation of IIST, 106 students from B.Tech., 16 students from Dual Degree, 89 from M.Tech. and 12 students completing their Ph.D. programme were conferred with degrees. With this the total number of degrees awarded by the institute has gone up to 1379 in B.Tech. stream, 66 under dual degree, 583 in M.Tech. and 102 in PhD. It is gratifying to note that a total of 1224 graduates from the institute have chosen ISRO as their domain of work. The students from the institute are doing well in the Masters Programme at California Institute of Technology (Caltech) and one of our students, fifth from the Institute till now, has been awarded the prestigious Abdul Kalam Prize for the academic year 2021-22 in Aerospace Engineering instituted at Caltech.

IIST is waiting for its INI status and is also getting ready for NAAC and NBA accreditation. IIST has been ranked 44th in National Institute Ranking Framework (NIRF) and striving hard to improve the ranking further.

There is no doubt that the institute has done its best and responded with vigor and brilliance to inspire the young minds to further the humanity's quest for knowledge.

I urge the IIST community to continue to strive hard and put in their best efforts to make our institute one of the best learning centers in the world.

Unnikrishnan Nair S
Director, IIST

The Institute

1. The Institute

Indian Institute of Space Science and Technology Thiruvananthapuram, Kerala was established in 2007 to develop and discover new frontiers in science and technology and to shape manpower to facilitate the same. Established as a Deemed to be University under Section 3 of the UGC Act 1956 by Department of Space, IIST was Asia's first Space University. In the 15 years of its functioning, the institute has further dynamically evolved and expanded as a centre of multidisciplinary learning and research that spans themes across the fields of Aerospace, Avionics, Chemistry, Earth and Space Sciences, Humanities, Mathematics and Physics. IIST offers undergraduate courses in 3 different branches and postgraduate programmes under 15 different branches of Science, Technology and Engineering streams, with a synergetic emphasis on Space Science & Technology applications. Engaging with concepts, models, science and technological applications in a rigorous, multi-disciplinary approach, IIST today is a center for learning and problem solving that engages with the needs of the local and the global, the technological as well as the societal. IIST has been striving to build a strong research tradition, which can be seen by the impressive statistics of various research indicators. IIST also has a number of national and international collaborations, both as MoU at the level of institute and faculty-to-faculty collaboration.

The Institute exists as a symbiotic counterpart of ISRO-infusing thought, and cutting edge technology the ISRO's fields of action. The students of IIST get several opportunities to contribute as interns and employees to various centres of ISRO forming a valuable human resource base. The Doctoral and Post Doctoral research programmes of IIST invites students to engage boldly in innovative and interdisciplinary areas of research that are geared to address the pressing needs in the country. The state-of-the-art facilities in the various departments, the culture of strong interdisciplinary and collaborative work in tandem with support of the various centres of ISRO empower students and research scholars in this pursuit.

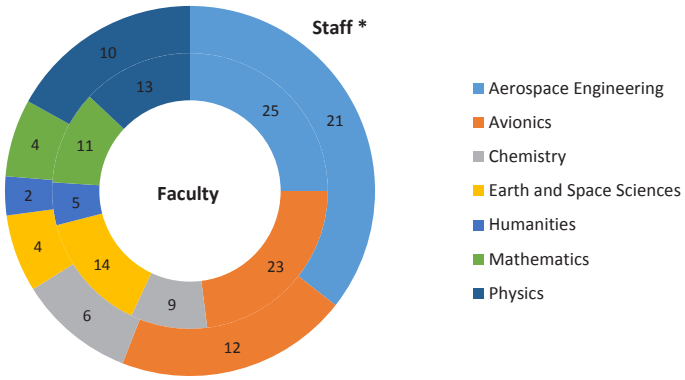
One of the most important highlight of 2021-22 was the launch of IIST's first student satellite INSPIRESat-1 from Sriharikota at 5.59 am on February 14, 2022. The small satellite that weighs less than 10 kg is a collaborative effort by the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado Boulder, the National Central University, Taiwan and the

Nanyang Technological University in Singapore, apart from the IIST. INSPIRESat-1 was also an exemplar for the nature of cutting edge, hands-on work in the institute's programmes. Last year, IIST saw a change in the reigns of leadership. Dr. V. K. Dadhwal, former Director, IIST who oversaw the development of IIST in these crucial budding years retired on July 24, 2021 after 32 years of illustrious service in ISRO and IIST. Shri. S. Somanath, Director, VSSC was given the additional charge of Director, IIST. On his appointment as Chairman, ISRO Dr. D. Sam Dayala Dev, Director, IISU took over the reigns of IIST on January 20, 2022. Strengthened by these associations, collaborations and a strong leadership, IIST envisages to be a global nodal center for research, education and action in space related disciplines in the coming years.

1.1 IIST at a Glance 2021-22

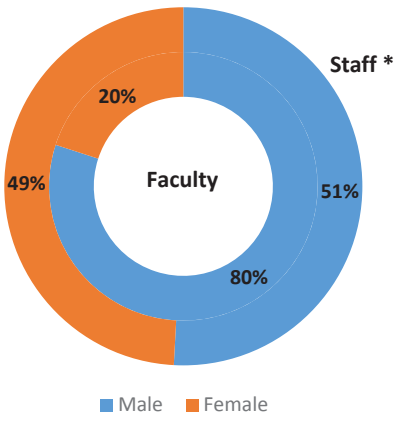
Departments and its strength

Faculty & staff strength in various department



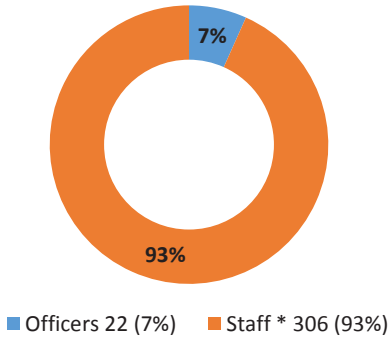
** Staff - Technical, scientific, and hired man power*

Gender wise distribution of faculty & staff in various departments

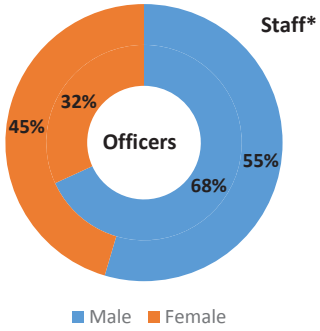


Administration and other Essential Services

Administrative Strength



Gender Statistics - Administrative and other Essential Services



**Staff includes hired man power*

Students Strength *(as on 31-03-2022)*

B.Tech. students enrolled in 2021	134
B.Tech. students in campus	501
Dual Degree students enrolled in 2021	22
Dual Degree students in campus	101
M.Tech students enrolled in 2021	112
M.Tech students in campus	210
Doctoral students enrolled in 2021	56
Doctoral students in campus	264
Post Doctoral Scholars in campus	5

Projects and Collaborations

ASRG Projects approved	30
ASRG Projects under review	4
Externally funded projects	16
Extramural Research Projects	27
MoUs signed	3

Research Outcome

Book / Book chapters	22
Journal Papers	228
Conference Proceedings	119
PhD Thesis Defended	23
Patents Granted *(till date)*	9
Patent application submitted *(till date)*	12

Centre of Excellence

Centre of excellence	5

Awards and Achievements

Awards and recognitions	39

Research Resources

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

Startups

Incubated	1
Pre-incubated state	2
Application submitted	2

Placements

Placement (B.Tech./ Dual Degree- ISRO)	86
Placement (B.Tech./ Dual Degree- Placement cell)	19
Placement (M.Tech. - Placement cell)	46

RTI Status

From April, 2021 to March, 2022 (Decentralised the processing of applications under RTI and CPIO, IIST has been disseminating the information directly to the applicants).

Application Received	Information given	Appeal Received	Appeal Settled	CIC Hearing
58	55	4	3	Nil

Vigilance Status

Number of Vigilance Cases: NIL

1.2 Statutory Bodies

1.2.1 IIST Governing Body

S. Somanath *(from 14.01.2022)* **K. Sivan** *(till 14.01.2022)*	Secretary, DoS/ Chairman, ISRO **President**
M. Maheshwar Rao	Additional Secretary & FA, DoS
Shantanu Bhatawdekar *(from 24.02.2022)* **R. Umamaheswaran** *(till 24.02.2022)*	Scientific Secretary, ISRO Headquarters
S. Unnikrishnan Nair *(from 07.02.2022)* **S. Somanath** *(till 06.02.2022)*	Director, VSSC
V. Narayanan	Director, LPSC
Nilesh M. Desai	Director, SAC
Prakash Chauhan *(from February 2022)* **Raj Kumar** *(till February 2022)*	Director, NRSC
D. Sam Dayala Dev *(from 20.01.2022)* **S. Somanath** *(24.07.2021 - 20.01.2022)* **Vinay Kumar Dadhwal** *(till 24.07.2021)*	Director, IIST **Secretary**

1.2.2 IIST Governing Council

S. Somanath *(from 14.01.2022)* **K. Sivan** *(till 14.01.2022)*	Secretary, DoS/ Chairman, ISRO **Chairperson**
M. Maheshwar Rao	Joint Secretary & FA, DoS
G. Jayanthi	Joint Secretary (Finance), DoS
Shantanu Bhatawdekar *(from 24.02.2022)* **R. Umamaheswaran** *(till 24.02.2022)*	Scientific Secretary, ISRO Headquarters
D. Sam Dayala Dev *(from 20.01.2022)* **S. Somanath** *(24.07.2021 - 20.01.2022)* **Vinay Kumar Dadhwal** *(till 24.07.2021)*	Director, IIST **Secretary**

1.2.3 IIST Board of Management

D. Sam Dayala Dev *(from 20.01.2022)* **S. Somanath** *(24.07.2021 - 20.01.2022)* **Vinay Kumar Dadhwal** *(till 24.07.2021)*	Director, IIST **Chairman**
M. Maheshwar Rao	Joint Secretary & FA, DoS
Shantanu Bhatawdekar *(from 24.02.2022)* **R. Umamaheswaran** *(till 24.02.2022)*	Scientific Secretary, ISRO Headquarters

V. Narayanan	Director, LPSC
Prakash Chauhan *(from February 2022)* **Raj Kumar** *(till February 2022)*	Director, NRSC
Virendra Kumar Tewari	Director, IIT Kharagpur
V. Kamakoti *(from 17.01.2022)* **Bhaskar Ramamurthi** *(till 17.01.2022)*	Director, IIT Madras
A. Ajayaghosh	Director, NIIST
Anil Bharadwaj	Director, PRL
A. Chandrasekar	Dean (Academics and Continuing Education), IIST
Raju K. George	Dean (Research & Development and Intellectual Property Rights), IIST
Kuruvilla Joseph	Dean (Student Activities, Student Welfare and Outreach), IIST
N. Sabu	Professor, Department of Mathematics, IIST
Vani Devi M.	Assistant Professor, Department of Avionics, IIST
Y. V. N. Krishna Murthy	Registrar, IIST **Secretary**

1.2.4 IIST Finance Committee

D. Sam Dayala Dev *(from 20.01.2022)* **S. Somanath** *(24.07.2021 - 20.01.2022)* **Vinay Kumar Dadhwal** *(till 24.07.2021)*	Director, IIST **Chairman**
M. Maheshwar Rao	Joint Secretary and FA, DoS
Bijay Kumar Behera	Associate Director, BEA ISRO Headquarters
A. Chandrasekar	Dean (Academics and Continuing Education), IIST
Raju K. George	Dean (Research & Development and Intellectual Property Rights), IIST
Y. V. N. Krishna Murthy	Registrar, IIST
Sivanandan G.	Sr. Head Accounts/ IFA LPSC, Valiamala
R. Hari Prasad	Deputy Registrar (Finance) **Member Secretary**

1.2.5 IIST Academic Council

D. Sam Dayala Dev *(from 20.01.2022)* **S. Somanath** *(24.07.2021 - 20.01.2022)* **Vinay Kumar Dadhwal** *(till 24.07.2021)*	Director, IIST **Chairman**
A. Chandrasekar	Dean (Academic & Continuing Education), IIST
Raju K. George	Dean (Research & Development and Intellectual Property Rights), IIST
Kuruvilla Joseph	Dean (Student Activities, Student Welfare & Outreach), IIST
K. Sudhakar	Former Professor, IIT Bombay
K. R. Ramakrishnan	Former Professor, IISc Bangalore
A. Ajayaghosh	Director, NIIST, Thiruvananthapuram
K. Kurien Issac	Senior Professor, Department of Aerospace Engineering
C. S. Narayanamurthy	Senior Professor, Department of Physics
Aravind V.	Professor and Head, Department of Aerospace Engineering
A. Salih	Professor, Department of Aerospace Engineering
Manoj T. Nair	Professor, Department of Aerospace Engineering
Deepu M.	Professor, Department of Aerospace Engineering
Anup S.	Professor, Department of Aerospace Engineering
Chakravarthy P.	Professor, Department of Aerospace Engineering
Deepak Mishra	Professor and Head, Department of Avionics
N. Selvaganesan	Professor, Department of Avionics
B. S. Manoj	Professor, Department of Avionics
Priyadarshnam	Professor, Department of Avionics

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

1.3 Functionaries in Academics, Administration and Other Units

Director		
D. Sam Dayala Dev *(From 20.01.2022)* **S. Somanath** *(24.07.2021 - 20.01.2022)* **Vinay Kumar Dadhwal** *(till 24.07.2021)*		
Registrar		
Y. V. N. Krishna Murthy	Sr. Professor	
Deans		
A. Chandrasekar	Academics & Continuing Education	
Raju K. George	Research and Development & IPR	
Kuruvilla Joseph	Students Activities, Student Welfare & Outreach	
Chief Technology Officer		
G. Ayyappan	Prof. Satish Dhawan Professor	
Department Heads		
Aravind Vaidyanathan	Professor	Aerospace Engineering
Deepak Mishra	Professor	Avionics
K. Y. Sandhya *(from 01.01.2022)* **K. Prabhakaran** *(till 31.12.2021)*	Professor	Chemistry
Rama Rao Nidamanuri *(from 01.01.2022)* **Samir Mandal** *(till 31.12.2021)*	Professor	Earth and Space Sciences
C. S. Shaijumon *(from 01.01.2022)* **Lekshmi V. Nair** *(till 31.12.2021)*	Associate Professor Professor	Humanities
C. V. Anil Kumar *(from 01.01.2022)* **N. Sabu** *(till 31.12.2021)*	Professor	Mathematics
Sudheesh C. *(from 01.01.2022)* **Umesh R. Kadhane** *(till 31.12.2021)*	Associate Professor Professor	Physics
Officers		
C. V. H. S. S. Mallikarjuna Rao	Head Civil and Maintenance Division	
Sennaraj V.	Deputy Registrar, Grade II (Academics)	
R. Hari Prasad	Deputy Registrar Grade II (Finance)	

Shri. Mohan Sukumar	Scientist/ Engineer 'SF' (Computer System Group)
Bindya K. R.	Deputy Registrar, Grade I (General Administration, Student Activities and Welfare)
Ramanathan S.	Deputy Registrar, Grade I (Recruitment and Review)
Subash Chandran M. B. **Rakesh R. Menon**	Deputy Registrar, Grade I (Purchase) Deputy Registrar, Grade I (Stores)
Abdunnasar A.	Library Officer-D
Vinod Kaimal K. P.	Head - Canteen Services
Rajeena Beegam S. **Reny Thomas**	Deputy Registrar, Grade I (Finance)
Pradeep Kumar K. R.	Senior Administrative Officer & PRO (Establishment and Transport)
Cimy Asaf	Assistant Director (Official Language)

Academic Departments

Department of Aerospace Engineering

2.1 Department of Aerospace Engineering

Vision

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

Mission

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

Core Research Focus

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

Fact File

Number of faculty	:	25
Technical Staff	:	06
Tutors/ Technicians	:	12*
Non-teaching staff	:	03*
Research Scholars	:	57
Number of PhDs conferred	:	05

Laboratory / Research Facilities

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

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

Research and Developments

- Faculty members from department have been contributing actively to Advanced Space Research Group (ASRG) activities. Six projects have been approved till date under ASRG scheme.
- Department has initiated MoUs with various Industries/ R&D organizations including Larson & Tubro, Sree Chitra Tirunal Institute of Medical Sciences and Technology (SCTIMST), Technion - Israel Institute of Technology, Isae-Supaero Toulouse, France.
- Faculty members from Department holds various externally funded projects, funded by DST-SERB, DRDO, Indian Oil Ltd etc.

Research outcomes - Fact File

International Journal	:	41
Conference Papers	:	34
Book chapters	:	03
Patents	:	01+02 (under review)
Projects	:	07

** - Hired manpower*

Contributions to Institute Level Space Missions

- Department of Aerospace is actively involved in Small Satellite and Payload development (SSPACE) activities at IIST, with core focus on Mechanical Design, Design for manufacturing and fabrication, Structural analysis and propulsion etc.
- Faculty from department is fully involved in IIST Ground Station Development.
- Initiatives in cold gas propulsion system development.
- 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 department was included in Inter Centre Study Team constituted for advanced R&D technology project titled 'General Purpose Humanoid Robot with Human-like Degrees of Freedom' under My Vision 2030 of DTDI, ISRO HQ.

Outreach Activities

- More than 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 Activity Board at IIST.

Startup Activities

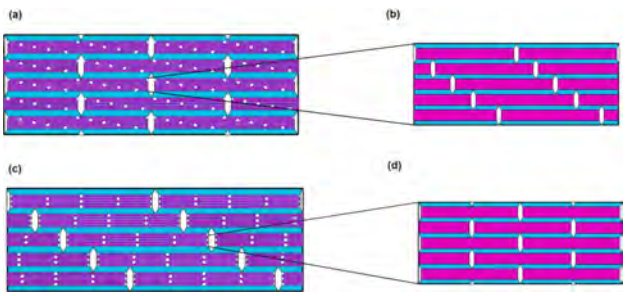
Vashishtha Research Pvt. Ltd., one of the startup initiative by a Research Scholar from Department of Aerospace, IIST has made significant progress in their developments. The startup aims to contribute positively to the industry 4.0 and the vision of **'Atmanirbhar Bharat'**. During the recent past, they have been recognized by many awards and grants including;

- 2nd prize Winner of **DRDO Dare to Dream event 2021** in the Startup category.
- Winner of **Niti Aayog Atma-Nirbhar India Challenge 2021 (ANIC).**

The startup focuses on the development of state-of-the-art, computer controlled Inspection Systems that integrate Robotic systems and Non Destructive Testing/ Metrology instruments together with advanced path planning and data integration capabilities through dedicatedly developed advanced 3D Viewer GUI software. The startup has successfully developed custom-made Laser Measurement System, Stockpile Volume Estimation system, Conveyor belt Volume Estimation system etc., for industries and academic institutes. Presently the development of Robotic solutions and cable driven parallel robotic systems for industry/ agricultural applications is ongoing.

Faculty Profile

Anup S., Professor



Research Interest

Mechanics of Bio-inspired composites, Micromechanics, Molecular Dynamics simulation of nanocomposites, Fracture Mechanics of composites

Research Highlights

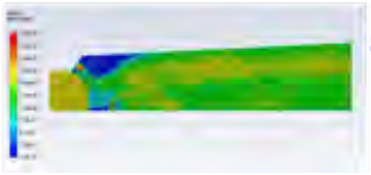
- Mechanical properties of two hierarchical bio-inspired (2H) models with two different architectures were analysed; Better toughness could be obtained for non-self-similar structures

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

Aravind V., Professor and Head

- **Medium Independent Jet Engine**
  - No need for atmospheric oxygen
  - Eliminates Scramjet Complexities
    - Ignition, Flame Holding and Flame stabilization
  - ISP of MI-Scramjet
    - 900s
      - H_2-O_2 rocket- 420 s
  - Propellant Gain – 20-25 %
  - Chamber Pressure Reduction
    - 60-70% as compared to Rocket

Engine Class	Conventional Scramjets	H_2-O_2 Rocket Engine	MI-Scramjet
ISP (s)	8163	420 - 450	880-900



Simulation Results
Mach Contour

Research Interest

- Scramjet mixing and Combustion
- MI-Jet engine for earth and martian environment
- Liquid rocket engine combustion instability
- Launch Vehicle Design

Research Highlights

- Curved pylon geometry for enhanced mixing of fuel and and oxidizer in scramjet engines
- Aerated injection for gaseous and liquid injection in Scramjet and MI-Scramjet operations
- Sub-cavity based oscillation suppression in supersonic Cavity flows
- Design of a combustion chamber to study liquid rocket Engine combustion instability
- Development of cold gas thruster for satellite applications
- Preliminary design of a hybrid rocket

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

Ayyappan G., Professor Satish Dhawan Professor

Research Interest

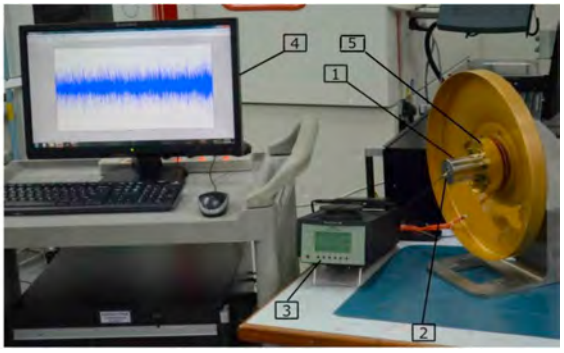
- Launch Vehicle Design
- Integrated design analysis of STS (Space Transportation System)
- Design of Liquid Rocket engines
- Combustion instability and performance study of injector configuration of Liquid Rocket engines
- Composite Throats for Liquid Rocket engines
- Research Management for Advanced Space technologies

Research Highlights

- Composite material lined combustor for hybrid rocket engine studies
- Lox-Methane engine design with throttling capability
- Hybrid Rocket engine design for Sounding Rocket Experiments (IHRX)
- Subsystem design for Hybrid rocket engine
- Reusable launch vehicle technologies development using Hybrid Rocket Experiments
- System engineering of Small Satellites

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

Bijudas C. R., Associate Professor

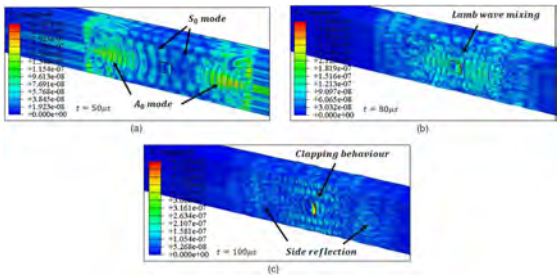


Research Interest

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

Research Highlights

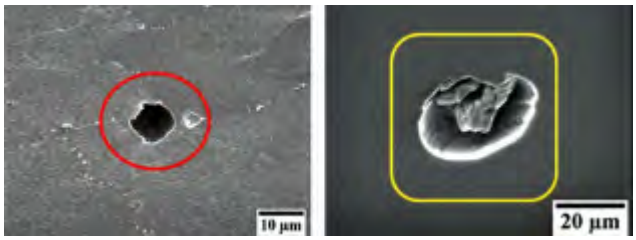
- Health monitoring of rolling element bearings using improved wavelet cross spectrum technique and support vector machines



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

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

Chakravarthy P., Professor

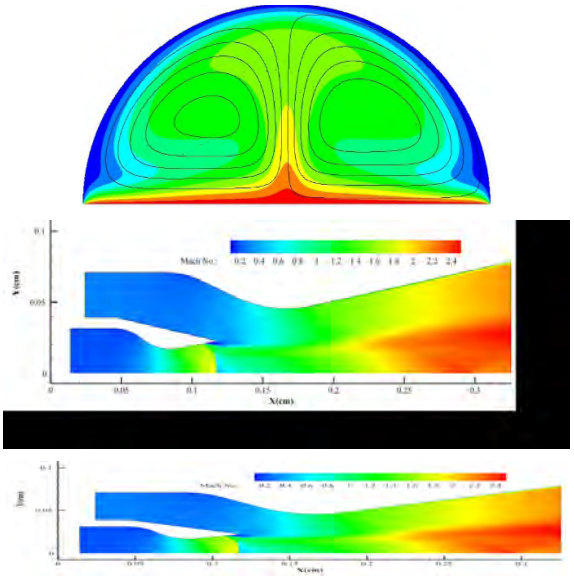


Research Interest

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

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

Deepu M., Professor



Research Interest

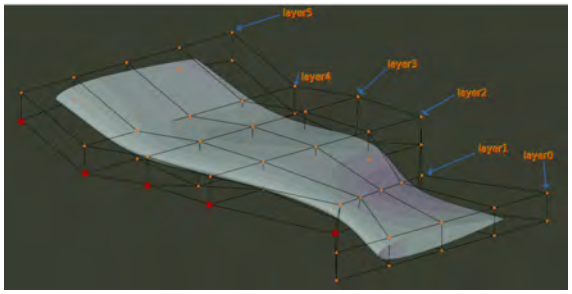
Modeling of turbulent, compressible, reacting flows in propulsion systems, heat & mass transfer enhancement, heat transfer in microchannels, and heat transfer in reactive materials.

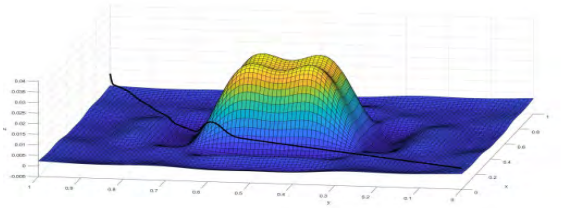
Research Highlights

- Analysis of a dual throat nozzle for the development tri-propellant engine
- Rayleigh–Bénard convection in phase changing materials
- Heat transfer enhancement in regenerative cooling passages

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

Devendra Prakash Ghate, Assistant Professor





Research Interest

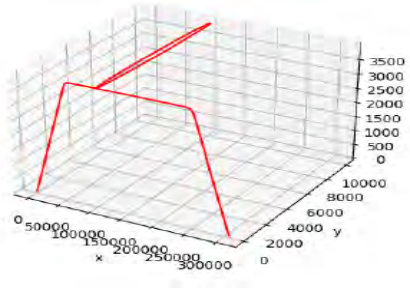
Trajectory Optimization, Multi-disciplinary Optimization, Adjoint Methods

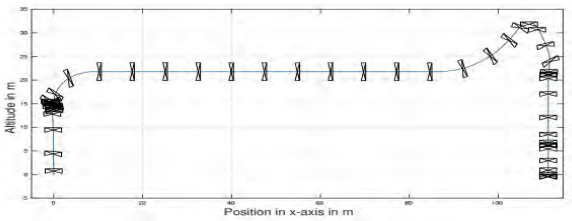
Research Highlights

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

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

Dhayalan R., Assistant Professor





Research Interest

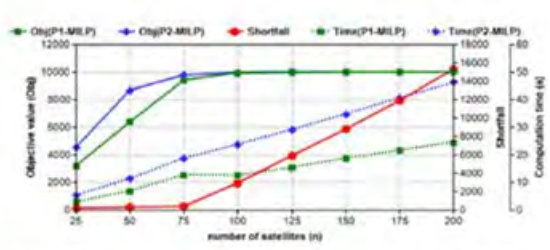
- Flight Dynamics and Control
- UAV design and Flight Tests
- System Identification
- Intelligent Unmanned Systems

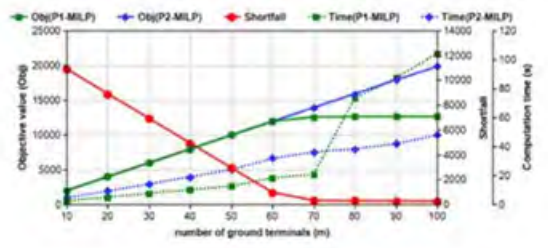
Research Highlights

- Automation of complete flight profile using LQR
- RL based control for Tail-sitter VTOL UAV
- Flight Dynamics of Flapping Wing UAV

Reference: https://iist.irins.org/profile/165447

Girish B. S., Associate Professor





Research Interest

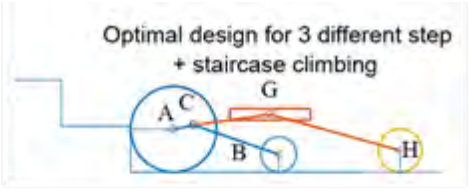
Operations research applications in production planning, scheduling, transportation and space systems

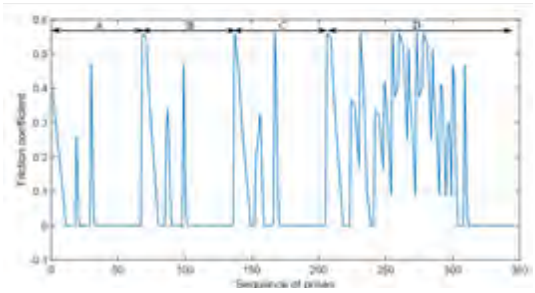
Research Highlights

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

Reference: https://iist.irins.org/profile/55854

Kurien Issac K., Senior Professor





Research Interest

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

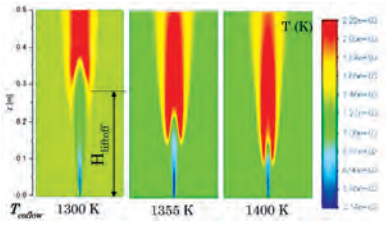
Research Highlights

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

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

Mahesh S., Assistant Professor

Inverse Diffusion Flame Regimes in Coaxial Burner



Lifted Jet Flame in Co-flow

Research Interest

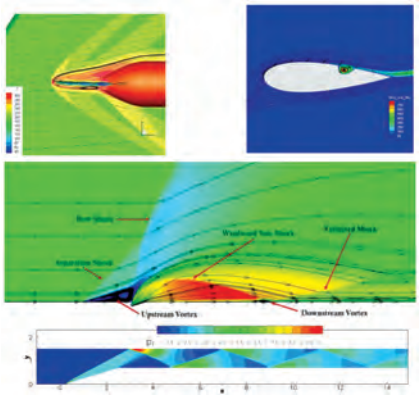
- Unsteady Reacting Flows
- Swirl Combustion
- Jet Flame Characterization

Research Highlights

- Characterization of Swirl Inverse Diffusion Flames
- Development of Annular Swirl Burner

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

Manoj T. Nair, Professor



Research Interest

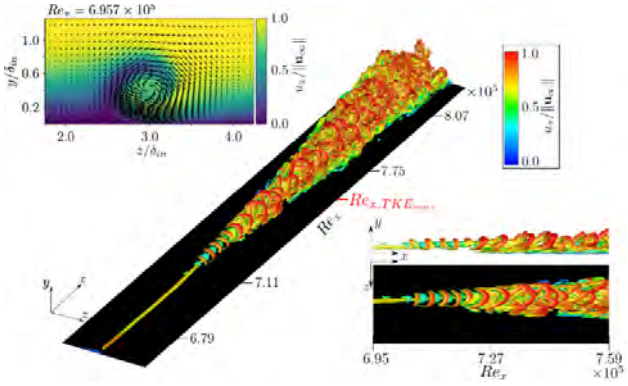
- Computational Fluid Mechanics
- Hypersonic Aerothermodynamics
- Aerodynamic Shape Optimization
- Compressible & Incompressible Flow
- Unsteady Flows
- Large Eddy Simulation

Research Highlights

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

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

Manu K. Vasudevan, Associate Professor



Research Interest

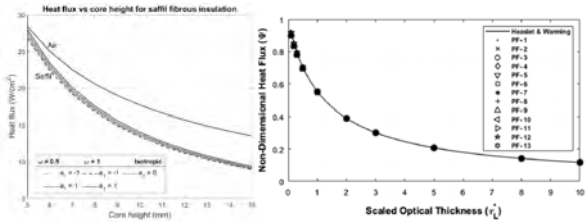
Flow instability and transition, Boundary layer flows, Stratified flows, Experimental and computational fluid mechanics

Research Highlights

- Direct numerical simulation of transitional flows

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

Pradeep Kumar P., Associate Professor



Research Interest

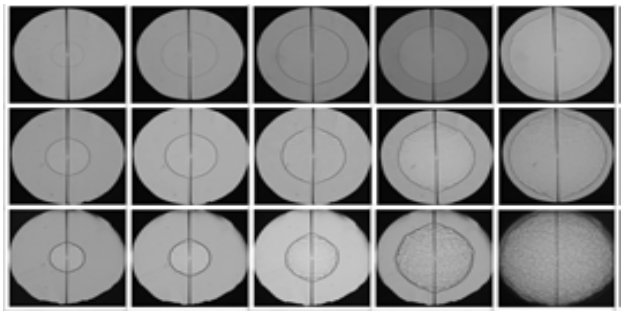
Two-phase flows, Electronic cooling, Radiation heat transfer in high temperature insulation, micro-scale flows and heat transfer

Research Highlights

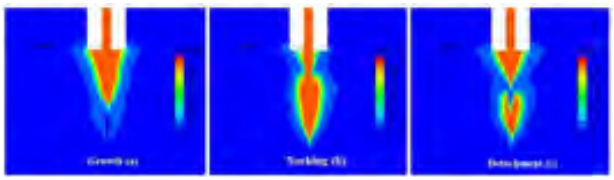
- Sizing of Insulation Panels with a Coupled Conduction and Radiation Heat transfer Model
- Assessment of discrete ordinate method for radiatively Participating, Anisotropically Scattering Gray planar Media [jointly with IISc]

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

Prathap C., Associate Professor



Spherical flame propagation of producer gas at 1 bar, 300K



Simulation of Direct Contact Simulation of steam in water

Research Interest

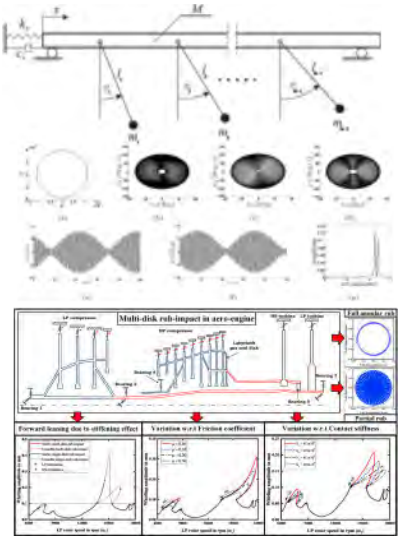
Combustion, Laminar Burning Velocity, Syngas, producer gas, chemical kinetics, Swirl flames, porous combustion, catalytic combustion, carbon fiber formation, biomass gasifier, IC engines, microgravity combustion, laser ignition, hybrid rocket propulsion, Direct Contact Condensation

Research Highlights

- Generated an accurate database on Laminar Burning velocity of oxy-n-dodecane, oxy-producer gas mixtures using spherical flame experiments
- Commissioned an optical cryobath for measuring the Direct condensation of steam in LN_2

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

Praveen Krishna I. R., Associate Professor



Research Interest

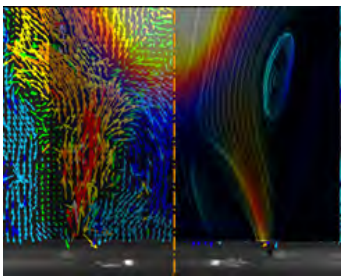
- Nonlinear Dynamics
- Vibro-Acoustics
- Fluid Structre Interaction
- NVH

Research Highlights

- Identification of energy dependent synchronization in coupled pendulums using semi-analytical method
- Response and stability analysis of a two-spool aero-engine rotor system undergoing multi-disk rub-impact

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

Rajesh Sadanandan, Associate Professor



Research Interest

Aerospace Propulsion

Rocket Propulsion: thrust augmentation, throttling

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

Clean Combustion

Burner development for natural gas fuels and biofuels (gaseous and liquid)

Optical and Laser Diagnostics

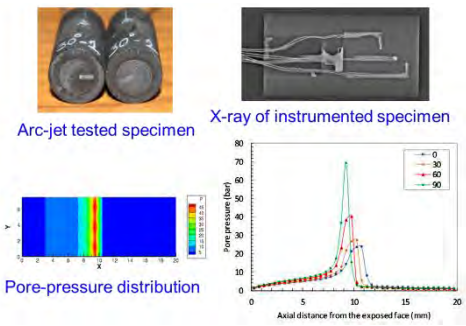
Schlieren, Luminosity, Chemiluminescence, kHz, PLIF, PIV, PDPA, TDLAS

Research Highlights

- Establishment of atmospheric test for combustion instability studies, developed effervescent based liquid fuel injectors and burners, gaseous fuel flexible burners for combustion applications
- Establishment of atmospheric test rig for atomization studies
- Laser based sensors for thermometry

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

Raveendranath P., Adjunct Professor



Research Interest

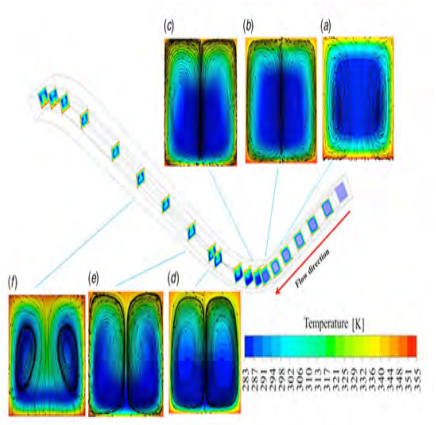
- Advanced Locking-free Finite Element Models
- Coupled numerical simulation of Ablative composites
- Modeling of mechanics of nano-structures

Research Highlights

- Developed 2D-axisymmetric finite volume model for thermochemical response of Carbon-Phenolic ablative composite
- Arc jet tests conducted on Carbon-Phenolic material prepared at different ply orientations
- Developed a novel analytical model for bending in nanobeams within the framework of Eringen's nonlocal elasticity theory

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

Salih A., Professor



Research Interest

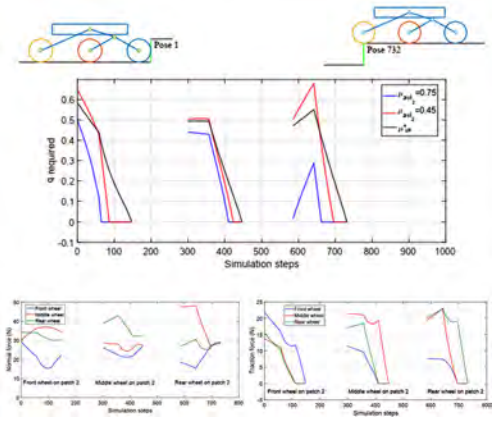
Level set based numerical simulation of multiphase flows, Bubble and drop simulations, Sloshing dynamics, Modelling of compressible liquids, Simulation of water hammer phenomena.

Research Highlights

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

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

Sam Noble, Reader



Research Interest

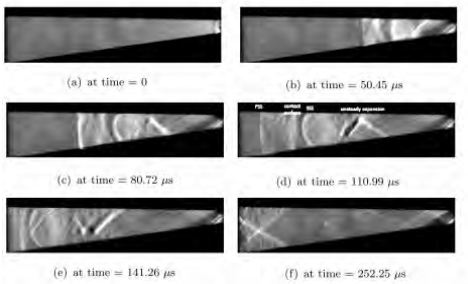
- Design and synthesis of mechanisms
- Robotics/ assitive mechanisms
- Optimal design

Research Highlights

- Optimal design and performance optimization of wheeled rover on uneven hard terrain
- Deployment mechanism for multifold mirror/ reflectors

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

Satheesh K., Associate Professor

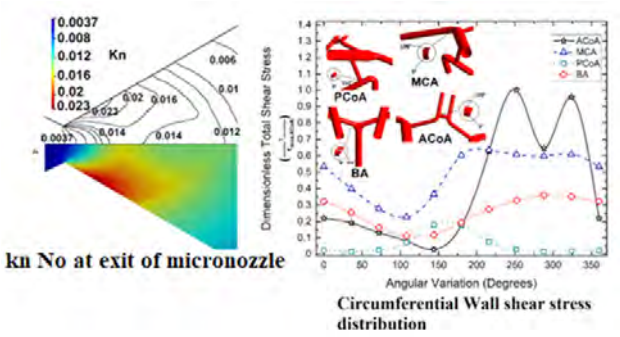


Research Interest

- High speed flow, shock tunnels
- Quantitative diagnostics in high enthalpy flows

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

Shine S. R., Associate Professor



Research Interest

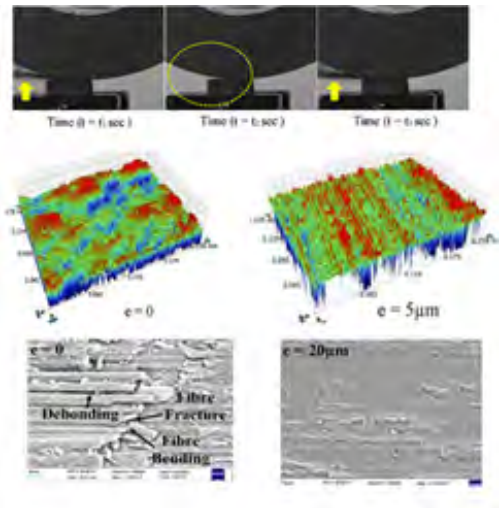
- Heat transfer in space applications
- Bio-fluid mechanics
- Bio-heat transfer

Research Highlights

- Developed a human thermoregulatory model incorporating morphological details of Indians.
- Hemodynamics associated with the arteries of the circle of Willis (CoW) is analyzed to identify possible cerebral aneurysm initiation locations using computational methods.

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

V. S. Sooraj, Associate Professor



Research Interest

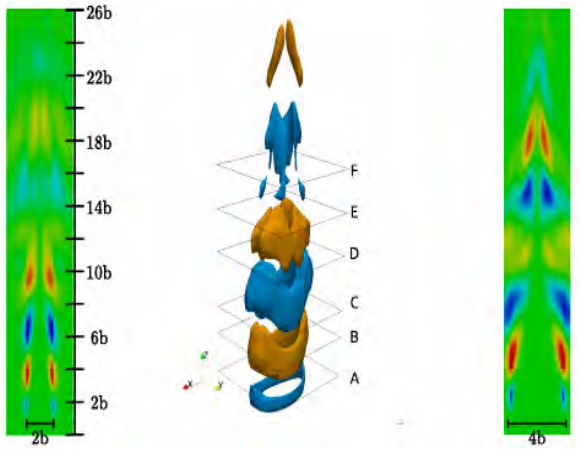
Machining and Precision manufacturing, machining of difficult to cut materials/ composites, Additive Manufacturing

Research Highlights

- Establishment of a minimal damage machining strategy for CFRP composites for Aerospace applications
- Green machining strategies for difficult to machine Materials

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

Vinoth B. R., Associate Professor



Research Interest

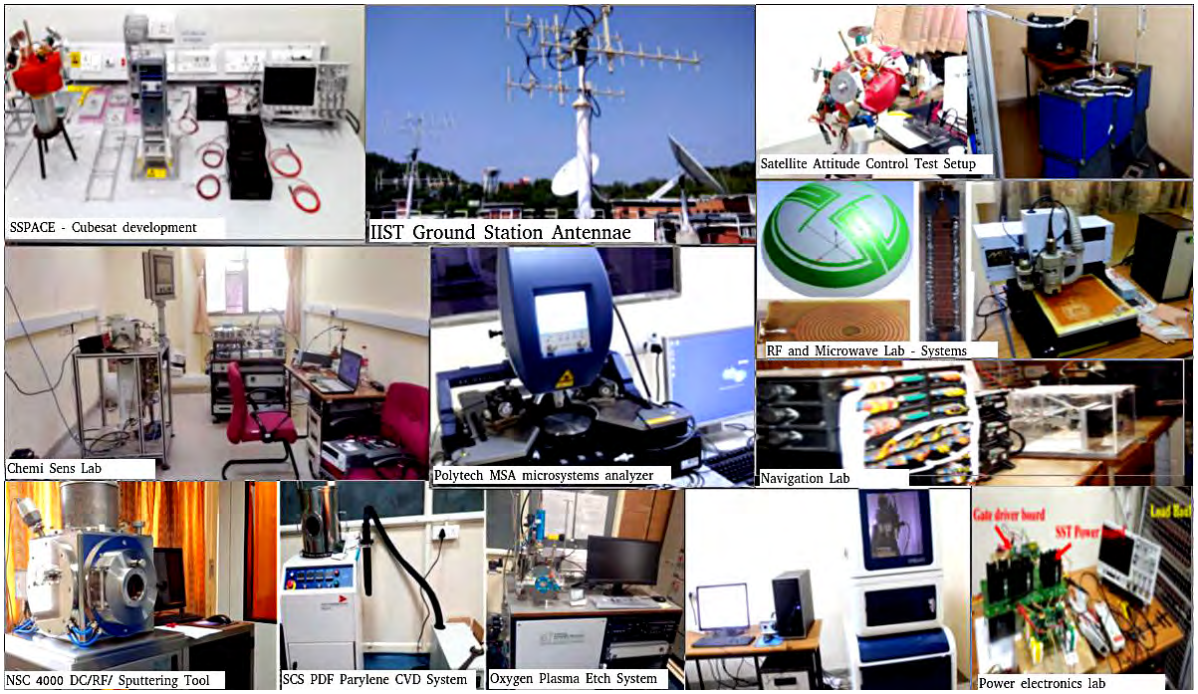
- Flow instability
- Aerodynamics and Aeroacoustics
- Flow and acoustic control

Research Highlights

- Stability and experimental studies of low-density jets
- Bi-Global stability analysis of fountains
- Stability analysis of unsteady pipe flows

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

Core Research Focus

(a) Computer vision, intelligent robotics, & Machine learning with applications

(b) Control systems

(c) Digital Signal Processing and Communication Systems

(d) Microwave and RF design

(e) Power electronics

(f) VLSI and Microsystems

Fact File

Number of faculty	:	23
Technical Staff	:	09
Non-teaching staff	:	02
Research Scholars	:	63
Number of PhDs conferred	:	02

Laboratory/Research Facilities

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

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

- Faculty members from the department have been contributing actively to Advanced Space Research Group (ASRG) activities. Five projects have been approved till date under ASRG scheme [https://www.iist.ac.in/departments/projects/46].
- Department has initiated MoUs with various In-

dustries / R&D organizations including TU-Delft, University of California San Diego, University of California Irvine, Institution of Electrical and Electronics Engineers, New Jersey, and Iowa State University, Ames, IA, USA.

- Faculty members from the Department hold various externally funded projects, funded by DST-SERB, DBT, DRDO, Indian Oil Ltd etc. [https://www.iist.ac.in/departments/projects/46]

Research Outcomes - Fact File

International Journal	:	45
Conferences	:	50
Book & Book chapters	:	04
Patents	:	01 (Under review)

Contributions to Institute Level Space Missions

- Department of Avionics is actively involved in Small- spacecraft Systems and PAyload CEntre (SSPACE) activities at IIST, with core focus on On-board Computer System, Communication System, Electrical Power System, Attitude Determination & Control System and other Payload activities.
- Faculty from department is also involved in IIST Ground Station Development.
- Department is involved in ISRO collaborative missions including Advanced Retarding Potential Analyzer for Venus Mission (ARIS-Venus).
- Faculty from the department was included in the Inter Centre Study Team constituted for an advanced R&D technology project titled 'General Purpose Humanoid Robot with Human-like Degrees of Freedom' under My Vision 2030 of DTDI, ISRO HQ as well as other robotics projects.

Outreach Activities

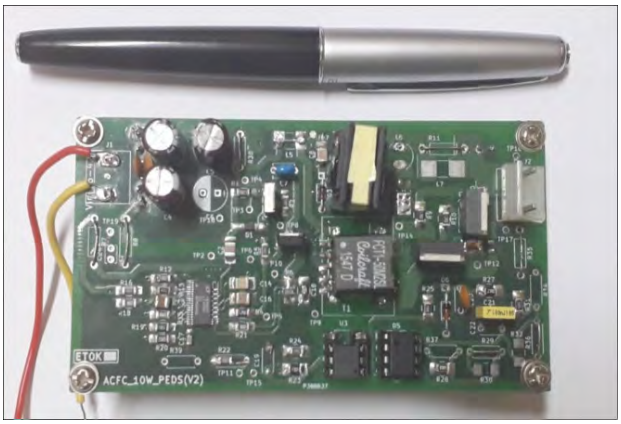
- More than 32 conferences/ workshops/ seminars/ FDPs, participated by faculty members
- Reviews/ Technical discussions at ISRO/ other organizations/ Institutes
- Contributed to various outreach activities for school/ college students initiated by Student Activity Board at IIST

Startup activities

The department of Avionics is supporting Vashishtha Research Pvt. Ltd. Company in incubation and innovation.

Faculty Profile

Anindya Dasgupta, Associate Professor



Research Interest

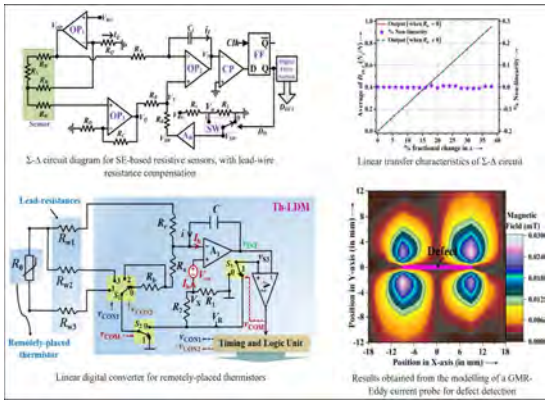
- Modelling and control of Power Electronics(PE) systems for distributed generation and microgrids

Research Highlights

- Sensorless current control schemes for Dual Active Bridge Converters
- Control schemes for modular solid state transformers

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

Anoop C. S., Associate Professor



Research Interest

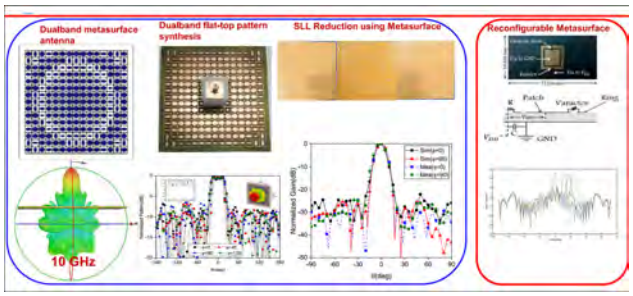
- Measurements and Instrumentation
- Sensor-Interfacing Electronics
- Direct-Digitizers
- Analog Signal Processing

Research Highlights

- Design, Analysis, and Performance Evaluation of a Linearized Thermistor–Based Temperature Measurement System
- Σ-Δ-based Direct Digitizers with Lead-Wire Compensation for Single-Element Resistive Sensors
- Semi-Analytical Method for Modelling of EC Probes for Defect Detection in Metallic Specimens

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

Basudeb Ghosh, Associate Professor



Research Interest

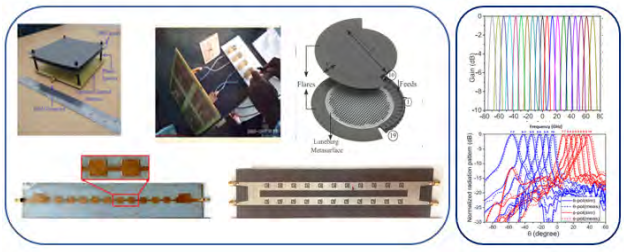
- Antenna design
- Computational electromagnetics
- Microwave Imaging
- Radar Technology

Research Highlights

- Metasurface Antenna Analysis and Design
- Reconfigurable antenna for Space Applications
- Synthetic Aperture Radar (SAR) antenna

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

Basudev Majumder, Assistant Professor



Research Interest

- RF & Microwave Engineering
- Applied Electromagnetics
- Antennas
- RF Circuit design
- MMIC

Research Highlights

- Design and analysis of phase-shifter-less beam steering antenna design using the leaky wave concept
- Design and analysis of metasurface based metallic and dielectric lenses for RF energy harvesting purpose
- Design and analysis of Fabry Pérot antenna with a multilayer superstrate having nonuniform unit cells as a receiving antenna for radio frequency (RF) energy harvesting applications

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

Chinmoy Saha, Associate Professor

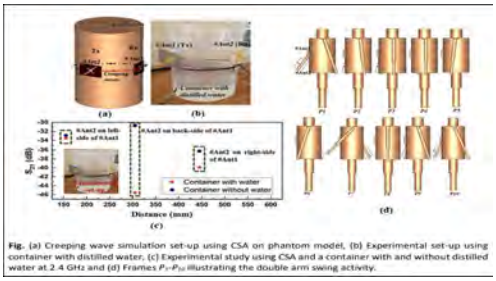
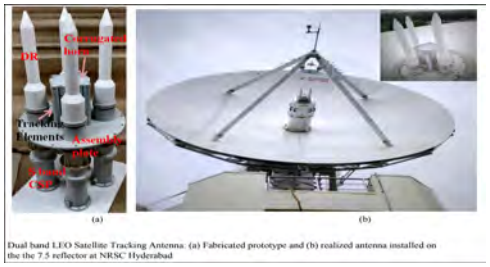


Fig. (a) Creeping wave simulation set-up using CSA on phantom model, (b) Experimental set-up using container with distilled water, (c) Experimental study using CSA and a container with and without distilled water at 2.4 GHz and (d) Frames P_1-P_{10} illustrating the double arm swing activity.



Dual band LEO Satellite Tracking Antenna: (a) Fabricated prototype and (b) realized antenna installed on the the 7.5 reflector at NRSC Hyderabad

Research Interest

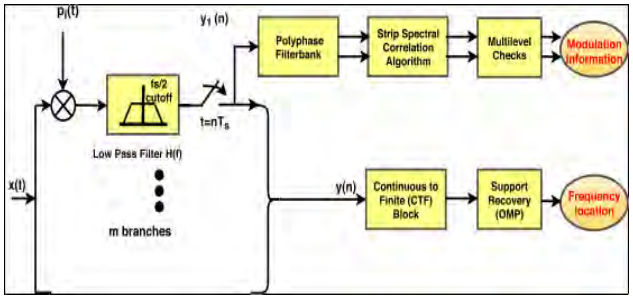
- Planar Microwave circuits and systems
- Wireless Power Transfer
- Energy Harvesting
- Feed Antennas for Satellite Tracking Applications
- Metamaterial
- Printed and Ultra Wide band (UWB) antennas
- Multifunctional Antennas
- THz Technology
- Bio-electromagnetics and Biomedical Engineering

Research Highlights

- Investigation of Creeping Wave Characteristics and Double Arm Swing Activity using Twelve Cylinder Phantom Model
- Realization of Dual Band (S-X) Ground Station Antenna for Low Earth Orbit (LEO) Satellite Tracking Application: A successful ongoing collaboration between IIST and NRSC Hyderabad

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

Chris Prema S., Assistant Professor



Research Interest

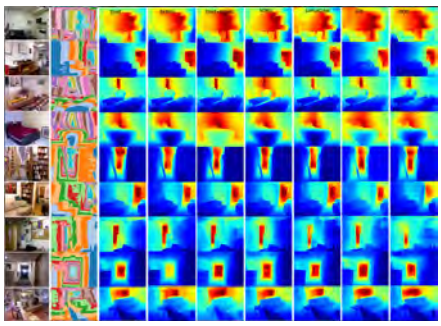
- Cognitive Radio
- 5G Communications
- Automatic Modulation and Classification of signals
- Spectrum Prediction/ Sharing

Research Highlights

- Low-Complexity Cyclostationary Feature Detection Using Sub-Nyquist Samples for Wideband Spectrum Sensing
- Cooperative Automatic Modulation Classification using Higher Order Statistics

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

Deepak Mishra, Professor & Head



Research Interest

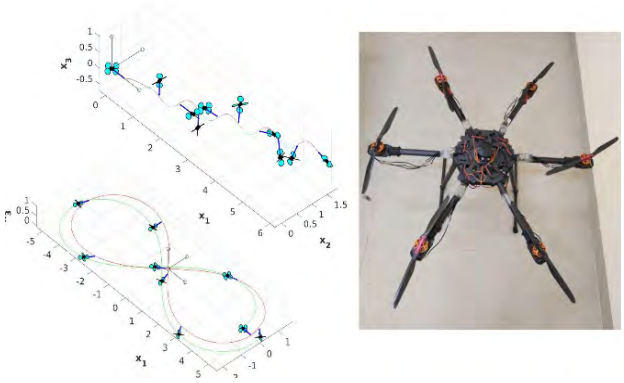
- Computer vision
- Deep learning
- Machine learning

Research Highlights

- Edge loss functions for deep-learning depth-map, the figure show Depth map prediction after training, a visual comparison (Dark blue is nearest and dark red is farthest) using several Modified loss functions.
- Visual object tracking using guided samples for the input of CNN rather than random samples for object tracking.

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

Harsha Simha M. S., Associate Professor

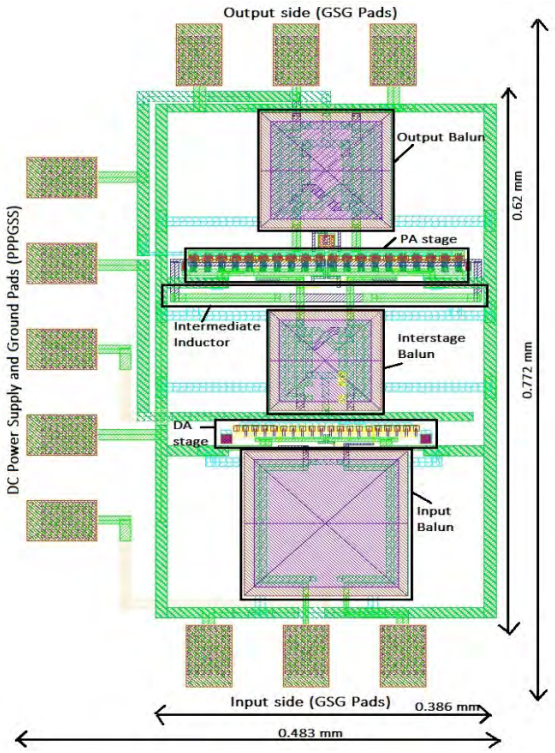


Research Interest

- Nonlinear Dynamics and Control
- Spacecraft Attitude Control
- Geometric Control and Lie Group Variationally Integrators

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

Immanuel Raja, Assistant Professor



Wideband millimeter-wave power amplifier for 5G applications in 65nm CMOS

Research Interest

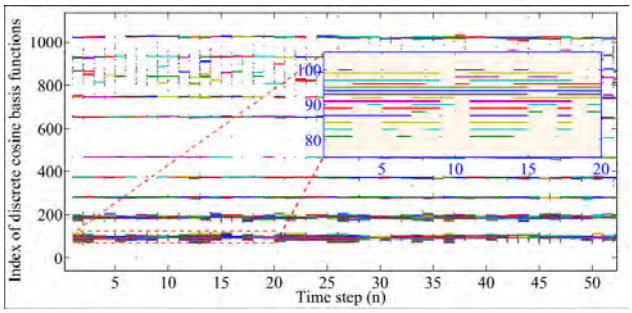
- Analog, mixed-signal and RF IC design

Research Highlights

- Wideband 5G millimeter-wave CMOS Power Amplifier with more than 6 GHz bandwidth in 65nm CMOS
- Low area closed-loop phase correction circuitry for millimeter-wave beam forming applications in 65nm CMOS
- Analog frontend for temperature sensors operating on a unipolar supply, with capability for amplifying negative input signals in CMOS

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

Lakshmi Narayanan R., Associate Professor



Research Interest

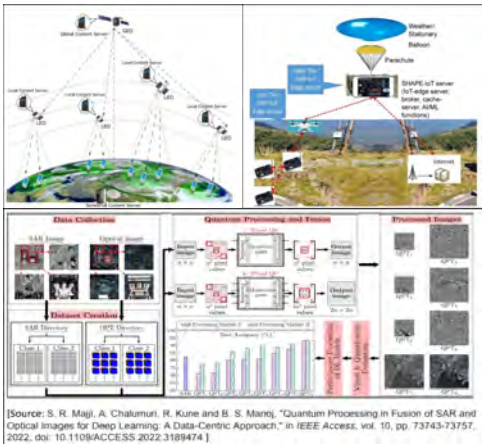
- Statistical Signal Processing
- Compressive Sensing

Research Highlights

Development of efficient methods for compressed sensing and estimation of a signal with a time varying sparse representation on a suitable orthogonal basis.

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

Manoj B. S., Professor



Research Interest

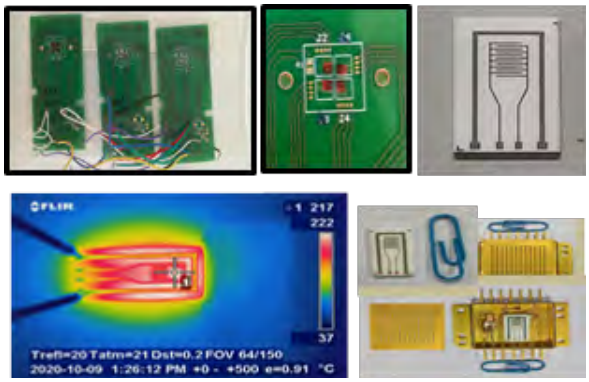
- Software Defined Networks
- Satellite-based IoT
- 6G-satellite network integration
- Quantum Machine Learning
- Complex Networks
- Wireless Mesh Networks
- Network security

Research Highlights

- Proposed a novel concept called Space-Based Hosting Service for delivering low latency web content delivery to unconnected rural areas.
- Developed a multi-tier hierarchical IoT system and associated solutions
- Developed Quantum Big Data Analytics solutions

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

Palash Kumar Basu, Associate Professor



Research Interest

- Gas and Bio sensors

Research Highlights

- HSFC and IIST has signed a MoU to develop gas sensors for upcoming HSP. A calibration facility has been established for the same purpose. NH_3 and CO sensor are optimized and both are under fabrication.

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

Priyadarshnam, Professor

Prototype of OBC developed at IIST

Prototypes of Magneto torquers (air core & permander core)

Research Interest

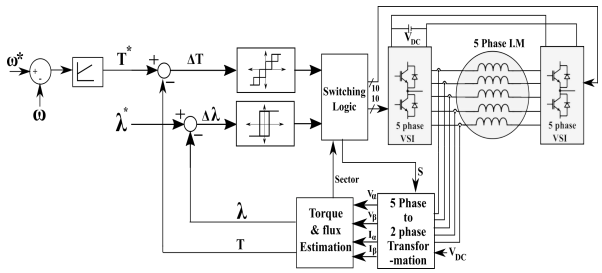
- Control Systems
- Small Spacecraft missions
- Spacecraft Engineering
- Systems Design for Space missions

Research Highlights

- InspireSat1 launch and operations
- Spacecraft systems and development for AHAN, XNAV, ISAT2, Astrobiology, Linear Airbearing and others
- Parameterisation of states and inputs for Linear Dynamical Systems

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

Rajeevan P. P., Associate Professor



Research Interest

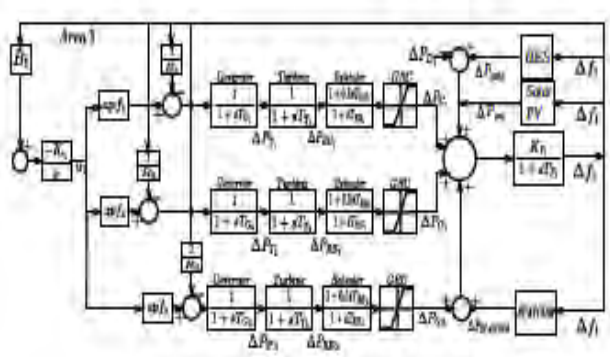
- Power Electronics
- Control of Electric Drives
- Renewable Energy
- Power Quality

Research Highlights

- A new series voltage compensated induction generator system with open-end stator windings that can deliver active power to the grid without drawing reactive power from the grid was proposed.
- A new control scheme for speed range extension of scalar-controlled induction motor drive with open-end stator windings was proposed.
- A new five level torque comparator based DTC scheme for dual inverter fed five phase open-end winding induction motor drive that facilitates elimination of harmonic voltages in the auxiliary plane was developed.

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

Rajesh Joseph Abraham, Associate Professor



Research Interest

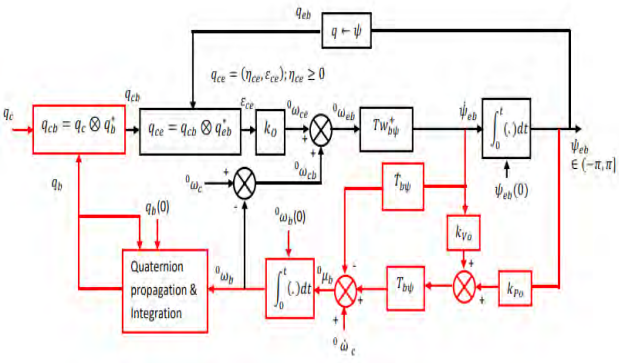
- Control System and applications

Research Highlights

- Robust control design techniques - H∞ and mixed sensitivity H∞ - have been designed to control the speed of a DC motor with structured uncertainties in the parameters and are tested in closed-loop configuration with the plant.
- A linear time invariant model for a STATCOM is developed to regulate area frequencies in the presence of the utility side Automatic Generation Control (AGC) for the maiden time.

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

Sam K. Zachariah, Adjunct Professor



Research Interest

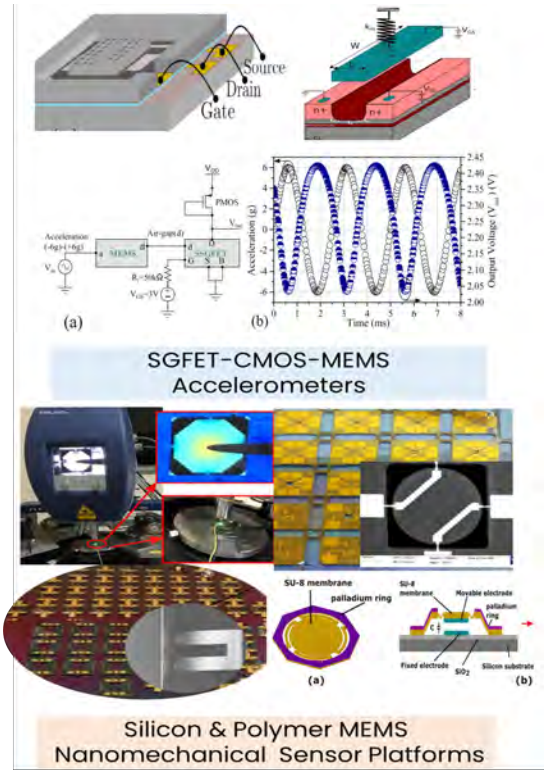
- Motion Control of Autonomous Robots

Research Highlights

- Principal Investigator for a DRDO Funded Research Project on Locomotion Control of Biped and Quadruped Robots.
- Developed a novel algorithm for singularity- free attitude Control of Rigid body based on 4-axis gimbal angle paramerization of Attitude error.

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

Seena V., Associate Professor



Research Interest

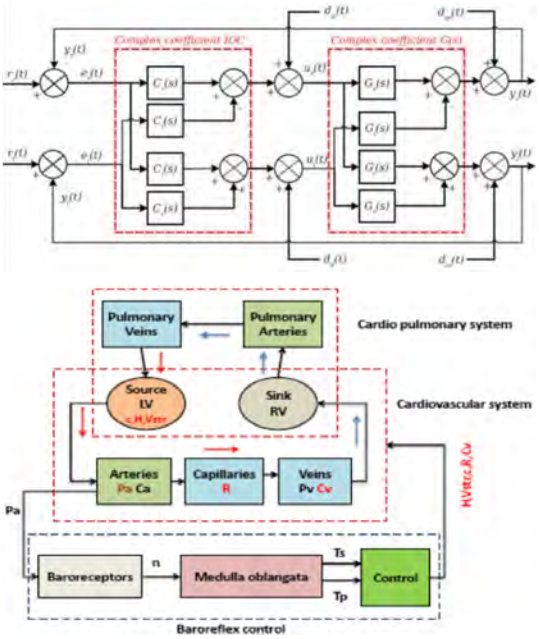
- NEMS
- Microelectronics & Microsystems
- CMOS-MEMS integration

Research Highlights

- Development of CMOS-MEMS Sensors with FET based Transduction. Our recent research aims at developing robust MEMS-FET accelerometer sensor that can operate in open loop and closed loop.
- Research on Nanomechanical Membrane flexure and Cantilever Sensor Platforms with good potential for the development of various applications ranging from cost effective micro sensors in the field of environmental monitoring to homeland security.
- A novel hydrogen sensor with polymer ring-flexure- membrane nanomechanical MEMS architecture with electrostatic transduction for ultra-sensitive gas sensing applications.

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

N. Selvaganesan, Professor



Research Interest

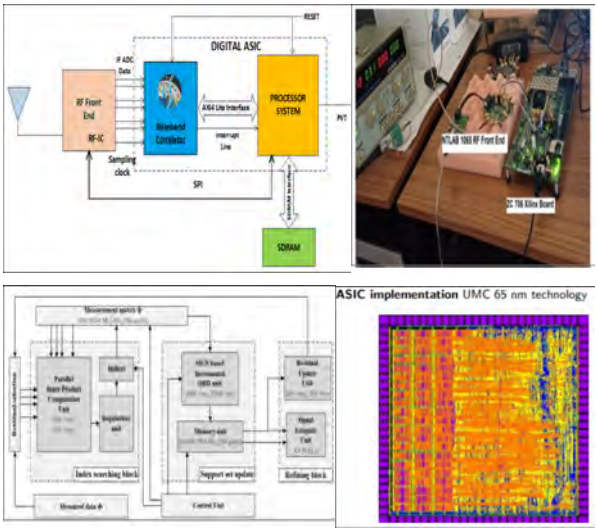
- Modelling and Control System Design

Research Highlights

- Unified Complex Coefficient PID Controller Tuning for Complex Coefficient System: Tuning of complex coefficient proportional integral derivative controller is proposed for such systems to meet the desired frequency domain specifications in positive and negative frequencies.
- Baroreflex control model for cardiovascular system: Developed a heart modelled by Muliers approach, systemic vasculature, baroreceptor sensor using stress-strain based Voigt model and Hodgkin-Huxley based autonomic nervous control.

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

Sheeba Rani J., Associate Professor



Research Interest

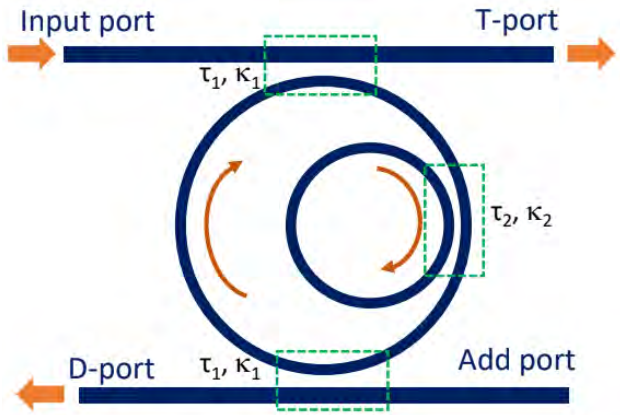
- Signal Processing algorithms and architectures

Research Highlights

- Simple Lossless algorithm and architecture for satellite onboard processing
- Algorithm and architectures for sparse signal recovery problems
- IRNSS baseband receiver architectures and navigation algorithms

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

Sooraj R., Associate Professor



Research Interest

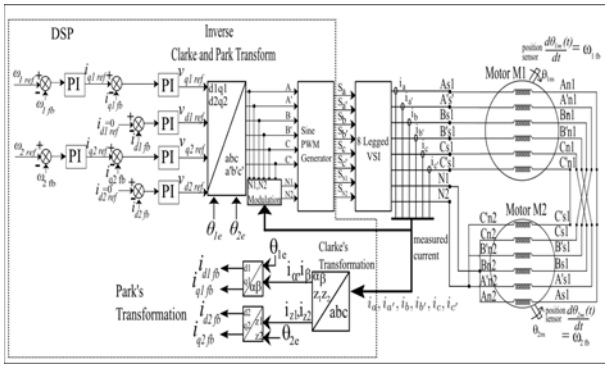
- Semiconductor Optoelectronics
- Photonics

Research Highlights

- Realization of optical logic gates using microring resonators (MRR)
- Proposed a new configuration for MRR resulting in smaller device size compared to parallel and series MRR configurations, thus leads to better footprint management in interconnect architecture.

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

R. Sudharshan Kaarthik, Associate Professor



Research Interest

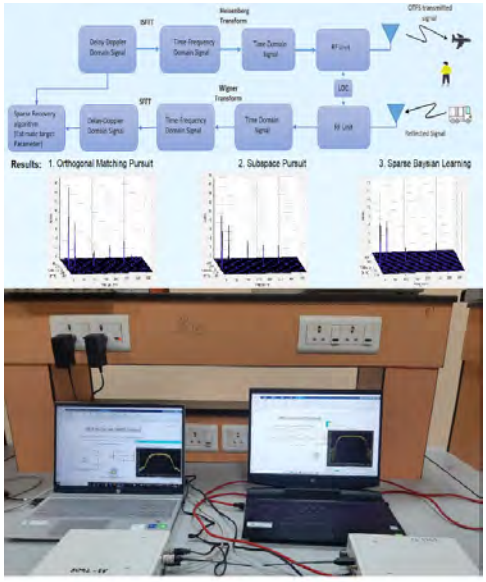
- Power Electronics
- Electric Drives
- Multilevel Inverters

Research Highlights

- Multi-phase Drives with fault-tolerance: a decoupled control strategy with zero torque pulsations for series-connected synchronous split-phase motors under OC fault condition is explored.
- Developed a new grid connected induction generator (IG) system having open-end stator windings with a series reactive power compensator.
- Paralleling inverters: Increasing the power capability of a power electronic converter system requires inverters to be connected in parallel. A novel dynamic carrier changing technique has been developed for modulating parallel inverters.

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

Vanidevi M., Assistant Professor



Research Interest

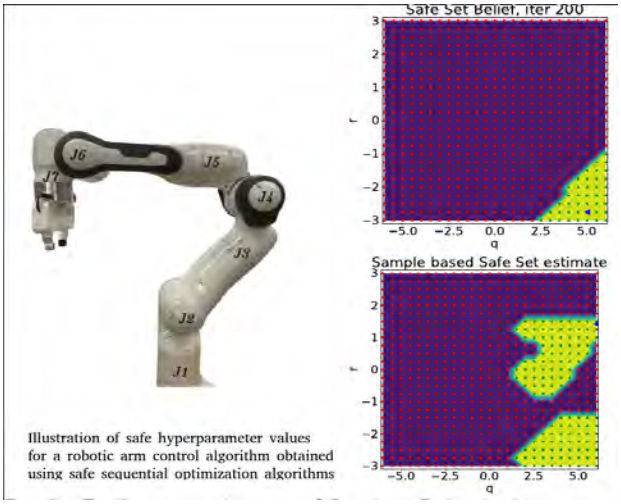
- Millimeter wave signal processing, Massive MIMO system, MIMO OFDM system
- Hybrid beamforming design in Millimeter wave channel – 5G communication
- Orthogonal time frequency space Modulation – 6G modulation candidate
- Joint communication and Radar system

Research Highlights

- Developed SIC-based hybrid precoding using sub-connected and fully-connected structures for multi-user (MU) cases.
- Analyzed different sparse signal recovery algorithms like the orthogonal matching pursuit (OMP), the subspace pursuit (SP), and the sparse Bayesian learning (SBL) for an OTFS-based monostatic single-input-single output (SISO) radar system that uses CPPS.
- A network ECG-SRCNN (ECG Super-Resolution Convolutional Neural Network) is proposed to reconstruct a high- resolution ECG signal from its low-resolution counterpart.

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

Vineeth B. S., Assistant Professor



Research Interest

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

Research Highlights

- Characterization of age of information for multiple access protocols and deterministic scheduling protocols.
- Development of safe sequential optimization algorithms - posterior sampling viewpoint for hyperparameter optimization.

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

Department of Chemistry

2.3 Department of Chemistry

Vision

To be a centre of symbiosis of different branches of science, ultimately leading to novel material development, their testing and applications in diverse areas of Materials Science & Technology including future space programmes 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 design and development of novel Materials & Processes to meet future technological challenges
- To achieve ultimate goal of contributing to India's future space missions including Human in Space Program

Core Research Focus

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

Fact File

Number of faculty	:	09
Technical Staff	:	02*
Tutors /Technicians	:	02*
Non-teaching staff	:	02*
Research Scholars	:	26
Number of PhDs conferred	:	03

Laboratory / Research Facilities

Department of Chemistry, IIST owns 01 instructional lab and 09 research labs which include

- Material Characterization Laboratory
- Nano Science Laboratory
- Inorganic Chemistry Laboratory
- Organic Chemistry Laboratory
- Polymer Processing Laboratory
- Chemistry Engineering Laboratory
- Physical Chemistry Laboratory
- OLED/ Battery Fabrication Lab
- General Chemistry Laboratory

Research and Developments

- Faculty members from department have been contributing actively to Advanced Space Research Group (ASRG) activities. Total four projects have been approved till date under ASRG scheme.
- Faculty members from Department holds various externally funded projects, funded by DRDO, DBT, HSFC-Gaganyan and ISRO.

Research outcomes - Fact File

International Journal	:	33
Conference Papers	:	08
Book & Book chapters	:	08
Patents	:	01
Projects	:	07

Contributions to Institute Level Space Missions

- 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.
- Faculty from department is fully involved in the development of novel materials, their testing and

applications in diverse areas of Material science & technology, including materials to cater to the demand of future space program of the nation.

- The Human Spaceflight Centre funded Space Biology payload for the developmental flights of Gaganyaan Mission (PIs: Dr. K. G. Sreejalekshmi and Dr. Ravikumar Hosamani) has cleared the System Concept Review and the prototype for test purposes was developed. TIFR Mumbai has entered into an MoU with IIST for sharing the hardware developed by IIST for conducting their planned spaceflight research.
- Faculties from department undertake interdisciplinary research projects funded by IIST and projects in areas of high relevance to space program in collaboration with ISRO.

Outreach Activities

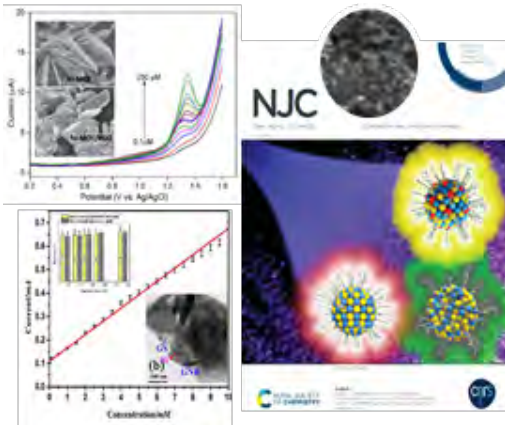
- More than 25 conferences/ workshops/ seminars/ FDPs, participated by faculty members
- Reviews/ Technical discussions at ISRO/ other organizations/ Institutes
- Contributed to various outreach activities for school/college students initiated by Student Activity Board at IIST

Startup activities

1. **SPACETIME 4D Printing Solutions LLP** is a startup initiative by one of the alumni from 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.
2. **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

Gomathi N., Associate Professor



Research Interest

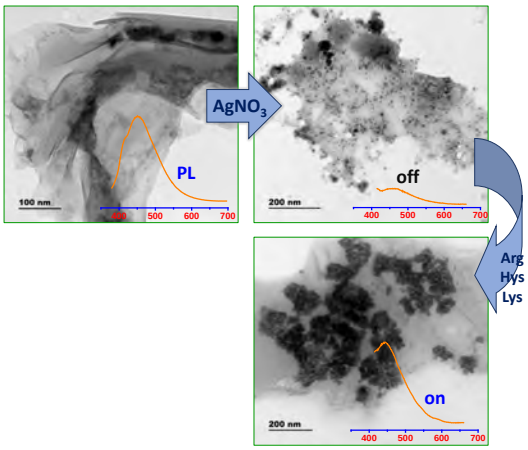
Electrochemical Sensor, Fluorescence Sensor, Metal Organic Framework (MOF), Graphene based Material

Research Highlights

- Graphene and MOF based electrodes for electro-chemical sensing of biologically important analytes
- Quantum dot-based fluorescence sensor for heavy metal detection

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

Jobin Cyriac, Associate Professor



Research Interest

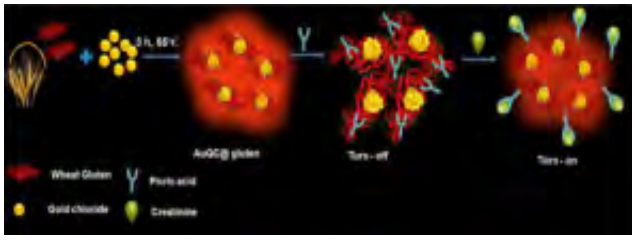
Nanomaterials-based fluorescence chemical sensors, 2D materials, Surface-enhanced Raman spectroscopy (SERS), Mass spectrometry

Research Highlights

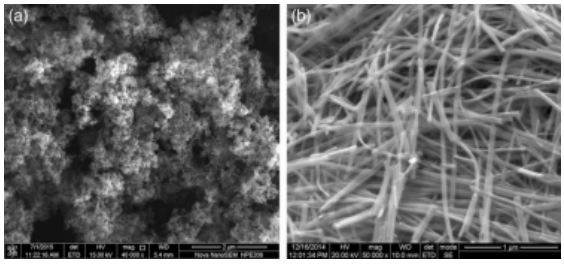
Detection and screening of basic amino acids using the luminescence switching of WS_2 nanosheets- Ag_2O nanoparticles composite

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

Kuruvilla Joseph, FRSC, Outstanding Professor



DOI: 10.1021/acssuschemeng.7b00273



DOI: 10.1002/pc.25058

Research Interest

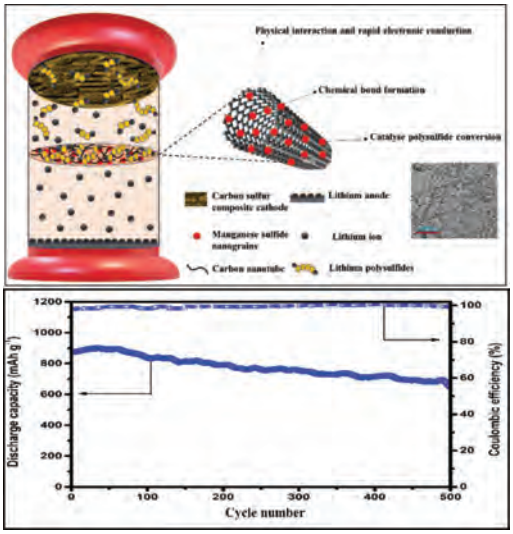
- Epoxy Toughening using novel toughening agents
- Materials for EMI shielding
- Carbon fibers from lost cost precursors
- Biosensors
- Advanced polymer composites for multi-functional applications
- Polymer based flexible aerogels

Research Highlights

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

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

Mary Gladis J., Associate Professor



Research Interest

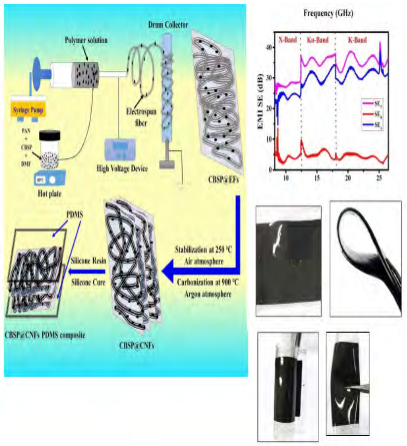
Materials for Li-ion/ Metal-sulphur batteries & Super Capacitors, corrosion & coatings, trace elemental Analysis

Research Highlights

- Efficient polysulfide shuttle mitigation using Potential polysulfide immobilizer for lithium-Sulphur batteries
- Porous carbon electrodes for high performance Symmetric super capacitors

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

Nirmala Rachel James, Professor



Research Interest

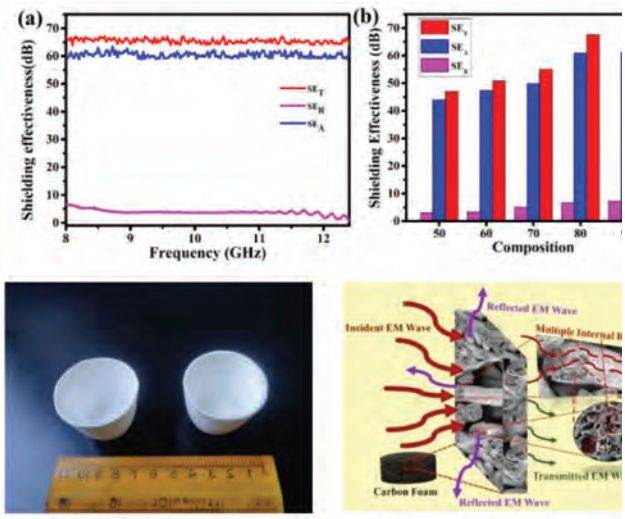
- Polymer nano composites for EMI shielding
- Polymers for biomedical applications

Research Highlights

Flexible polymer composites based on carbon nanofibres from electrospun polymers with high EMI shielding property

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

Prabhakaran K., Professor



Research Interest

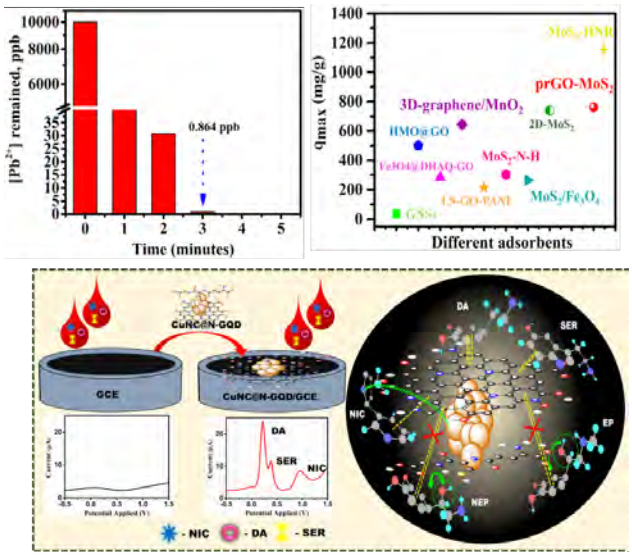
Ceramic processing using natural binders, SiBOC foams for thermal protection, Materials for microwave dielectric and EMI Shielding applications

Research Highlights

Established high throughput slip-casting usingnatural rubber latex. Carbon foams with high EMI shielding capability is developed from biomasses.

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

Sandhya K. Y., Professor & Head



Research Interest

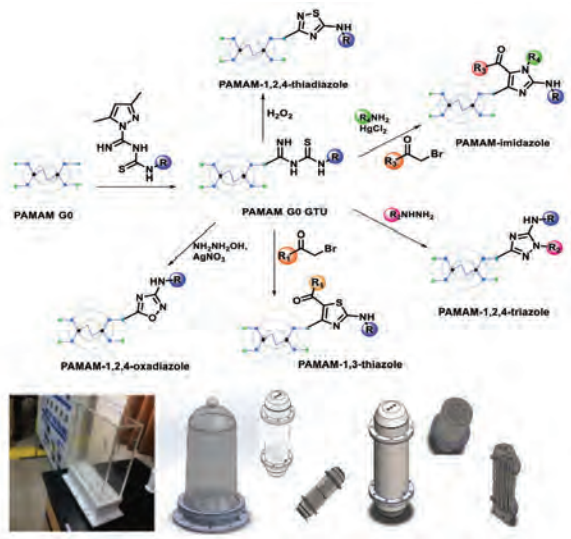
Design, synthesis and application of nanofunctional materials for various applications such as toxic metal ions removal from water, electrodes for electrochemical sensing & energy storage.

Research Highlights

- Development of a material for ultra-selective and rapid removal of Pb (II) ions from water within ≤ 3 minutes.
- Synthesized a stable copper nanocluster-nitrogen doped graphene quantum dots which exhibits simultaneous sensing properties towards dopamine, serotonin and nicotine.

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

Sreejalekshmi K. G., Associate Professor



Research Interest

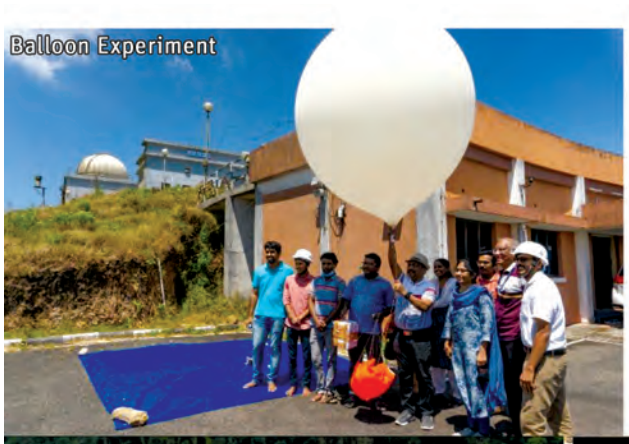
Molecular materials, Smart materials, Microgravity research, Space Biology & Bioastronautics

Research Highlights

- Design and synthesis of dual state emissive Molecular library
- PAMAM conjugates as nanotherasonistics
- Materials and systems for cabin air revitalisation

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

Department of Earth and Space Sciences



2.4 Department of Earth and Space Sciences

Vision

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

Mission

- To offer postgraduate and doctoral programs in 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 Focus

(a) Astronomy and Astrophysics

(b) Atmospheric and Ocean Sciences

(c) Remote Sensing

(d) Planetary Geosciences

Fact File

Number of faculty	:	14
Tutors /Technicians	:	03*
Non-teaching staff	:	01*
Research Scholars	:	39
Number of PhDs conferred	:	05

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

Research and Developments

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 - Fact File

International Journal	:	48
Conference Papers	:	11
Book and Book chapters	:	03

Contributions to Institute Level Space Missions

- Faculty members of the department are contributing to the Small Satellite Payload development (SSPACE) acitivities, 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

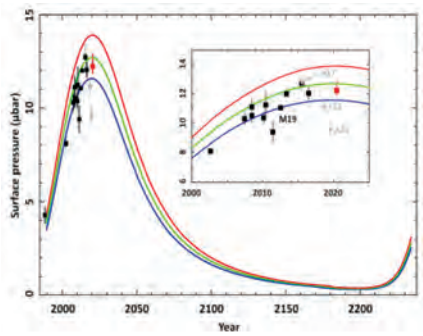
- Conduct various outreach/training programmes to school and college students such as Geoconnect, Astronomy School, STORM etc. Also contribute actively to various outreach activities for school/ college students initiated by Student Activity Board of IIST.
- Students and faculty members of the department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

Start-up activities

Bhuh Pramaan is a Bengaluru based start-up company being incubated under the Space Technology Innovation and Incubation Centre, IIST. Being mentored by the Remote Sensing Faculties of the Department of Earth and Space Sciences, 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

Anandmayee Tej, Professor



Research Interest

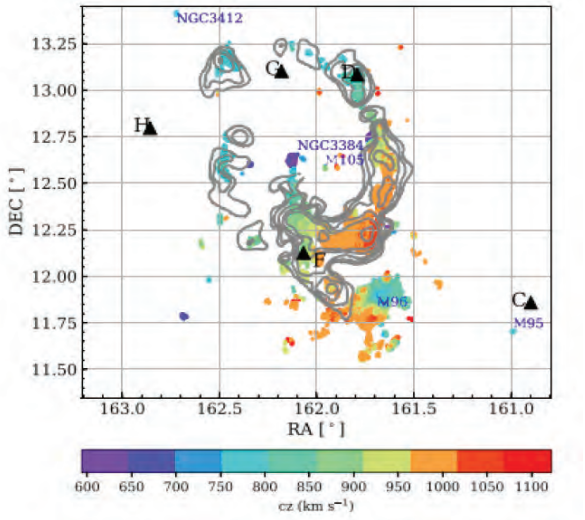
- High-mass star formation
- Particle acceleration in stellar systems
- Probing atmospheres of solar system objects from stellar occultation events

Research Highlights

The results also show that Pluto's atmosphere has been in a plateau phase since mid-2015, a result which is in excellent agreement with theoretical models. This plateau epoch is preceded by a period in which a threefold monotonic increase of pressure was observed. The NASA New Horizons flyby in 2015 July revealed a large depression, Sputnik Planitia, filled by N_2 ice, which appears to be the main engine that controls the seasonal variation of atmospheric pressure during one seasonal cycle. A gradual decline should then last for two centuries under the combined effects of Pluto's recession from the Sun and the prevalence of the winter season over Sputnik Planitia. This occultation was particularly timely as it can test the validity of the current models of Pluto's atmosphere evolution. Moreover, as Pluto is now moving away from the Galactic plane as seen from Earth, stellar occultations by the dwarf planet are becoming increasingly rare, making this event a decisive one.

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

Anand Narayanan, Professor



Research Interest

Evolution of baryons over cosmic time

Physical and chemical conditions in diffuse gas in extended regions surrounding galaxies and intergalactic space

Fast flowing feedbacks from Active Galactic Nuclei

Research Highlights

- Published one of the largest surveys of metal enriched diffuse gas outside of galaxies in the low redshift universe using data from the Hubble Space Telescope
- Mapped the distribution of chemical elements, including atomic hydrogen in the larger environment of the Leo - I group of galaxies in the nearby universe
- Reported detections of cold gas in galaxy intragroup and galaxy intracluster environments

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

A. Chandrasekar, Outstanding Professor

Research Interest

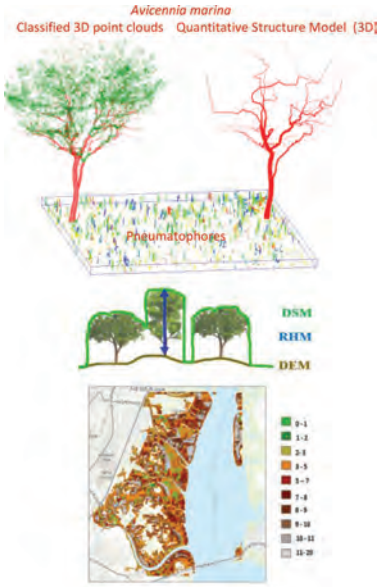
Land atmosphere interaction processes, Data Assimilation

Research Highlights

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

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

L. Gnanappazham, Associate Professor



Research Interest

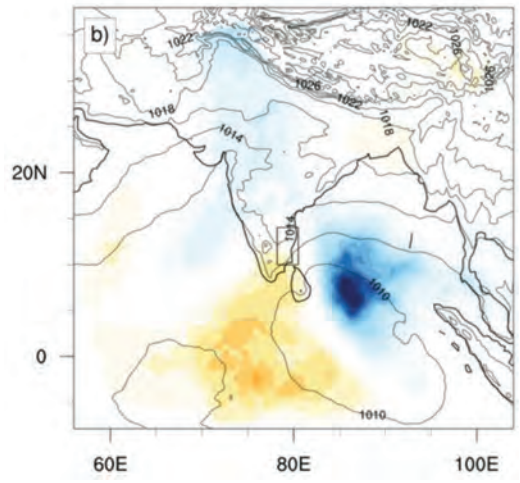
Harnessing the potential of Geospatial tools for Biophysical characterisation of Indian mangroves.

Research Highlights

- Stereo images from Remote sensing satellites to derive relative tree height of the forests
- LiDAR survey for field data collection for structural properties
- Upscaling the property retrieval from field data to space borne data
- Monitoring the vegetation diversity using recent high resolution data

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

Govindan Kutty M., Associate Professor

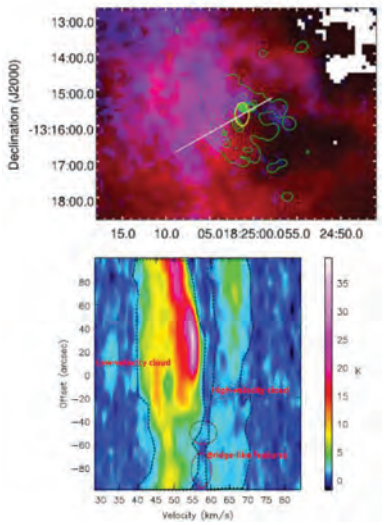


Research Highlights

- Forecast sensitivity analysis provides an objective way to understand how a forecast variable responds to changes in the initial conditions
- Impact of diagonal approximation is tested using multivariate forecast sensitivity analysis using ensembles
- Multivariate sensitivity substantially improves the sensitivity estimates
- The potentail error growth regions in the models can be identified using Multivariate sensitivity analysis

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

Jagadheep D. Pandian, Associate Professor



Research Interest

High-mass star formation, HII regions, Galactic Structure, Astrophysical Masers

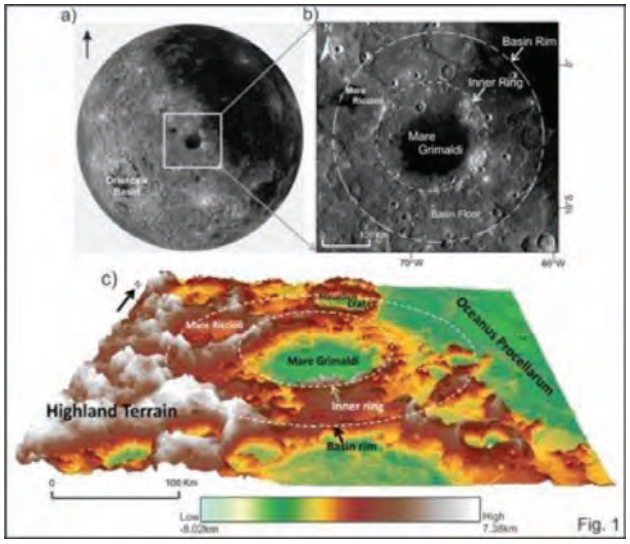
Research Highlights

The GLOSTAR survey: Overview of the survey, 6.7 GHz methanol masers in Cygnus X region and star formation in the central molecular zone

- Detection of a cloud-cloud collision in G18.148–0.283
- A study of astrochemistry towards 6.7 GHz methanol masers

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

Rajesh V. J., Associate Professor



Research Interest

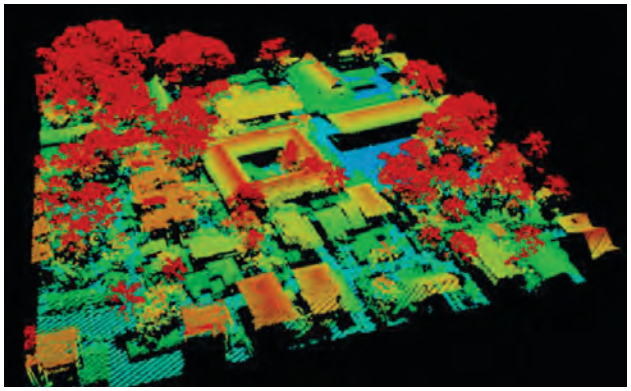
Planetary Geology, Planetary Analogues, Petrogenesis of ultramafic rocks, and stable C- and O-isotopes of carbonates

Research Highlights

- Thermal and volcanic history of the Moon between ~ 4.0 Ga and 1.2 Ga
- Younger basalts of Erathosthenian epoch were reported for the first time in the Grimaldi basin
- Spectrochemical features of Cr-spinels from Sittampundi Anorthosite Complex (SAC) in southern India and their significance on lunar spinel compositional variations

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

A. M. Ramiya, Assistant Professor



Research Interest

Processing of High-resolution Remote sensing data

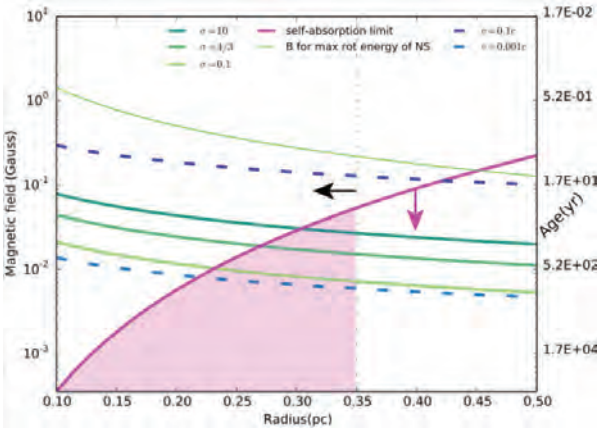
Focus on: LiDAR Point cloud processing and applications

Research Highlights

- CityGML based 3D models from Aerial LiDAR point cloud
- Conscious Point cloud: Spatio-Semantic Query
- Deep-learning algorithms for labelling LiDAR point cloud/ High resolution image

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

Resmi L., Associate Professor



Limits on the magnetic field and age of the radio nebula associated with FRB121102.

Research Interest

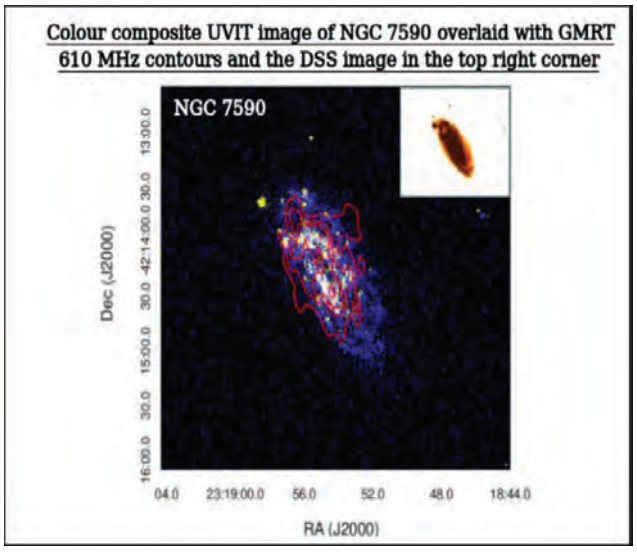
Gamma-Ray Bursts, Electromagnetic counterparts gravitational wave sources, Fast Radio Burst

Research Highlights

From radio observations of its persistent counterpart, inferred the progenitor of the Fast Radio Burst FRB121102. We found that it can be an ordinary Neutron Star, ~ 500 years old, of < 40s period, and with a magnetic field > 1012G.

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

Sarita Vig, Professor



Research Interest

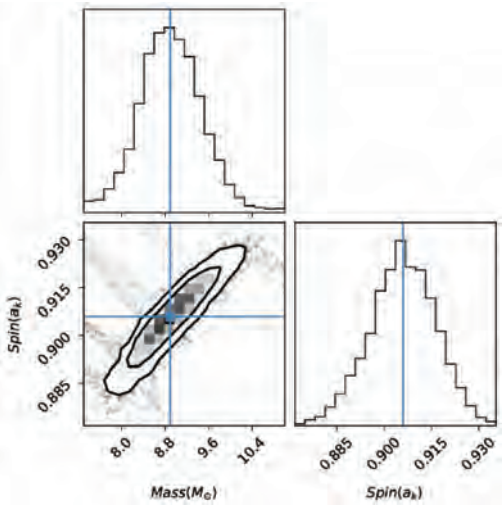
Cold dust content in nearby galaxies, Early phases in massive star formation, Photodissociated regions towards star-formation in Interstellar medium

Research Highlights

- Used ultraviolet observations from UVIT-AstroSat and radio observations from GMRT, India, to probe the cold dust content of 4 nearby galaxies *IC 5325, NGC 7496, NGC 7590 and NGC 7599*
- [CII] emission towards RCW36 observed and analysed with Fabry-Perot spectrometer on-board TIFR 100-cm balloon borne telescope.
- Observed fragmentation of cloud, infall and outflow signature towards massive protocluster G31.41+0.31 using the International facility Atacame Large Millimetre Array (ALMA), Chile.

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

Samir Mandal, Professor



Research Interest

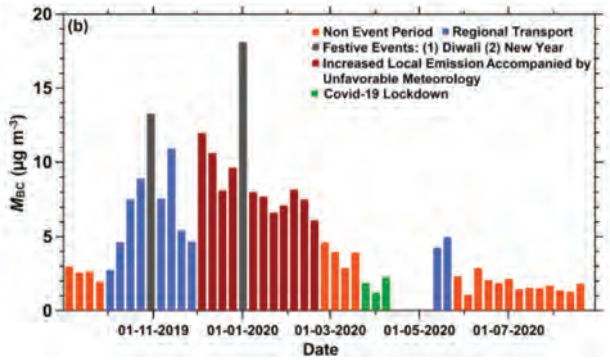
Accretion physics and raditive processes around compact objects; Study of Tidal Disruption Events; Spectral and temporal variability of AGNs

Research Highlights

We study the outbursting sources LMC X-1, LMC X-3 and MAXI J0637-430 using various X-ray instruments data across the globe. We model the data to extract the spectral and accretion parameters. We constrain mass and spin of both LMC X-1, LMC X-3 as shown in the figure. Finally, we connect the spectral and accretion parameters to address the accretion dynamics of the sources.

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

P. R. Sinha, Assistant Professor



Research Interest

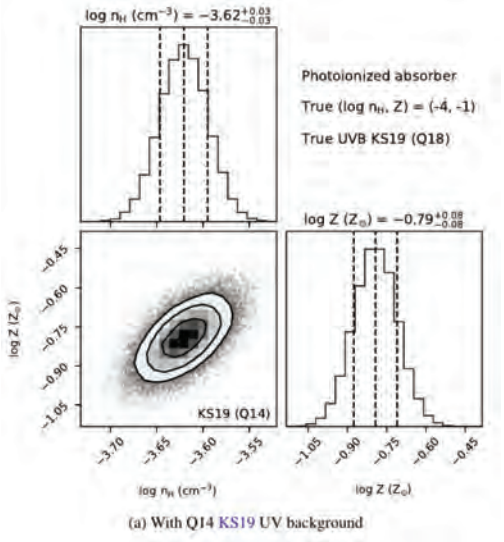
Air-borne measurement of aerosols, Dynamics of aerosols Radiative impact of aerosols Aerosol-cloud-monsoon interaction

Research Highlights

Reported Black Carbon aerosol mass concentrations (M_{BC}) with characterized continuous soot monitoring system (COSMOS) and presenented major sources of BC in winter and post-monsoon in New Delhi and recommendation for air quality mitigation strategy (in collaboration with University of Tokyo and National Physical Laboratory (NPL), India.

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

Vikram Khaire, DST-Inspire Faculty



(a) With Q14 KS19 UV background

Research Interest

Intergalactic and circumgalactic medium, Galaxy formation, Machine learning applications in Astronomy, Astrobiology

Research Highlights

- New method to measure the thermal stateof the intergalactic medium Impact of UV background on the properties of the circumgalactic medium
- Searching exoplanets in transit using a novel machine learning technique

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

Department of Humanities

2.5 Department of Humanities

Vision

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

Mission

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

Core Research Focus

(a) Space Economics, Technology Diffusion and Economic Development

(b) Cultural studies

(c) Gender Studies

(d) Supply chain Management

(e) Space Technology and Society

(f) Study of the Marginalized Communities

Fact File

Number of faculty	:	05
Technical Staff	:	01*
Tutors/ Technicians	:	01*
Non-teaching staff	:	01*
Research Scholars	:	14
Number of PhDs conferred	:	02
Number of Post-Doctoral students	:	01

Laboratory / Research Facilities

Department of Humanities, IIST owns 1 instructional lab and 1 research lab

- Language Lab
- Audio Visual Lab

The Audio Visual lab offers 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 and language lab in training of English language.

Research and Developments

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

Research outcomes - Fact File

International Journal	:	12
Conference Papers	:	02
Conferences Attended	:	09
Plenary Sessions	:	59
Book Chapters	:	03
FDP Organized	:	01

Contribution to Indian Space Research

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

Outreach Activities

- **Nirmaan**, the social outreach club of IIST is manned by the department. It provided online classes on Space Science, Technology, Values and Career Guidance to the students of an NGO - KAP in the Jan-Mar 2022 session. Masks and sanitizers were distributed to the students. **Dhwani**, a program to audio record the text books was also done to help the visually challenged students of Jagathy Blind School.
- Faculty members have delivered quite a good number of talks in the form of keynote addresses and had handled plenary sessions for conferences/ workshops/ seminars/ webinars and FDPs. Acted as Resource person on issues related to the new Pandemic - Covid Art and also on creative writing/ gender sensitization at various centres and universities.
- They have been reviewers of various technical forums of ISRO, State Govt. and Central Govt., and various national level universities and institutes, and also editors/ subeditors of reputed academic journals.
- Contributed genuinely as motivational speakers in various forums at schools, colleges and universities.
- Actively engaged in the print, visual and social media panel discussions on international and socioeconomic and cultural topics.
- Faculty members and research scholars of the Department were actively engaged in various fundraising programmes as part of the pandemic.

Contributions to Institute Level Activities

- Department has initiated the NPTEL local chapter and the institute level SPOC where the Single Point of Contact is Dr. Babitha Justin.
- A five-day online FDP on Life Skills Management was organized by the Department imparting the 21st century skills to the faculty members of various Universities and colleges.
- Department of Humanities is actively involved in many institute-level programs and committees. Various institute level clubs like Nirmaan, Quiz club, MUN Club and Movie Club are manned by the Department.

Audio Visual Lab

Faculty Profile

Babitha Justin, Associate Professor

Research Interest

Cultural Studies, Gender studies, Pandemic Visual Cultures

Research Highlights

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

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

Gigy J. Alex, Associate Professor

Research Interest

Food and Cultural Studies, Science Fiction

Research Highlights

- Investigation of cookbooks from Kerala as part of cultural studies
- Food narratives as memorial sites for recreating the past, a study based on select short stories

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

Lekshmi V. Nair, Professor

Research Interest

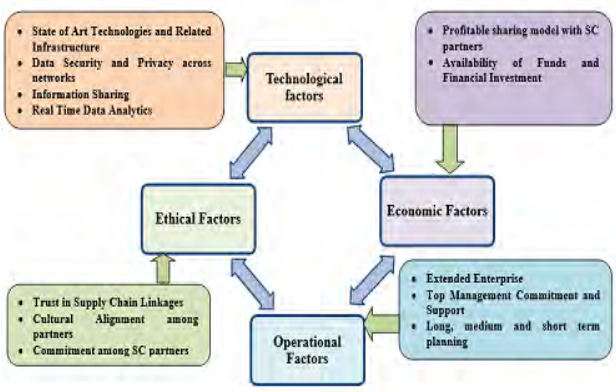
Science, Technology & Society, Study of Marginalized Communities, Social Research

Research Highlights

- Impact of Mass Media on the Education of Adivasi Communities in Kerala
- Impact of Telemedicine in the Remote Areas of India

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

V. Ravi., Professor



Research Interest

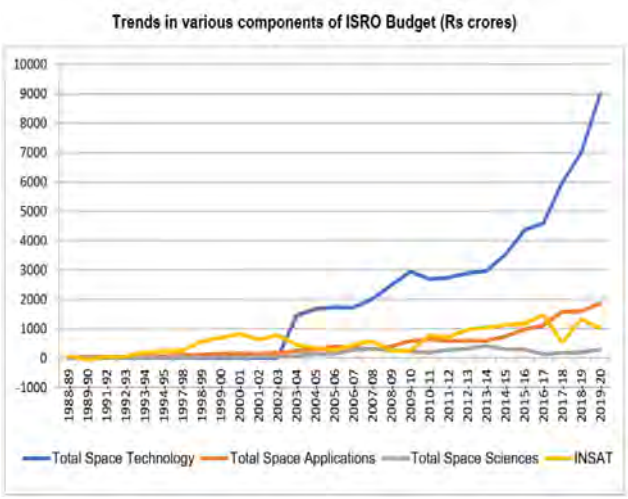
Supply Chain Management, Reverse Logistics, Digital Supply Chain, Sustainable supply chains, multi-criteria decision making.

Research Highlights

- Modelling of interrelationships amongst enterprise and inter-enterprise information system barriers affecting digitalization in electronics supply chain
- Analysis of enablers of sustainable supply chain management in electronics industries

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

Shaijumon C. S., Associate Professor & Head



Research Interest

Space Economics, Development Economics, Agricultural Economics, Macroeconomy and Neuro Economics

Research Highlights

- Estimation of Space Economy of India
- Estimation of Impacts of Space Technology in Indian Economy
- Cost-Benefit analysis of Space Technology
- Understanding the role of Extension activities in Rice cultivation

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

Department of Mathematics

2.6 Department of Mathematics

Vision

To be an excellent centre for research and education in Mathematics and its applications, recognised nationally and globally for its high-quality research and teaching.

Mission

- Provide excellent teaching and research environment for undergraduate, postgraduate, and doctoral students for critical and innovative thinking in different areas of Mathematics and its applications.
- Foster research collaborations at the national and international levels to create a dynamic and active research environment.
- Make IIST a national-level knowledge hub for different mathematical activities.

Core Research Focus

(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	:	17
Number of PhDs conferred	:	04

Laboratory / Research Facilities

- Programming lab
- M.Tech Machine Learning instructional lab
- Mathematics Research lab

Seminar/ Conference/ Workshop Arranged

- 22nd December 2021 (National Mathematics day celebration): "Polynomials: Genesis and some early results", Prof. Neena Gupta, Theoretical Statistics and Mathematics Unit, Indian Statistical Insitute, Kolkata.
- 7th March 2022 (National Science day and International Womens' day): "Topology of Algebraic varieties", Prof. Jaya. N. Iyer, Institute of Mathematical Sciences, Chennai.
- 9th March 2022 (National Science day and International Womens' day): "The (Un) Bearable Irrationality of π", Prof. Sujatha Ramdorai, University of British Columbia, Canada.

Research and Developments

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

Research outcomes - Fact File

International Journal	:	23
Conference Papers	:	08
Book Chapters	:	01

Faculty Profile

Anil Kumar C. V., Professor & Head

Research Interest

Dynamics and Rheology of micro particle suspensions, Time series analysis

Research Highlights

- Developed equations governing the migration of an arbitrary forced spheroid in quiescent/ simple-shear/ uniform/ oscillating/ oscillating-shear flows at low Reynolds number.
- Reported strong dependence of the size and shape of the attractor on the controlling parameters such as aspect-ratio, Reynolds-number, amplitude and frequency of the external force and initial orientations or positions of the suspension.
- The dependencies of oscillations on the parameters can be utilized for better separation of particles.
- The results can be used to validate complex software developed for suspension flow problems.
- The conventional Q-curves for prolate spheroid show a greater variation with respect to the particle parameters.
- It is confirmed that Basset memory force causes a phase shift in the oscillations, while the other two forces have no effect on the phase.
- The linear scaling of amplitude on particle aspect ratio observed for the spheroids may give insight into the physics, especially regarding the quantum of velocity disturbances due to particle size.

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

Deepak T. G., Professor

Research Interest

Applied Probability, Stochastic Processes, Queueing Theory

Research Highlights

- Conducted modelling and performance analysis of some communication related queueing systems.
- Developed a new class of multivariate probability distributions which form a dense subset of the set of all probability distributions defined on any k-orthotope in $[0,\infty)^k$. This class can be used to model insurance data associated with the patients suffering from relapsed diseases like ulcer, cancer etc.
- Carried out parameter estimation and computed Fisher information for some functions of phase type random variables which can be used for modelling some random phenomena arising in practical situations.
- Developed a general class of circular probability distributions which form a dense subset of the set of all circular distributions. Also demonstrated how this new class of distributions could be used for modelling some wind directional data.

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

Kaushik Mukherjee, Associate Professor

Research Interest

My primary research interest is associated with the development of efficient numerical techniques (with emphasis on both theoretical and computational aspects) such as Finite Difference and Finite Element methods on various layer-adaptive meshes for numerical approximation of partial differential equations (PDEs), specifically, singularly perturbed PDEs, which often arise in several branches of engineering and applied mathematics including fluid dynamics, gas dynamics, heat transfer, semiconductor device modeling, financial modeling, mathematical biology, chemical-reactor theory etc.

Research Highlights

- Developing a parameter-uniform globally second-order accurate new FMM in combination with temporal Richardson extrapolation for a class of singularly perturbed parabolic convection-diffusion PDEs with regular boundary layer.
- Pursuing stability and convergence analysis of a new second-order FMM (in space) for a class of singularly

perturbed parabolic convection-diffusion PDEs with strong interior layers.

- Extending convergence analysis of higher-order parameter-uniform numerical methods for semilinear singularly perturbed parabolic PDEs with smooth data.
- Proposing a novel approach for efficient numerical approximation of a coupled system of singularly perturbed time-delay parabolic PDEs on generalized adaptive mesh.

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

Natarajan E., Associate Professor

Research Interest

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

Research Highlights

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

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

Prosenjit Das, Associate Professor

Research Interest

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

Research Highlights

- Discovered the structure of A^2-fibrations having fixed point free locally nilpotent derivations.
- Proposed the notion of residual rank and residual rigidity of locally nilpotent derivations of affine fibrations.

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

Raju K. George, Outstanding Professor

Research Interest

Mathematical Theory of Control, Machine Learning

Research Highlights

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

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

N. Sabu, Professor

Research Interest

- Partial Differential Equation, Mathematical Elasticity, Homogenization

Research Highlights

- Two-dimensional approximation of eigenvalue problem for this piezoelectric shells with variable thickness.

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

Sakthivel K., Associate Professor

Research Interest

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

Research Highlights

- Analyzed the optimal control problem of minimizing the vorticity of the flow field subject to the dynamics specified by the damped Navier-Stokes-Voigt model.
- Studied the inverse problem of reconstructing the spatial load in the damped Kirchhoff–Love plate equation from final time-measured displacement using the variational method.
- Derived stability estimates for determining the spatial load in the plate model by applying the variational approach and singular value decomposition.

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

Sarvesh Kumar, Associate Professor

Research Interest

My primary scientific interests lie in the area of computational PDEs; in particular, I focus on the development of suitable finite volume, finite element, discontinuous Galerkin and virtual element methods for the approximation of the PDEs occurring in science and engineering.

Research Highlights

- Proposed new virtual element formulations for the approximations of optimal control problems governed by diffusion problems.
- Developed a new class of virtual element methods for approximating nonstationary Stokes, Navier-Stokes, and poroelasticity problems.
- Carried out convergence analysis of locking free four fields conservative finite element formulations for Biot's consolidation law.
- Focusing on the development of conservative virtual element methods for the approximation of miscible displacement problems in porous media.

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

K. S. Subrahamanian Moosath, Professor

Research Interest

Differential Geometry and Applications, Information Geometry.

Research Highlights

- Conformal submersion with horizontal distribution is defined which is a generalization of the affine submersion with horizontal distribution.
- A necessary and sufficient condition for a semi-Riemannian manifold to become a statistical manifold in the case of a conformal submersion with horizontal distribution is proved.
- Obtained a necessary and sufficient condition for the tangent bundle to become a statistical manifold with respect to the Sasaki lift metric and the complete lift connection.
- A necessary and sufficient condition is obtained for statistical manifold structures to be dual to each other for a non-degenerate equiaffine immersion.
- Centro-affine immersion of codimension two into a dually flat statistical manifold is defined. Also, proved that the statistical manifold realized in a dually flat statistical manifold of codimension two is conformally-projectively flat.

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

S. Sumitra, Associate Professor

Research Interest

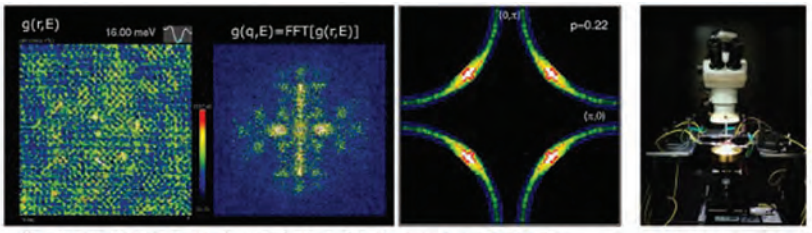
Kernel Methods, Deep Learning and Topological data Analysis

Research Highlights

- Designed Kernels for analysing Graph Data
- Developed Centrality based Active Learning techniques for Graph Data
- Developed techniques for improving Generative Adversial Networks. Developed Scale Ranking Estimator (SRE), which is trained using self-supervision. SRE enhances the disentanglement in directions obtained by existing unsupervised disentanglement techniques. These directions are updated to preserve the ordering of variation within each direction in latent space. Qualitative and quantitative evaluation of the discovered directions demonstrates that our proposed method significantly improves disentanglement in various datasets. We also show that the learned SRE can be used to perform Attribute-based image retrieval task without further training.

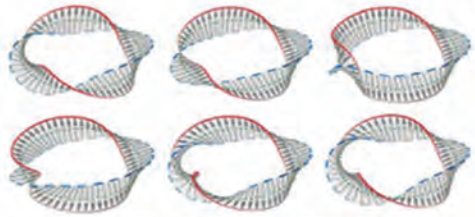
Reference: https://www.iist.ac.in/mathematics/sumitra

Department of Physics



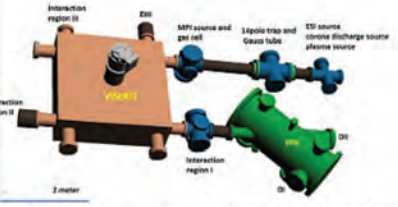
Visualizing electronic structure in both real and momentum space with Spectroscopic Imaging STM(SI-STM)

Micro-probe station

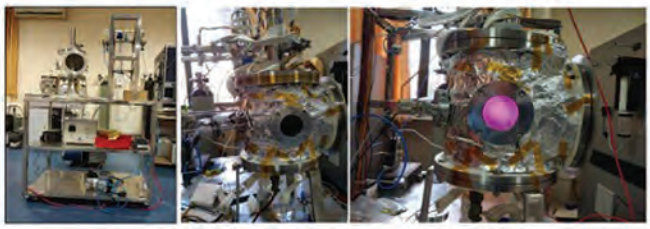


Rogue breathers in a spin chain : Special Spin chain modes, associated with changing linking number by '2' 'continuously'

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



"VISRIT". Preliminary design of Versatile Ion Storage Ring at IIST



Home-built Plasma Atomic Layer Deposition (ALD) system

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

2.7 Department of Physics

Vision

To be the hub of knowledge that facilitates young minds to experience every possible facet of nature, evolving science and technology for a better world for all.

Mission

- Strive for elucidation that acts as a joint holding the knowledge link between the master and the disciple.
- Empower the students with Physics, the basis for tools, technology, and instrumentation in scientific, engineering, and medical fields.
- Lead the next generation through innovations in research and development for self-reliance.
- Harness the power of emerging science in Quantum Information and Quantum technology utilizing the immense expertise of department faculty in Classical and Quantum optics as well as in Solid State Physics.

Core Research Focus

(a) Applied and Adaptive optics, 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	:	13
Technical Staff	:	01
Tutors/ Technicians	:	06*
Non-teaching staff	:	02*
Research Scholars	:	35
Number of PhDs conferred	:	02
Number of Post doctoral students	:	02
DST Woman Scientist	:	01

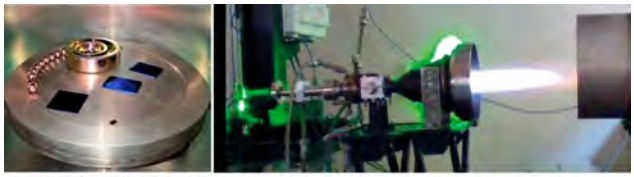
Laboratory/ Research Facilities

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

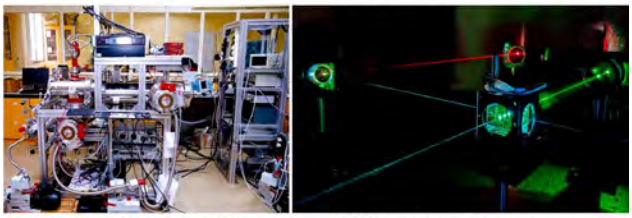
- General Physics Laboratory
- Modern Physics Laboratory
- Solid State Physics Laboratory
- Solid State Technology Laboratory
- Applied and Adaptive Optics Laboratory (PG)
- Optics Laboratory (UG)
- Quantum Technology Laboratory
- Computational Physics Laboratory

In addition, there are the following dedicated research laboratories.

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



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



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

Research and Developments

- Faculty members from the department have been contributing actively to the development of space science and technology by actively being involved in research projects in collaboration with other ISRO and DOS centers through Advanced Space Research Group (ASRG) activities.
- Active collaboration for achieving larger scientific goals with other national and international research groups, such as
  - Physical Research Laboratory, Ahmedabad, India
  - Space Applications Center, Ahmedabad, India
  - National Chemicals Laboratory (NCL Pune), Tata Institute of Fundamental Research (TIFR) Hyderabad
  - SRM University, Andhra Pradesh, India
  - School of Physics, University of Hyderabad, India
  - Weizmann Institute of Science – Israel
  - Technion Institute of Technology – Haifa – Israel.
  - Extreme Light Infrastructure – Nuclear Physics – Magurelle
  - Center for Quantum Research and Technology, University of Oklahoma, USA
  - University of Electro-Communications, Tokyo– Japan
  - Technical University of Denmark – Denmark
- Faculty members from Department hold various externally funded projects funded by DST-SERB, UGC-DAE-CSR, etc.
- "The Extended Hadamard Transform: Sensitivity-Enhanced NMR Experiments Among Labile and Non-Labile 1Hs of SARS-CoV-2-derived RNAs" coauthored by Dr. S. Jayanthi, Associate Professor, Dept. of Physics, has been selected for the cover feature article in the European Chemistry Society's publication – ChemPhysChem.
- The work demonstrating maximal two-qubit entanglement at IIST, "Polarization-spatial Gaussian entanglement in partially coherent light fields," authored by S Asokan, research scholar, and Dr. J. Solomon Ivan, Associate Professor, has been editor's pick for the Journal of Optical Society of America A.

Research outcomes - Fact File

International Journal	:	26
Conference Papers	:	06

Contributions to Institute Level Space Missions

- Department of Physics is actively involved in Small Satellite and Payload development (SSPACE) activities at IIST, with a core focus on sensors and payload design and development.
- Faculty from the department undertake consultancy projects (ISRO) on emerging technologies such as Diagnostics for Stationary Plasma Thrusters.
- Surface Discharge Sparkplugs that Operate at 1 kV instead of 6 kV in standard sparkplugs are developed through technological innovation under a project with the Liquid Propulsion Systems Center (LPSC).
- A laser ignition system for rocket fuel is designed and successfully demonstrated under a project with ISRO Inertial Systems Unit (IISU).
- Surface Engineering Techniques for improving the Life and Performance of Ball-bearing systems in ISRO Spacecrafts are realized using a project with IISU.
- Proposed India's first cryogenic ion storage ring, "VIStRIT" to study organic molecules in a space-like environment.
- 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.

Outreach Activities

- More than 15 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.

Faculty Profile

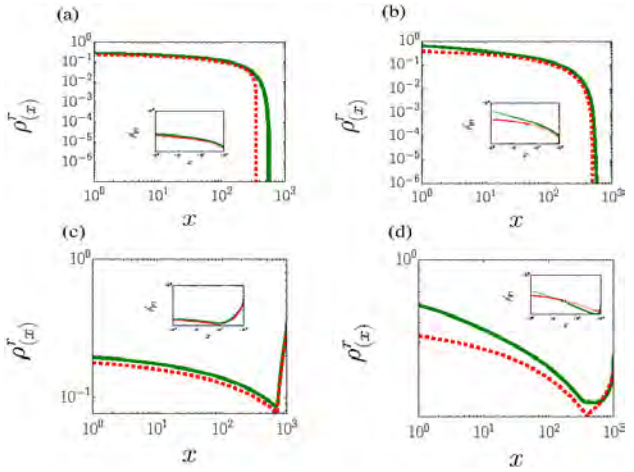
Apoorva Nagar, Associate Professor

Research Interest

Steady states and phase transitions in nonequilibrium systems, Biological Physics

Research Highlights

- Study on the effect of long hops on a lattice model with open and closed boundaries
- Study on the effect of resetting dynamics on the totally asymmetric exclusion process (TASEP)



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

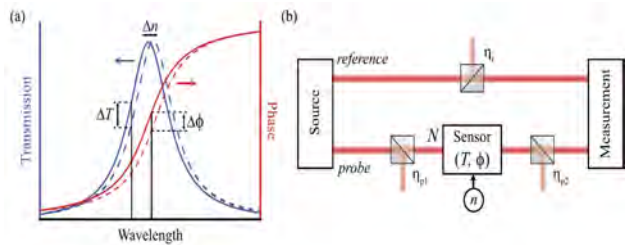
Ashok Kumar, Assistant Professor

Research Interest

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

Research Highlights

- A theoretical study is carried out on cascaded nonlinear optical systems to demonstrate continuous-variable multipartite entanglement
- Fundamental sensitivity bounds are obtained for quantum enhanced sensors based on transmission and phase estimation



- Demonstrated Einstein–Podolsky–Rosen paradox with position–momentum entangled macroscopic twin beams

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

Dinesh N. Naik, Assistant Professor

Research Interest

Areas: Coherent & Incoherent Optics, Guided Wave Optics, Singular Optics, Adaptive Optics, Signal & Image Processing

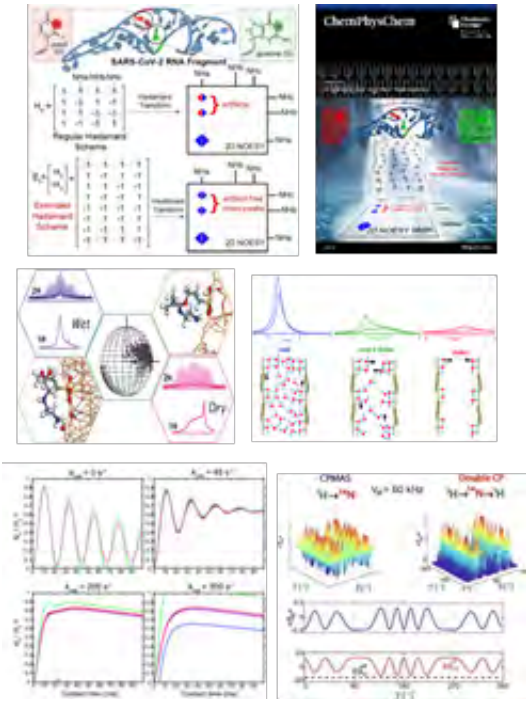
Techniques: Optical system design, Optical Interferometry, Wavefront sensing/reconstruction, Spectroscopy, Polarimetry, Holography, Tomography, Correloscopy

Research Highlights

- Sensitivity Enhancement In Low coherence Fourier Transform Spectral Interferometry
- Phase retrieval utilizing asymmetry in object
- Profilometry on optically rough tilted surfaces

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

S. Jayanthi, Associate Professor



Research Interest

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
- Sensitivity enhancement in NMR experiments : Extended Hadamard Transform - applied to SARS-CoV2 RNA
- Improvement of heteronuclear transfers through J-driven cross polarization (J-CP)

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

K. B. Jinesh, Associate Professor

Research Interest

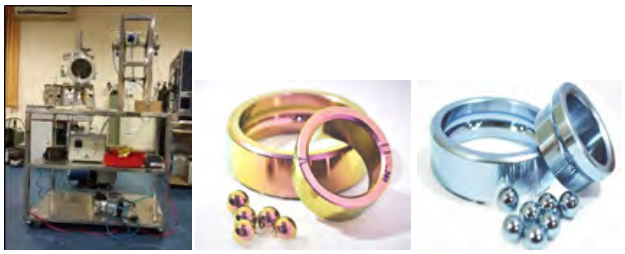
Thin film Deposition techniques: Atomic Layer Deposition (ALD), Pulsed Laser Deposition (PLD) systems. Future memory devices for data storage and computation; Novel devices for electronic applications. New technology developments for ISRO applications.

Research Highlights

Based on the MoU signed between IISU and IIST, we have designed an Atomic Layer Deposition (ALD) system, and constructed it through Hind High Vacuum Pvt. Ltd., Bangalore. This system was used for developing hard-coatings for ball-bearing systems for ISRO applications, and the project has been successfully concluded with deliverables and technology transfer.

EMERAL lab focuses on indigenous development of deposition systems such as ALD and Pulsed Laser Deposition PLD techniques. Based on the developments, we have signed an MoU with industrial partner for developing commercial ALD systems, which is a project funded by Department of Science and Technology (DST).

Based on two MoU's signed between Liquid Propulsion Systems Center (LPSC) and IIST, we developed Surface Discharge Sparkplugs and Laser-assisted ignition systems for the cryogenic engines.

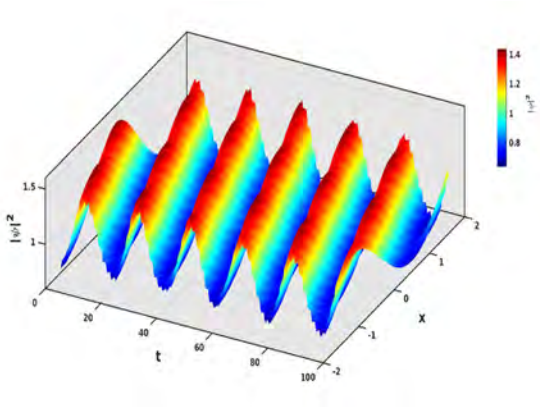


The home-built ALD system and the coatings developed for ball-bearing systems for satellite applications.

Semiconductor surface discharge sparkplugs for cryogenic engines.

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

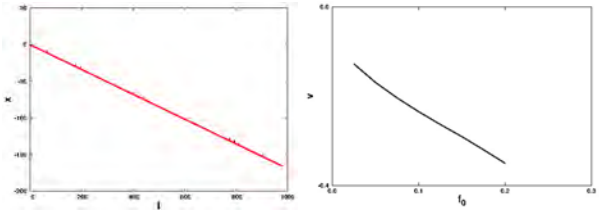
S. Murugesh, Professor



Research Interest

Soliton theory, Integrable systems, applications.

Research Highlights

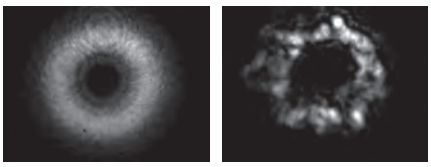


Emergent structures in parametrically driven Kerr medium:

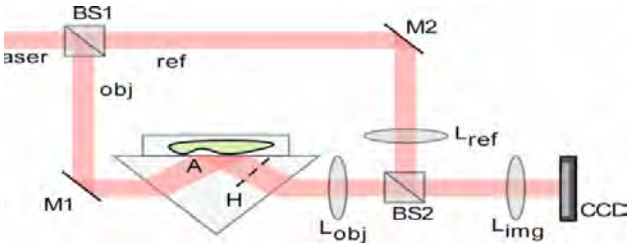
We have investigated long time dynamics of spatially periodic breather solutions in a Kerr medium under driving. A key feature is the emergence of steady soliton like behavior over long distances, which can be helpful in real world communication applications.

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

C. S. Narayanamurthy, Senior Professor



Partial recovery of turbulence impacted Laguerre Gaussian beam



Experimental geometry for total internal reflection based digital holography

Research Interest

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

Research Highlights

- ***Freeform optics:*** A new two mirror off-axis telescopic system capable of performance like conventional two mirror RC telescopic system using freeform surfaces is designed.
- ***Wave propagation through atmospheric turbulence:*** The propagation characteristics of topologically charged Laguerre-Gaussian beams through a dynamic (rotating) pseudo random phase plate mimicking atmospheric turbulence, like beam wandering, scintillation etc are measured in laboratory level.
- TIR digital Holographic Microscopy for optical testing
- Changing patterns in Aerosols Optical, Physical, and Chemical properties across the globe, with NARL, Gadanki, Tirupati

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

Naveen Surendran, Associate Professor

Research Interest

Condensed matter theory: quantum spin systems, topological order, Floquet systems

Research Highlights

- We have obtained exact solutions for topological edge states in the three-dimensional Kitaev model on the hyperhoneycomb lattice.
- We have studied the phenomenon of dynamical freezing in four-band models, which are relevant for three-dimensional Kitaev systems.

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

Solomon Ivan, Associate Professor

Research Interest

Classical Optics, Quantum Optics, Quantum Information

Research Highlights

- Theoretically outlined the possible improved phase sensitivity in a Mach-Zehnder interferometer. Constructed quantum optical states that out perform states which were previously the state of art.
- Outlined a novel quantum genetic algorithm to solve optimization problems on a sphere.
- Showed that optical entanglement can be generated simply by reflecting light off a dielectric.

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

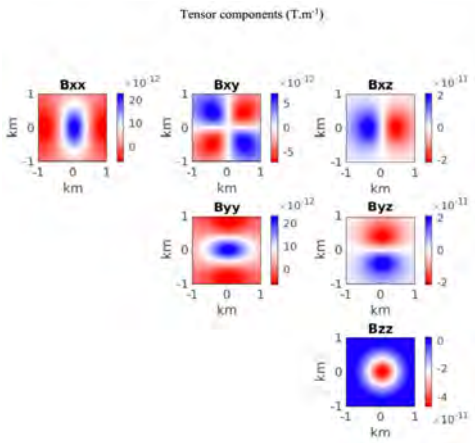
Sourin Mukhopadhyay, Assistant Professor

Research Interest

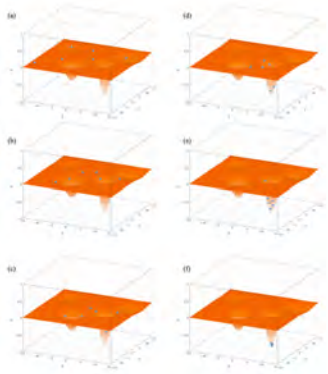
Quantum Spectroscopy at the Atomic scale, high Tc superconductivity, magnetism (spintronics) and Quantum Sensing using superconductors.

Research Highlights

- Development of a SQUID based full tensor gradiometer



- Magnetic dipole localization algorithm development



- Development of fluxgate magnetometer for students CubeSat project (ongoing)
- Development of Spectroscopic Imaging STM to visualize quantum matter at the atomic scale (ongoing).

Reference: https://www.iist.ac.in/physics/sourin.mukhopadhyay

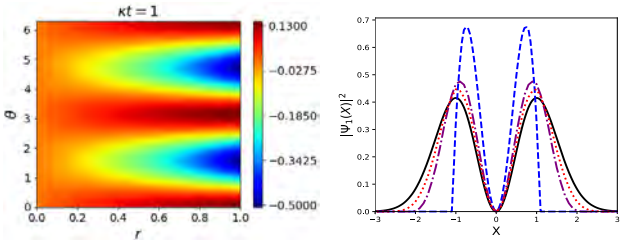
Sudheesh Chethil, Associate Professor & Head

Research Interest

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

Research Highlights

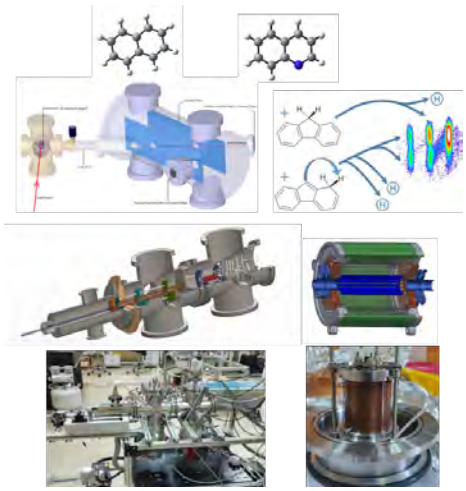
- A new measure of nonclassicality using the area spanned on the tomographic plane is introduced.
- The absence of squeezing for the superposition states is explained based on the expectation value of the energy density. We find that the expectation value of energy density in quantum wavepackets that show no squeezing is positive.



- A definition of quadrature operator for deformed algebra is derived to obtain the quadrature operator eigenstates and wavefunctions.

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

Umesh R. Kadhane, Professor



Research Interest

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 offers undergraduate and postgraduate programmes in several areas leading to the degrees of B.Tech., Dual Degree, M.Tech., M.S., and Ph.D. in Science, Engineering & Technology and Humanities. Other programmes offered by the institute include certificate courses and short term courses. The teaching methodology aims at using the inputs from core functional areas to interdisciplinary issues and problem solving. Classes are offered using different techniques ranging from classroom lectures using chalk and board to flipped classrooms. The students undertake internship, projects, assignments, conduct field observations, make presentations, and participate in group discussions and seminars and are encouraged to develop industry linkages, whenever applicable. In order to continue imparting high-quality and holistic education to the much larger student population and to keep pace with the scientific, technological advancements and socioeconomic realities of the country, the institute ensures that the syllabus of all the programmes are modified once in 3 years. New institute electives in line with the NEP has been introduced which include Game Theory and Creative Writing.

Response to COVID 19 pandemic

IIST community has risen to the occasion of the COVID 19 pandemic and has displayed inspiring leadership, empathy and engagement. From ensuring that those students who had difficulties in accessing online classes always had a choice of staying on campus for as long as they needed, to developing its own facilities for taking care of the COVID patients on campus during the peak of the second wave. IIST has emerged stronger from these challenging times. The COVID SoP committee chaired by Dean Student Activities and with HoDs, other faculty members and staff as members reviewed the situation and suggested changes as and when was found necessary. Coordinating with various Departments and offices of the campus, appropriate responses were planned under various pandemic scenarios that evolved over the year. The institute counsellor and faculty mentors kept in constant touch and tried to personally interact with the students, as IIST felt that many students need psychological aid to relieve their stress during the time of pandemic and afterA. A team of doctors, nurses and staff were on the frontline in the fight against the COVID-19 pandemic throughout the year.

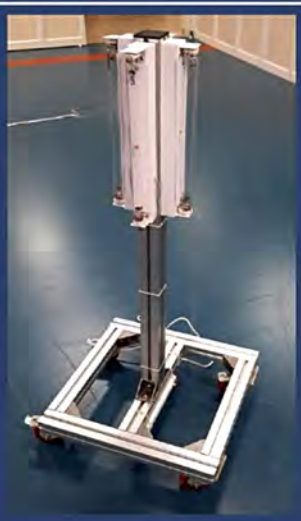
As part of the Academic response to Covid-19 pandemic all courses continued to be delivered in an online mode till March 2022. Classes were managed through MOODLE Lecture Management System and delivered through dedicated licensed Microsoft teams Platforms. Internal assessments and exams were conducted though Moodle, with online proctoring via teams. Lab courses were reconfigured to online lab contents and were successfully managed with virtual lab simulations and recorded videos. Course projects, Internships and Final Year B.Tech. Projects were successfully managed through hybrid online/ offline mode. Most of our programmes including our flagship Foundation Day Programme was re-designed and managed through virtual mode. The end semester exams, 2021 for all the batches were conducted in an online mode. For the graduating students, the institute completed the comprehensive viva voce and the project evaluation through online mode and the results of the graduating students were declared on 30th June, 2021. With classes for the 2020-21 academic year being disrupted by the first nation-wide lockdown, the new odd semester started only by August 2021. The first term for the new batch of B.Tech. students started only on December 1, 2021 due to the delayed JEE Advanced test.

With the COVID situation in the state turning favourable, the institute started the process of bringing in the undergraduate and post graduate students

Sanitizer Dispenser- Inhouse Production

Mobile UV disinfection unit

Sensors and Payloads Development Laboratory (SPDL) at IIST has come up with a simple, portable and omnidirectional UV disinfection prototype to sanitize workplaces remotely and safely . The unit uses established technique of killing the pathogens by photodissociation of their genetic material (RNA and DNA). The unit is capable of completely destroying all types of viruses and bacteria from any open surface. This time-tested technique is often used in advanced biology and biomedical laboratories. To achieve required sanitization capability, a very high-power UV-C lamp with emission in 257nm range is used. The radiation pattern is optimized for a standard office or laboratory table level environment. The dose rates for a given room and orientation of the surface are calculated using the standard dose required for the complete RNA and DNA damage. Though 257nm radiation is generally considered safe for humans, since it is incapable of penetrating the top dead layer of human skin, the unit is prepared for complete handsfree and unmanned operation. A typical office room of about 25 sq. m. or a lab space of 40 sq. m. can be disinfected within 15 mins of irradiation by this unit.



Areas which can be sanitized are:

- Computer desks, keyboards, mouse, etc.
- Chair handles, hand and back rest, head rest, etc.
- Writing/drawing desks, table stationary.
- Door handles, locks, knobs, etc.
- Laboratory tables (height between 0.5m to 0.9m)
- Touchscreen devices, knobs, switches, etc.
- Tools, tool cabinets, storage areas, etc.

SPDL team with the prototype

Future scope: The present version is a simple design. It has the potential to grow into more sophisticated and consumer-oriented product. The SPDL lab will be pursuing the following few possibilities in the future.

- The present prototype is built at a cost of about Rs 25,000 with two spare tubes. Next version will be totally handsfree and remote controlled, with programmable controller.
- The follow-up version will be based on modern high-power UV-C LED technology and IoT based control.
- A modified version can be offered to hospitals for corridor and ward sanitization.
- A specialized version can be made for on body disinfection of Personal Protection Equipment (PPE).

Prepared by, Dr. Umesh Kadhane, Dept. of Physics, IIST (June 2020)

in a phased manner. All students were requested to complete both their vaccinations. By January 2022, the second semester and third semester undergraduate students followed by the first semester post graduate were brought to the campus. They were followed by the fourth semester and the first semester UG students. The boys were quarantined in the ATF guest house, in the VSSC Campus and the girls in IIST. COVID-19 testing drive for the student community was organized with support of RGIMS, Trivandrum. With an increasing number of COVID positive cases on the campus, IIST converted its guest houses into COVID-19 Quarantine Facility to treat COVID positive patients with mild to moderate symptoms. The facility provided them basic medical services, such as regular temperature and oxygen monitoring, advice from doctors and nurses of the Institute, medicines, blood and RT-PCR tests, hard-to-access health services, such as oxygen concentrators and tanks, and nutritious meals four times daily. Institute medical staff and ambulance services are available 24x7. Those with severe symptoms were shifted to a nearby hospital. IIST switched to the offline mode of teaching and learning from March 2022.

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

3.1 Undergraduate Programme

In 2021, IIST offered B.Tech. programmes in Aerospace Engineering and in Electronics & Communication Engineering (Avionics), each with 67 seats annually and a dual degree programme with B.Tech. in Engineering Physics in 22 seats. Students of the Dual degree programme spend an additional fifth year to acquire either Master of Technology degree in Optical Engineering or Earth System Sciences or Master of Sciences in Astronomy or Astrophysics or Solid State Physics.

The following are the enrollment details of the undergraduate programmes offered by the institute for the year 2021-22

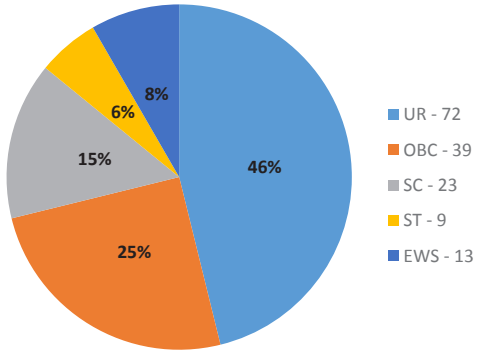
UG Programme	Gen	OBC	SC	ST	PwD* Gen	PwD* OBC	EWS**	PMSSS***	Total
Aerospace Engineering	32	16	9	4	0	0	6	0	67
Electronics & Communication Engineering (Avionics)	32	16	10	3	0	0	6	0	67
Dual Degree (Engineering Physics)	8	7	4	2	0	0	1	0	22

* *Persons with Disabilities (PwD)*

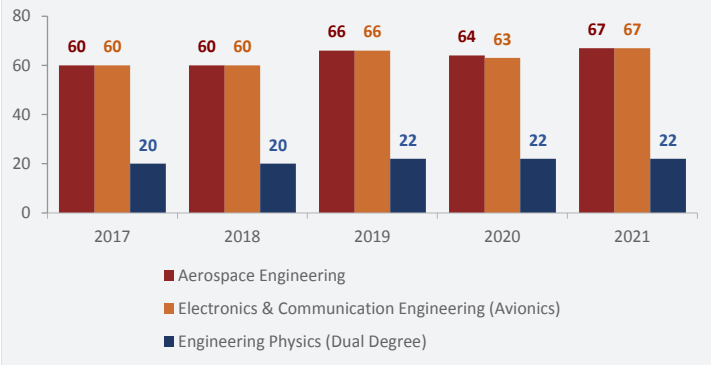
** *Economically Weaker Sections (EWS). As per government directive, the reservation for the EWS has been started from the academic year 2019-2020*

*** *Prime Minister's Special Scholarship Scheme*

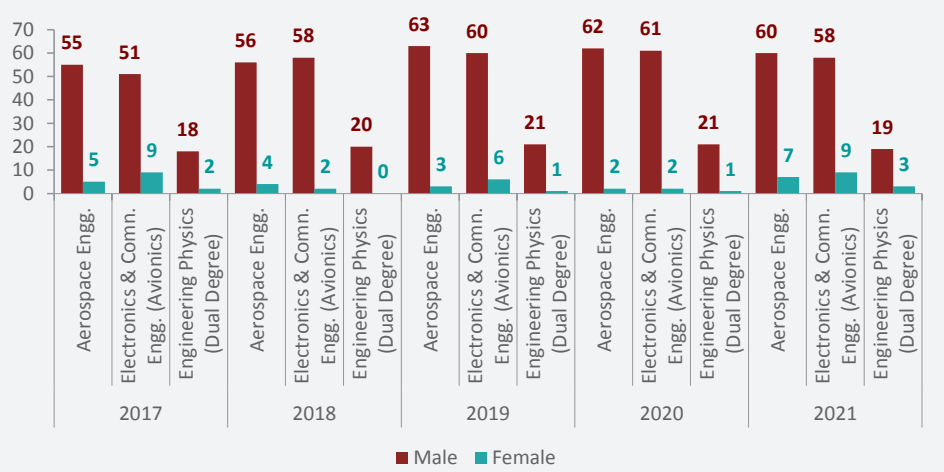
Distribution of B.Tech. & Dual Degree students enrolled in different categories (2021 admission)



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 Post Graduate Programme

The institute in the reporting period offered 15 Master of Technology/ Master of Science programmes. Admissions to the programmes were based on the performance in national level examinations such as GATE or JEST, followed by an interview.

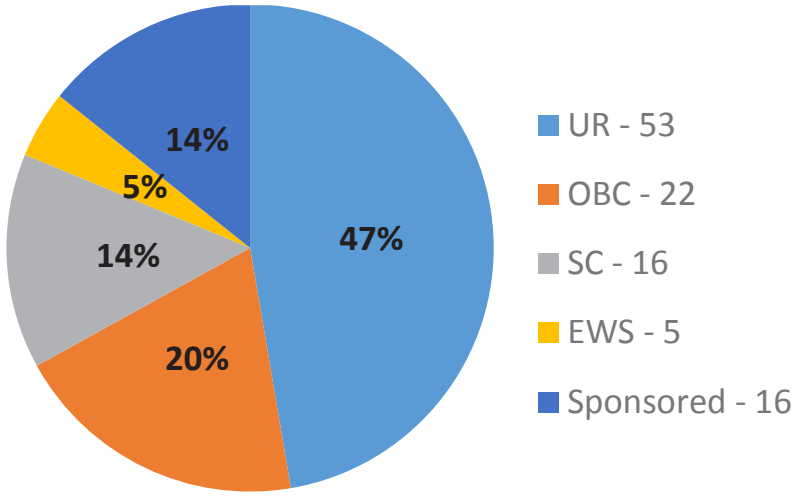
Category-wise details of students enrolled during the reporting period across various M.Tech. and Master of Science Programmes of IIST are as follows:

Branch	2021 Enrolled							Total
	UR	OBC	SC	ST	PwD*	EWS**	Sponsored	
Aerodynamics and Flight Mechanics	3	1	2	0	0	1	1	8
Structures and Design	3	2	2	0	0	1	2	10
Thermal and Propulsion	4	2	2	0	0	1	0	9
Control Systems	5	0	0	0	0	0	2	7
Digital Signal Processing	4	1	1	0	0	0	3	9
Power Electronics	5	2	2	0	0	0	0	9
RF and Microwave Engineering	4	3	1	0	0	1	1	10
VLSI and Microsystems	5	2	1	0	0	0	0	8
Materials Science and Technology	5	1	1	0	0	0	2	9
Astronomy and Astrophysics	3	1	0	0	0	0	0	4
Earth System Science	3	2	1	0	0	0	0	6
Geoinformatics	2	0	0	0	0	0	4	6
Machine Learning and Computing	3	2	2	0	0	1	1	9
Optical Engineering	3	2	0	0	0	0	0	5
Solid State Technology	1	1	1	0	0	0	0	3
Total	**53**	**22**	**16**	**0**	**0**	**5**	**16**	**112**

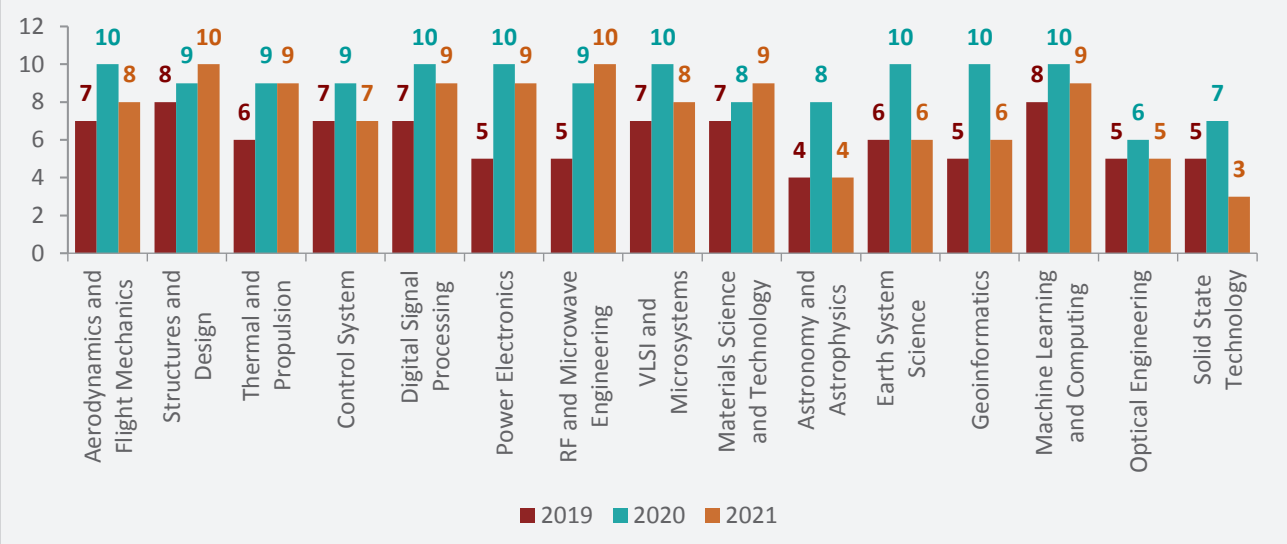
* *Persons with Disabilities (PwD)*

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

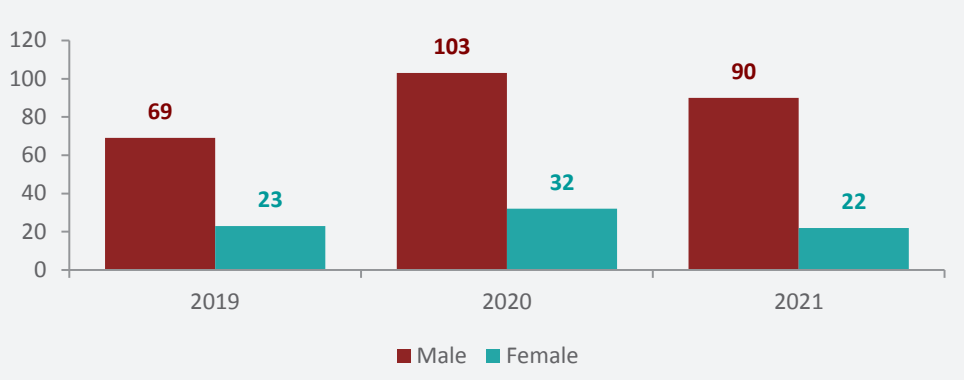
Distribution of M.Tech./ M.S. students in different categories (2021 admission)



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



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

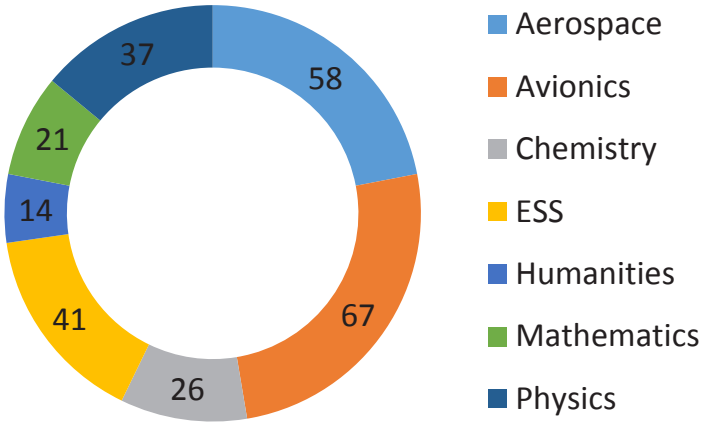


3.3 Doctoral Programme

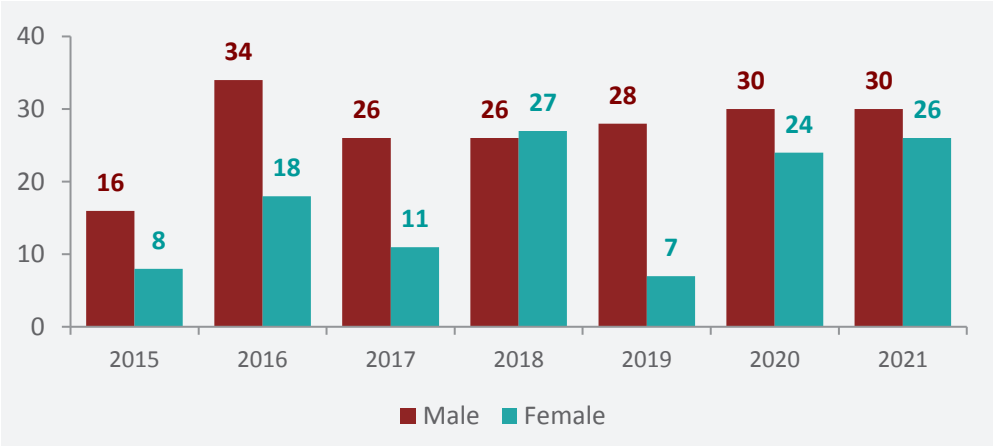
In order to enhance our research output, IIST has been continuously striving to admit quality candidates for its Ph.D. programmes. In 2020-21, IIST offered Ph.D. programme in all the 7 departments. Admissions to the Ph.D. programmes were held this year in July 2021 and January 2022 based on test and interview with a basic qualification of GATE/ UGC/ CSIR NET-JRF/ JEST or equivalent exams. During this period, 56 students registered for Ph.D. programme, the details of which are as follows:

Department	Full Time	Part Time	Total
Aerospace Engineering	10	4	14
Avionics	11	3	14
Chemistry	5	1	6
Earth and Space Sciences	6	1	7
Humanities	3	1	4
Mathematics	2	1	3
Physics	8	0	8
Total	**45**	**11**	**56**

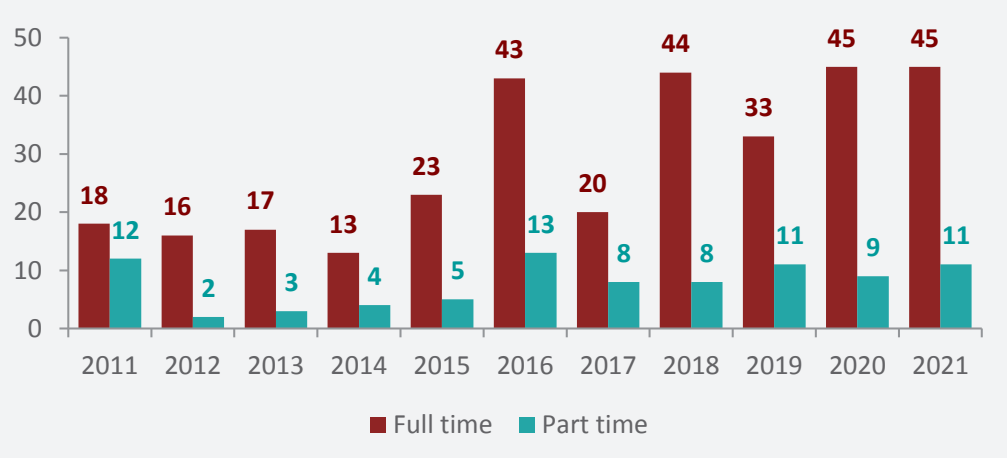
Number of students currently doing Ph.D.



Gender statistics of students enrolled for Ph.D. (Yearwise)



Number of Ph.D. students enrolled since 2011 (Year wise)



3.4 Convocation

The 9th convocation of IIST was held in a hybrid mode on 4th September 2021. Director, IIST; Deans and Head of Departments joined in an offline mode from IIST. Chairman, ISRO; Chancellor, IIST; the Chief guest and the degree recipients attended the programme in an online mode. Certificates and medals were awarded to the students through their computer generated Virtual Avatars.

Dr. G. Satheesh Reddy, Chairman, DRDO and Secretary, DDR&D was the chief guest of the day. Dr. B. N. Suresh. Hon. Chancellor, IIST declared the convocation open. Shri S. Somanath, Director, IIST welcomed the degree recipients and others and presented the report on IIST for the year 2020-21. Dr. G. Satheesh Reddy, the chief guest delivered the convocation speech. Dr. K. Sivan, President, Governing Body, IIST and Secretary, Dept. of Space joined the proceedings virtually and addressed the students.

3.5 Degrees Conferred

In the ninth convocation of IIST, B.Tech. degrees were conferred on 106 students, 56 students graduating in Aerospace Engineering and 50 in Electronics and Communication Engineering. 16 Students of the Dual Degree programme received their B.Tech. degree in Engineering Physics and M.Tech./ M. S. in their specialization- Optical Engineering, Solid State Physics, Earth Systems Science and Astronomy & Astrophysics. M.Tech. degree was conferred on 89 students (Department of Aerospace - 22, Department of Avionics- 30, Department of Chemistry -7, Department of Earth and Space Science - 10, Department of Mathematics - 7, Department of Physics - 9) and Master of Science degree was received by 4 students from the Department of Earth and Space Science. Ph.D. degrees were awarded to 12 students across all the seven departments, which also include the 100th Ph.D. degree from IIST. After degree were conferred in the 9th convocation, the total degrees awarded by the institute will be 1379 B.Tech., 66 dual degree, 583 M.Tech. and 102 Ph.D. degrees.

Degree	Discipline	No. of Students Passed out
Bachelor of Technology	Aerospace Engineering	56
	Electronics & Communication Engineering (Avionics)	50
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	4
	B.Tech. in Engineering Physics + M.Tech in Optical Engineering	4
	B.Tech. in Engineering Physics + Master of Science in Solid State Physics	4
Master of Technology	Aerodynamics and Flight Mechanics	7
	Structures and Design	9
	Thermal and Propulsion	6
	Control Systems	7
	Digital Signal Processing	7
	Power Electronics	5
	RF and Microwave Engineering	5
	VLSI and Microsystems	6
	Materials Science and Technology	7
	Earth System Science	5
	Geoinformatics	5
	Machine Learning and Computing	7
	Optical Engineering	5
	Solid State Technology	4
Master of Science	Astronomy and Astrophysics	4

3.6 Ph.D. Thesis Submitted / Defended

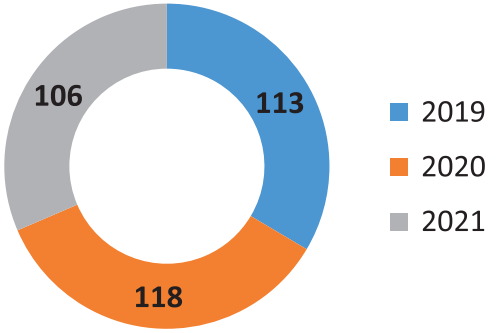
23 students had completed their Ph.D. programme and successfully defended their thesis the report period. (List is given in the order: Student name, Thesis title, Department, Guide(s) name, Date of defense)

1. Namitha Issac - Early Stages of High-Mass Star Formation: A Multiwavelength Investigation - Earth and Space Sciences / Dr Anandmayee Tej / 21-04-2021
2. Sarath Babu - Software Defined Disruption Tolerant Networks - Avionics / Dr B S Manoj / 28-05-2021
3. Pramod Panchal - Livelihood Investigation on wave front sensing for propagation characteristics of turbulence impacted light beams - Physics / Dr C S Narayana murthy / 04-06-2021
4. Darshika Singh - Developing Unconventional Holo graphy and Imaging methods using Intensity and Polarization Correlation: Spatial Statistical Optics Approach - Physics / Dr Rakesh Kumar Singh / 19-06-2021
5. Rajkumar - Livelihood Vulnerability of Rice Farmers of Tamil Nadu, India to Climate Variability and Extremes - Humanities / Dr C S Shaijumon / 01-07-2021
6. Ramesh N - Fuel Optimal Trajectory and Guidance Design for Lunar Soft Landing at a Target Site - Aerospace Engineering / Dr R V Ramanan / 02-07-2021
7. Arun Govind Neelan - Higher-Order High-Resolution Schemes for Hyperbolic Equations - Aerospace Engineering / Dr Manoj T Nair / 14-07-2021
8. Niteshkumar Agrawal - Design, Characterization and Development of Various Plasmonic Optical Sensors for Biomedical Applications - Avionics / Dr Chinmoy Saha / 16-07-2021
9. Jishnu Chandran - Development of a Mathematical Model for Compressible Liquid Transients and Its Numerical Implementation - Aerospace Engineering / Dr A Salih / 13-08-2021
10. Sam Noble - Performance Optimization and Optimal Design of Six Wheeled Rover for Uneven Hard Terrain - Aerospace Engineering / Dr K Kurien Issac / 17-08-2021
11. Job Mathai - Lower Dimensional Approximation of Some Problems for Thin Piezoelectric and Elastic Shells with Nonuniform Thickness - Mathematics / Dr N Sabu / 16-09-2021
12. Dubacharla Gyaneshwar - Robust Image Classification Algorithms for Multispectral and Hyperspectral data in real-Time Environment - Earth and Space Sciences / Dr N Rama Rao / 22-10-2021
13. Deepu T S - Study of Select Issues in Supply Chain Digitalization - Humanities / Dr V Ravi / 29-10-2021
14. Nisha Balachandran - Organic-Inorganic Hybrid Perovskites: Synthesis, Characterization and Evaluation - Chemistry / Dr Jobin Cyriac / 01-11-2021
15. Sudhanshu Shekhar Jha - Multi-Platform Hyperspectral target Detection and Modelling in Dynamic Atmospheric Conditions - Earth and Space Sciences / Dr N Rama Rao / 03-11-2021
16. Rekha Bharali Gogoi - Impact of Ensemble Derived Flow-dependent Background Error Covariance in a Data Assimilation System for Regional-scale NWP model - Earth and Space Sciences / Dr Govindankutty M / 08-11-2021
17. Yogesh Sanjay Choudhary - Highly Emissive CdTe Quantum Dots Passivated with Novel Branched Ligands as Fluorescent Sensors - Chemistry / Dr Gomathi N / 03-12-2021
18. Mahesh T V - Geometry of Immersions, Submersions, Harmonic Maps and of Estimation on Statistical Manifolds - Mathematics / Dr K S S Moosath / 27-12-2021
19. Chithra A - Investigations on carbon composite foams from biomass by filter-pressing for thermal insulation and EMI shielding applications - Chemistry / Dr K Prabhakaran / 09-02-2022
20. M Arrutselvi - Stabilized Virtual Element Method for the nonlinear convection-diffusion problems - Mathematics / Dr E Natarajan / 04-03-2022
21. Thesniya P M - Morphological and Spectrochemical Characterization of Pyroxene- and Spinel-bearing Lithologies and Impact Cratering Mechanics of the Moon: Implications for Lunar Endogenic and Exogenic Processes - Earth and Space Sciences / Dr Rajesh V J / 09-03-2022

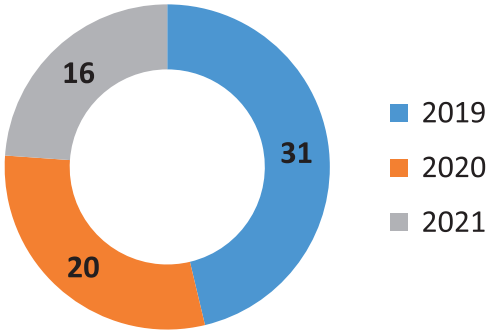
22. Aryadutt Oamjee - Mixing Enhancement and Flame-holding in Supersonic Combustors using Pylon-Cavity Flameholder - Aerospace Engineering / Dr Rajesh S / 22-03-2022

23. Nitesh Verma - Lowest Order Virtual Element Approximations for Unsteady Fluid Flow Problems - Mathematics / Dr Sarvesh Kumar / 25-03-2022

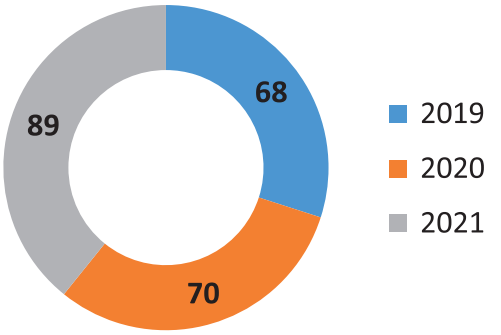
B.Tech. students graduated in the last three years



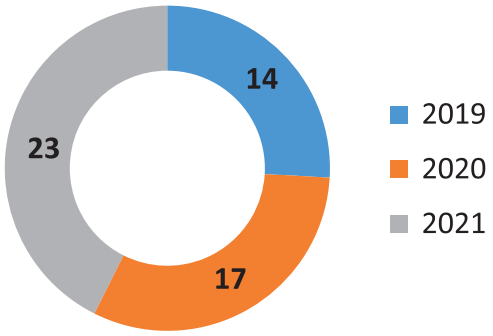
D.D. students graduated in the last three years



M.Tech./M.S. students graduated in the last three years



Ph.D. students graduated in the last three years



3.7 Academic Laurels

Shashank Tomar of B.Tech., Aerospace Engineering was awarded the coveted Gold Medal for being the best academic performer in all B.Tech. branches and Sandeep C. R. of M.Tech. Machine Leaning received the Gold Medal for topping all M.Tech. programmes. Excellence certificate and cash award for the student who has secured Best academic score in Electronics and communication went to Partha Sarathi Samanta, while Raghav Hariharan was selected as the all-rounder and the best outgoing student.

Gold medal for the topper of all B.Tech. Branches	Gold medal for the topper of all PG specializations	Best academic score in Electronics and communication	Best all-rounder and the best outgoing student
			
Shasank Tomar	Sandeep C. R.	Partha Sarathi Samanta	Raghav Hariharan

The toppers of Aerospace Engineering, Shashank Tomar and Dibya Kanti Golui and that of Electronics and Communication Engineering, Pratik Sharma undertook a Masters Programme at California Institute of Technology (Caltech), USA before joining ISRO. The 9-months programme is financially supported under the DoS-Caltech Professor Satish Dhawan Endowment Fellowship.

Masters Programme at California Institute of Technology (Caltech), USA

Dibya Kanti Golui
Aerospace Engineering

Shansank Tomar
Aerospace Engineering

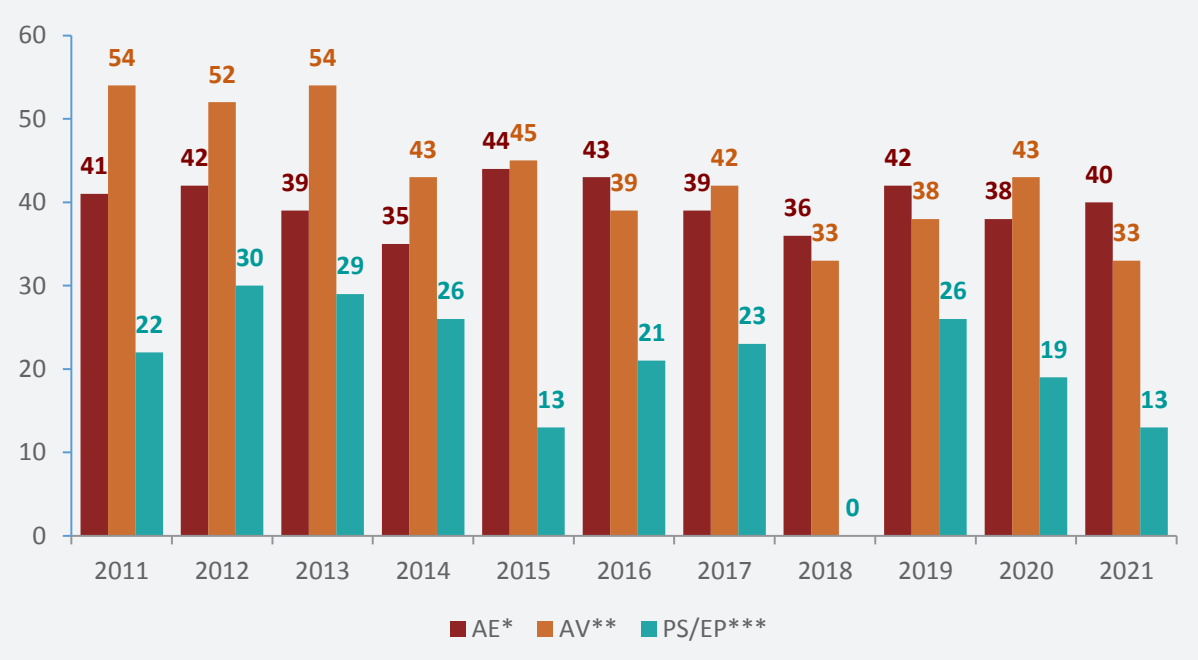
Pratik Sharma
Electronics and Communication Engineering

3.8 Placement

ISRO Placement for B.Tech. Students

In 2020-21, the placement process in IIST went online. IIST graduates who secure a CGPA of 7.5 and above are absorbed into the different centres of ISRO/ DOS. In 2021, 86 students, were offered placement in ISRO. A total of 1137 graduates from the institute have joined ISRO so far.

ISRO/ DoS absorption data



* *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.*

The Placement Cell at IIST continually liaise with industry, R&D organizations, and management Institutions, with the vision of training, career-guidance, internship/ project, and campus placements for our post graduate and undergraduate students. The Placement Officers in charge of the Placement Cell are Dr. Pradeep Kumar P, Associate Professor, Department of Aerospace Engineering and Dr. Immanuel Raja, Assistant Professor, Department of Avionics.

The Placement Cell works in line with the policies of the Institute and tries to coherently match the interests of students with an appropriate job profile. The Placement Cell channelizes feedback from Industry, R&D Organizations and Management Institutions on academic programmes, to the Institute. The Placement Cell continually functions to safeguard the interest of the students and endeavours to be a part of their safe and secure future.

A company/ R&D/ Management, registers with the Placement Cell, through an online job portal for the purpose of placement and internship. Upon registration, the Company will receive a Log-In ID and Password to input more details. The Placement Cell will appropriately co-ordinate to take the process further. The internship period for both B.Tech. and M.Tech. Programmes usually lasts for two months, tentatively from May to July, every year. However, internships which require more than two months, for selected M.Tech Programmes, can be worked out in line with the Institute policies and guidelines. The Companies / Organizations are welcome to contact the Placement Cell for further details and discussions. Companies visited us during the period April 2021 to March 2022 includes, M/s TCS, M/s Robert Bosch, M/s Agnikul Cosmos, M/s Intel Technology, M/s Mercedes Benz, M/s Continental Automotive, M/s Infosys, M/s SquareYard, M/s BYJU's, M/s TATA Elxsi, M/s Delta Electronics, M/s C-DAC.

For the year April 2021 to March 2022, the maximum package [CTC] was 20 Lakhs for M.Tech. students, 9.18 Lakhs for Dual degree students and 8 Lakhs for B.Tech. students. The average package for M.Tech. students is 12 Lakhs, Dual degree students is 7 Lakhs and 6.5 Lakhs for B.Tech. students.

Interactive Sessions

1. M/s Santamonica conducted an interactive session with final year and pre-final year B.Tech. and M.Tech. students regarding higher studies opportunities.
2. M/s Growware Global conducted online training and doubt clarifying on interviews and CV/ resume writing for final year and pre-final year B.Tech. and M.Tech. students.
3. IIST Alumni students working in VSSC have conducted an interactive session with B.Tech. pre-final year students to share their work experience in VSSC and advised students regarding absorption.

Internship Details

B.Tech. Batch (2018-2022) and M.Tech. Batch (2020-2022)

Sl. No.	Name of the Student	Course	Company
B.Tech.			
1	Chunduri Sai Abhishek	Avionics	M/s Robert Bosch
2	Yugal Joshi	Avionics	M/s Robert Bosch
M.Tech.			
1	Rinu Preethi B	Control System	M/s TCS
2	Amit Kumar	Machine Learning and Computing	M/s Robert Bosch
3	Anindya Palaparthi	Geoinformatics	M/s Robert Bosch

Sl. No.	Name of the Student	Course	Company
4	Ravi Kumar Gautam	Machine Learning and Computing	M/s KPIT
5	Venkata Naga Sai Bharadwaja Edera	Machine Learning and Computing	M/s KPIT
6	Ankit Singh	VLSI and Microsystems	M/s Ignitarium Solutions
7	Shaik Gulzar Ahmed	Thermal and Propulsion	M/s Textron India
8	Thota Vamsi Krishna	Digital Signal Processing	M/s Continental Automotive
9	Anant Dashpute	Machine Learning and Computing	M/s Continental Automotive
10	Shubham Wankhade	Digital Signal Processing	M/s Continental Automotive
11	Akshay Shaji	VLSI and Microsystems	M/s INTEL
12	Ankit Singh	VLSI and Microsystems	M/s INTEL
13	Rinu Preethi	Control System	M/s INTEL
14	Sai Divya	RF and Microwave Engineering	M/s INTEL
15	Harshit Shukla	VLSI and Microsystems	M/s INTEL
16	Sarath KR	VLSI and Microsystems	M/s INTEL
17	Srinivasan S	Aerodynamics & Flight Mechanics	M/s Textron India
18	Patel Mital L	Structures & Design	M/s Larsen & Toubro Ltd
19	Yagna Prabhala	Machine Learning and Computing	M/s Continental Automotive
20	G Rajashree Sawale	VLSI and Microsystems	M/s GalaxEye
21	Gopika Das	Geoinformatics	M/s GalaxEye
22	Anbu Mathi R	RF & Microwave Engineering	M/s GalaxEye
23	Dharmik Trivedi	Aerodynamics & Flight Mechanics	M/s Textron India
24	G Rajashree Sawale	VLSI and Microsystems	M/s C-DAC
25	Pratik Verma	Structures & Design	M/s Vashishtha Research
26	Keerthana George	Optical engineering	M/s Vashishtha Research
27	Sai Lakshmi	Control System	M/s Skyroot Aerospace
28	Ranjeet Shakya	Control System	M/s Aadyah Aerospace
29	Chinmay M Shirodkar	Thermal and Propulsion	M/s Skyroot Aerospace
30	Aseem Garg	Geoinformatics	M/s CropIn Technology
31	Palaparthi Anindya	Geoinformatics	M/s CropIn Technology
32	Bhukya Naveen	RF & Microwave Engineering	M/s TCS

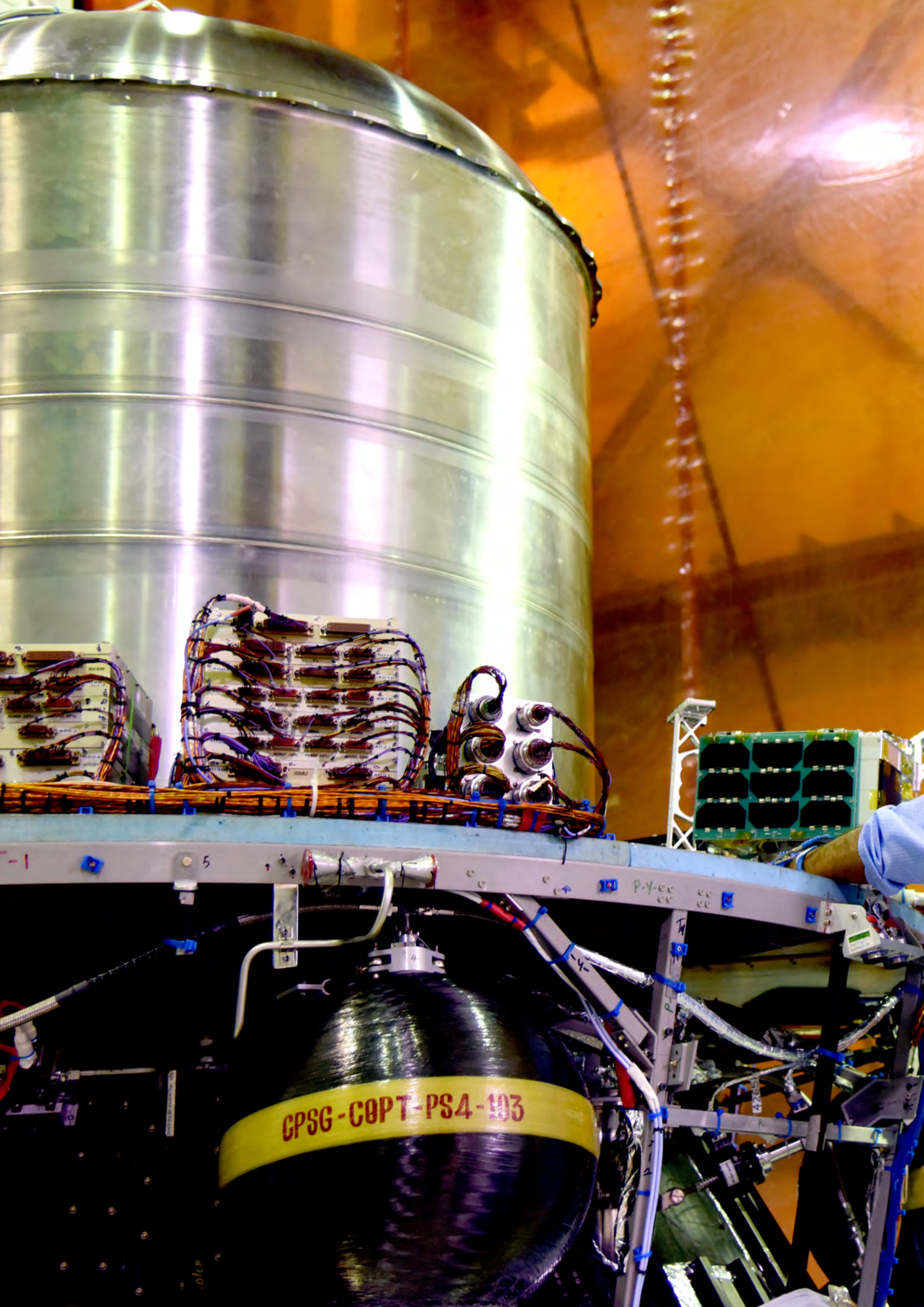
Placement Details

B.Tech. Batch (2018-2022), Dual Degree (2017-2022) and M.Tech. Batch (2020-2022)

Sl. No.	Name of the Student	Course	Company
B.Tech.			
1	Adithya Venkateswaran	ECE	M/s Infosys
2	Uggirala Sai Lokesh	ECE	M/s Infosys
3	Urlankala Dhana Ganesh	ECE	M/s Infosys
4	Uggirala Sai Lokesh	ECE	M/s ITC Infotech
5	Chunduri Sai Abhishek	ECE	M/s Agnikul Cosmos
6	Athul Pramod	ECE	M/s Agnikul Cosmos
7	Vajji Chandra Pavan	ECE	M/s SquareYard
8	N Mahesh Sreevatsava	ECE	M/s BYJU's
9	Kirneshwar Vudayagiri	Aerospace Engineering	M/s BYJU's
10	Prashant	ECE	M/s BYJU's
11	Yugal Joshi	ECE	M/s TATA Elxsi
12	Shobith Sharma	ECE	M/s TATA Elxsi
Dual Degree			
1	Kiran L	Astronomy & Astrophysics	M/s Infosys
2	Kiran L	Astronomy & Astrophysics	M/s C-DAC
3	Shivam Kumaran	Astronomy & Astrophysics	M/s C-DAC
4	Anjishnu Adhikari	Solid State Physics	M/s C-DAC
5	Kiran L	Astronomy & Astrophysics	M/s LatentView
6	Soumya Kohli	Astronomy & Astrophysics	M/s SquareYard
7	Roohullah Kaleem Ansari	Optical Engineering	M/s BYJU's
M.Tech.			
1	Aditya Narayan Pradhan	Machine Learning and Computing	M/s Mercedes Benz
2	E E V N Sai Bharadwaja	Machine Learning and Computing	M/s Mercedes Benz
3	Shivaprasad Nadagoudr	Machine Learning and Computing	M/s Mercedes Benz
4	Yagna Parbhala	Machine Learning and Computing	M/s Mercedes Benz
5	Anant Rajendra Dashpute	Machine Learning and Computing	M/s Mercedes Benz

Sl. No.	Name of the Student	Course	Company
6	Aakash Parihar	Control Systems	M/s Mercedes Benz
7	B Rinu Preethi	Control Systems	M/s Mercedes Benz
8	Parusu Solomon	Digital Signal Processing	M/s Mercedes Benz
9	Siddhi Sunil Kadam	Power Electronics	M/s Mercedes Benz
10	Mohit Kumar	Power Electronics	M/s Mercedes Benz
11	Rajat Kumar Singh	Control Systems	M/s Mercedes Benz
12	Anupam Samanta	Power Electronics	M/s Delta Electronics
13	Aishwarya B	Power Electronics	M/s Delta Electronics
14	Tanvi Gudapati	Power Electronics	M/s Delta Electronics
15	Prashant Raj Patro	Control Systems	M/s TCS
16	Yagna Parbhala	Machine Learning and Computing	M/s TCS
17	Gopika Das K	Geoinformatics	M/s Esri India
18	Ranjeet Shakya	Control Systems	M/s Aadyah Aerospace
19	Ganesh Malgunde	Earth System Science	M/s Infosys
20	Rajashree Sawale	VLSI & Microsystems	M/s C- DAC
21	Chinmay Shirodkar	Thermal & Propulsion	M/s Agnikul Cosmos
22	Alan Joseph	Thermal & Propulsion	M/s Agnikul Cosmos
23	Adarsh Jayagopal	Materials Science and Technology	M/s Agnikul Cosmos
24	Vishesh Garg	Control Systems	M/s Agnikul Cosmos
25	Chinmay Shirodkar	Thermal & Propulsion	M/s Skyroot Aerospace
26	Anant R Dashpute	Machine Learning & Computing	M/s Continental Automotive
27	Shubham Wankhade	Digital Signal Processing	M/s Continental Automotive
28	Sarangu S	Earth System Science	M/s SquareYard
29	Harshit Shukla	VLSI & Microsystems	M/s INTEL
30	Rinu Preethi B	Control Systems	M/s INTEL
31	Rajkumar Jha	Aerodynamics & Flight Mechanics	M/s BYJU's
32	Siddharth Upadhyay	RF and Microwave Engineering	M/s BYJU's
33	Sai Chaitanya	Aerodynamics & Flight Mechanics	M/s BYJU's
34	Kuldeep Singh Rajput	Structures & Design	M/s BYJU's

Sl. No.	Name of the Student	Course	Company
35	Bhuvan Joshi	VLSI & Microsystems	M/s BYJU's
36	Rahul Niddana	Optical Engineering	M/s TATA Elxsi
37	Rudrakshi Garg	Power Electronics	M/s TATA Elxsi
38	Kali Shreyo Ghosal	RF and Microwave Engineering	M/s TATA Elxsi
39	Vamsikrishna Thota	Digital Signal Processing	M/s TATA Elxsi
40	Krishna Vijay	Earth System Science	M/s TATA Elxsi
41	Siddharth Upadhyay	RF and Microwave Engineering	M/s TATA Elxsi
42	Sai Lakshmi S	Control Systems	M/s TATA Elxsi
43	Rajashree Sawale	VLSI & Microsystems	M/s TATA Elxsi
44	Sai Divya B	RF and Microwave Engineering	M/s TATA Elxsi
45	Sudev Namboothiri N M	Optical Engineering	M/s TATA Elxsi
46	Keerthana George	Optical Engineering	M/s TATA Steel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Research & Development

4. Research and Development

The vision of IIST is to be a leading academic institution, especially in Space Science and Technology by advancing knowledge through high impact education and research, catalyzing innovation driven entrepreneurship, thereby addressing strategic goals of the nation and the needs of global society. Our endeavour is to raise the bar and set higher benchmarks for ourselves and for the rest of the country. Despite the lockdowns and the consequent disruptions, our faculty members and research scholars were able to undertake high impact research projects and produce output of a consistent high quality. This section outlines the major developments in Research & Development activities in IIST in 2021-22.

4.1 Space Technology and Research in IIST

IIST's INSPIRESat-1 launched successfully on 14 Feb 2022 at 5:59 am, using PSLV C-52

INSPIRESat-1 is a student satellite jointly developed by Small-spacecraft Systems and PAyload CEntre (SSPACE), Indian Institute of Space Science and Technology (IIST), Thiruvananthapuram, India, and Laboratory of Space Physics, University of Colorado, Boulder, USA, to provide education and space science research to the students of the collaborating universities. Two other universities who contributed in this journey include NTU, Singapore and NCU, Taiwan.

The main scientific aims of the INSPIRESat-1 mission are:

1. Improve the understanding of Ionosphere dynamics through observations of ion temperature, composition, density and velocity. This effectively means characterization of plasma parameters and irregularities in the low- and mid-latitude ionosphere.
2. Improve our understanding of the sun's coronal heating processes by measuring the Soft X-Ray spectrum of the sun.

INSPIRESat-1 is a 3-axis stabilised spacecraft carrying two payloads, the CIP and the DAXSS. The spacecraft weighs 8.38 kg with stowed dimensions = 312 mm x 190 mm x 221 mm [during launch without the ring], and deployed dimensions = 535 mm x 190 mm x 450 mm [in space]. The INSPIRESat-1 was environment tested and qualified for launching into space at LASP. The payloads are expected to capture data for scientific requirements in the polar low earth Orbit (LEO) of approximately 529 km altitude. The spacecraft is expected to function normally for 6 months to 1 year during which sufficient data for scientific purposes would be gathered. The data will be shared with all INSPIRE partners and the scientific outcome will be published.

Engineering Novelty

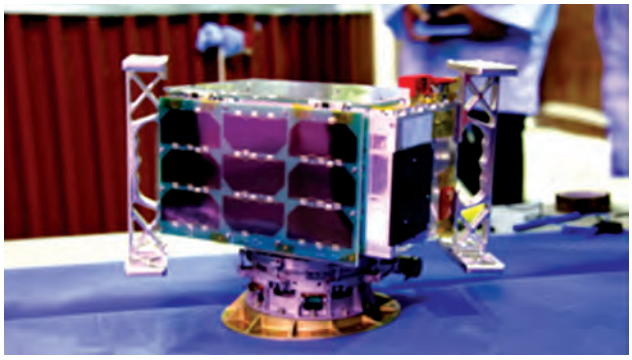
Apart from payloads, the following features are exclusive for this spacecraft:

- The electronics of the spacecraft are made from Commercial off-the-shelf (COTS) electronic components with most of them having space heritage. This allows building a cost-effective system.
- The Attitude Determination and Control System (ADCS) is a COTS system with space heritage. This system has a small form factor and with very good pointing accuracy of at least 0.007 deg in all axes.
- This spacecraft does not have an active station-keeping mechanism using propulsion. However, due to the small dimension of the spacecraft, the expected drift is not-significant during the lifetime of the mission with a minimum of 6 months and up to 1 year. Further, the drift does not affect the scientific data capture of the mission, which is ionosphere property and remote measurement of the sun's X-rays.
- The spacecraft revolves above the Earth at an altitude of 529 km with a time period of 95 mins. Over the Indian continent, there are at least two passes per day, where we get the opportunity to download data. In addition, the spacecraft is also tracked from LASP, USA, NTU, Singapore and NCU, Taiwan.

The spacecraft was integrated and tested at LASP. Further, environment tests like thermovac and vibration tests were carried out at LASP facilities. Following this, the spacecraft was shipped to IIST for ground station integration and LVI match mate tests.

Summary of InspireSat-1 Accomplishment on Feb 14 2022 [upto 10 am]

1. INSPIRESat-1 was successfully launched at 5:59 am by PSLV C-52 mission. The satellite separated from the PS4 stage at around 6:17 am IST. The visually observed tumble rates of the satellite were very low, which is very favourable for the satellite.
2. The first set of beacons were successfully received at LASP, University of Colorado Boulder during 7:02 - 7:08 am IST. The packets were successfully decoded confirming the deployment of solar panels and antenna. The spacecraft is in the Sunpoint mode and the battery is fully charged as expected. All spacecraft subsystems are performing nominally.
3. The IIST ground station was able to receive beacons at 7:37 am IST even with an extremely low elevation pass (less than 5 degrees). IIST pass is low in elevation according to expectations, and very low power could be received. Next nominal pass at IIST is expected to be at 17:58 hrs on 14/02/2022.
4. Shortly afterwards Dhruva Space Pvt. Ltd., India successfully received the beacons. The decoding of the beacons are in progress.
5. The LASP ground station at Alaska was able to receive the beacon during the pass at 8:43-8:50 am IST. The data received is being decoded at IIST.
6. Amateurs have started to report beacons from all over the world.



SDSC MID team & INSPIRESat-1 IIST team integrating the spacecraft to PSLV C-52 EB Deck.

Other Facilities

1. Small-spacecraft Systems and PAyload CEntre (SSPACE)

About the Centre

Small-spacecraft Systems and PAyload CEntre (SSPACE) was established in 2018 as an interdisciplinary research and development centre. The main objective of the centre is for conceptualising, evolving design and development of small spacecraft systems & payloads and also for establishing required equipment and facilities. Further, in this fast emerging field the centre aims at creating an R&D environment for knowledge

INSPIRESat-1 team with Chairman, ISRO.

sharing among the faculty members, researchers, students and visiting scientists by collaborating with ISRO centres and also globally with like-minded academic institutions. The growing emerging trend in the use of small satellites and its constellations in the global scenario demand an urgent need of capacity building in the areas of theoretical design, system engineering and realisation of small and high performance satellite systems.

A number of small satellite projects have been initiated at Small-spacecraft Systems and PAyload CEntre (SSPACE), with the core objective of design and realisation of a space-borne hardware. These include small satellites such as IIST Cubesat (AHAN), INSPIRE missions, ISAT2, XNAV, nanosatellites for the Venus mission, and science payload projects such as RPA (Retarding Potential Analyzer) and PILOT for the PS4 platform, MOM-2 and Venus mission. These systems are being designed and developed by the concerted effort of faculty members, students and project engineers of IIST. Further, a number of future technology demonstration small satellite missions that are envisaged include docking experiments, astrobiology experiments, reentry experiments, constellation formation and maintenance and so on.

Major Space Missions

The major space mission development areas envisaged are the following

Space mission design using small satellites: A number of space missions involving small satellites are being explored. The following have already been launched

- **ARIS [PS4 payload, Q2-2019] [Advanced (Retarding Potential Analyser) for Ionosphere Studies]**

This was a technology demonstration mission consisting of a retarding potential analyser (RPA) capable of measuring ion velocity, temperature and velocity as a PS4 orbital stage payload. This flew successfully in the C-49 mission in April 2019.

- **InspireSat-1 [Q1-2022]**

This was a jointly developed small satellite mission between IIST, University of Colorado, Boulder, USA, NCU, Taiwan, and NTU, Singapore. The mission consists of two payloads, Compact Ionospheric Payload (CIP) and Dual Axis X-ray Solar Spectrometer (DAXSS). The spacecraft was launched as a secondary payload on the PSLV C52 Mission on Feb. 14. 2022. The InspireSat1 mission is under progress and science data has been made public to Inspire Partners.

The following missions are under progress

- **AHAN [Q4-2022]**

This spacecraft is being developed by IIST with the main payload as GMC to study the radiation counts at LEO.

- **ISAT2 [Q1-2025]**

This spacecraft is being developed by IIST with the main payload as Magnetic gradiometry on LEO, the top side ionosonde payload.

- **XNAV [Q1-2026]**

This spacecraft is being developed by IIST to demonstrate navigation using pulsar stars in the X-ray band.

More missions that are being deliberated and reviewed include docking experiments in space, astrobiology payloads etc.

- **Design and development of small satellite subsystems**

The intention for developing the space missions include capacity building in the area of spacecraft engineering. Towards this direction the subsystems of the spacecraft are being indigenously developed by the students of the institute. The following subsystems have been developed and are being developed:

- The OBC for InspireSat-1 and InspireSat-2 have been designed at IIST and have been shown to perform to their designed specification in those missions. Hence the OBC is qualified as TRL 9.
- The EPS for InspireSat-1 and InspireSat-2 have been designed at IIST and have been shown to perform to their designed specification in InspireSat1, thus qualifying EPS at TRL 9.
- The communication board, ADCS and the cold gas thrusters are in the process of development.
- Space science using small satellites and payloads

The main scientific purpose of the space mission is to explore space science on the LEO. The main thrust area has been space weather. Towards this direction the following areas are being explored.

- Radiation studies at LEO
- Ionosphere studies at LEO
- Sun's Solar flare understanding

Instruments/ Products developed/ Payload/ Sensors/ Detectors

The following are the major products developed

- **ARIS sensor**

A Retarding Potential Analyser has been indigenously developed for the ARIS mission.

- **OBC for small satellites**

The onboard computer developed for the InspireSat1 mission can be used in future small satellite space missions.

- **EPS for small satellites**

The Electrical Power System developed for the InspireSat1 mission can be used in future small satellite space missions.

- **Integrated Diagnostics Module (IDM)** for onboard diagnostics of an electric propulsion system to be installed on a Technology demonstration satellite (TDS-1).
- **ARIS-2** hardware is made ready and functional testing completed at IIST. Awaiting the next opportunity on a suitable PSLV mission with a stabilised PS4 platform.
- **LEO plasma simulation facility** is established for testing payloads and small satellites (80 cm X 80 cm X 80 cm or smaller).

Existing Collaborations

MoUs have been signed with the following universities for research and development in the area of space science and technology

- Laboratory of Atmospheric and Space Physics (LASP), University of Colorado, Boulder
- Nanyang Technological University (NTU), Singapore

MoUs are under discussion with the following university for research and development in the area of space science and technology

2. ARIS-2

An advanced retarding potential analyser for ionospheric studies (ARIS) was designed and built by IIST faculty, project fellows and students with support from IISU and VSSC. The second hardware of ARIS -2 payload is ready and awaiting a launch opportunity. Activities for RPA-V payload for venus mission are in progress and project funds are awaited. IIST is part of ISRO's TDS-01 satellite mission. IIST will be providing the IDM payload for the satellite. We have demonstrated a large area soil moisture sensor based on thermal neutron detection. The technology will greatly reduce the dependence on imports and make the sensor compact and affordable to small farming communities.

3. Human Space Programme @ IIST (HSP@IIST)

HSFC, ISRO head quarters is funding the project 'Spaceflight induced changes in Kidney stone formation in Drosophila Melanogaster' by Dr. K. G. Sreejalekshmi and her team which was chosen as a biology payload for the first developmental flight of Gaganyaan. The spaceflight hardware design is completed and experimental verification tests are progressing well in the space life science research unit established at IIST. Along with that, gravitational biology research was also initiated and a Random Positioning Machine was designed, fabricated and tested for microgravity science experiments.

Research is in the advanced level for developing Indigenized gas sensors for crew cabin monitoring led by Dr. Palash Basu. Other explored areas include development of handheld sensor platform for point-of-care purpose, wireless communication systems for human health monitoring, prognosis and diagnosis by Dr. Selvaganesan, Dr. Vanidevi and Dr. T. G. Deepak. Another project dealing with the human thermal management by Dr. Shine S. R. in collaboration with SCTIMST, Thiruvananthapuram is under consideration for induction in the HSP.

4. Ground Station

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

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

4.5 meter S-band dish antenna

Standalone SDR-based VHF-UHF Ground Station Unit

IIST Satellite Ground Station Control Room

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

The stand-alone VHF/UHF SDR Ground Station Unit

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

This standalone Ground Station unit is designed with the latest state of the art technologies like wideband SDR (Software Defined Radio) based MODEM and fully integrated network-based architecture. In this architecture, RF loss is minimal, due to the co-location of RF power amplifiers very close to the antenna pedestal. A weather proof 19-inch 24U equipment rack houses the VHF/UHF RF Power Amplifiers, LNAs, TR (Transmit-Receive) Switches, BPF (band Pass Filters), a USRP SDR Modem and an Intel-NUC computer running GNU-Radio software on Linux operating system. The Antenna Assembly is mounted on a set of Elevation-over-Azimuth rotators capable of 0-360 degrees motion in Azimuth plane and 0-90 degrees motion in elevation plane. These rotators are 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.

5. STIIC

In line with the expanding entrepreneurial ecosystem within the country, IIST has established Space Technology Innovation and Incubation Centre (STIIC) in its campus. Through STIIC, IIST strives to achieve the mission to foster the spirit of innovation and act as a pedestal to assist knowledge driven enterprises to establish and prosper under systematized scientific guidance and thereby mould successful

entrepreneurs. The activities of STIIC are formulated, streamlined, guided, supported, and monitored by STIIC Establishment and Operational task team and the IPR and Incubation Cell Monitoring Committee. During the report period, STIIC made significant strides in formulating its policy guidelines and various operational procedures. A website was designed and shared internally for comments and suggestions from IIST faculty, (https://stiic6.wixsite.com/my-site) and is currently under refinement. The STIIC office complex was inaugurated by Shri. S. Somanath, Director IIST on January 12, 2022.

Current status of incubation with STIIC is summarized below

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

4.2 Advanced Space Research Group

Recognizing the imperative need of reinvigorating and streamlining IIST's research environment to catch up with advances in the ever dynamic space sector, ADVANCED SPACE RESEARCH GROUP (ASRG) was constituted in IIST (vide Office Order No. SC/CH/A.22/92/2020 dated 29/10/20). ASRG, headed by the Chief Technology Officer, IIST and with members from all the academic departments as well as a member from the Capacity Building Programme Office (CBPO), ISRO has a focused goal to co-ordinate all joint Research activities between IIST and ISRO centers. 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 programmes. To this end, ASRG link units have been established at all participating ISRO centres and an Empowered Overseeing Committee periodically review the activities of ASRG.

Total projects approved	30
Participating ISRO Centres	VSSC, LPSC, IPRC, IISU, HSFC, NRSC, SAC, LEOS, ISTRAC
Participating Departments of IIST	Aerospace Engineering, Avionics, Chemistry, Physics, Earth and Space Science, Mathematics
Total projects under consideration	4

Details of Projects Approved under ASRG

Sl.No.	Title of the Project	IIST PI	Department	DoS PI	Duration
1	Development of Control design strategy for coupled MIMO (multi input multi Output) systems	Rajesh Joseph Abraham	Avionics	Kapil Kumar Sharma	1 Year commenced
2	Control design strategy for systems with structured uncertainty	Rajesh Joseph Abraham	Avionics	Anish Antony	1 Year commenced
3	Nano structured high performance anode materials for high power, higher safety and fast charging Li-ion battery	Mary Gladis J.	Chemistry	Jalaja K., S. V. S. Narayana Murty, Bibin John, Mercy T. D.	2 Years
4	High-Q dielectric thin films with tunablity in Microwave frequencies for Space applications	K. B. Jinesh	Physics	K. Ashok	2 Years
5	Development of Yttrium Iron Garnet (YIG) thin films for space applications and Dielectric Test setup for ceramics at high Electric field and temperatures	K. B. Jinesh	Physics	K. Ashok	2 Years
6	Development of Magneto Dielectric Substrate/ Metamaterial based L- band Antenna	Basudeb Ghosh	Avionics	K. Ashok, Femina Beegum S.	1 Year
7	Implicit large Eddy Simulation of Jets	Manoj T. Nair	Aerospace Engineering	Sanjoy Kumar Saha	3 Years Commenced
8	Supersonic combustion of isrosene behind two strut configuration	V. Aravind	Aerospace Engineering	Desikan S. L. N., B. Murugan	3 Years Commenced
9	Development of Graphene based anticorrosion coating for stainless steel bipolar plates of PEM fuel cells	K. Y. Sandhya	Chemistry	Remyamol T.	2 Years
10	Improved Silicon-graphene based composite as anode materials for lithium battery cells and exploring the possibility of other battery technologies	K. Y. Sandhya	Chemistry	S. A. Ilangovan, S. Sujatha	2 Years
11	Graphene nano platelets incorporated zinc rich epoxy coating for corrosion protection of steel hardware	Mary Gladis J., Kuruvilla Joseph	Chemistry	Anoop S., Venugopal A., Jalaja K., Narayana Murty S. V. S.	2 Years

Sl.No.	Title of the Project	IIST PI	Department	DoS PI	Duration
12	High Performance SAR ADC with auto calibration and self-correction for sensor closed loop application	Immanuel Raja	Avionics	Raghunath K. P., Rekha A. R.	3 Years Commenced
13	Near and field diagnostics NET	Umesh R. Kadhane	Physics	Varaprasad Kella	2 Years Commenced
14	Development and implementation of LIF inversion algorithm for NET diagnostics at SEP facility in LPSC	Umesh R. Kadhane	Physics	Varaprasad Kella	3 Years Commenced
15	Life time predication of HET liner using simulations	Umesh R. Kadhane	Physics	Pranav Nath	1 Year Commenced
16	Experimental and Numerical Investigation of Direct Contact Condensation of GCO2/ steam in LN2	Prathap C., Manu K. V.	Aerospace Engineering	Deepak Agarwal, Anant Singhal	3 Years Commenced
17	Performance and Instability Analysis of Methane- Oxygen Combustion using shear coaxial injectoron	Aravind V.	Aerospace Engineering	Assiz M. P., Muthukumaran C. K.	3 Years Commenced
18	Three-dimensional DSMC (Direct simulation monte-carlo) simuIation for satellite thrusters	Shine S. R.	Aerospace Engineering	Arun Kumar, Deepak Agarwal, Vinse Antro W.	3 Years Commenced
19	Development of Real Time Gas Sensor Array to Monitor Critical Gases in Crew Module for Human Space Mission	Palash Kumar Basu	Avionics	Sreejith	3 Years Commenced
20	Spaceflight Induced changes in Kidney Stone formation in Drosophila Melanogaster Experimentation. Biology payload for Gaganyaan	K. G. Sreeja lekshmi	Chemistry	Ravikumar Hosamani, Xavier Raja	2 Years Commenced
21	Development of Mathematical Human Thermal Behavior Model for a Reference Indian Subject linked to Human space flight programme of HSFC (Gaganyaan Projects)	Shine S. R.	Aerospace Engineering	Chiranjivi, Eswer, Jayanand B. Sudhir	3 Years Commenced
22	Machine learning driven Augmented Reality based Campus walkthrough.	Deepak Mishra, A. M. Ramiya	Avionics, ESS	Jai G. Singla	3 Years
23	Interference analysis and co-existence studies between GSO and NGSO satellite systems	Vani Devi M., S. Chris Prema, Lakshmina-rayanan	Avionics	S. C. Bera, Saket Buch	2 Years

Sl.No.	Title of the Project	IIST PI	Department	DoS PI	Duration
24	Cold Flow Characterization of a Dual Throat Nozzle (DTN) based Tri-Propellant Engine Propulsion System	Deepu M.	Aerospace Engineering	Bijukumar K. S.	3 Years
25	Design of Multi-Channel Temperature Monitoring ASIC	Immanuel Raja	Avionics	Deepu Roy, Padmakumar	2 Years
26	Cloud physical properties under Polluted and Unpolluted conditions for Climate Studies	P. R. Sinha	Earth and Space Sciences	S. V. S. Sai Krishna, Shivali Verma	3 Years
27	Automatic labeling methods for development of machine learning applications for inventory of horticulture plantations	A. M. Ramiya, Deepak Mishra	ESS, Avionics	R. Hebbar, Vinod P. V.	2 Years
28	DEEP CLOUD: Deep learning based system for time series Cloud detection using multi-sensor satellite Imagery	N. Rama Rao	Earth and Space Sciences	T. Sai Kalpana	3 Years
29	Tracking & Nowcasting of severe convective storms using deep learning (DL)/ machine learning (ML) techniques	Deepak Mishra, Sumitra, P. R. Sinha, Govindan Kutty	Avionics, Mathematics, Earth and Space Sciences	V. K. Anandan, Shivang Mishra	3 Years
30	Design and construction of MEMS-based portable Seismocardiogram for on-board Cardiac health monitoring of Astronauts.	K. B. Jinesh	Physics	Jiju John	1 Year

Externally Funded Projects Details - 2021-22 [Department of Space]

Sl. No.	Name of the Funding Agency	Title of the Project	Principal Investigator	Amount (in Rs.)	Duration
1	IPRC, Mahendragiri	Development of Novel N_2O_4 scrubber system	Kuruvilla Joseph	4,00,000	
2	IISU, Vattiyoorkavu	High performance SAR ADC with auto calibration and correction for sensor loop application	Immanuel Raja	67,42,000	3 years
3	Department of Space	Developing the laboratory model of Retarding Potential Analyser	Ambili K. M.	70,00,000	
4	Department of Space	Initiation activities related to payloads recommended for the future planetary exploration	Umesh R. Kadhane	10,00,000	

Sl. No.	Name of the Funding Agency	Title of the Project	Principal Investigator	Amount (in Rs.)	Duration
5	Vikram Sarabhai Space Centre	Development of Algebraic Multi-grid methods for solving sparse linear system	Natarajan E.	5,07,500	
6	IISU, Vattiyoorkavu	Development of Atom interoferometer	Umesh R. Kadhane	5,50,000	
7	IISU, Vattiyoorkavu	Surface Engineering Techniques for improving the life and performance of ball bearings in ISRO spacecraft mechanisms	Jinesh K. B.	49,60,000	
8	IPRC, Mahendragiri	Design & Development of High Performance Hydrogen Sensor	Palash Kumar Basu	20,60,000	
9	Indian Space Research Organisation	Development of Science payload for unmanned mission of Indian Human Space Programme	K. G. Sreejalekshmi	72,00,000	5 years
10	Liquid Propulsion Systems Centre	Establishment of Laser Profilometry based on Holographic Principle	Dinesh Naik		
11	Liquid Propulsion Systems Centre	Development of Laser Ignition Systems	Jinesh K. B.	31,14,000	
12	Liquid Propulsion Systems Centre	Development of Surface Discharge Spark plugs	Jinesh K. B.	23,64,000	
13	Liquid Propulsion Systems Centre	Development of Particle-in-cell Monte Carlo model of 300mN SPT	Umesh R. Kadhane	7,50,000	6 months
14	Liquid Propulsion Systems Centre	Development and implementation of diagnostic tools for high thrust electric propulsion system	Umesh R. Kadhane	1,81,60,000	18 months
15	Space Applications Centre	A study on the effects of inospheric variabilities on the usability of IRNSS / GAGAN using observations and models	Ambili K. M., Priyadarshnam	26,00,000	
16	Department of Space	Human Space Programme - Real Time Gas Sensor	Palash Kumar Basu		

4.3 New MoUs signed and other 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 of eminence.

New MoUs signed

1. MoU was signed with The Delft University of Technology (TU Delft) on May 17, 2021, to carry out the Academic programmes and Research activities involving students and faculty members in each institution. The signing of this Agreement shall enable pursuing the following potential interest areas of cooperation: exchange of faculty members, students, and researchers, scientific materials, publications, and information. Joint research meeting Ph.D. program, Dual Degree/ Double Degree programme will also be carried out.
2. MoU was signed with L&T on March 10, 2022. The objective of this MoU is to set forth the broad parameters of cooperation between the Parties in the area of specific research, innovation, and applied science. L&T will be engaging with IIST for Ph.D. & M.Tech. programmes, wherein L&T engineers, who are interested, will be doing research & studies at IIST. IIST and L&T will decide on the specific areas of the research and development that will be carried out at IIST. L&T will also be engaging with IIST to work on funded projects under the Space Technology Innovation and Incubation Centre (STIIC).
3. MoU was signed with IISU, ISRO on March 23, 2022. The purpose of this MoU is to establish a co-operative framework between the Parties for of the project entitled "High Performance SAR ADC with auto calibration and self-correction for sensor closed loop application".

IIST has research collaborations with the following national and international institutes.

Existing MoUs

- 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
- Cnrs, Femto-St, Besançon, France
- Isae Supaero, France
- Max Planck Institute for Radio Astronomy
- TIFR, Mumbai
- Public Health Foundation of India

IIST will actively consider extending this cooperation by facilitating student and faculty exchange programmes across universities, Joint Doctoral Programme, etc., in the future.

Future Areas of Collaborations

Discussions and approval process are underway with Centre for Development Studies for Research and Academic Activities in areas of economics and sociology and National Central University (NCU), Taiwan. Further, a draft proposal is being made for the technology development of Microwave Rocket Propulsion at IIST which will be submitted to DTDI (Directorate of Technology Development and Innovation). Discussions are also ongoing with Augsense Lab Pvt. Ltd., Rajasthan Central University and TCS for a joint satellite mission.

4.4 Centres of Excellences

The following Centres of excellence are functioning in IIST.

1. Advanced Propulsion and Laser Diagnostics Lab (Department of Aerospace Engineering)

The setting up the Advanced Propulsion and Laser Diagnostics (APLD) is aimed at the establishment of a centre of excellence that will serve as (i) centre for conducting academic research in IIST which would assist ISRO activities, (ii) national facility for performing advanced research and (iii) national technological development centre for aerospace organizations. The current objective is to perform

propulsion research studies that are of academic interest and also complement ISRO's ongoing technological development activities.

2. Centre of Advance Research in Nanoscience and Technology (Department of Chemistry)

Center for Nanoscience and Energy Materials was established in Department of Chemistry 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 analyzer, Glove box, electro-spinning machine, Contact angle Goniometer, HPLC, Planetary ball mill and surface area analyzer.

3. NEMS and Opto-Nanoelectronics (NEMO) (Department of Avionics)

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

4. Computer Vision and Virtual Reality Lab (CVVR lab) (Department of Avionics)

Vision: To transcend in the area of virtual reality and intelligent computer vision for cutting edge space science, societal and technological applications.

Mission: To design and develop state of the art technological solution, algorithms for both space and non-space 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.

5. Centres of Excellence (Multidisciplinary) (recommended)

- Advanced Combustion Research Lab
- ASIC Design and Characterization Lab
- Advanced Space Robotics & Control Lab

They will be an integration of several labs of IIST and has been welcomed by several ISRO centres.

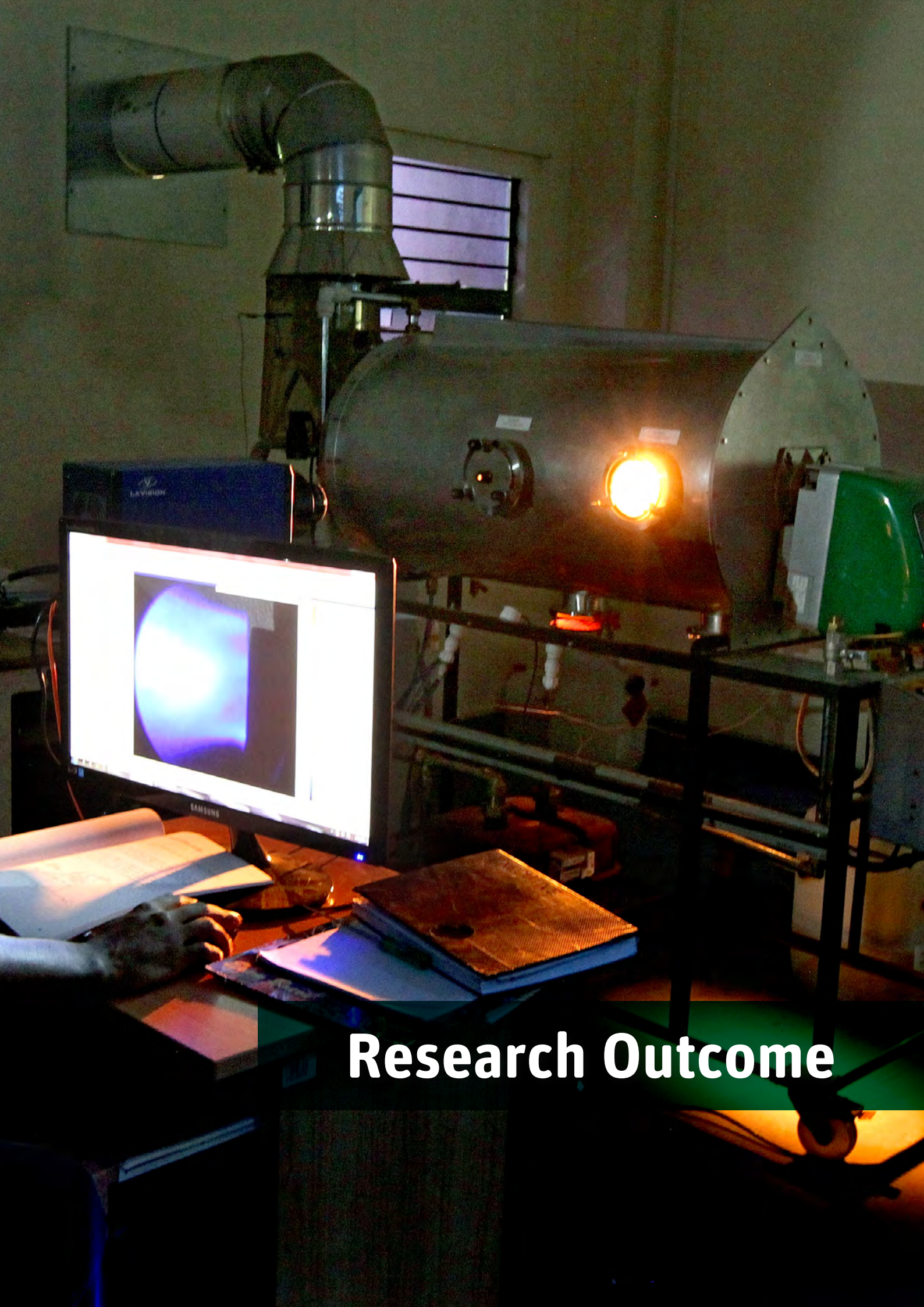
4.5 Extramural Research Projects

Externally Funded Projects Details - 2021-22 [Other than Department of Space]

Sl. No.	Name of the Funding Agency	Title of the Project	Principal Investigator	Amount (in Rs.)	Duration
1	Department of Science and Technology	Probing the Intergalactic and Circumgalactic Medium	Vikram Kisan Khaire	22,00,000	5 years
2	Department of Biotechnology	Investigating the Nanomaterials Based Exosome Characterization for Cancer Prognostic : An Approach towards Liquid Biopsy for Cancer	Palash K. Basu	32,88,200	3 years
3	Department of Biotechnology	Development of Low cost, Low power, High Performance Sensor Array with Suitable Optical Source to Measure the Emission of Green House Gases: Broad Applications towards Agriculture and Environment Monitoring Including Harsh Condition	Palash K. Basu	50,26,080	2 years
4	Department of Biotechnology	Advanced spectroscopic imaging to investigate flavonoid interactions and molecular processes in hepatocytes	Shaiju S. Nazeer	1,13,60,000	5 years
5	Department of Biotechnology	The Rural-Urban Interface of Bangalore: A Space of Transitions in Agriculture Economics and Society - Phase II	Rama Rao Nidamanuri	83,15,480	3 years
6	Department of Science and Technology	LOC approaches for Separation and Analysis of Exosome Derived Biomarker for Cancer Prognostic	Palash K. Basu	32,35,459	3 years
7	Department of Science and Technology	Development of an Atomic Layer Deposition System	Jinesh K. B.	1,13,08,720	3 years
8	Department of Science and Technology	Supersymmetric quantum mechanics and Riemann hypothesis	Pushpa Kalauni	29,65,118	3 years
9	Department of Science and Technology	City GML based 3D models for smart cities in India using LiDAR point cloud	A. M. Ramiya	33,29,683	2 years
10	Indian Council of Social Science Research	Lifeline for Remote India: A study on Tele Medicine Units in India	Shaijumon C. S.	13,97,500	

Sl. No.	Name of the Funding Agency	Title of the Project	Principal Investigator	Amount (in Rs.)	Duration
11	Mangrove cell	Monitoring the health of mangroves of Maharashtra state using near real time satellite remote sensing data	L. Gnanappazham	77,95,000	3 years
12	Max Planck	Partner Group for Galactic Star Formation	Jagadheep D.	46,56,430	5 years
13	Ministry of Electronics and Information Technology	Design & Development of NavIC Receiver	Priyadarshnam	68,20,000	3 years
14	Ministry of Earth Sciences	Improving the Prediction of Thunderstorms using Dual - Resolution Hybrid Ensemble - Variational Data Assimilation System using WRF Model	Govindankutty M.	48,00,480	3 years
15	Science and Engineering Research Board	Understanding the Physical Conditions of Baryons Outside of Galaxies in the Low Redshift Universe	Anand Narayanan	16,03,654	3 years
16	Science and Engineering Research Board	Developing a source of bright entangled light for quantum communication and quantum sensing	Ashok Kumar	24,55,029	2 years
17	Science and Engineering Research Board	Turbulent induced aberrated wavefront correction without adaptive optics	C. S. Narayana murthy	52,62,400	3 years
18	Science and Engineering Research Board	Design of a Transmitter with Integrated Power Amplifier (PA) for Millimeter-wave 5G Bands in 65nm CMOS	Immanuel Raja	29,68,630	2 years
19	Science and Engineering Research Board	Investigation, Design and Implementation of Multifunctional 5G Antenna Systems for Cognitive Radio and mm-Wave Applications	Chinmoy Saha	55,24,024	3 years
20	Science and Engineering Research Board	Variation in Biogas Fuel Composition on the Flame Stability and Pollutant Emissions under Practically Relevant Flow Conditions	Rajesh S.	48,22,400	3 years
21	Science and Engineering Research Board	Structure and dynamics of ultra-relativistic jets	Resmi L.	6,60,000	3 years

Sl. No.	Name of the Funding Agency	Title of the Project	Principal Investigator	Amount (in Rs.)	Duration
22	Science and Engineering Research Board	Understanding the influence of young massive stars on the surrounding interstellar medium	Sarita Vig	22,89,859	3 years
23	Science and Engineering Research Board	Discontinuous virtual element approximation for non-stationary fluid flow problems	Sarvesh Kumar	6,60,000	3 years
24	Science and Engineering Research Board	Development of novel numerical techniques for miscible displacement problems in porous media	Sarvesh Kumar	19,40,400	3 years
25	Science and Engineering Research Board	Investigation of Transition Metal Dichalcogenides based Thin film transistors for Ultra Sensitive Nanomechanical Bio/chemical Sensor	Seena V.	79,23,520	3 years
26	Science and Engineering Research Board	Electron impact secondary electron - ion coincidence spectrometer for investigation of dissociation dynamics of PAHs	Umesh R. Kadhane	47,77,056	3 years
27	Science and Engineering Research Board	Wireless-ReLod - Wireless Reliable, Low Latency Networks for IIoT and Field Bus replacement	Vineeth B. S.	18,11,320	3 years



Research Outcome

5. Research Outcome

Despite the lockdown and the restrictions associated with the pandemic, IIST has improved its credentials in research as evidenced by way of publications and patents

5.1 Publications in Journals

Aerospace Engineering

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Humanities

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Mathematics

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- Yadav, N.S. and **Mukherjee, K**., 2020, September. An Efficient Numerical Method for Singularly Perturbed Parabolic Problems with Non-smooth Data. In *International Conference on Computational Sciences-Modelling, Computing and Soft* (pp. 159-171). Springer, Singapore.
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Physics

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5.6 Patents

Patents Awarded

- Gluten Protecte d Gold Quantum Cluster as a Creatinine sensor,

  Name of Inventor: Meegle S. Mathew, **Kuruvilla Joseph**

  Patent No. 372438. Date of Award: 22/7/2021

  File No. 201741000489 dtd 5/7/2017

The patent granted for the development of novel creatinine sensor using gold nanoclusteras substrate. It present the cost-effective synthesis of novel, water-soluble, and stable fluorescent gold quantum clusters via a facile and green method using wheat gluten protein as a stabilizing agent (Au_{QC}@gluten). Gluten, a cysteine-rich protein serves as an effective stabilizing agent for these clusters. Contrary to any other protein protected gold quantum cluster, Au_{QC}@gluten is highly stable toward reactive oxygen species like H_2O_2, revealing its promising application in biomedical fields. The synthesised gold nanocluster used for the development turn on fluorescent sensor.

Patents Under Review

- Quad Cross and Symmetrical Non-planar Beam Piezoresistive MEMS Accelerometers for Low Cross Axis Sensitivity and Fabrications Methods thereof

  Name of Inventor - **V.Seena**, K.Hari, S. Rohit

  Status - Patent application under review

5.7 Awards and Achievements

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

Notable Achievements

- Dr. B. N. Suresh, Hon. Chancellor and Founder Director, IIST was elected as an **International Member of the United States of National Academy of Engineering (INE)**. The honour was bestowed upon him in recognition of his distinguished contributions in engineering, for contributions to advances in technologies for space exploration and for his leadership to promote peaceful uses of outer space.
- Dr. V. K. Dadhwal, Former Director, IIST and Dr. Kuruvilla Joseph, Outstanding Professor and Dean (SA, SW and OR) have been listed among the top **2 percent Scientists by Stanford University**, across the world in all subject fields for the year 2020.
- Dr. Kuruvilla Joseph - In 2020-21, **Wiley has recognized** one of his article in the journal Polymer Engineering and Science as the **top cited article**.

Aerospace Engineering

- Devendra Ghate and Pankaj Priyadarshi (VSSC), Shashank Tomar, 2021 batch, B.Tech., Aerospace, INAE best student project Award (Aerospace) 2021.
- V S Sooraj, Danish Handa, Research Scholar, Best Paper Award in PLMSS 2021.
- Prathap C., Manu K. V. and Mohd Abdullah Khan, M.Tech., Thermal and Propulsion 2020 batch, First position in Thesis-2021, ISHMT Trivandrum Chapter.

Avionics

- Anoop C. S., Kerala State Young Scientist Award, 2021.
- Anoop C. S., Outstanding Reviewer Recognition, IEEE Transactions on Instrumentation and Measurement, 2021.
- Ishank Shekhar, B.Tech. ECE, Innovative Student Projects Award - 2021, Indian National Academy of Engineering (INAE), mentored by Rajeevan P. P.
- Seena V., IEEE Senior Member Elevation.
- Gopalakrishnan, B.Tech. ECE, First Place in Graduate Project Award 2021 by IEEE Circuits and Systems Society - Kerala Section, mentored by Immanuel Raja.
- Usurupati Samiyalu, M.Tech., Best Thesis award by IEEE Microwave Theory and Techniques Society (MTT-S) Kerala Chapter 2021, mentored by Immanuel Raja and Chinmoy Saha.
- M. Vani Devi - Senior Membership in IEEE.
- Chinmoy Saha - AICTE-Visvesvaraya Best Teacher Award 2021.
- Chinmoy Saha - IETE-Prof. SN Mitra Memorial Award 2021.
- Chinmoy Saha - Nominated as Chairman of Conference Activity Board of IEEE Kerala Section.
- Siri Gadipudi, B.Tech. ECE - INAE Innovative Student Project Award - 2021, mentored by R. Sudharshan Kaarthik, Rajeevan P. P.
- R. Sudharshan Kaarthik - Student team (Pragya Yadav (M.Tech. 2020 PE), Vidya V (Phd), Srikara Reddy (M.Tech 2020 PE), Harshith V Reddy (M.Tech 2021 PE), G Sai Pavan (M.Tech 2021 PE), Mokshith SR (M.Tech 2021 PE) and VLN Mallikarjun (B.Tech. 2021 ECE), Texas Instruments India Chairman Award for Technical Innovation (1st Prize) in the India Innovation Challenge and Design Competition (IICDC) organized by DST, AICTE, Texas Instruments, IIM Bangalore and mygov.in
- R. Sudharshan Kaarthik - IEEE Outstanding Researcher Award 2021.
- Shantanu Shakya, Soumyadip Bhunia, Moksh Bhateja and Jyoti Bhramar Manjul (Team 'Exploding Stars') first prize in designing 'space habitats' for space pioneers of the future organised as part of World Space Week Celebrations.
- Pragya Yadav (M.Tech PE 2020), Harshith V Reddy (M.Tech PE 2021), Mallikarjun K (B.Tech. AV 2020), Sai Pavan (M.Tech PE 2021), Srikara Reddy (M.Tech PE 2020), Mokshith (M.Tech PE 2021), Vidya V (PhD, AV) - Texas Instruments India Chairman Award for Technical Innovation (1st Prize) in the India Innovation Challenge and Design Competition (IICDC) organized by DST, AICTE, Texas Instruments, IIM Bangalore and mygov.in.

Chemistry

- Sreekala K., Haritha, H. and Mary Gladis, J., Graphene-lithium cobalt vanadate nanocomposite as synergistic immobilizer of polysulfides for advanced lithium-sulfur batteries, International Symposium on Advanced Materials (ISAM-2021), Organised by Materials Research Society of India, Thiruvananthapuram, 26-27 March 2021. (Oral, Best paper award).
- Sreekala, K., Haritha, H., Mary Gladis, Aqueous Processable Polymer Blend as a Multifunctional Binder for High-Performance Lithium-Sulfur Batteries, J., National Conference on Recent Trends in Material Science and Technology (NCMST), Indian Institute of Space Science and Technology (IIST), 29-31 December 2021. (Poster, Best poster award).

Earth and Space Sciences

- IIST is part of an international consortium (GLOSTAR) that is carrying out an extensive new survey of our galaxy, the Milky Way, in order to get a global view on the star formation activity. Jagadheep D. Pandian, along with IISc, Max Planck Institute for Radio Astronomy and an international team of

astronomers has revealed previously unseen signatures with unprecedented sensitivity and details that hint at how stars form and die. The survey will serve as a bedrock for ongoing and future studies on star formation in the Milky Way. The results of the GLOSTAR team which revealed unseen signatures in the Milky Way with unprecedented sensitivity and details were published in a series of papers on *Astronomy & Astrophysics*.

- Gaurav Kumar (M.Tech. 2020) has been selected for Ph.D. programme with fellowship at the University of Valencia, Spain.
- A. M. Ramiya, Kerala State Young Scientist Award, 2021.

Mathematics

- K. Sakthivel and D. Anjuna, Department of Mathematics, Best Paper Award (Third Prize), On unique determination of unknown spatial load distribution in Euler-Bernoulli beam equation, Symposium on Differential Equations: Analysis, Computation and Application, IIT Roorkee, December 2-3, 2021.

Physics

- C. S. Narayanamurthy - Distinguished Fellow of Optical Society of India, from May 2021
- C. S. Narayanamurthy - Elected to President of Optical Society of India from July 2021-2024.
- C. S. Narayanamurthy - Core Committee Member, DST (Govt. of India), Devise development programme, July 2021 - July 2024.
- C. S. Narayanamurthy - Received SERB/DST Core Research Grant Rs. 52,00,000 for implementing project on "Turbulent induced aberration correction without adaptive optics" April 2021.
- Umesh Kadhane's joint proposal with Istituto di Struttura della Materia, Rome, Italy has been selected for three years of researcher exchange funding under the Indo-Italian Executive Programme of Scientific and Technological Cooperation 2022 - 2024.
- S. Jayanthi - Cover Feature: The Extended Hadamard Transform: Sensitivity-Enhanced NMR Experiments Among Labile and Non-Labile 1Hs of SARS-CoV-2-derived RNAs (ChemPhysChem 4/2022).
- Ashok Kumar - Received SERB - Start up Research grant (December 2020 to June 2022)
- Ashok Kumar - Received "Certificates of Recognition" from Elsevier for reviewing their journals.
- J. Solomon Ivan - The paper 'Polarization-spatial Gaussian entanglement in partially coherent light fields' with S. Asokan, was chosen as an 'Editor's pick' in JOSA.
- J. Solomon Ivan - Received 'Certificate of recognition' from Optica Publishing Group, for reviewing their papers

Hindi

Awards received under TOLIC Rajbhasha Puraskar Yojana 2020 -2021:

- IIST was awarded third prize in TOLIC Rajbhasha award for Outstanding Performance in the Implementation of Official Language Hindi (Category-3).
- Hindi House Journal of IIST named 'Antarish Dhaaraayen' was awarded second prize in TOLIC Rajbhasha Award for Best Hindi Journals.
- Ashok Kumar - Received prize in "TOLIC Rajbhasha Utsav 2021-22" under the auspices of TOLIC, Thiruvananthapuram on topic Tasveer Kya Bolti He (for Hindi Speaking Officials).
- Bindya K. R. - Received prize in "TOLIC Rajbhasha Utsav 2021-22" under the auspices of TOLIC, Thiruvananthapuram on topic Tasveer Kya Bolti He (for Non-Hindi Speaking Officials).

5.8 Seminars/ Workshops Organized

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

Sl. No.	Title	Organizers	Dates	Place
1	MATLAB Workshop on DSP System Design	Sheeba Rani J	February 9, 2022	Virtual mode
2	IEEE Space Antenna Workshop (ISAW-2021)	IEEE IIST Student Branch and IEEE MTT-S and AP-S Kerala Chapter Coordinator - Chinmoy Saha)	December 23-24, 2021	Virtual mode
3	IIST Astronomy & Astrophysics School	Astronomy Group - ESS Department, IIST Coordinators - Anand Narayanan, Anandmayee Tej, Jagadheep D, Resmi L., Samir Mandal and Sarita Vig	December 8-18, 2021	Virtual mode
4	Two day workshop on Astrobiology	ASTROBIOLOGY@IIST in collaboration with SPACEONOVA Coordinator- K G Sreejalekshmi	November 19-20, 2021	Virtual mode
5	Outreach discussion series with Public in Astronomy called 'Ask an Astronomer'	IIST and Astronomical Society of India (ASI) outreach Coordinator- Sarita Vig	February 12, 2022	Virtual mode
6	AICTE Training and Learning (ATAL) Academy Sponsored Faculty Development Pragramme (FDP) On Life Skills Management am	Online Organised by Department of Humanities Indian Institute of Space Science and Technology, Thiruvananthapuram Coordinator- Gigy J Alex	July 12-16, 2021	Virtual mode
7	Workshop on Applied Optics and Optical Metrology for Steel Industry	R&D Tata Steel, Jamshedpur and Deptartment of Physics, IIST Coordinator- Dinesh N Naik	July 14 - Aug 10, 2021	Virtual mode
8	Five Day Webinar on National Webinar On Covid-19-Vulnerability, Adaptation And Capacity Building Among Tribal Communities	Department of Humanities, IIST & Department of Sociology, University of Kerala Coordinator-Lekshmi V Nair	April 15-19, 2021	Virtual mode

5.9 Institute Seminars/ Talks

Sl. No.	Title of the talk	Speaker	Date	Organizer
1	Seeing unseen through gravitational waves	Dr. Archana Pai, IIT-Bombay	March 25, 2022	Rama Rao Nidamanuri
2	Using global observations to constrain the sinks and optical properties of aerosols	Dr. Daniel Murphy, NOAA USA	March 16, 2022	P. R. Sinha
3	Citation Network Analysis: a computer-assisted systematic method of literature review	Prof. Satheesh Kumar, Department of Future Studies, University of Kerala	March 16, 2022	Natarajan E.
4	The (Un) Bearable Irrationality of π	Prof. Sujatha Ramdorai, University of British Columbia, Canada.	March 9, 2022	Prosenjit Das
5	Topology of Algebraic varieties	Prof. Jaya N. Iyer, Institute of Mathematical Sciences, Chennai	March 7, 2022	Prosenjit Das
6	How to publish the research findings	Prof. V. Radhakrishnan, AICTE/ INAE Distinguished Visiting Professor	February 18, 2022	V. S. Sooraj
7	History of Indian Space Research and Innovation Methodologies at ISRO in the last Six Decades	Dr. B. N. Suresh, Chancellor, IIST,	February 16, 2022	IIST
8	Creative and Innovative Research	Prof. V. Radhakrishnan, AICTE/ INAE Distinguished Visiting Professor	February 15, 2022	V. S. Sooraj
9	An Exposure to Academic Research	Prof. V Radhakrishnan, AICTE/INAE Distinguished Visiting Professor	February 14, 2022,	V. S. Sooraj
10	Professional Ethics	Rashmi M., Faculty, VIT	December 28, 2021	Lekshmi V. Nair
11	Polynomials: Genesis and some early results	Prof. Neena Gupta, Theoretical Statistics and Mathematics Unit, Indian Statistical Institute, Kolkata	December 21, 2021	Prosenjit Das

Sl. No.	Title of the talk	Speaker	Date	Organizer
12	Biorobotics: Building Robots Emulating Nature's Marvels	Dr. Mrudul Chellapurath, Max Planck Institute for Intelligent Systems, Stuttgart, Germany	November 27, 2021	Sam Noble
13	The Application of Machine Learning and Artificial Intelligence in Early Warning Systems and Disaster Management	Dr. Dimitrios A Karras, Associate Professor, School of Science, National & Kapodistrian University of Athens, Greece	November 22, 2021	L. Gnanappazham
14	Climate Science- Research Contributions of Professor Manabe and Professor Hasselmann	Prof A. Chandrasekar, Dean Academic IIST	October 20, 2021	Samir Mandal
15	Advances in Aeronautics and Astronautics in India since Independence	Dr. B. N. Suresh, Chancellor, IIST	October 6, 2021	IIST
16	Introduction to Cantera	Nikhil Verma, PMRF Scholar, Department of Mechanical Engineering, IISC Bangalore	August 9-13, 2021	Prathap C.
17	Seminar on Ethics	Smt. Devidas	August 18, 2021	SAB
18	Emerging Trends in Wearable Electrochemical Sensors	Dr. Vinu Mohan AM, DST-INSPIRE Faculty, CSIR-CECRI, Tamil Nadu, India	July 26, 2021	Manoj B. S.
19	Outcome based education and NBA Accreditation Process	Prof. Elizabeth Elias, (Retd.), NIT Calicut	July 10, 2021	IIST
20	Building Bridges between Informal and Formal Knowledge Systems: Honey Bee Network Model	Prof. Anil K. Gupta (IIMA & IITB, ACSIR)	July 12, 2021	Gigy J. Alex
21	The Game of Life - Playing with Resources, Action Experiences and Conditions	Prof. L. S. Ganesh, IIT, Chennai	July 12, 2021	Gigy J. Alex

Sl. No.	Title of the talk	Speaker	Date	Organizer
22	Problem Solving and Decision Making	Prof. M N Mohemedunni Alias Musthafa Central University, Kasargod	July 13, 2021	Gigy J. Alex
23	Exploring Self through Art and Breathing	Shri. Jeetin Rangher Soch Studio, Creative Therapist, Bangalore	July 13, 2021	Gigy J. Alex
24	Life Skill Challenges and Remedies in Educational Institutions	Dr. Rita Rani Bhattacharjee, VIT, Vellore	July 14, 2021	Gigy J. Alex
25	Self Awareness and Empathy	Dr. Arun B. Nair, Govt. Medical College, Thiruvananthapuram	July 15, 2021	Gigy J. Alex
26	Verbal Communication in Professional Spaces	Prof. Sanjay Muttoo, University of Delhi	July 15, 2021	Gigy J. Alex
27	Life Skills during and Post Pandemic Times.	Rev. Fr. Dr. M. K. George, Former Director, Indian Social Institute, Bangalore	July 16, 2021	Gigy J. Alex
28	Introduction to Applied Psychology	Dr. Shabu B. Raj, Scientist, DRDO	May 14, 2021	Lekshmi V. Nair
29	National Education Policy 2020: Implementation at IIST	Dr. B. N. Suresh, Chancellor, IIST	April 1, 2021	IIST

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

Aerospace Engineering

- 8th International conference on Product Lifecycle Modeling Simulation and Synthesis (PLMSS 2021), 17th - 18th Dec 2021, Organized by VSSC and IIST. - B. S. Girish.
- 8th International Conference on Product Lifecycle Modeling, Simulation & Synthesis (PLMSS), 17-18 December 2021, Organized by ISRO, IIST and PLMSS - V. S. Sooraj.
- National Conference on 'Artificial intelligence (AI) - enabled Aerobots and Hydrobots- ASET 2022, 17-18 March 2022, Organized by IISU, IIST and ASI - V. S. Sooraj.
- Pre-conference Workshop, Digital Aerospace Manufacturing, PLMSS 2021, 16 December 2021 - V. S. Sooraj.
- Lavision's Online PIV seminar on DAVIS, October 4-7, 2021, LAVISION - Prathap C.
- Lavision's Online PIV seminar on PIV / SPIV, October 11-14, 2021, LAVISION - Prathap C.
- Lavision's Online PIV seminar on Tomo-PIV/ Shake-the

- Box, October 18-21, 2021, LAVISION - Prathap C.
- The art gallery of Engineering Graphics, 2-6 August, 2021, Sree Chitra Thirunal College of Engineering, Thiruvananthapuram, Faculty Development programme - Sam Noble.
- 8th International Conference on Product Lifecycle Modeling, Simulation & Synthesis (PLMSS), 17-18 December 2021, Organized by ISRO, IIST and PLMSS - Sam Noble.
- National Conference on 'Artificial intelligence (AI) - enabled Aerobots and Hydrobots- ASET 2022, 17-18 March 2022, Organized by IISU, IIST and ASI - Sam Noble.
- Pre-conference Workshop, Digital Aerospace Manufacturing, PLMSS 2021, 16 December 2021 - Sam Noble.

Avionics

- Telemedicine's and its applications for the Common man during COVID19, July 10-12, 2021, Indian Space Industry Exhibitors - N. Selvaganesan.
- Introduction to the Mathematical Modelling of Smart Materials and their Applications to Sensors & Actuators, 10 to 14 Jan. 2022, IIT Jammu - Sooraj Ravindran.
- Silicon Photonics: Future of Integrated Circuits, December 20th-24th, 2021, NIT Nagpur Sooraj Ravindran.
- FDP on Quantum Information Processing & Applications, 23/08/2021 to 27/08/2021 Central University of Punjab - Sooraj Ravindran.
- Student Assessment and Evaluation, 20-24 September 2021, NITTTR Kolkata - Rajesh Joseph Abraham.
- Engineering Capstone Project, 25-29 October 2021, NITTTR Kolkata - Rajesh Joseph Abraham.
- NBA Accreditation for Engineering Colleges, 04-08 October 2021 - Rajesh Joseph Abraham.
- NCC 2021, 27 - 30 July 2021, IIT Kanpur - Vineeth B. S.
- European Workshop on Onboard Data Processing OBDP 2021 organized by ESA, June 14-17, 2021, Online - Sheeba Rani J.
- Training Course on Prevention, Prohibition and Protection of Sexual Harassment at Workplace (POSH-15), November 15-16, 2021 organized by ISTM New Delhi - Sheeba Rani J.
- ASeT 2022 conference on Artificial Intelligence enabled Aerobots and Hydrobots organized by IISU, IIST, ASeT from March 17-18, 2022 - Sheeba Rani J
- One-day virtual workshop on 5G NR Physical Layer: Modelling, Technologies and Standards, IITB, COME foundation, March 26, 2022 - M. Vani Devi.
- One week online STTP on Mathematical Methods in signal and image processing, organized by D Y Patil Deemed to be University, December 13-18, 2021 - M. Vani Devi.
- Conference on Artificial Intelligence (AI) Enabled Aerobots and Hydrobots, March 17-18, 2022, VSSC, IISU and IIST - R. Sudharshan Kaarthik.
- International Transportation Electrification Conference, IEEE / ICAT, Manesar, December 16-18, 2021. - R. Sudharshan Kaarthik.
- International Conference on Power Electronics, Smart Gris and Renewable Energy, IEEE Industry Applications Society, Trivandrum, January 2-5, 2022 - R. Sudharshan Kaarthik.
- FDP on Sustainable transport Sources for Future Mobility Application, MNIT Bhopal, November 22-26, 2021. - R. Sudharshan Kaarthik.

Chemistry

- Online FDP on Life Skills Management, July 12 -16, 2021 organized by IIST and sponsored by AICTE, ATAL - J. Mary Gladis.
- Confederation of Indian Industry training programme (online) on "Best Practices & Procedures from Invention Disclosure to Patent Grant", July 29-30, 2021 - K. G. Sreejalekshmi.

Earth and Space Sciences

- INTORMET-2021, November 23-26, 2021 - Govindan Kutty.
- Indian Physics Association (IPA) Young Physicists Meet - January 31, 2022 - Sarita Vig.
- "Counting Photons in the Universe" a public talk ('Astro Adda' Program) at Planetarium and Regional Science Centre, Kozhikode, Kerala, India, September 16, 2021 - Vikram Khaire.

Mathematics

- The 4th BRICS Mathematics Conference, at IISER Thiruvananthapuram, December 07-10, 2021 - Prosenjit Das.

Physics

- Online Orientation Training Programme for Mentors, July 26-30, 2021 under National Initiative for Technical Teachers Training by AICTE - Sudheesh Chethil.


GO
SLOW

Student Activities & Outreach

6. Student Activities and Outreach

Covid-19 pandemic still continued in an unfavourable condition in the beginning of 2020-21. The student activities and student affairs had by then adapted to the new way of life. Consistent efforts have been made for the students to lead a balanced life in harmony with their teachers, fellow students and family. Teaching- learning continued to be in an online mode till 2022. All student activities and programmes faced a setback as the student community found it difficult to adjust to the new culture of offline classes, with no experience and the experienced seniors placed in ISRO by then. The new batch of students joined online. It was ensured that they settle down in their new surroundings comfortably.

Online Freshers' Orientation Programme was organized at the beginning of the academic session. Counselling Service was provided to students who faced problems during the pandemic and after joining IIST. Faculty members and alumni association pitched in to support those students who had financial hardship, and emotional/ psychological problems affecting academic pursuits. Laptops and hardwares were provided to needy students. Some of the students who found it really difficult to attend classes from home were brought back to IIST. Continuous review meetings were held for the students to be brought back to the campus.

IIST strongly believes that education should not be restricted to the four walls of a class room. In IIST, academics and extracurricular activities complement each other for the all round development of student. The following bodies oversee the pace and mode of student activities in the campus

Students Activity Board

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

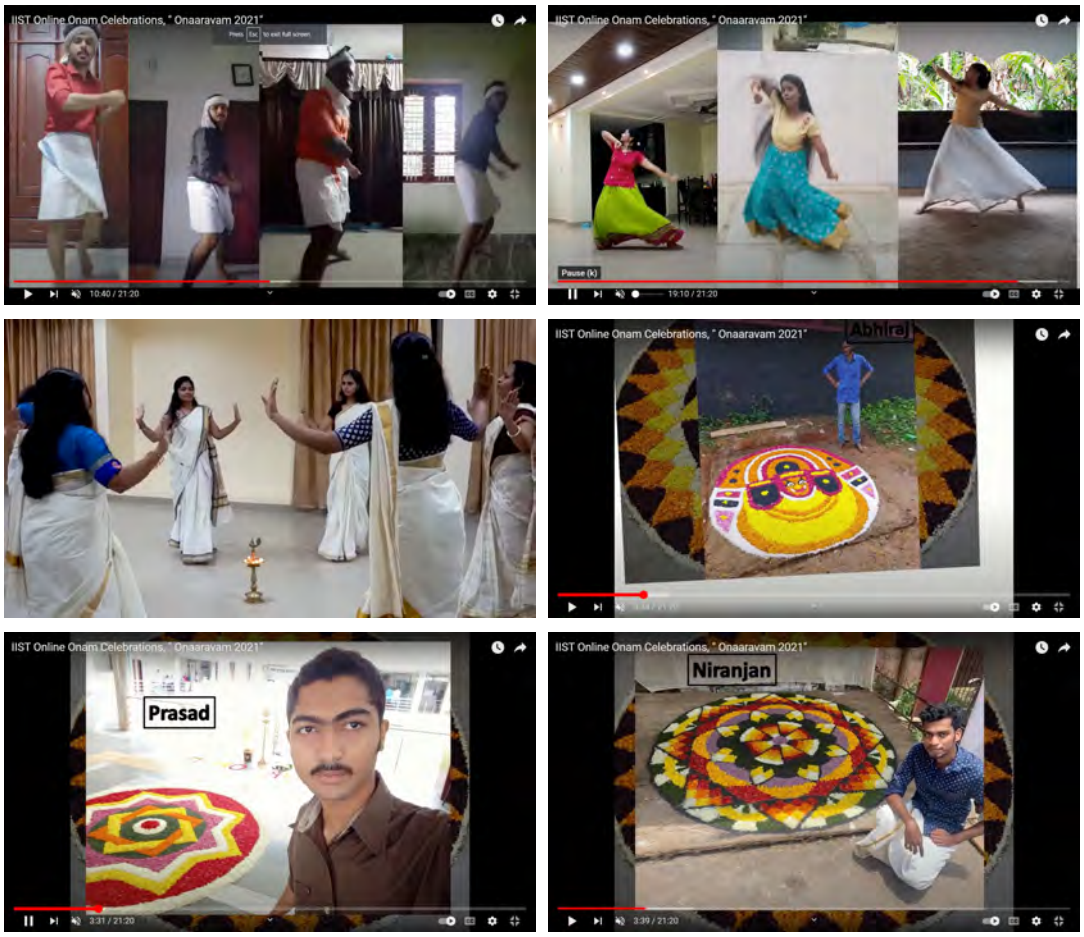
Dean (Student Activities and Student Welfare) heads the Student Activity Board (SAB) with Registrar, IIST; Heads of all Department, Chairman of various institute committees- Sports, Technical, Cultural, Hostel and Canteen committee and student representative as members. Each of these committees is chaired by a senior faculty member and consist of faculty members and student representatives. The student representatives provide feedback and suggestions on all aspects concerning student issues on campus (curricular and co-curricular). The board meets once a month or as and when needs arises. SAB organize and coordinates Dhanak, the intercollegiate cultural fest, Conscientia, the inter-collegiate Tech Fest, the Annual Sports Day of IIST and all other student's activities in IIST. The various students clubs and the mentoring system of IIST is also manned by SAB.

6.1 Events & Activities under SAB

Due to the COVID 19 pandemic the range of events organized in this session was very less. The major programmes include the following

Onam

After a hiatus of 3 years, IIST celebrated virtually the Vibrant and joyous festival of Onam on 28th September 2021. Considering the pan Indian nature of the institute, students organized several online programmes so as to familiarize the culture of the land and its people and inculcate the profound spirit of oneness and equality, which is associated with Onam. The celebrations included presentations of Kerala music, dance, flower arrangements (pookalam), and brief Onam messages, most of which were pre-recorded.

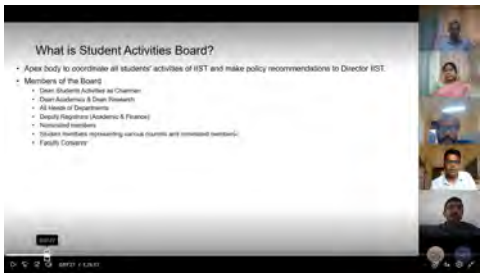


Induction Program

Student Activity Board organized a 10 day intensive induction programme for the newly joined B.Tech. students from December 1-9, 2021 and a 7 day induction programme for the newly joined M.Tech. and Ph.D. students from August 16-24, 2021. Both the programmes were inaugurated by Shri. S. Somanath, Director, IIST. The sessions were designed to provide information and support on issues relevant to new students and also to facilitate the easing of transition into the life of IIST as well as encouraging academic and personal success.

The programme included an introduction to the institute by Registrar, Deans, the 7 different departments and by various units of IIST. The other workshops were handled by Dr. Rashmi M., Faculty, VIT, Vellore on Peer Pressure, Shri. Pranjal Prateek, Alumnus of IIST on From IIST to IIM and to being an Entrepreneur, Dr. Blessing Calvin, Psychologist on After Class 12: Student Aspirations and Family Expectations and a session on Sexual Harassment at College/ Workplace by Ms. Ishani, Campaigns Manager, Gender & Sexuality team &

Ms. Margaret Johnson, Youth Engagement Strategist, Jhatkaa.org. The programme of Happiness Quotient, organised in evenings was a fantastic journey of 7 or 8 sessions that helped the students to start their B.Tech. journey on the best note. Sessions included a mix of yoga for toning the body, meditations to improve concentration, breath-work to enhance immunity and lung capacity, ice-breakers and interactions to know other students, IIST seniors, games, music and loads of fun.



Teachers' Day

Students of IIST organized Teachers' Day in an online mode on September 5, 2021 as a mark of respect and love towards their teachers and to celebrate the birth anniversary of *Dr. Sarvapalli Radha Krishnan,* the second President of India, who was a great scholar, philosopher, diplomat and above all, a teacher. Inaugurated by Shri. S. Somanath, he recollected his childhood teachers and the way they have moulded him. This was followed by a few games and cultural events which quite literally created an atmosphere of devotion and was a genuine delight for the audience.

Mentoring Programme @ IIST

The mentoring programme of IIST functioned actively under the Students Activity Board (SAB). This is a voluntary service rendered by the faculty members of IIST mainly focusing on the first year B. Tech. students. This provided friendly guidance and support to the students staying at home and faced with different problems due to COVID 19 and also to the students once back in IIST and staying outside of the parents umbrella for the first time. Mentoring system at IIST assisted the students in adapting to the new system, helped to solve multiple issues faced by students before and after COVID, language issues, logistics, personal problems, academics and so on. Each volunteered faculty member was assigned 2-4 students.

6.2 Student Clubs

Guided and supported by faculty members of IIST, the following clubs functioned in IIST in the year 2021-22

Mathematics Club

The objective of the club is to provide a platform for having open discussions on any topic in Mathematics. Department of Mathematics, IIST resumed the activity "*The Discussion of the Month*" of the Mathematics Club on14th Mar 2022. As part of *Pi day*, a talk by Mr. Utkarsh Rajput, Research Scholar, Department of Maths was organized. He spoke on the topic - History and computation of "π".

FOSS

The FOSS Group, IIST is aimed at promoting the use of Free and Open Source Software tools in the fields of core research pertaining to Aerospace, Avionics and Physical sciences. The group, germinating from the basic idea of a shared and free community, is aimed at promoting a complete or near-complete adoption of FOSS based platforms for all academic research and development activities going on at IIST. The group conducted software workshops and lectures to improve the overall comfort of students with FOSS software and scientific computing in general.

AeroClub

AeroClub, IIST is a student endeavour in the campus that tries to instil the engineering and scientific aptitude among IISTians through its various activities. Founded back in November 2013, the club has since then organised various demonstrations, workshops, talks, sessions, seminars and competitions. The club is run by a mix of students from all batches and supported by two faculty mentors. The club is one of its kind in the sense that the senior students guide the juniors regarding certain ideas and concepts while the juniors reciprocate them in terms of excellent work, and in the process, both of them learn something new, which is quite enthusiastic. The same has been showcased in the form of AeroClub Summer Projects. Club's outreach activities includes inviting industry experts both inside ISRO and outside of it, where it has invited eminent personalities to discuss topics in its Open House sessions The club also seeks out to merriment and fun occasionally. Many projects undertaken by members of the club and others under it have been promising in results. Overall, the club seeks out to keep up to the principle, 'Knowledge and happiness are best enjoyed when shared', through the efforts of many in the institute with wide participation.

IEEE Student's chapter

IIST has an active IEEE Student Branch functioning, since 2011. During the last one year, the student branch has organized several student-driven events and talks which include Bike-o-Roptor Design Contest, talk by Dr. Palash Kumar Basu, Associate Professor, Department of Avionics on Design and Development of Low Power, Low Cost, High-Performance Gas Sensor Array for Exhale Breath analyzer: Present and Future, 2nd IEEE Engineering in Medicine and Biology (EMB) Kerala Chapter's Distinguished Lecture titled ***"Biology in Space: Challenges and Opportunities for Engineers" by Dr. K. G. Sreejalekshmi, IIST,*** lecture series L4 (*Learn from Leaders and Learn from Legends*) which was followed by talk on Role of MTT-S volunteer in shaping future of engineering students post COVID-19' by Dr. Shiban Koul. Department of Avionics and IEEE IIST Student Branch jointly launched Avionics Ph.D. Talk Series with the talk by Mr. Sarath Babu on Type Based Analysis of Road Networks as the first in the series.

Astronomy Club

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

Robotics Club

IIST has a student driven club focusing on robotics. Avionics Department coordinates the operation with the following three faculty coordinators: Prof. Sam Zachariah, Dr. Selvaganesan, and Dr. B. S. Manoj. This club organized various student events including robotics prototype building, projects on control systems development for robotics, and unmanned aerial vehicle development. A robotics lab is also managed by the club members.

IIST Quiz Club

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

Movie and Performing Arts Club

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

Physics Club

Physics Club endeavours to instill curiosity amongst IISTians regarding Physics. Our one and only motto is 'Question Everything'. To that end, we have organized several sessions to shed light on various areas of physics and to instigate IISTians to probe deeper into them. We have also introduced the Physika Lecture Series. Following in the footsteps of Dr. Richard Feynman's 'Physics' Lecture Series, the lectures aim to bring forth the research being actively pursued by professors, to the student community.

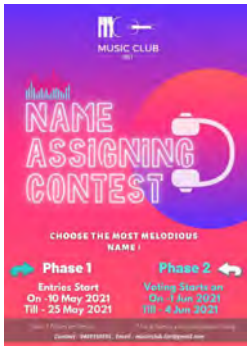
Musical Club

Music club online induction programme (5th February)

Due to the prevailing situations, the induction was held online. However, the pandemic did not dampen the spirits and the enthusiasm of the music club as we interacted with the fresh batch of IISTians and had a fun interactive session about the music club and its various events. The 2020 batch was exposed to and briefed about the cultural events in IIST and it was deliberated how such events would be conducted online.

Name assigning contest

A competition was organized online from 10th May-6th June to give the music club a name. This competition was organized mainly with the objective of making the club more official and more involved in the vibrant campus culture of IIST. Many names were suggested and through extensive voting, the most popular name was chosen. This marked the beginning of "NepTunes", the Music club of IIST. The name *Neptunes (Connects Astronomy to Music)* . The winner of the competition was Suvan Nanda.



Logo designing

The logo for the music club was designed by the members of the Music club on 28th July. The logo incorporated the

theme of music as well space science by combining the elements of a Guitar and a Rocket taking off to make our amazing logo.

Dhun 2021

Dhun, the massive inter-college music competition was organized from 3rd August - 31st August with full fervour. A lot of entries from singers as well as instrumentalists from various colleges were received and the competition was held on the Instagram page. Winners were declared by combining the opinions of our judges as well as the public opinion on our social media page. The winners of the competition were:

Gandham Ravi Verma, IIST - 1st place; Swamini Munagekar, SNDT Women's University - 2nd place; Karthika Menon, IIST and Pranav Koppa, IIST - 3rd place.

Azadi ka Amrit Mahotsav celebrations

As a part of the Azadi ka Amrit Mahotsav celebrations on 15th August (75th Independence Day Celebs), the members of the music club collaborated online and made a music video completely from scratch including the Recording and Sound Editing and displayed it during the online celebrations. In addition to this, the video was also posted on the official YouTube account of IIST and the music club social media accounts as well. Nearly 17 music enthusiast participated to make our own Independence day Special Music Video. The Video later also got published on IIST's Youtube Page.

Onam Music Video

Onam 2021 was again organised in online mode and once again members of music club were ready with a own version of Kuttanadan Punjayile Song. The tracks and music was made from scratch.

Music club induction

The incoming batch of 2021 was welcomed to the campus and the music club induction programme was held. They were made aware of the music club events and new and innovative events were planned to make the new semester as eventful and colourful as possible.

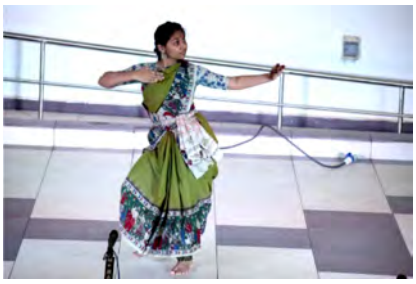
2022: A gradual return to normal

Konchords

The most awaited music club event of the semester, Konchords was finally conducted after a long break. Because of the long pause, the newest edition of Konchords was held with a lot of pomp and ceremony in a grand fashion. The event was organized in the Amphitheatre under the starry skies of April. A plethora of cultural programmes were lined up. Speakers and instruments were rented, banners were printed and put up, sound systems were brought in and the night exploded in dance, music and revelry. The event was a success with 35+ events including Band Performances, Solo singing, Solo Dancing, Standup Comedy, Group Dance and Singing, Acting starting from Indian Classical to Western Pop. The Open Air theatre saw the biggest crowd gathered together that Semester.








Jamming Sessions

These are the most fun part of the club, where all the students just come sing, jam and compose music together. The most creative vertical of Music Club.

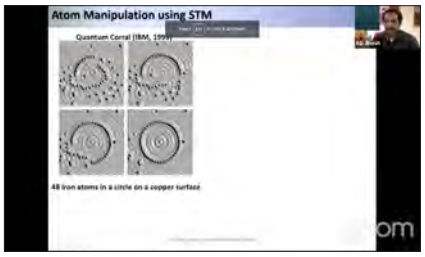
6.3 Outreach and Social Interactions

IIST @ Schools

As part of the 15th Foundation Day Celebrations, IIST conducted the IIST@Schools programme in an online mode for 250 students of an NGO in Kanyakumari, Kumari Arivial Peravai on September 12, 2021. KAP is a voluntary group in the field of science and Technology in Kanyakumari District imparting scientific awareness to the village students and trying to bring out the hidden talents in them. Dr. Kuruvilla Joseph, Dean, Students activities and outreach program, IIST welcomed the dignitaries and students.

The programme was inaugurated by Shri. S. Somanath, Director. VSSC and IIST. He talked about the importance of science, space science and technology and that the objective of ISRO is not only to pursue space science research and planetary exploration, it also aims to harness space technology for the nation's development. Space technology, he said was nothing special and that it was the same engineering sciences (electrical, mechanical, and chemical) that make everyday products. However, he explained that space technology was different in terms of applying the science and carrying out the project execution. Listing out the key abilities and skills of a space scientist, he emphasized upon having a deep understanding in one domain and stated that such an

understanding cannot be obtained from textbooks or the best Universities. Instead, he said that such knowledge could be acquired only by working with experts who have already burnt their fingers by making multiple attempts. He emphasised the need for a critical mindset and a cynical approach. He added that every successful space system is the result of a questioning mindset and that inculcating a "tomorrow it is likely to fail" mindset in designers and engineers would result in wonderful systems. Dr. Y. V. N. Krishnamurthy, Registrar, IIST, Dr. L. Muthu, former Deputy Director, LPSC, Shri. Mullanchery M. Velaian of KAP and Dr. Lekshmi V. Nair, Convenor of the programme and Professor, Department of Humanities, IIST were also present. Talks were delivered by Dr. Sudharshan Kaarthick, Associate Professor, Department of Avionics, IIST on Electric Vehicles and Dr. Jinesh K. B., Associate Professor, Department of Physics, IIST on "Seeing atoms - the story of microscopes".



NIRMAAN

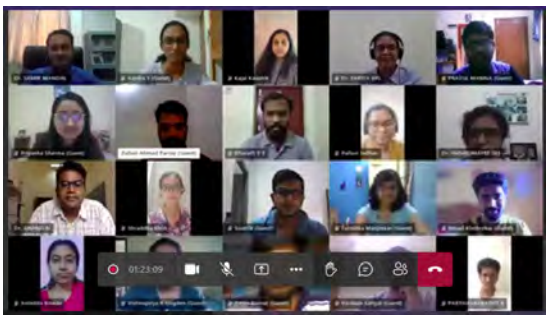
A series of online classes were given to the students of Kumari Arivial Peravai from January - March, 2022. The topics discussed and experimented were

- Backyard Science- Seeing science in simple things around.
- Vihang- Workshop on water rocket making and the science behind.
- Lumière- Demonstrations and discussion on various optical phenomena.
- Star Trek- Lectures on astronomy.
- Khula Aasmaan-Personality development
- Hakuna Matata- Competitions and certificate distribution.

NIRMAAN volunteers also got involved in voluntary work in the community Kitchen centres which were functioning all over the city. They were there hectically working and trying to provide food for those suffering from the pandemic. Team Nirmaan also distributed masks, books and sanitizers to the children of Balika Sadanam, an orphanage in Thiruvallom, Trivandrum.

10th IIST Astronomy and Astrophysics School

The Department of Earth & Space Sciences of IIST organized its annual Astronomy & Astrophysics School from December 8 - 18, 2021. The school was conducted in online mode. It was meant to acquaint students with the basics of astrophysics. 80 students from various Universities, IITs, IISERs and colleges across India programme attended the programme. The faculty members of the Department gave 30 lectures across a range of topics during the school and covered the following topics: Introduction to Astronomy and Astrophysics by Dr. Anand Narayanan, Star formation and Interstellar medium by Dr. Sarita Vig, Detection Techniques: Extrasolar Planets by Dr. Anandmayee Tej, Stellar evolution and compact objects by Dr. Samir Mandal Galaxies and Cosmology by Dr. Vikram Khaire.



6.4 Interactions/ Talks delivered by Faculty outside IIST

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
1	Metaheuristics and its applications, Online Faculty development programme on Optimization techniques	B. S. Girish	College of Engineering Perumon, Kollam, Oct 2,2021	Invited Lecture
2	Green manufacturing: from a technology and research perspective	V. S. Sooraj	APJ Abdul Kalam Kerala Technological University, Trivandrum, August 12, 2021	FDP Programme
3	Introduction to combustion, flame and its applications	Prathap C.	Department of Mechanical Engineering, Mepco Schlenk Engg. College, Sivakasi, August19-21, 2021	Invited Lecture
4	Direct Contact Condensation of Gaseous Jets	Prathap C.	LBS College of Engineering, Kasaragod, July28,2021	Invited Lecture
5	Towards a Cleaner Combustion	Prathap C.	Maharishi Markandeshwar (Deemed To Be University), Mullana, May26, 2021	Invited Lecture
6	Advanced TIG welding processes in International Conference on Recent Trends in Mechanical Engineering	Chakravarthy P.	Government Engineering College, KR PET, Karnataka, March14-15, 2022	Invited Lecture
7	Application of bispectrum analysis to detect faults in helical geared system	Praveen Krishna I. R.	AICTE sponsored Short Term Course of six days on the topic Prognostics and Health Management of Engineering Systems. March 7 - 12, 2022	Invited Lecture
8	'Thermo-regulatory aspects and human physiology of Space flight and its modeling'	Shine S. R.	STTP “Circulatory Physiology, Mechanics and Design (CPMD), IIT Madras, March 22, 2022	Invited Lecture
9	Robot Dynamics and Control	K. Kurien Issac	FDP on "Robotics and Control", Department of Robotics and Automation, Adi Shankara Institute of Engineering and Technology, Kalady, April 20, 2021	Invited Lecture
10	Kinematics of Mars Rover	K. Kurien Issac	IEEE Student Branch of IIT Mandi.	Invited Lecture
11	Limit Cycle Predictions for Systems Containing Separable Nonlinearity	N. Selvaganesan	STTP on Mathematical Modeling and Control System Design, RAIT, Mumbai, July 1, 2021	Invited Talk
12	Nonlinearity	N. Selvaganesan	Online ATAL Faculty Development Programme (FDP), Trends in Measurement and Control for System Automation, BIT-Mesra, Ranchi, July 2, 2021	Invited Lecture

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
13	Limit Cycle Predictions for System with Nonlinearity	N. Selvaganesan	Smart Energy Systems For Sustainable Smart Cities - A Research Perspective sponsored by SERB, NIT Puducherry, Feb 22, 2022	Invited Talk
14	Intelligent Radio for 5G Communication	S. Chris Prema	Department of Electronics and Communication Engineering, The Oxford College of Engineering, Bangalore on January, 21, 2022	Resource person
15	Multilevel Inverters", Faculty Development Programme on 'Power converters - an embedded system based approac	Rajeevan P. P.	Federal Institute of Science and Technology, Angamaly, Kerala, India, July 27, 2021	Invited Talk
16	Multilevel Inverters and PWM Schemes	Rajeevan P. P.	Robert B Moore lecture series, IEEE IAS Student chapter, National Institute of Technology, Calicut, India, October 13, 2021	Invited Talk
17	Multilevel Inverters-Topologies and Control Schemes	Rajeevan P. P.	Short Term Training Programme on "Potential Areas in Renewable Technologies and Grid Integration", Department of Electrical Engineering, Government Engineering College, Thrissur, India, November 8 - 12, 2021	Invited Lecture
18	Speed Range Extension Schemes for Drivers used in Electric Vehicle	Rajeevan P. P.	AICTE Training And Learning (ATAL) Online Faculty Development Programme on "Research Trends in Design and Control of Electric Vehicles", College of Engineering, Perumon, Kollam. Kerala, India, January 17 - 21, 2022	Invited Lecture
19	CMOS-MEMS Sensors with FET Based Active Transduction: A Paradigm Shift	Seena V.	Indo -South Korea JNC for Environmental Cyber Physical Systems Workshop on Sensors, IIT Roorkee, November 23-25, 2021	Invited Lecture
20	Opportunities in Space Science and Technology	Immanuel Raja	IEEE Kerala Student Branch Special lecture on October 20, 2021	Special Lecture
21	Bandits - An application oriented introduction	Vineeth B. S.	CSI Trivandrum (Thursday Talk Series), July 2021	Lecture Series
22	Reinforcement learning for communication networks	Vineeth B. S.	ATAL FDP, CoE Karunagapally, August 2021	Invited Talk
23	Reinforcement learning for communication networks	Vineeth B. S.	FDP, organized by EICT, NIT Warangal, February 2022	Invited Lecture

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
24	Segmentation Techniques, FDP on Object detection and recognition using Deep Learning	Sheeba Rani J.	Koneru Lakshmaiah Education foundation (Deemed University) Telangana November 8, 2021	Invited Talk
25	CNN for Image Classification	Sheeba Rani J.	IEEE IC workshop Organized by KLU, Sriviliiputhur, December 23, 2021	Invited Lecture
26	Bayesian Networks and Application	Sheeba Rani J.	FDTP on "IT8601 - Computational Intelligence" sponsored by CFD, Anna University on February 1, 2022	Invited Lecture
27	Semiconductors for Information and Communication Technologies,	Sheeba Rani J.	National Conference on Communication and signal processing by Dept of ECE RMK college of Engineering, Chennai, October 8-9, 2021	Invited Talk
28	Satellites and Introduction	Priyadarshnam	IIIT Dharwad, June 21, 2021	Invited Lecture
29	Trends, Techniques and Future Challenges in Antenna Engineering for Ground, Space and Versatile Applications	Chinmoy Saha	AICTE-QIP sponsored Short Term Course on "Electromagnetics: Recent Trends and Future Applications, IIT Indore, India, February 28-March 5, 2022	Invited Lecture
30	Challenges, Design and Realization of Multifunctional Antennas (MFA) and Photo Conductive Antennas (PCA) & Associated System Components for Microwave, mm-Wave and THz Applications	Chinmoy Saha	Short-term course, Emerging Trends in Antenna Design for RF Energy Harvesting Circuit (ETAD- RFEHC), NIT Delhi, January 3-7,2022	Invited Lecture
31	Trends, Techniques and Future Challenges in Antenna Engineering for Ground, Space and Versatile Applications	Chinmoy Saha	IEEE Space Antenna Workshop (ISAW - 2021), IEEE MTT-S Kerala Chapter, India. Dec 23 - 24, 2021	Keynote Talk
32	Trends, Techniques and Future Challenges in Antenna Engineering for Ground, Space and Versatile Applications	Chinmoy Saha	IEEE International Conference on Technology, Research, and Innovation for BEtterment of Society (TRIBES - 2021), DSPM International Institute of Information Technology, Raipur, Dec 17 - 19, 2021	Invited Talk
33	Trends, Techniques and Future Challenges in Antennas Engineering for Ground, Space and Versatile Applications	Chinmoy Saha	IETE Prof. S.N. Mitta Memorial Award Lecture, IETE Trivandrum Centre, Trivandrum 2021, Dec 11, 2021	Memorial Award Lecture

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
34	Near and Far-Field Wireless Power Transfer: Trends, Techniques and Recent Development	Chinmoy Saha	Faculty Development Programme, SRM University Nov.15-20, 2021	Invited Lecture
35	Metamaterial Inspired Antennas for Modern Wireless Applications: Concepts and State of the Art Techniques	Chinmoy Saha	AICTE ATAL workshop organized by Guru Ghasidas Vishwavidyala (Central University), Bilaspur, Sept. 20-24,2021	Invited Lecture
36	Antennas for Space and Ground: An Overview	Chinmoy Saha	IEEE AP-S Kerala webinar talk, organized by NSS College of Rajakumari, Kerala,	Invited Talk
37	Antennas for mm wave 5G, MIMO Technology and Cognitive Radio Applications: Fundamentals and Advanced Concepts	Chinmoy Saha	AICTE ATAL Workshop at Saranathan College of Engineering, Trichy, India during June 07-11, 2021	Invited Lecture
38	Integrated Chargers for Electric Vehicles	R. Sudharshan Kaarthik	ATAL FDP on Electric Charging Station for Vehicles, Government Engineering College Thrissur, Kerala, February 23, 2022	Invited Lecture
39	Modeling, Simulation and Control of PMSM and BLDC motors, Design and Simulation of High Power Systems	R. Sudharshan Kaarthik	Vikram Sarabhai Space Centre (VSSC), 28 July, 2021	Invited Talk
40	Power Hardware in the Loop Emulators for Electric Machine Emulation, Software Tools for Power Converter Design	R. Sudharshan Kaarthik	National Institute of Technology, Trichy, April 29, 2021	Invited Talk
41	Title Deep learning for computer vision	R. Sudharshan Kaarthik	Research Perspectives of Machine Learning & Deep Learning for Signal Processing Applications, Sree Chitra Thirunal College of Engineering, Trivandrum, September 6 - 10, 2021	Invited Talk
42	Biomedical engineering at KTU	R. Sudharshan Kaarthik	FGD on Emerging Trends and Developments in Biomedical Engineering, College of Engineering Perumon, August 09- 14, 2021	Invited Lecture
43	Space Biosciences Research: Enabling advancements in Space Explorations	K. G. Sreeja lekshmi	Centenary Celebrations at St. Berchmans College, Changanassery, Kerala on March 24, 2022	Special Lecture
44	Gravitational Biology: The role of microgravity simulating facilities to assist 'Space Experiments on Earth Laboratorie	K. G. Sreeja lekshmi	Indian Analytical Science Congress 2022, Munnar, Kerala, March 10-12, 2022	Invited Talk

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
45	Human Space Mission and emerging domains of research in India	K. G. Sreeja lekshmi	Astrobiology Club Inauguration at Shoolini University, Himachal Pradesh, February 4, 2022	Special Lecture
46	SPACE BIOSCIENCES: Systems for Space Laboratory experiments	K. G. Sreeja lekshmi	Online Winter School in Physics and Chemistry conducted by UGC-HRDC, Kannur University, Thavakkara December 4,2021	Invited Talk
47	From molecules to materials to systems; Online Winter School in Physics and Chemistry	K. G. Sreeja lekshmi	UGC-HRDC, Kannur University, Thavakkara December 4, 2021	Invited Talk
48	Biology in Space: The unique features of space laboratories and challenges for researchers	K. G. Sreeja lekshmi	Centenary Celebration Webinar, organised by Union Christian College, Aluva November 13,2021	Invited Talk
49	Space Biosciences: Challenges and Opportunities	K. G. Sreeja lekshmi	CNI ITE Kottayam World Space Week celebrations 2021, October 12, 2021	Invited Talk
50	Space Biology Experiments to assist informed decisions for human space missions	K. G. Sreeja lekshmi	World Space Week Celebrations 2021 organised by Breakthrough Science Society & Kerala State Science and Technology Museum on October 9, 2021	Invited Talk
51	Life Into Space: An Introduction to Space Biology	K. G. Sreeja lekshmi	UL Space Club World Space Week celebrations 2021, October 9, 2021	Invited Talk
52	Emerging Opportunities in Space Science and Research	K. G. Sreeja lekshmi	World Space Week 2021 Virtual Open House, jointly organised by VSSC, IISU and LPSC Thiruvananthapuram, October 5, 2021	Invited Talk
53	Biology in Space Challenges and Opportunities for Engineers	K. G. Sreeja lekshmi	IEEE Engineering in Medicine and Biology (EMB) Kerala Chapter; Distinguished Lecture Series-2; Online session on July 15, 2021	Invited Talk
54	Space Bioscience: Challenges and Research opportunities	K. G. Sreeja lekshmi	Webinar organized by Nesamony Memorial Christian College, Martandam on July 8, 2021	Invited Talk
55	The Amazing World of Nanomaterials: big things from a tiny world', Lecture series: Frontiers of Science and Technology	Jobin Cyriac	JMM Study Centre, Thiruvananthapuram, Thiruvananthapuram, August 27, 2021	Invited Talk
56	Athirukalillatha Sasthram	Jobin Cyriac	Vijayavazhi Lecture series, Malankara Diocese, Adoor, November 27, 2021	Invited Talk

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
57	Luminescent WS2 nanomaterials: Chemical sensor applications	Jobin Cyriac	National Conference of Materials Science and Technology (NCMST-2021), IIST, Thiruvananthapuram December 29-31, 2021	Plenary lecture
58	Mass Spectrometry: Concepts and applications	Jobin Cyriac	Workshop on Molecular Spectroscopy, University of Calicut, March 14, 2022	Invited Lecture
59	Bio-Medical Spectroscopy	Shaiju S. Nazeer	AICTE-ATAL Sponsored 5 day Faculty Development Programme on PHOTONICS AND LASER, MES College of Engineering Kuttippuram, September 24, 2021	Invited Lecture
60	Univariate and multivariate analysis	Shaiju S. Nazeer	UGC-HRDC - Bharathiar University - Refresher Course in Computer Sciences, Department of Computer Science, Bharathiar University, Coimbatore, November 12, 2021	Invited Lecture
61	Nanomaterials for electrochemical sensing applications	K. Y. Sandhya	National Webinar organized by Holy Cross College (Autonomous), Nagercoil, February 21, 2022	Invited Talk
62	Stable Copper Nano Cluster Decorated Nitrogen-Doped Graphene Quantum Dots for the Simultaneous Sensing of Dopamine, Serotonin, and Nicotine,	Saisree S., Research Scholar, K. Y. Sandhya	National Conference of Materials Science and Technology (NCMST-2021), IIST, Thiruvananthapuram December 29-31, 2021	Paper Presentation
63	Ultra-selective and real-time detection of dopamine using molybdenum disulphide decorated graphene-based electrochemical biosensor,	Arya Nair J. S., Research Scholar, K. Y. Sandhya	National Conference of Materials Science and Technology (NCMST-2021), IIST, Thiruvananthapuram December 29-31, 2021	Paper Presentation
64	Electrochemical sensor for sensing of biologically important analytes	Gomathi N.	KTU sponsored Faculty Development Programme on “Biosensors in Point-of Care Diagnostics: Strategies and Implementation”, organized by Sahrdaya College of Engineering and Technology, Kodakara, Kerala, April 20, 2021	Invited Lecture
65	Nanomaterials for Sensing Applications	Gomathi N.	Indian Institute of Chemical Engineers (IIChE) student chapter, Indian Institute of Petroleum and Energy (IIPE), Vishakapatnam, organized, Andhra Pradesh, September 25, 2021	Invited talk

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
66	Familiarizing Science Education Courses & Opportunities	Kuruvilla Joseph	Webinar organized by Manorama on May 07, 2021	Inaugural and National Science Day lecture
67	Ground and space based retrieval of aerosol	P. R. Sinha	Faculty Development Programme (FDP) of AICTE held in IIST during January 28 - February 1, 2022	Invited Lecture
68	The GLOSTAR survey	Jagadheep D.	Regional Astronomy Meeting - VII, online mode, September 8, 2021	Invited Talk
69	Geospatial and earth observation related opportunities in academia and research	A. M. Ramiya	1st Taiwan India Joint space Technology workshop on Collaboration: Opportunities and Challenges, October 2021	Invited Lecture
70	Ëyes from Space	A. M. Ramiya	World Space Week, Women in Space, Kumaraguru College of Technology, October 2021	Invited Talk
71	LiDAR Remote Sensing and Applications	A. M. Ramiya	State Environment Impact Assessment Authority (SEIAA), Kerala, March 2021	Invited Talk
72	Land Surface Modeling Studies over the Indian Region	A. Chandrasekar	International Symposium on Tropical Meteorology (INTROMET-2021) on Changing Climate: Consequences and Challenges, (online talk), organized by Indian Meteorological Society& Cochin University of Science and Technology, November 25, 2021	Invited Talk
73	Multivariate Ensemble Sensitivity Analysis for Understanding the Dynamics of Convective Events	Govindan Kutty	EnKF Workshop 2021, NORCE, Norway	Invited Talk
74	Data Assimilation and Predictability Through Ensemble Approaches	Govindan Kutty	University of Hohenheim, Germany	Invited Talk
75	Applications of Remote sensing in Precision Farming	L. Gnanappazham	Pushkaram College of Agricultural Sciences, TNAU, Pudukottai, Tamil Nadu. February 28, 2022	Invited Lecture
76	Mapping mangroves from space	L. Gnanappazham	National Space Science Symposium (NSSS - 2022) by ISRO -IISER Kolkatta; January 31 -February 2, 2022	Invited Lecture
77	A Voyage to the Moon	Rajesh V.J.	Webinar conducted in connection with the Observance of 52nd Anniversary of Moon Landing organized by the Breakthrough Science Society Trivandrum Chapter on July 25. 2021	Invited Lecture

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
78	Role of Geology in Planetary Exploration	Rajesh V. J.	National seminar on Art of Research & Teaching in Geology (Geo-ART-2022), MES college Ponnani, Kerala on March 26, 2022	Invited Lecture
79	Career Development, Vigyan Vidushi	Sarita Vig	Tata Institute of Fundamental Research for women students, May 31 -June 1, 2021	Invited Lecture
80	Early phases in massive star-forming regions	Sarita Vig	Institute Colloqium at the Aryabhatta Institute of Observational Sciences (ARIES) - Nainital, May 11, 2021	Invited Lecture
81	Observing the Stars	Sarita Vig	Online lecture at the Astronomy Olympiad Orientation Camp 2021, organised by the Homi-Bhabha Centre for Science Education (HBCSE-TIFR), Mumbai, July 14, 2021	Invited Lecture
82	An Introduction to Stars	Sarita Vig	15-hour online lecture series organised by Breakthrough Science Society in association with Astronomical Society of India - Public Outreach and Education Committee, Sept 19 - Oct 31, 2021	Invited Lecture
83	Early phases in massive star formation	Sarita Vig	National Conference on Recent Advances in Astrophysics, Calicut Univ, Feb 18, 2022	Invited Talk
84	Wonders of Cosmos	Sarita Vig	SRM University, Amravati, Andhra Pradesh, April 17, 2021	Invited Lecture
85	Star clusters - Jewel caskets in the sky	Sarita Vig	SRM Institute of Science and Technology (SRMIST), Chengalpattu, Tamil Nadu, on occasion of World Space Week, Oct 6, 2021	Invited Lecture
86	Stars and star clusters	Sarita Vig	Kumaraguru college of Technology, Coimbatore, on occasion of World Space Week, Oct 5, 2021	Invited Lecture
87	Wonders of Cosmos	Sarita Vig	IEEE-IAS Student Chapter - NIT Calicut, Oct 19, 2021	Invited Lecture
88	Star Clusters - Jewel Caskets in the Sky	Sarita Vig	Jashore University of Science and Technology, Bangladesh, Feb 25, 2022	Invited Lecture
89	Wonders of Cosmos	Sarita Vig	Regional Childrens Science Congress, Organised by Navodaya Samithi, Jawahar Navidaya Vidyalaya - Rangareddy Dist, Feb 21, 2022	Invited Lecture
90	Radiative Transfer in the Accretion Disc, Exploring the Saga of Compact Objects (ESCO)	Samir Mandal	Lecture Series December 4, 2021	Invited Lecture

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
91	Role of XSPECT in exploring accretion physics in black hole X-ray binaries	Samir Mandal	Science with XSPECT onboard XPoSAT, September 22, 2021	Invited Lecture
92	Cultural Discourse of Cuisines: Reading Select Culinary Memoirs from Kerala	Gigy J. Alex	International Virtual Conference on Cultural Studies/ Nirmala College, Moovattupuzha, September 10, 2021	Invited Talk
93	Management in Life	V. Ravi	AICTE sponsored Online FDP on Life Skills Management organized by Department of Humanities, IIST on July 15, 2021	Invited Lecture
94	Data driven research and data analysis tools	V. Ravi	FDP on "Advanced Tools for Research " organized by National Institute of Technology, Calicut on March 4, 2022	Invited Lecture
95	Methods of Social Science Research	Lekshmi V. Nair	Littcritt, May 15 -16, 2021	Invited Lecture
96	Activity-Based Life Skill Training for SC/ST Students	Lekshmi V. Nair	Periyar Central University, Salem, June 25-26, 2021	Invited Lecture
97	Covid 19 - Trends Ahead	Lekshmi V. Nair	Indian Sociological Society. September 2021	Invited Talk
98	Open Dialogue with Babitha Justin	Babitha Justin	Organised by One Future Festival, March 27, 2021	Invited Lecture
99	Poetry Reading	Babitha Justin	Anantha Festival Samyukta Poetry curated by Sivakaami Velliangri., April 13, 2021	Invited Lecture
100	Making Art from the Margins	Babitha Justin	TES Thiruvananthapuram. April 13, 2021	Public lecture for Post Graduate and Ph.D. students
101	Poetry Reading	Babitha Justin	Reading Week, at Nedumangad Government College, Thiruvananthapuram June 20, 2021	Guest of Honour
102	Women and Creativity	Babitha Justin	Women Employees Benevolent Organisation (WEB), ISRO, June 26, 2021	Motivational Talk
103	Covid Art	Babitha Justin	SAC, July 29, 2021	Resource Person
104	Art at the Times of a Virus: Covid Art	Babitha Justin	Episteme: Forum for Interdisciplinary Studies in Humanities. September 21, 2021	Resource Person
105	Contemporary Indian Fiction and Poetry	Babitha Justin	Refresher Course. Pondicherry University. December 13, 2021	Resource Person

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
106	Telemedicine and its economic impacts	Shaijumon C. S.	National Webinar on Telemedicine and its applications for the common man during Covid pandemic, Space Industry Exhibitors 10-July 12, 2021	Invited Lecture
107	Economic and Business Climate of Kerala	Shaijumon C. S.	US Consulate Chennai, July 13, 2021	Online Lecture
108	Career Planning for Economics Graduates	Shaijumon C. S.	Induction programme for MA Students at Department of Economics, October 13, 2021	Special Address
109	Possibilities for Improvements in the collection of Non-Tax Revenue	Shaijumon C. S.	Pre-Budget Meeting of economists of Kerala State by Hon. Finance Minister of Kerala, November 18, 2021	Invited Lecture
110	Analysis of National Budget 2022-23	Shaijumon C. S.	24th Union Budget Analysis Meeting, SB College February 8, 2022	Online Lecture
111	Capex to Push for Virtous Cycle	Shaijumon C. S.	Union Budget Analysis Meeting, VTM NSS College, February 9, 2022	Online Lecture
112	Big Take Aways of the Union Budget 2022-23	Shaijumon C. S.	Union Budget Discussions, MG College, February 15, 2022	Online Lecture
113	Amrit Kaal, the 25-year long leadup to India @ 100	Shaijumon C. S.	A Panel Discussion on Union Budget, Christ Nagar College, February 16, 2022	Invited Lecture
114	Academic and Career Planning for Economic Graduates	Shaijumon C. S.	St. Theresa's College, Ernakulam, March 14, 2022	Online Lecture
115	India's Space Economy, 2011-12 to 2020-21: Its Size and Structure	Sunil Mani, V. K. Dadhwal, Shaijumon C. S.	Webinar at Centre For Development Studies March 25, 2022	Online Lecture
116	Economic and Business Climate of Kerala	Shaijumon C. S.	US Consulate Chennai, July 13, 2021	Online Lecture
117	Machine Learning	Sumitra S.	Refresher Course in Data Analytics and Machine Learning, Organized by the Human Resource Development Centre, University of Kerala, February 24, 2022	Invited Lecture
118	Introduction to Deep Learning	Sumitra S.	KTU sponsored 3 Day Online FDP on Data Analytics using R, Organized by Department of Computer Science and Engineering, Thangal Kunju Musaliar Institute of Technology, Kollam, June 25, 2021	Invited Lecture

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
119	Mathematical Foundations of Machine Learning and Deep Learning	Sumitra S.	KTU sponsored FDP on Research Perspectives of Machine Learning & Deep Learning for Signal Processing Applications, Organized by Department of Electronics & Communication Engineering, Sree Chitra Thirunal College of Engineering, Trivandrum on September 6, 2021	Invited Lecture
120	Data Science: Field of Mathematics	Sumitra S.	National Mathematics Day Celebrations, Organized by Department of Mathematics, Mar Thoma College for Women, Perumbavoor, December 18, 2021	Invited Lecture
121	Google Page Ranking	Sumitra S.	National Mathematics Day Celebrations, Organized by Department of IT and ACM Student Chapter, Thiagarajar College of Engineering, Madurai, December 22, 2021	Invited Lecture
122	Research and career Opportunities in chemistry	Kuruvilla Joseph	Webinar Series CHEMILUMINESCENCE, organized by Mar Ivanios College, Trivandrum on June 02, 2021	Resource Person
123	Research, Consultancy and startup: How To Go About It?	Kuruvilla Joseph	Webinar Series, St. Thomas College Thrissur and jointly Organized by Internal Quality Assurance Cell Research Council Startup & Innovation Cell on June 16, 2021	Resource Person
124	Space Material Qualification	Kuruvilla Joseph	Conference on frontiers of Space Technology and applications for Humanity at Central University of Jammu, Samba, J&K On 12th -13th March 2022	Technical Talk
125	On some classes of probability distributions governed by Markov processes	Deepak T. G.	International conference on emerging trends in statistics and data science (online), September 7-10, 2021	Invited Lecture
126	Role of Mathematics in present day life,	Deepak T. G.	International conference on basic and applied sciences organized by SCMS college of engineering and technology, Karukutty during December 16-17, 2021	Invited Lecture
127	Lecture Series	Deepak T. G.	Berchmans lecture series in Mathematics organized by Dept. of Mathematics, SB College, Changanassery during January 6-7, 2022.	Invited Lecture

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
128	Some insights on Applied Mathematics	Natarajan	National webinar, AVS College of Arts and Science, Salem, October 23, 2021	Invited Lecture
129	Finite element method for engineers	Natarajan	National Conference on Applications of Mathematics, December 21, 2021	Invited Lecture
130	On the Virtual element method and its applications	Natarajan	Workshop on Recent development in Mathematical modeling in Engineering Sciences, NIT Uttarakhand, December 31, 2021	Invited Lecture
131	Nonlinear Finite element analysis	Natarajan	Online workshop on Advances in Applied Mathematics and Computational Methods, VIT-AP, Andhra Pradesh, January 7, 2022	Invited Lecture
132	Modelling and Control of Artificial Satellites	Raju K. George	2nd International Conference on Computational Sciences- Modelling, Computing and Soft Computing (CSMCS-2022) March 28th to 30th 2022, Manipal Institute of Technology Manipal Academy of Higher Education, Karnataka	Key Note Address
133	On Controllability of Heterogeneous LTI Network Systems	Raju K. George	International Conference on Mathematical Modelling and Computational Intelligence Techniques (ICMMCIT-2021), March 2-4, 2022	Invited Lecture
134	Fixed Point Theorems and its Applications	Raju K. George	SVNIT, Surat, Organised by Applied Maths and Humanities Department on December 6, 2021	Invited Talk
135	Controllability Analysis by Using Monotone Operators	Raju K. George	International Conference on Recent Advances in mathematical Sciences and its Applications, Mother Teresa Women's University, Kodaikanal, T.N, Aug 26-27, 2021	Plenary Talk
136	Importance of Simulations and Mathematical Modelling for Engineering system study	Raju K. George	Orientation programme in Some Applications of Mathematics in Engineering, Mar Baselios College of Engineering and Technology, Trivandrum, Kerala, April 24, 2021	Invited Lecture
137	Mathematical Modelling using Differential Equations and Solutions of Laplace Transformation	Raju K. George	Student Induction Programme in Importance of Mathematics in Engineering, 27th April 2021, Science and Humanities Association of Xavier's SHAX, Tirunelveli.	Invited Lecture
138	Contemporary holography	C. S. Narayana murthy	UGC Refresher Course on Physics, Bharathiyar University, Coimbatore(Online), November 7, 2021	Invited Lecture

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
139	Effect of non-local hops on the totally asymmetric exclusion process	A. Nagar	Statistical Physics: Recent Advances and Future Directions" organised by ICTS (TIFR) on February 14-15, 2022	Invited Lecture
140	Spatial quantum correlation properties of bright twin beams of light	Ashok Kumar	Summer School on Quantum Information and Quantum Technology -2021 organized by IISER Kolkata, June 29, 2021	Invited Talk
141	Brain-inspired memory technologies: Functional Materials for Energy, Environment and Biomedical Applications (FARAON)	K. B. Jinesh	Madurai Kamaraj University, February 4, 2022	Invited Lecture
142	Artificial Brain for Artificial Intelligence	K. B. Jinesh	Prof. Chellamma Mathew Memorial Talk, Mar Thoma College, Thiruvalla February 2022	Invited Lecture
143	Integrating Science: intelligence to artificial intelligence	K. B. Jinesh	National Science Day Lecture, February 2022, BCM College, Kottayam	Invited Lecture
144	Breather modes in spin systems: Some geometric insights	S. Murugesh	Invited RUSA lecture at Bharathidasan University, Feb 15, 2022	Invited Lecture
145	Demonstrating classical-optic entanglement in an interferometer	J. Solomon Ivan	QIQT-2021 in IISER Kolkata July 9, 2021	Invited Lecture
146	Quantum Condensed Matter	Sourin Mukhopadhay	National conference on quantum condensed matter, QMAT-2021, TIFR	Invited Lecture
147	Superposition, Squeezing and Energy Density	Sudheesh Chethil	Summer School on Quantum Information and Quantum Technology (QIQT 2021), IISER Kolkata, June-July 2021	Invited Lecture
148	Searching for molecular seed for life in our solar system: a mission plan	Umesh Kadhane	SAMP Colloquium on 20th August 2021	Invited Lecture
149	Wave optics and coherent image processing	Dinesh N. Naik	Applied Optics and Optical Metrology for Steel Industry jointly organized by R&D Tata Steel, Jamshedpur and Dept. of Physics, IIST - 14/07/2021 to 10/08/2021	Invited Lecture

Sl. No.	Title of Lecture/ Presentation	Author(s)	Conference Name, Duration, Place	Remarks
150	Conoscopic holography and applications	Dinesh N. Naik	Applied Optics and Optical Metrology for Steel Industry" Jointly organized by R&D Tata Steel, Jamshedpur and Dept. of Physics, IIST - 14/07/2021 to 10/08/2021	Invited Lecture
151	Optical interferometry and Surface profilometry	Dinesh N. Naik	Applied Optics and Optical Metrology for Steel Industry" Jointly organized by R&D Tata Steel, Jamshedpur and Dept. of Physics, IIST - 14/07/2021 to 10/08/2021	Invited Lecture
152	Advanced Functionalized Materials for analytical, Environmental and biomedical Applications	Kuruvilla Joseph	National seminar (NSAFM-2022), University of Kerala, Kariavattom Campus on 23rd -25th March 2022	Keynote Speaker

EVENTS & VISITS @ IIST

7. EVENTS and VISITS @ IIST

The pandemic disrupted not just the academic activities but also the host of events and extracurricular activities of the Institute. Towards the beginning of the period under report students, faculty and staff of the institute continued to remain connected through online platforms and online events and activities were conducted. The online competitions and events along with the offline events hosted by the Institute provided a platform for all concerned to remain connected and tide over the difficulties of these times. The following are the events organized in IIST during 2021-22.

7.1 Azadi ka Amrit Mahotsav (AKAM)

- Azadi Ka Amrit Mahotsav AKAM, an initiative of the Government of India to celebrate and commemorate 75 years of independence and the glorious history of its people, culture and achievements was officially flagged off in IIST on 15th August 2021.
- The web banner for AKAM was officially released on the occasion and the Padyatra within the campus carrying the National flag was enthusiastically organised with the active participation of students, faculty members and staff. Rendering of the National Anthem and other patriotic songs by students who were at home due to the pandemic was coordinated in web mode on the day.

- "Space on Wheels" vehicle from VSSC for exhibition of a timeline of India's 75 major achievements of space programme was parked in IIST with display of 75 images captured from Chandrayaan-1, Mars Orbiter Mission, Astrosat and Chandrayaan-2 spacecraft on 28th September, 2021 respectively which attracted students and staff alike.

- An exhibition of 75 images captured from various missions of ISRO like Chandrayaan-1, Mars Orbiter Mission, Astrosat, and Chandrayaan-2 spacecraft, showcasing the significant achievements of ISRO's interplanetary missions was organised in the corridor of the Administrative Block on 22nd October, 2021

- IIST officials and students participated in the Cycling events and PadaYatra organised by the Joint Committee (VSSC, LPSC, IISU & IIST) for Implementation of AKAM activities on 31st October 2021, highlighting 75 important milestones leading to Indian Independence.

- Prof. Jyothiranjan S. Ray, Director, National Centre for Earth Science Studies (NCESS) delivered a lecture on "Retracing the path of the River Saraswati" on 7th November, 2021 in connection with the year long celebration - Azadi ka Amrit Mahotsav in webinar mode. This was part of the webinar series advised by Government of India to mark the Birth Anniversary of Sir. C.V. Raman.

- Inputs from IIST was provided for inclusion in the Coffee table book in digital mode complied by NRSC which showcased 75 major activities of ISRO's Centres/ Units.

- Apart from the joint activities with ISRO centres, various events were organised in IIST in connection with AKAM. Online competitions viz. Slogan writing, essay writing, speech, patriotic song and quiz were held in Hindi and English in connection with observance of Rashtriya Ekta Diwas from 25th - 29th October, 2021 for IIST students, staff and school children and prizes in the form of books were distributed.
- 9th NCMST (National Conference on Recent Trends in Material Science and Technology) organised by Department of Chemistry from 29th - 31st December 2021 was also dedicated to the theme of AKAM.

7.2 Techno - felicitation to Director, IIST

IIST in collaboration with Indian Society of Remote Sensing Thiruvananthapuram Chapter and IEEE Geoscience and Remote Sensing Society, Kerala Chapter organized a techno-felicitation (online) on July 22, 2021 at 2pm to bid a warm farewell to Dr. V. K. Dadhwal, Director, IIST and to honour his committed service to IIST and ISRO. The technical session was presided over by Dr. B. N. Suresh, Chancellor, IIST, with Dr. Shailesh Nayak, Director, NIAS and Former Secretary, MoES, Dr. R. R. Navalgund, Former Director, SAC & NRSC, Shri. S. Somanath, Director, VSSC and Dr. Narayanan, Director, LPSC and Dr. D. Sam Dayala Dev, Director, IISU as the guests of the day. This was followed by felicitations, where friends and colleagues of Dr. V. K. Dadhwal reminisced about his illustrious journey in IIST and ISRO.

7.3 New Director assumes charge

Shri. S. Somanath, Director, IIST took over as Director- in charge of IIST on 24th July 2021. He took over from Dr. V. K. Dadhwal who had been the Director since July 2016. Dr. Y. V. N. Krishna Murthy, Sr. Professor and Registrar, IIST was also present during the handing over ceremony.

7.4 Swachh Bharat Programme 2021

As a part of the Swachh Bharat Programme 2021 competitions were held to identify best kept rooms in IIST. All the Administrative Sections, Department Offices, Academic blocks and hostels and prizes were inspected and prizes awarded to Best Kept Rooms. Cleaning drive was undertaken in all academic and administrative building post lockdown and once in 2 months. In view of the current pandemic situation, students undetook cleaning drives in their hostels.

7.5 Inaugurations

Space Technology Innovation and Incubation Cell (STIIC)

Shri. S. Somanath, Director, IIST inaugurated Space Technology Innovation and Incubation Cell (STIIC) on January 12, 2022. Prof. Kuruvilla Joseph, Registrar, Deans, Faculty and Staff attended the inaugural function. STIIC established in IIST, with the support of Deptartment of Space facilitate the incubation of new enterprises with innovative technologies. STIIC would facilitate and support product innovations and developments, simulation and prototyping, pilot experimentation, software testing, training and other technology related works. While the emphasis of the STIIC is on Space related innovations / technologies, it also covers all areas of Science and Technology in harmony with the Nation's interest.

Sports Facilities

Shri.S. Somanath, Director, IIST inaugurated the new sports facilities- two badminton courts and one squash court in the Student Activity Centre, IIST on November 16, 2021. Prof. Kuruvilla Joseph, Registrar, IIST, Prof. Raju K George, Dean, R&D, Head of the Departments, Faculty, Officers, Staff and Students attended the function.

Medical Facility

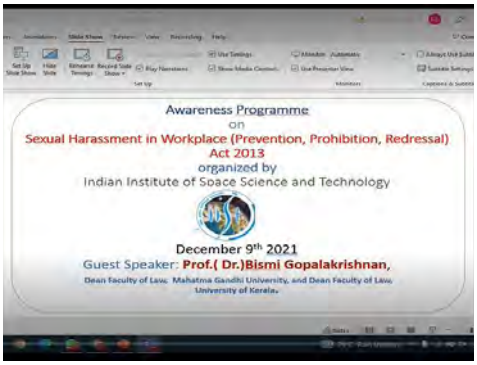
Shri. S. Somanath, Director, IIST/VSSC inaugurated the new Medical and Counselling Service Facility on 23rd November 2021. The new facility houses the OP rooms, counselling room and wards for the patients.

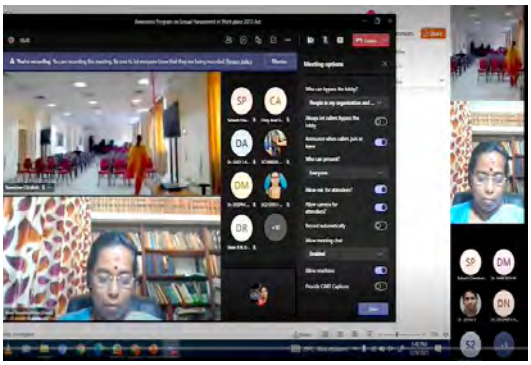
7.6 Events organised by ICC

Seminar on Harassment at Work Place Act

An online seminar on Sexual Harassment at workplace act 2013, was organized on 9th December 2021 to sensitise the IIST community on the Prevention, Prohibition, Redressal Act 2013 (POSH, 2013). This seminar is organized to commemorate the 8th anniversary of notification of the landmark legislation. **Prof. (Dr.) Bismi Gopalakrishnan**, Dean Faculty of Law, Mahatma Gandhi University, and Dean Faculty of Law, University of Kerala spoke on the subject through virtual Mode. She had elaborated on what gender bias and related harassment to women in community is and how POSH Act helps the victims to avail the benefits. The procedure

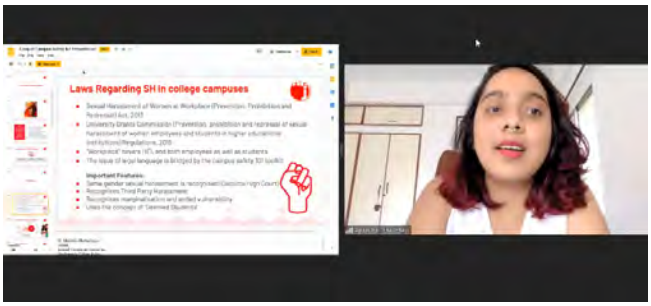
to file a complaint before ICC, responsibilities of the ICC and the employer were also touched upon by Dr. Bismi. She had also advised the IIST community to be bold enough to come out with their problems and seek the help of such acts for justice.





Awareness programme on Sexual Harassment at Workplace

On December 10th 2022, the institute along with the ICC organized an awareness talk on Sexual Harassment at workplace Act 2013 for the newly joined B.Tech. I year students (2021 Batch). The talk was delivered by Ms. Ishani, Campaigns Manager, Gender & Sexuality team & Ms Margaret Johnson, Youth Engagement Strategist, Jhatkaa.org.



7.7 New Chairman, ISRO

Shri. S. Somanath, Director - in charge of IIST has been appointed as the Chairman of the Indian Space Research Organisation (ISRO). Shri. S. Somanath took over the reins from Dr. K. Sivan and at a critical juncture when sweeping reforms and critical missions are set to define the forward journey of the storied space agency. In his 6 months stint as Director in charge of IIST, he had contributed immensely to teaching - learning, research and overall development of IIST.

With Shri. S. Somanath assuming charge as Secretary, Department of Space and Chairman, Space Commission, Dr D. Sam Dayala Dev, Distinguished Scientist / Director, IISU was given the additional charge of the post of Director, Indian IIST on 20th January 2022.

Somanath appointed new Chairman of ISRO

He played a major role in development of the GSLV Mk-III

SPECIAL CORRESPONDENT

Eminent rocket scientist S. Somanath has been appointed Chairman of the Indian Space Research Organisation (ISRO) and Space Secretary.

Dr. Somanath is taking over the reins of ISRO at a critical juncture when sweeping reforms and critical missions are set to define the forward journey of the storied space agency.

Commenting on his priorities, Dr. Somanath told *The Hindu* that space sector reforms, which involves handholding the private sector and start-ups so that they emerge as key partners in the sector's development, find a top spot on his list.

"We have to build their brand and support them to come up. The idea is that the space ecosystem should become more vibrant, economically viable and self-sustaining. IN-SPACe is defining a new model, which is also designed to expand our space economy. The ₹6,000-crore space economy that we have in India today should grow to a ₹60,000-crore space economy," said Dr. Somanath, who has been serving as the Director of the Vikram Sarabhai Space Centre (VSSC) and the Indian Institute of Space Science and Technology (IIST).

S. Somanath

The senior space scientist is also taking over at a time when ISRO has numerous missions and projects – the Gaganyaan human spaceflight mission included – waiting in the wings. Further, the COVID-19 has played havoc with ISRO's schedules over the past two years, setting another challenge.

Looking back, Dr. Somanath recalls his younger days, when, as a student, he developed a keen passion for space technology. He joined the VSSC in the Polar Satellite Launch Vehicle (PSLV) project in 1985, after obtaining his B.Tech. in mechanical engineering from the TKM College of Engineering, Kollam, and a Master's in aerospace engineering from the Indian Institute of Science, Bangalore with specialisation in structures, dynamics and control.

Dr. Somanath has played a major role in the development of the PSLV and the Geosynchronous Satellite Launch Vehicle Mk-III (GSLV Mk-III). He joined the GSLV Mk-III project in 2003, and served as Project Director from 2010 to 2014. "Somanath is an expert in the area of system engineering of launch vehicles. His contributions in PSLV and GSLV MkIII were in their overall architecture, propulsion stages design, structural and structural dynamics designs, separation systems, vehicle integration and integration procedures development," according to ISRO.

Later on, he had a two-and-a-half-year stint as Director, Liquid Systems Propulsion Centre (LPSC), Valiamala, where he contributed to the development of the indigenous cryogenic stages for the GSLV. Dr. Somanath took over as the Director, VSSC, in January 2018.

Dr. Somanath's wife Valsala is employed in the GST Department, Kerala. They have a daughter, Malika, and a son, Madhav, both of whom are engineers.

From Thuravoor school student to ISRO chief, an illustrious journey

EXPRESS NEWS SERVICE

THE Centre on Wednesday appointed senior rocket scientist and director of Vikram Sarabhai Space Centre (VSSC) S Somanath as the next chief of the Indian Space and Research Organisation (ISRO).

Somanath, who has been instrumental in the development of the GSLV Mk-III launcher and a team leader for the integration of the Polar Satellite Launch Vehicle (PSLV) during the early phase of his career, has been appointed Secretary of the Department of Space and Chairman of the Space Commission for a three-year term by the Appointments Committee of the Cabinet.

Leading Gaganyaan

Somanath Sreedhara Panicker is presently serving as the chairman of the management councils of launch vehicle programmes and Gaganyaan

Somanath Sreedhara Panicker, who has been heading the VSSC here of ISRO, which is the lead centre responsible for launch vehicle development, since January 22, 2018, will succeed K Sivan as the next head of one of the world's leading space agencies. The appointment is for a combined tenure of three years from the date of joining the post, inclusive of an extension in tenure beyond the age of superannuation in public interest, or until further orders whichever is earlier.

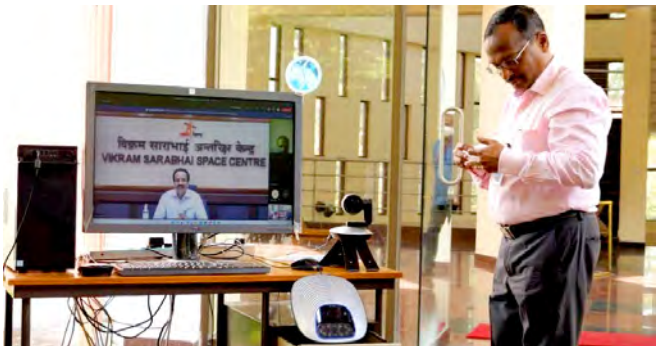
In the 38 years of service in ISRO, he handled various responsibilities. He was the director of Liquid Propulsion Centre of ISRO, associate director of VSSC, project director of GSLV Mk-III Rocket and chief of different technology domains. With a strong background in design, development and management of launch vehicle systems, he is presently serving as the chairman of the management councils of launch vehicle programmes and Gaganyaan, ISRO's human spaceflight programme, steering the technology development and management across the organisation.

A native of Thuravoor near Cherthala, he had his schooling at St Augustine High School, Thuravoor there and did his predegree course at Maharaja's College, Ernakulam.

A graduate in mechanical engineering from TKM College of Engineering, Kollam, and a Master in Aerospace Engineering from the Indian Institute of Science, Bangalore, he was the mission director for the first experimental mission of LVM3-X/CARE on December 18, 2014. After taking charge as the director of the Liquid Propulsion Systems Centre (LPSC) in July 2015, he led the team to realise the Indian cryogenic stages for four successful missions of GSLV and 13 successful missions of PSLV with the liquid stages realised by LPSC.

Now, his team is working on Gaganyaan, which involves the crew escape system in the event of a launch abort. Somanath is also awarded with a slew of honours from ISRO and professional bodies in India. Presently, he serves as one of the vice presidents of International Astronautical Federation in charge of the technical activities.

7.8 Flag off - INSPIRESat-1



Dr. D. Sam Dayala Dev, Director, IIST flagged off INSPIRESat-1 satellite on 11th February, 2022. This was the joint effort of the students and faculty members of IIST and University of Colorado. Shri S. Somanath, Secretary, Department of Space / Chairman, ISRO attended the function in an online mode. Dr. Y. V. N. Krishna Murthy, Registrar, IIST Prof. A. Chandrasekar, Dean, IIST, Team members, faculty, staff and students attended the function.

7.9 Visits to IIST

Chairman ISRO visit IIST

Shri. S. Somanath visited IIST on Feb 1, 2022. This was his first visit after taking charge as Chairman, ISRO, where he talked about his vision about ISRO and IIST.

Visit of Kerala Administrative Service (KAS) officers

The first batch of Kerala Administrative Service (KAS) officers visited IIST on 24th February, 2022 accompanied by faculty members from IMG, Trivandrum. Dr. Y. V. N. Krishna Murthy, Sr. Professor and Registrar, IIST greeted the visitors and made a short presentation about IIST and also on on the topic “Geospatial technologies for decision making”. As part of the programme, visit to Small Satellite Lab, Atomic Molecular Lab, Gas/Bio Sensor Lab and IIST Ground Station were arranged.

International Delegations

Mr. H.E. Marden Van den Berg, Ambassador of the Netherlands to India visited IIST on March 25, 2022. He was accompanied by Ms. Akanksha Sharma, Deputy Head of Innovation, Consulate General of the Netherlands, Bangalore and Dr. Venkatesha Prasad, Associate Professor, TU-Delft.


Ambassador of the Dominican Republic to India Mr H.E.David Emmanuel Puig Buchel visited IIST on March 31, 2022


7.10 Course on 'Integrated Design of Space Vehicle'

Dr. B. N. Suresh, Chancellor, IIST offered a course on "Integrated Design of a Launch" Vehicle for the final year students. It was one of the most highly sought after courses of IIST and was attended by 75 students and a few faculty members. This was followed by a visit to SDSC - SHAR.

7.11 Felicitations

IIST felicitated its Honourable Chancellor & Founding Director, Dr. B. N. Suresh, for getting elected as an International Member of the United States of National Academy of Engineering. The honour was bestowed upon him in recognition of his distinguished contributions in engineering, contributions to advances in technologies for space exploration, and leadership in promoting peaceful uses of outer space. Dr. D. Sam Dayala Dev (Director, IIST) Prof. Kuruvilla Joseph (Dean, SA&SW) and Prof. Raju K. George (Dean, R&D, IPR), HoDs, members of faculty, officers, students and staff joined in a hybrid mode.

A book titled "Numerical Methods for Atmospheric and Oceanic Sciences", authored by Prof. A. Chandrasekar, Dean (Academic & CE) and published by Cambridge University Press, was released by Dr. B. N. Suresh. Dr A. Salih, Professor, Dept. of Aerospace Engineering, introduced the book to the audience. Dr. Y. V. N. Krishna Murthy, Registrar IIST proposed the vote of thanks.

7.12 Aideu

The institute bid farewell to Dr. C. O. Arun, Associate Professor, Dept. of Aerospace Engineering, on Thursday, 24th Feb 2022. Prof. Y. V. N. Krishnamurthy, Registrar IIST, chaired the farewell function. Deans, HoDs, faculty members, officers, staff, and students attended the function in a hybrid mode.

7.13 Celebrations - Days of Importance

IIST Day & Dr. APJ Abdul Kalam Memorial Lecture Series

Shri. A. S. Kiran Kumar, Former Chairman ISRO and Member, Space Commission inaugurated the 15th IIST Foundation Day Celebrations and delivered the 7th Dr. APJ Abdul Kalam Lecture on 14th September, 2021. Dr. APJ Abdul Kalam Lecture series has been instituted in IIST in 2017 in the fond memory of its first Chancellor, Dr APJ Abdul Kalam.

Considering the recent policy changes and future space activities and as part of our efforts to reach out to the industries, an IIST- industry interface was organized as part of the foundation day celebrations. The aim of the programme was to collaborate in areas of interest and also to initiate a robust technology transfer mechanism. The interactions focused on the themes of Aerospace Technology and Materials, Sensors, Payloads, Small Satellites, Space Applications (Ground Station, Data Processing, AR/VR, Satellite RS &GIS, GIS Navigation, UAS, and Data Analytics/ML). 48 industries participated in the programme. An ISRO -IIST interface was organized. Dr.Sam Dayala Dev, Director, IISU spoke about the Opportunities in ISRO, Dr.D Radhakrishnan, Director, NSIL on the Opportunities in space industry and Col. H S Shankar VSM (Retd.), CMD, Alpha Design Technologies Pvt. Ltd on Space Industry perspective - opportunities and challenges. The other programmes of the day included an online technical session for school students and an online alumni meet where 108 alumni from various ISRO Centres interacted online with the Director, Registrar and other faculty members of IIST.

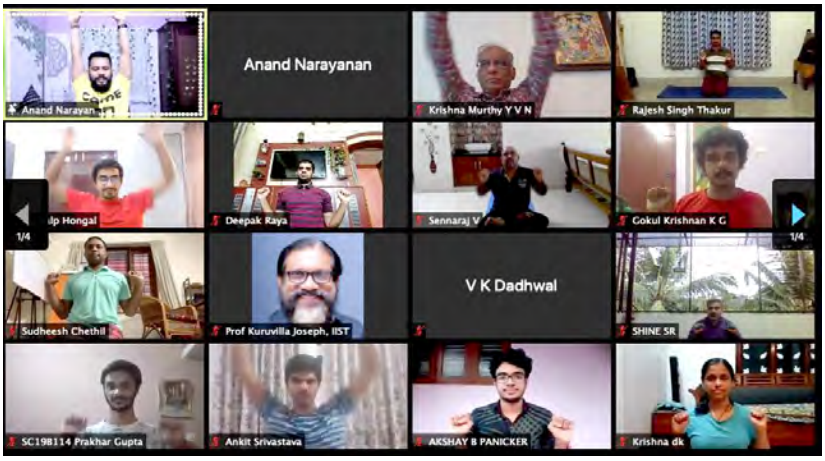
IIST-ISRO Meet

As part of the XV Foundation Day celebrations, IIST organized an online meet with all ISRO Centres on September 13, 2021 by inviting all ISRO centres as well as Units and Director, CBPO ISRO HQ. Main focus of the conference discussion was to foster the collaborative R&D activities of ISRO & IIST.

The meet was inaugurated by Shri. S. Somanath, Director IIST. In his opening remarks he emphasized the significance of the meet in terms of mutual understanding of the possibilities for research collaborations and the best utilization of the existing resources and facilities for supporting the ongoing and upcoming space activities. Prof. Y. V. N. Krishna Murthy, Registrar, IIST coordinated the programme from the Academic council Hall. Dean R&D presented briefly on the overall research activities at IIST. This was followed by presentations on research activities by HoDs of the 7 academic departments. The thrust areas of research in each department were highlighted along with the ongoing and upcoming research projects in collaboration with various ISRO centres. Chief Technology officer, Dr. G. Ayyappan made a short presentation on the activities of the Advanced Space Research Group (ASRG) at IIST. In his presentation, he mentioned the modus operandi of identifying and managing the projects with various ISRO centres. He also announced that the techno-managerial software IRACE will be launched in a couple of weeks. As a first phase ,20 numbers of research projects from VSSC, LPSC, HSFC and IISU are launched. 20 more research projects from other ISRO Centres are in the final phase of ASRG Discussions. He indicated the R&D vision of ASRG as facilitating IIST to become the Space Innovation Hub, analogous to the Caltech-JPL model. The final goal of IIST is to emerge as a 'Research centre capable of Independent Experimentation and realization of Projects in Space Science & Technology'.

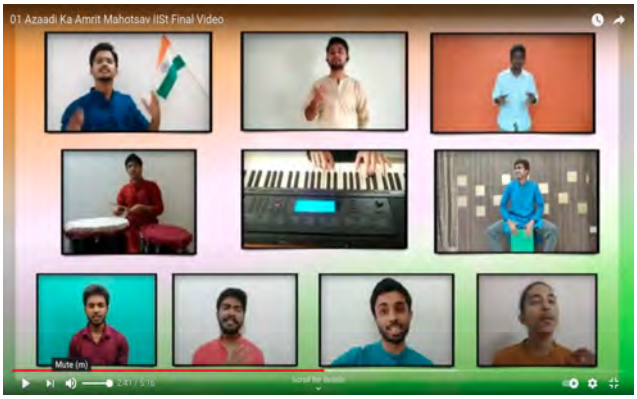
International Yoga Day 2021

International Day of Yoga 2021 celebrated in IIST on **June 21, 2021**, brought together students and staff for a virtual session for celebrating Yoga as a way of life. Expert trainers Shri. Anand Narayan and Smt. Rajalekshmi S. guided the attendees through various simple asanas, breathing techniques and silent meditation, all in one hour.



Independence Day

Independence Day 2021 was celebrated with the curtain raising for Azadi ka Amrit Mahotsav Celebrations. Prof. Y. V. N. Krishna Murthy, Registrar, IIST gave the independence day speech followed by padayatra, planting of trees and a quiz programme for the students of IIST. The music club of IIST offered a musical treat in honour of the the men and women who had laid down their lives in the altar of freedom and to those brave hearts who safeguard our nation from the front lines.



National Engineer's Day

IIST celebrated 15th September, 2022 as National Engineer's Day to appreciate the contributions of Bharat Ratna Sri Mokshagundam Visvesvaraya. Prof. Suresh Subramonium, Director, CET School of Management, Thiruvananthapuram delivered an online lecture on "Lessons to learn from a Great Engineer of all time - Sir Dr Bharat Ratna Sri Mokshagundam Visvesvaraya".

Vigilance Awareness Week - 2021

Vigilance Awareness Week - 2021 was observed in IIST from October 26 to November 01, 2021 with the theme "Independent India @ 75: Self-Reliance with Integrity". The Observance of Vigilance Awareness Week in IIST commenced with the Integrity Pledge read by Registrar, IIST and taken by all IIST personnel on 26th October, 2021 at 11.00 am. After the pledge, the official banner was launched through IIST website.

Ambedkar Jayanthi

Due to covid-19 pandemic, the birth anniversary celebration of Dr. B. R. Ambedkar was celebrated by distributing sweet packets worth of Rs 350/- to all the employees on 30th November, 2021 instead of arranging lunch on the day of celebration. This was decided based on the communication received from Department of Space, vide letter No. A.2/11/6/2005-I dated 03.11.2021.

Samvidhan Diwas (Constitution Day)

Samvidhan Diwas (Constitution Day) was observed in IIST on November 26th, 2022 with Prof. Kuruvilla Joseph, Registrar, IIST reading out the preamble in the Council Hall, Administrative building. HoDs, Deans and Administrative staff attended the programme in the Council Hall and rest of the officials and staff read the Preamble from their respective areas.

Republic Day

Republic day was celebrated in all its grandeur in IIST. Independence day message was delivered by Dr. Y. V. N. Krishna Murthy, Registrar, IIST followed by inspection of guest of honour. Social and cultural events by the students, staff and CISF personnel, distribution of awards and prizes for various competitions, seminars and talks, among other activities marked the celebrations of the day. Many of the programmes were conducted in

an online mode.

International Women's Day Programme

A formal function was organised in IIST on March 9th, 2022 to celebrate International Women's day 2022. The function was held in a contained manner in view of the pandemic situation. The Chief Guest for the function was Dr. Vinitha V. Nair, Cardio Thoracic Surgeon, Thiruvananthapuram Medical College. An Alumnus of AIIMS, New Delhi and fellow of the Royal College of Surgeons, she was an integral part of all 4 cardiac transplants which is first of its kind in a government sector in Kerala. She has performed more than 500 adult & paediatric cardiac and thoracic procedures independently. She also had her training in paediatric cardiac surgery from Boston Childrens Hospital, USA and Hospital for Sick Kids, Toronto Canada.

She described her fight to establish herself in a male dominated field of Cardiac Surgery and advised the students that everything is possible if we have the passion to excel and we should not be deterred by the obstacles that stand in our path towards our dream.

The welcome speech was delivered by Dr. Nirmala Rachel James, Professor, Department of Chemistry and Chair Person, Gender Sensitization Cell, IIST and Presidential address by Dr. D. Sam Dayala Dev, Director, IIST. Dr.

Y. V. N. Krishna Murthy, Registrar, IIST felicitated the function and Ms. Febna Raheem, Research Scholar, IIST proposed the vote of thanks.

IIST Tribute to Melody Queen Late Smt Lata Mangeshkar

The students of IIST organised a cultural evening on March 9th, 2022 in connection with International Womens day as a tribute to the Queen of Melody: Nightingale of India Late Smt Lata Mangeshkar.

Exhibition showcasing talents of IIST students and women staff members

An exhibition cum sales by IIST students and the women staff members showcasing their talents was organized as part of Womens day celebration. This was visited by faculty, staff and students alike as it provided a one stop shop for several interesting products ranging from artefacts, paintings, pastries, other food items and soft drinks.

Inhouse Publications

Surabhi is the a bi-annual art and creative journal of Arts and Literature published by Indian Institute of Space Science and Technology. It publishes creative and literary articles written by students, staff and faculty of IIST as well as employees from various centres of Department of Space. It also publishes interviews of interesting and talented personalities from DOS. The institute publishes its 15th and 16th volume during this period.

The Sounding Rocket (TSR) is the biannual student newsletter composed and designed by students at IIST chronicling life and times at the institute.

IIST News Letter brings out the latest developments in the institute. It covers the whole spectrum of activities in the institute. The 7th volume of the newsletter was brought out during this period

Antarish Dhaaraayen is the inhouse Hindi Journal of IIST. The E- Journal contains articles, poems, reports of major functions and creative works of students and personnels of IIST as well as the technical articles in Hindi sent by the employees of various centre/ units of DOS/ ISRO. The fourth issues was published during the period 2021-22.

Institute Facilities, Infrastructure and Other Units

8. Institute Facilities, Infrastructure and Other Units

For attracting young talented academicians and post-doctoral fellows from across the world, in addition to world-class laboratories and high-end equipment required to conduct research, quality living experience such as accommodation facilities and mess also has to be provided.

8.1 Construction and Maintenance Division CMD

The Construction Maintenance Department is entrusted with the responsibility of construction and maintenance services of the institute. The works are carried out through contract by calling tenders and quotations in a transparent manner. For maintaining the quality in construction of buildings, the advice of top management and officials from other ISRO centres, who are expert in this area are also sought.

The capital work completed by CMD, IIST during the period was:

Solar power plants at various locations in IIST

- Cost of completion : Rs. 353.00 Lakhs
- Total capacity of solar plant : 500 kWp
- Energy savings per month : 60,000 Unit.
- Monetary savings on electricity charge per month : Rs. 3.24 Lakhs

Solar power plants at Interdisciplinary Block

Solar power plants at Admin Block

The minor works completed by CMD, IIST during the period were:

Modifications in Mess 3 for establishing Medical Centre at IIST, Valiamala

- Completion cost : Rs. 17.71 Lakhs

Modifications in Mess 2 for catering office space for Space Technology Incubation & Innovation Centre (STIIC)

- Completion cost : Rs. 9.58 Lakhs

Light vehicle parking area

- Total capacity : 51 Nos
- Cost of completion : Rs. 20.85 Lakhs

Two wheeler parking area

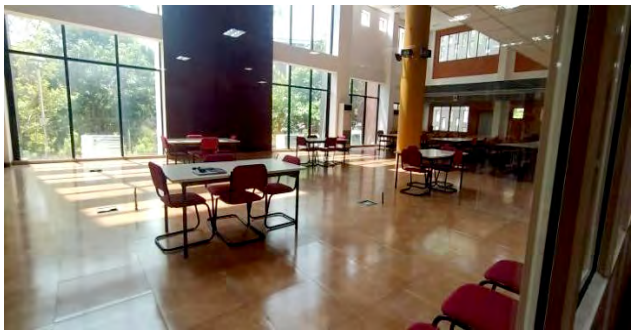
- Total capacity : 69 Nos
- Cost of completion : Rs. 12.80 Lakhs

Micro-Characterization Lab in R/111 in Avionics Block

- Completion cost : Rs. 4.64 Lakhs

Reading area for providing access from LGF level in Library

- Completion cost : Rs. 3.31 Lakhs



Shed for housing compressor near Thermal Lab in D4

- Completion cost : Rs. 5.23 Lakhs

8.2 The Multi-Disciplinary Computing Centre

The Multi-Disciplinary Computing Centre (MCC) of the institute was established to provide a wide range of computer-aided solutions for various research problems and facilitate and support the institute's essential teaching and academic goals. Areas of research interests of the center include the following: Big Data Analysis, Climate Modelling, Computational Fluid Dynamics, Computational Structural Mechanics, Computation-Assisted Materials Science, Virtual reality, Machine Learning, Network Science and Engineering, Nonlinear Dynamics, and Geoinformatics. Currently, the center has a parallel computing facility with the computational power of 25 teraflops, 40 workstations, GPU Servers, and 100 TB Storage Servers in the central facility. The following labs of various departments are also part of the center: Programming Labs (Mathematics, ESS), Machine Learning Lab (Mathematics), CADD Lab (Aerospace), Language Lab (Humanities), Computational Physics Lab (Physics), Molecular Simulation Lab (Chemistry), Virtual Reality Lab (Avionics), RF and Microwave Lab (Avionics). More than 150 students carried out their research/ project work during the year 2021-2022 using the computational facility of the center.

8.3 Student Amenity Centre (SAC)

SAC houses multiple facilities that cater to the needs of the IIST student community. The following facilities are currently operational in SAC.

- Indoor sports and fitness facilities
- Kitchen and mess hall with seating capacity of 450
- Amphitheatre with seating capacity of 820
- Multipurpose hall with seating capacity of 450

8.4 Sports & Fitness

A healthy, physically active student is more likely to be academically motivated, alert, and successful. It also helps in building self-discipline and confidence of the student and promotes teamwork and sportsman spirit. To ensure an overall healthy development, IIST encourages the students to actively participate in various sports activities. At IIST, we have a regular programme for students to train in various sports and fitness activities by well qualified physical education instructors. Students at IIST form various houses and intramural competitions on various sports events are scheduled round the year, culminating in the annual sports day. IIST teams regularly participate in various inter university events. IIST has teams for Cricket, Basket ball, Volley ball, Chess, Football and Badminton which regularly participate in intercollegiate events. Due to lockdown and the restrictions associated with COVID 19 pandemic, the number of events within and outside the institute remained very less.

All the hostels are equipped with Chess, Carrom and Table Tennis and these are accessible 24X7.

The Students Amenities Center (SAC) has the following facilities:



- Recreation hall
- Chess, Carrom, Billiards and Table Tennis
- Gymnasium equipped with Various facilities like treadmill, elliptic trainer, multigym and ab machine.
- Badminton courts
- Squash court





Students also have access to the following outdoor facilities

- Basketball court
- Volleyball court
- Outdoor gym
- Cricket net pitch area
- Cricket/Football ground

8.5 Library

IIST Library is an automated modern learning resource centre that facilitates access to accurate and authoritative information using state-of-the-art technology from print and electronic resources. The library spares no effort to fulfil its mission by selecting, acquiring, organizing, maintaining, and providing access to a balanced collection of print and digital materials suitable for the institutes academic and research purposes.

Details of library collection and expenditure for various resources during 2021-22 are given below:

Sl No.	Resources	New Addition During 21-22	Amount Spent During 21-22 (in Rs.)	Total No. as on 31st March 2022
1	Books	761	18.67 lakh	34180
2	E-Books	1513 *		8198
		304	31.09 lakh	
3	Print Journals	96	14.16 lakh	162
4	Individual Online Journals	1	9.27 lakh	5
5	Online Databases	5	181.12 lakh	21 (Total No. of Online Journals 6500+)
6	**Online Tools**			4
	(i) Similarity Checking Tool* (ii) Remote Access Facility* (iii) Current Awareness Service*			
	(iv) Writing Assistant Tool		3.98 lakh	
7	Bound Volumes	84		1262
8	CD / DVD	3		1046
9	Maps	0		122
10	Reports	102		1294

** Through Antariksh Gyaan Consortium*

Library & Information Services

Library provides the following services for the user community:

- IIST Virtual Library (IVL)
- Text Book Bank
- Front Desk Service
- Inter Library Loan
- Documentation Service
- Reference Service
- YouTube Video Lectures
- Reprographic Service
- Library Portal
- Reading Hall
- Multimedia Library
- Books on Call Service
- Similarity Checking Service
- Current Awareness Service
- IIST Social Media Management
- Online Resource Management
- Shodhganga Co-ordination
- Research Information Management Service
- Digital Library
- Binding Service
- Graphic Design Facility
- Web OPAC

Electronics Resources Subscribed: IIST library provides access to the following electronic resources:

American Institute of Physics (AIP), American Mathematical Society, American Meteorological Society, American Physical Society (APS), American Society of Mechanical Engineers (ASME), Annual Reviews, Association for Computing Machinery (ACM) - ACM Digital Library, Cambridge University Press (CUP), Institute of Physics (IOP),

JSTOR, MathSciNet, Optics Infobase, Oxford University Press (OUP), Royal Society of Chemistry (RSC) and Springer.

A software - Book Grant Management System - was developed to process the book grant requests of the students. Library continued to design the newsletter, magazine, annual report, convocation speech and materials for workshops and conferences.

Arranged a 'Book Fest' for selecting books for the library. Orientation programme and Resource Awareness Programmes were organised for new students to familiarise library resources, procedures

8.6 Computer Systems Group (CSG)

CSG operates and maintains computer systems, networks and communication infrastructure in IIST to provide and ensure 24x7 availability of all IT and non-IT systems and services that are essential for routine functioning of academic and administrative departments of IIST.

1. Server infrastructure
2. Network infrastructure, wireless and internet connectivity
3. Web servers, mail servers, database servers and domain servers
4. Computer and network security systems
5. Physical-security systems for access control and surveillance
6. Video-conferencing, webinar and live-streaming systems
7. Software licenses
8. Public-address and conference systems
9. Audio-visual and multi-media display systems
10. Desktop, laptop and workstation computers
11. Printers, scanners, copiers
12. Telephone exchange and telecom instruments
13. Epayment and sms gateways
14. Vsat-based broadcast and telecast devices
15. Consumables - cables, toner-cartridges & batteries.

IT and non-IT services are setup and facilitated to students, faculty and staff, in 4 academic blocks, 11 residential hostel buildings, library, student-activities centre and buildings of administrative offices and service facilities located across the campus.

Continued Support To Covid Pandemic Situation

IT infrastructure and services were extended for work-from-home, teach-from-home and learn-from-home for staff, faculty and students for uninterrupted continuation of academic and administrative activities of IIST during COVID closures in 2021.

Interactive virtual classroom/ meeting infrastructure, manpower and resources were setup for conduct of 'completely-online' as well as 'hybrid' interactive classes, exams and meetings.

MOODLE online learning platform setup during COVID 2020 continue to be maintained as the medium for hosting

digital academic contents and conduct of online courses and exams.

Remote access facilities to in-campus computing facilities continue for members of faculty and students.

IIST's servers, storage systems and virtual-server infrastructure

Servers (Tower, Rack, Blade Servers & Server Cluster for Virtual Servers), Storage (SAN of 96TB) + (SAN of 32TB) remain hosted and maintained in IIST Server Room in Aerospace Block.

Virtual Server Infrastructure consisting of 4 high-end hypervisors with linear cold-migration capability remains operational in the Server Room.

Open Source systems and databases are in predominant use for computer systems. Campus-wide license subscriptions are maintained for Windows Server and Redhat Linux operating systems.

Microsoft Campus Licensing Agreement continues to be renewed to make all its software available for students and faculty.

Free-for-university license of AUTOCAD software have been subscribed from Autodesk and are in use by staff, students and in academic labs.

Internet & Campusnet Services

Internet web sites, web applications and mail services for staff, students and faculty are operated and maintained in in-house server hosting facility in IIST.

SBI ePay gateway services integrated to IIST systems this year in addition to existing PayGov services to enable digital payments.

Multi-gateway SMS services integrated for Admission notifications.

Upgrade of Systems and Services planned for web services.

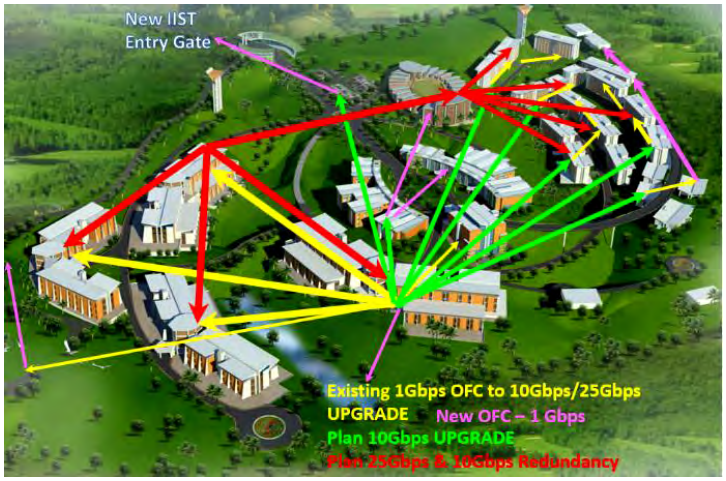
Augmentation of Virtual Server Infrastructure proposed for 2022-23.

Spacenet Web Services

EGPS/EPROC servers have been installed and made operational at IIST after setup of maintenance network links with VSSC. Setup of separate and secure SPACENET local-area networks in all administrative and academic departments have been completed, all computers in Purchase section have been migrated to SPACENET to enable EPROC in all offices.

COINS/COWAA servers remain operational with maintenance network links with SDSC.

Scientific and Engineering software used by academics departments remain hosted in licensing servers maintained at CSG. Migration of some licenses to the common computing facility established in Inter-Disciplinary Block is in progress.



Network Infrastructure

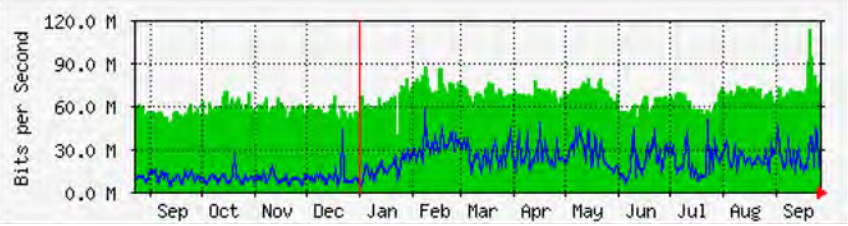
CAMPUS NETWORK backbone is hosted and maintained on dual-redundant modular Core

Network Switches linked over OFC to Distribution and Access Switches and ~150 802.11b/g/n based Wireless Access Points in all buildings.

- CAMPUSNET - ACADEMIC LANs available for Academic Depts, Labs, Faculty Rooms, Research Scholar Rooms in 4 Academic Blocks.
- CAMPUSNET-HOSTELS LANS: Consistent complaints about connectivity due to WiFi in 11 Hostels to be resolved by setup of wired networks in hostels.
- CAMPUSNET-WIRELESS LANS: Wireless Infrastructure to be upgraded as OEM support expires 2022. Preparation for Request for Proposal for WiFi6 based technologies is in progress.
- CAMPUSNET - PONMUDI: Setup of infrastructure in IIST Ponmudi Campus is in progress, with 20Mbps Leased-Line network link to begin with.
- SPACENET: consisting of nodes that require access to secure networks have been newly extended to selected computers in all academic and administrative departments across campus to facilitate EPROC.
- SECURITYNET: consisting of all physical security devices across the campus are being migrated into a separate and secure network with access only to authorized users.
- CAMPUSNET & SECURITYNET have been newly extended over OFC to power, water-supply and medical facilities that have 24x7 operations for improved communication and security.

Internet & Telephone Services

Upto 200Mbps of Internet Bandwidth on 1Gbps NKN link continue to be available round-the-clock at all offices and academic and residential locations in the campus since 2011. Daily internet usage peaked upto 196 Mbps.



Existing secondary 10Mbps Internet Bandwidth from BSNL link is being upgraded to 100Mbps with 64 IPv4 addresses for redundancy and increased bandwidth requirements.

BSNL's Telephone Exchange & Cellular Telecom services are maintained in-campus to facilitate official and personal communication.

Computer & Network Security Management

Ownership of Top Level Internet Domains of iist.ac.in & iist.org, and its SSL Certificates are renewed and maintained.

Computer and network security updated and maintained using UTMs to improve perimeter security.

End-Point Security subscription increased to 2600 nos. to comprehensively cover BYOD devices all internal network users of computers and smart phones in IIST.

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.

Application Security Audit of all Internet & Intranet Web Applications proposed to be conducted by CERT-IN empaneled 3rd-party agencies.

Physical Security Systems for Identity, Access Control & Video Surveillance

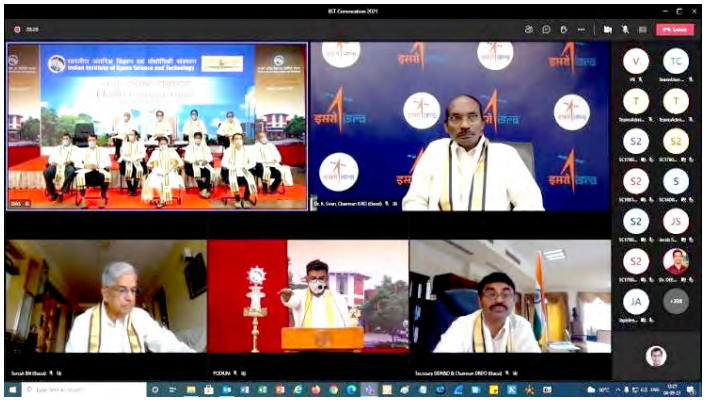
141 cameras for surveillance of entrances, stairs, elevators, corridors and outdoors of all buildings in the campus are currently in operation.

CCTV Monitoring by CISF, Hostel Services, Canteen Services, HoDs and CCTV Operations Centre in Admin Block have been setup in the current year. Classrooms and 24x7 labs/ facilities in IIST have been additionally included for video-surveillance.

Proposal for setup of in-campus Biometric Access Control & Attendance Systems for secure access to 24x7 labs/ facilities/ services have been approved. This is in addition to existing Campus Entry/ Exit systems operational at the gates based on DoS guidelines.

ID Cards along-with color-coded lanyards provided for all staff and students in IIST Campus. ID Cards for Interns, Startups and Visitors have been proposed for implementation.

Video Conferencing Systems & Services



Web-based Video-Conferencing Systems for Virtual Classrooms & Meetings Rooms have been established using cloud-services of Microsoft TEAMS.

2 conference rooms in IIST have been setup and linked to the centrally-managed SPACENET Room-based Video-Conferencing Systems newly established by ISRO HQ.

Web-conferencing & Webinar facilities and Live Streaming* setup for conduct of:

- Virtual 9th Convocation 2021*
- On-line UG Admission 2021
- On-line PG (MTech/MS & PhD) Admissions 2021 & 2022
- 15th IIST Foundation Day 2021*
- 7th APJ Abdul Kalam Lecture 2021*
- ISRO Placement Counselling 2021
- Interactive Classes & Online Exams.

Audio-Visual, Multi-Media & Public-Address Systems & Services

Audio-Visual and Multi-Media systems are operated in all conference-rooms and maintained in all classrooms for enabling lectures.

Portable public-address systems are also being operated and maintained for campus events and student activities.

Audio-Visual and Multi-media facilities setup for conducts of events :

- Independence Day Celebrations.
- Republic Day Celebrations.
- 15th IIST Foundation Day Celebrations 2021 Modern network-based multi-media systems, including interactive display panels to augment digital classroom facilities in all classrooms is proposed for 2022-23.

Modern audio-visual facilities in the 600-seater Amphi-Theatre and 200-seater Multi-Purpose Hall are proposed for setup in 2022-23.

State-of-the-art network-based audio-broadcast systems in corridors of all hostel-rooms and classrooms to address students in emergency situations is proposed for 2022-23.

Plan for establishing network-based video-signage display systems to display notices, schedules and events in foyers of all hostels and academic blocks is also proposed for 2022-23.

Consolidated Report of Services rendered to End-Users/ Devices by CSG		
Wired LAN Services for Official Desktop PCs	1000	devices
Wired LAN Services for Network Printers	20	devices
Wireless LAN Services for Official Laptop PCs	210	devices
Wireless LAN Services for Offical Desktop PCs	20	devices
Wireless LAN Services for BYOD Laptop PCs of Students	720	devices
Wireless LAN Services for BYOD Smarphones	300	devices
eLearning MOODLE Platform User Management Services	900	users
Official eMAIL ID Login User Login Services	200	users
Student eMAIL ID User Login Services	900	users
Web-Conferencing BLUEJEANS Conference Scheduling Services	5	IDs
Microsoft O365 TEAMS Web-Conferencing & Webinar Login & Scheduling Services	1550	users
MiFare Proximity ID Card Authentication Services	1400	cards
Biometric ACS Enrollment Services	1400	templates
Inventory & Help-Desk System Login & Update Services	140	users
End-Point Security ANTIVIRUS Client Services	2600	clients
Remote-NETWORK INGRESS-Access Services	30	users
Remote-NETWORK EGRESS-Access Services	20	users
Telephone Subscription Services	320	users

Consolidated Report of Inventory of IT & Non-IT Systems, Devices and Accessories operated/ maintained/ technically-supported/ stored by CSG	
Computers	1612
Computer Operating Systems	1429
Servers & Storage Systems	86
Network - Switches, Routers & Firewalls	190
Network - Wireless Devices	284
Network - SFPs, Modems & PoE Devices	169
Physical Access Control & Video Surveillance Systems & Devices	373
Audio-Video Conference Systems & Devices	58
Multimedia Systems & Devices	145
Public-Address & Conference Audio Systems & Devices	308
Telephone Connections & Instruments	447
Printers & Scanners	318
UPS	43
Tools & Testing Equipment	6
Total	**5468**

8.7 Software Support Group (SSG)

Software Support Group (SSG), lead by a team of IT professionals provides various software services and technical assistance in Indian Institute of Space Science and Technology.

SSG implement software support and services to the various departments such as Academics, Administration, Transport, Canteen, Purchase, Stores, Accounts and Placement in the Institute. SSG has designed, implemented, customized, tailored and updated many web applications within short time span without compromising accuracy. SSG plays an important role in providing software solutions based on Institute demand.

SSG Activities - A quick walk through

During the reporting year, the major accomplishments of SSG include the **release of new software** namely, Attendance Management System, SBI ePay Integration and revamping of P.G. and Ph.D. Admission Portal.

Attendance Management System- Automated the attendance processing of manpower contract using biometric data to ease salary computation.

SBI ePay- Integrated the SBI Payment Gateway with U.G. Admissions and Ph.D. Admissions.

P.G. and Ph.D. Admission Portal - Redesigned the portal with new features starting from online registration to selection and admission.

a. **Software support provided** for various activities in the Institute during the reporting period:

   Analysis, Design, Coding, Implementation, Maintenance and Enhancement

   - Book Grant Management System - Automated the process of book grant submission and approval.
   - Canteen Booking System - Allows online booking and cancelation of breakfast/lunch/dinner services with online payment mechanism.
   - IRACE - Automated the various stages in the submission of IIST-ISRO Research Projects.

- Thesis Submission and Evaluation Portal - To submit thesis files for review and evaluation.
- Online Counselling Software - For U.G. and P.G. admissions.
- iCampus - Manages academic functions in IIST campus.
- Academic Portal - Student view for academic activities in IIST.
- Online Student Feedback System - To record course feedback from student.
- ISRO Absorption Counselling Software - For ISRO absorption.
- Convocation Portal - For registration and posting convocation related information.
- Material Management System- For Stores, Construction and Maintenance Division.
- Online Application Submission for Recruitment - For Appointment on Short-term Contract Basis and Technical Assistant.
- CHSS Card Printing System - For generating CHSS cards.
- Student Activity Board - Event Management System.
- Card Generation System - For printing identity cards to students and employees.
- Payment Information System - For tracking budget details.
- Student/Staff Directory - Manages student and staff details.

b. Customized Applications:

Implementation, Maintenance and Enhancement

1. COWAA IIST MIS
2. Canteen Management System
3. TOMD for Transport
4. 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 trouble shooting

d. Other Activities:

1. Website design for seminars/ workshops on request
2. Analyze and provide various reports and charts based on requirement
3. Application deployment

e. Current Software in Development:

1. GTE-PLR Data Management Portal
2. Onboarding of IIST JRF/ SRF Recruitment on UMANG
3. Leave Management System

8.8 Purchase and Stores Division

IIST Purchase Section is working based on GFR, DOS Purchase Manual and guidelines of CVC and Public Procurement Policy. The Government e-Market Place (GeM) is being utilized for institute procurements. During the financial year 2021-22, IIST procured items worth Rs. 3.91 crores through 121 different Purchase Orders through GeM. 1229 indents worth Rs. 55.66 crores were processed and 1162 purchase orders worth Rs. 37.42 crores were released.

8.9 Medical Facilities

IIST Medical Facilities functions with two Doctors and four Nurses engaged on contract. This was shifted to a dedicated building which was inaugurated by Shri. S. Somanath, Director, IIST on 23rd October 2021. Dedicated rooms are earmarked for consultation, minor procedures, emergency, Nurse Station, triage area, Sterilization unit, Counselling, Male and female wards, storage, etc. The students are also covered under Group Medi Claim Insurance Policy and Accident Insurance Policy.

For specialized treatment, lab examinations etc., students are referred to outside hospitals recognized under the Insurance agency. A fully equipped Ambulance and a light vehicle are available round the clock to meet emergency situations.

- In May and September 2021 -Mass COVID 19 RT-PCR Testing arranged for students and staff at IIST in collaboration with state health services, D.M.O office and COVID 19 surveillance team without payment.
- After the close down due to pandemic situation, the Institute started functioning in the offline mode from January 2022. All students were quarantined in a separate facility and shifted to IIST campus after negative RT-PCR test result.
- RT-PCR is arranged for symptomatic students within the campus Government approved labs.
- Online awareness sessions on COVID 19 preventive measures, related protocols and vaccination were conducted for students and staff.
- COVID 19 webpage was integrated to IIST - homepage
- Covid positive students were shifted to Government CFLTCs and hospitals for isolation and treatment.
- Full-fledged First line COVID treatment centre was set up in Ashwini Hostel of IIST from February 2022.

Permanent staff are covered under Complementary Health Service Scheme (CHSS) of Department of Space. Those engaged on contract are covered under Employees' State Insurance Scheme which is managed by the manpower supply agencies. Those persons engaged under contract directly under IIST are advised to take medical insurance coverage, the premium of which is paid by IIST.

8.10 Counselling Facilities

The counselling service at IIST is primarily a student support service intended to help students make the best of their learning environment and achieve their academic and personal goals. The centre is committed to providing a confidential, welcoming and non-judgmental environment in which students are free to explore any concerns they may have. The goal is to promote well-being, reduce emotional distress and foster resilience, thus empowering each student to face life's challenges with confidence and maturity. This year the service has also been extended to interested faculty and staff members.

A healthy emotional life is the foundation for personal, academic and professional success. Honouring individual differences, the counsellor uses compassionate, professional interactions to:

- Help develop the skills, attitudes, abilities and insights to meet both academic and life challenges.
- Develop healthy coping strategies that will have a positive impact on physical and mental health.
- Assist in overcoming personal challenges that may be hampering wellbeing and academic progress.

During this academic year around 300 individual counselling sessions were provided in face-to-face interactions. The transition to online support was successfully made where in-person interactions were not possible. These sessions were conducted through phone calls, text exchanges, zoom meetings and email.

The COVID-19 pandemic has had a major impact on the lives of students, staff and their families. Social isolation, reduced face-to-face interactions, bereavement, loss of income, disruptions and disappointments have led to increased stress and anxiety and have either triggered mental health conditions or worsened existing ones. The need, therefore, to find ways to support each other with kindness and compassion becomes even more important. A webinar on "Mental health and well-being during COVID-19" was shared with students grappling with challenges arising from the pandemic.

A webinar on "Academic Integrity- What's the Right Thing to Do" was conducted for the students in order to encourage them to adopt strong ethical principles and commit to the values of honesty, respect and responsibility.

World Mental Health Day, celebrated annually on 10th October, represents a global commitment to raise awareness of mental health issues and to mobilise efforts in support of mental health and well-being. It provides an opportunity to talk about mental health, how we need to look after it, and the importance of reaching out instead of struggling alone. A newsletter was sent to all students, faculty and staff highlighting tips and resources to help them care for their mind.

In recent years there have been some exciting and fascinating discoveries on how the brain develops its strategies for responding to stress and what we can do to help it function at an optimum level. A presentation entitled "Neuroscience for Stress Management" with practical, easy-to-understand brain-based strategies to manage stress in constructive ways was shared with interested students and has received good feedback.

8.11 Halls of Residence

The residential facilities for students are spread across 11 Hostels (09 for Men & 02 for Women) inside the campus. They are named after mythological-constellations (Nakshatras) viz. Dhruva, Dhanista, Chitra, Revathi, Rohini, Ashwini, Ardra, Phalguni, Anuradha, Arundathi & Vishaka. Around 800 students stay in the hostels which are provided with separate reading rooms, national and vernacular newspapers, television with satellite connection, safe drinking water (both hot and cold) and 24 hr uninterrupted power supply with generator backup. All hostels are

Wi-Fi enabled with high speed access to the internet, digital library and other digital learning resources. Neat and tidy upkeep of the individual hostel rooms is the responsibility of the students while common area and corridors are cleaned by staff.

Two Laundry Huts are made available inside the campus separately for men and women with provision for installing their personal washing machines and also for manual washing of cloths. Services of a laundry service provider engaged on contract are also available.

Having kept closed for two years, three rounds of deep cleaning was carried out in all the hostels to enable students to return to a clean and hygienic environment.

8.12 Canteen Services

Canteen Services in IIST caters to the needs of about 800 residential students as well as research scholars inside the campus. It also caters to more than 300 officials which include Faculty members, Officers, Staff. Students mess in Students Activity Centre (SAC) has a capacity of 420 and other users dine at Thripti Hall in Aditi building with a seating capacity of 70. Latest kitchen equipment such as Cook Wok, Self cooking centre, Conveyer Chapathi Machine, Multi -function Vegetable Cutter, Automatic hood type dishwasher etc. are being used to simplify food production and cleaning.

Students Canteen Management Committee (SCMC), Canteen Management Committee and Canteen Procurement Committee are constituted to facilitate smooth function of Canteen Services. Online meal booking has been made mandatory for faculty members, officers, staff and students.

In the midst of Covid-19 pandemic, dedicated teams of Canteen Staff in all categories who were tested for COVID were stationed within the campus and were rotated on monthly basis. All major meals were provided in parcel to students who underwent quarantine. During this period, packed lunch was also provided to all Faculty members, Officers and Permanent Staff as per their bookings at their work place for a period of 45 days so as to avoid contact with resident students.

8.13 Transport Operations and Maintenance Division (TOMD)

Transport Operations and Maintenance Division (TOMD) of IIST is having a total number of 35 vehicles. This includes Light/Heavy vehicles, two wheelers, Ambulance etc. TOMD is operating 12 light vehicles and 05 route buses for official conveyance of faculty, officers and staff. Internal transport, purchase activities of various service divisions, requirement of students in connection with their academic and non-academic activities, Medical Services, conveyance for official guests and activities at Ponmudi Hills are supported by TOMD/IIST. During the period, transportation for faculty members and students were also extended in connection with the launch of INSPIRESat at SDSC/SHAR.

8.14 Bank/ Financial Services

An exclusive branch of Union Bank of India along with its ATM, caters to the banking needs of students and staff.

8.15 Security Services

Campus security is entrusted to CISF personnel. Janitorial staffs cater to the security of all academic blocks, admin blocks, library and hostels.

8.16 Other Units @IIST

8.16.1 Internal Quality Assurance Cell (IQAC):

The quality assurance is by-product of the ongoing efforts of an institution to define its objectives and chalk out a detailed work plan to realize them. This process specifies the checks and balances to evaluate the UG/ PG/ Ph.D.

degree programmes to which each of the tasks is fulfilled. IQAC ensure that all activities of IIST are done efficiently and effectively.

IIST had constituted IQAC in the year 2012 and institute was accredited in July 2012. The validity of the National Assessment and Accreditation Council (NAAC) accreditation is for 5 years which was ended in the July 2018. A functional IQAC and timely submission of Annual Quality Assurance Report (AQAR) are the minimum institutional requirements to apply for the second, third and subsequent cycles of accreditation.

To prepare and submit backlog AQAR (from 2016-17 to 2020-21), IQAC-AQAR committee was reconstituted by Director, IIST on 20-9-2021. After several meeting and deliberations all backlog AQAR's (5 academic period) were submitted by IIST in the NAAC portal on time, out of which 4 AQAR documents are accepted by NAAC authority and one AQAR is under NAAC review. The committee accomplished the task successfully and waiting for the approval of pending backlog AQAR. Once this process is completed, Self Study Report (SSR) will be prepared which helps IIST to go forward in the Second cycle of NAAC process.

Highlights (April 2021-March 2022)

- All backlog AQAR's (2016-17 to 2020-21) were submitted during this period
- IIST-IQAC webpage is hosted (https://www.iist.ac.in/iqac)
- Student Satisfaction Survey (SSS) regarding Teaching - Learning and Evaluation is obtained from IIST UG/PG students.

8.16.2 Hindi Section and Official Language Implementation Cell

IIST has a full-fledged 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 16th June, 2021 for the Executives, on September 30th, 2021 for the faculty members, on 29th December, 2021 for the Employees of Administrative areas and on 02nd and 3rd March 2021 for the Employees and officers of Technical areas.

- Four Quarterly meetings of the OLIC were conducted on (25.06.2021, 29.09.2021, 27.12.2021, 30.03.2022) 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.
- Hindi Essay Writing competitions were conducted for the students and staff of IIST in connection with the Independence Day Celebrations - 2021. Cash prizes were awarded to the winners of Hindi Competitions.
- Hindi Fortnight Celebrations were conducted in the Institute during the second half of September. During this

fortnight, various competitions in Hindi like *'What does the picture say', Simple Translation, Hindi Typing for staff members and 'What does the picture say', Hindi Elocution, Hindi Versification* for the students of IIST were conducted. Cash prizes were awarded to the winners of Hindi Competitions.

- As the country is celebrating its 75th year of Independence, Government of India has planned commemoration activity *'Azadi Ka Amrit Mahotsav.'* In order to converge the programme of *Rashtriya Ekta Diwas (National Unity Day) on 31st October, 2021 with the activities of Azadi Ka Amrith Mahotsav*, various competitions in Hindi and English were conducted for the students and Staff (Regular as well as Contract) of IIST. Books were awarded to the winners.
- In connection with the World Hindi Day Celebrations - 2022 in IIST various Hindi competitions like Essay Writing, Story Writing and Quiz were organized for the students of the institute on 10th, 14th and 15th January, 2022 and Noting and Drafting, Memory Test, Simple Translation for the employees on 11th, 12th and 13th January, 2022. Cash prizes and Certificates were awarded to the winners of Hindi Competitions in a Prize Distribution Function held during the Republic Day Celebrations on 26th January, 2022. The officers (members of faculty) of IIST who have been declared passed in the Hindi Praveen Examination conducted by Hindi Teaching Scheme in November 2021 were also awarded certificates in this function.

- The fourth issue of Hindi House Journal of IIST named 'Antarish Dhaaraayen' was released in a Prize Distribution Function held during the Republic Day Celebrations on 26th January, 2022. The magazine contains articles, poems, and creative works of students and Staff of IIST as well as the technical articles in Hindi sent by the employees of various centre/ units of DOS/ ISRO.

- Assistant Director (OL) conducted the Prabodh and Praveen **Examination of Hindi Teaching Scheme** during November 2021 at IIST. Out of the remaining staff for Hindi language training, 5 officers for Prabodh and 8 officers for Praveen were registered in **July-November 2021 session** and 4 officers for Prabodh, 5 officers for Praveen were registered in **January-May 2022 session.**
- 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 send to **four officers** who possess **proficiency in Hindi** to use Hindi in their official works.
- As per the Annual Programme for Implementation of Official Language Policy of the Union for the year 2021-22 issued by Department of Official Language and decision made in the 41st IIST OLIC meeting held on 21.12.2021, **three sections of the Institute** viz. **General Administration, Establishment and Review** have been notified for doing entire work in Hindi/ Bilingual.
- Record of Degrees conferred, Provisional Certificates, Degree Certificates and all other certificates such as certificate of participation/ certificate of merit etc., were prepared and issued in bilingual format (both Hindi and English). Institute Brochure, Annual Report 2020-2021 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.
- Thirty 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 and IIST.

Participation In Various Programmes

Joint Rajbhasha Utsav organized by Town Official Language Implementation Committee

IIST, Valiamala is a member of Town Official Language Implementation Committee (Office-2), Thiruvananthapuram and actively participated in its activities. The employees of the institute participated in Joint Rajbhasha Utsav organized under the auspices of the TOLIC. Smt. Bindya K. R., Deputy Registrar (Grade-I), Administration won First Prize in 'What does the picture say' competition among the Non Hindi Speaking Category and Dr. Ashok Kumar, Assistant Professor, Dept. of Physics won consolation prize in 'What does the picture say' competition among the Hindi Speaking Category.

8.16.3 Gender Sensitization Committee & Internal Complaint Committee

Gender Sensitization Committee works in IIST which not only addresses gender related issues but also provides training and gender sensitization programmes to faculty, staff and students**.** 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. During the reporting period Gender sensitization committee and ICC jointly organized IIST Women's day on March 9th 2022 at 3.00 pm. ***Dr. Vinitha V. Nair***, Assistant Professor, Department of Cardiac Surgery, Medical College, Thiruvananthapuram was the Chief guest on the occasion. An online seminar on Sexual Harassment at workplace act 2013, was organized on 9th December 2021 to sensitise the IIST community on the Prevention, Prohibition, Redressal Act 2013 (POSH, 2013). This seminar is organized to commemorate the 8th anniversary of notification of the landmark legislation. Prof. (Dr.) Bismi Gopalakrishnan, Dean Faculty of Law, Mahatma Gandhi University, and Dean Faculty of Law, University of Kerala spoke on the subject through virtual Mode. On December 10th 2022, the institute along with the ICC organized an awareness talk on Sexual Harassment at workplace Act 2013 for the newly joined B.Tech. I year students (2021 Batch). The talk was delivered by Ms. Ishani, Campaigns Manager, Gender & Sexuality team & Ms Margaret Johnson, Youth Engagement Strategist, Jhatkaa.org

8.16.4 Scheduled Caste/ Scheduled Tribe cell

The Scheduled caste/ Scheduled Tribe cell protects the interest and deal with issues faced by employees and students of SC/ST category. No grievance was received during the reporting period. The cell celebrated the birth anniversary celebration of Dr B R Ambedkar. Due to covid-19 pandemic, this was celebrated by distributing sweet packets worth of Rs 350/- to all the employees on 30 November, 2021 instead of arranging lunch on the day of celebration.

8.16.5 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
58	55	04	03	Nil

Vigilance Status

Vigilance cases pending and disposed off in the year 2021-2022 - Nil

8.16.6 Anti Ragging Cell

To build a ragging free environment by instilling the principles of democratic values, tolerance, empathy, compassion and sensitivity, an Anti Ragging Cell is in place in IIST. The cell had put up posters regarding anti-Ragging, the helpline numbers, details of counselling centres etc in all important points of IIST. Care had been taken by the cell to ensure that the newly joined students integrate smoothly with the life of IIST. No complaints were received by the cell during the reporting period.

8.16.7 Grievance Redressal Cell

The Grievance Redressal Cell (GRC) in IIST aims to look into the complaints lodged by any student, staff and faculty members and redress it as per requirement. Grievance can be stated regarding academic and non- academic matters within the campus through the letters and online, especially during pandemic. The institution aims at solving the grievances within a stipulated time so as to maintain a smooth ambience of teaching and learning.

8.17 Facilities for Persons with Disability

Facilities Buildings have disabled access ramp, lifts, accessible toilets etc., for the convenience of persons with reduced mobility. All the academic blocks, Administrative building and Library are provided with ramp and lifts and toilet for Divyangjan. Student Activity Centre, Hostels and mess building are also provided with accessible toilets and ramps.

Budget allocation Separate budget is not earmarked but activities for implementation of Rights of Persons with Disability Act, 2016 is accorded top priority and expenditure incurred in the general budget. Affirmative action Indian Institute of Space Science and Technology admits PwD students to UG & PG programmes as per Government of India guidelines with 5% reservation on horizontal level. In the 2021 UG Admission7 seats were reserved out of Total 140 seats and for 2020 PG Admission 5 seats were reserved out of total 90 seats.

IIST Alumni Association

9. Alumni @ IIST

IIST ALUMNI ASSOCIATION

Indian Institute of Space Science & Technology Alumni Association (IISTAA) was formally inaugurated on September 14, 2019 with an objective to provide a vibrant forum that promotes interaction and networking among alumni of the Institute.

The office bearers elected for the National body, for the period of 2021-2023 are as follows:

IISTAA Governing Body

National President	:	Surbhi Baghotia
National Vice President	:	Amogh Auknoor
National Secretary	:	Bhartendu Thakur
National Joint Secretary	:	Ankita Hudedagaddi
National Treasurer	:	Mustafa Shahid
Executive Member	:	Abhinav Kshitij
Executive Member	:	Apoorv Mehta
Executive Member	:	Gubbala S. V. Chandrakanth
Executive Member	:	Surya Sudhakar
Faculty Coordinator of Alumni Affairs	:	Dr. Shaijumon C. S.

Activities of IISTAA

1. 3D printing - A Gateway Webinar for Beginners A webinar on 3D printing

A webinar was conducted on basics of 3D printing, on 9th October 2021, with alumni, Vishak Sashidharan and Padmanabha Prasanna Simha (joining batch of 2014), as speakers.

2. Meet the Alumni - Interaction with First Year B.Tech. students as part of IIST Induction Programme

An online interaction "Meet the Alumni" with First Year B.Tech. students was organized 4th December 2021 as a part of IIST Induction Programme. A briefing was provided on courses offered by IIST and career opportunities after college. Session was successfully delivered and was well received by the students.

3. Welcome Session for latest members of Thiruvananthapuram Chapter

Thiruvananthapuram Chapter of IISTAA organized an online session to welcome the latest additions to the chapter, who joined various centres in the city in January 2022. A virtual interaction was arranged on 9th January 2022 at 09:00 pm, to get to know the new members and provide them with insights into living in and exploring the city as paid professionals.

4. Alumni Mentorship for current IIST students

Students from the 2019 (joining) batch had requested IISTAA for a Alumni-Student mentorship program. When a formal mode of mentorship is being worked, specific requests from students for guidance are being encouraged, entertained and resolved.

5. IIST Hindi Day Celebrations Quiz

An online quiz was conducted by alumni, Abhinav Kshitij and Amogh Auknoor, for students of IIST as a part of IIST's Hindi Day Celebration on 15th January 2022.

6. Guide to MBA : Applications, Courses and Jobs

Bengaluru Chapter of IIST Alumni Association successfully concluded a webinar on 'A Guide to MBA : Applications, Courses & Jobs' on 30th January 2022. The alumni speakers, Parth Sharma and Pranjal Prateek, shared their experience, answered queries and gave an insider's view of the business and entrepreneurial world.

7. Registration Drive (Oct 2021 - January 2022)

As part of the registration drive, IISTAA received INR 790500 as registration fees corresponding to 527 registered members (as on 31 Aug 2022) and bags with IIST logo has been given to the registered members.

Glimpses of Registration Gift Distribution

8. Purchase of Laptop for Student

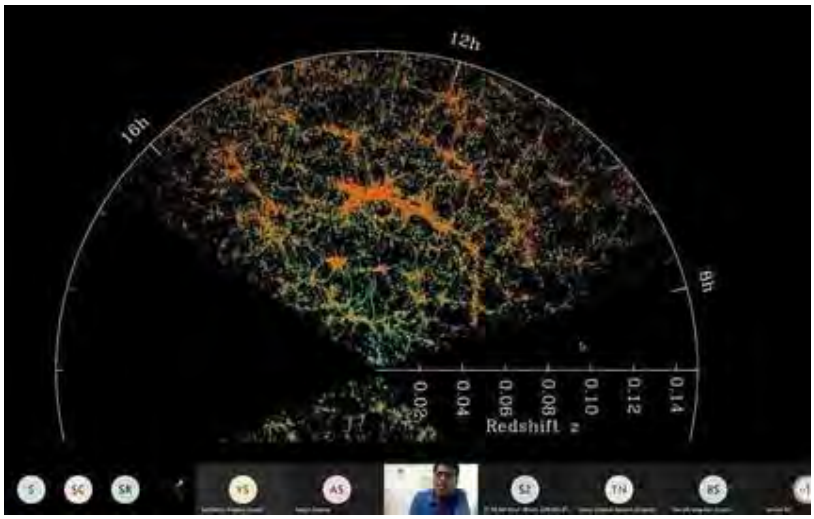
The laptop donation drive conducted during the last Executive Body's term was greatly appreciated by students and faculty of IIST. Based on the success of the previous drive and a request was made for an additional laptop for a student in need (identified by IIST). A laptop worth Rs. 40,490 has been purchased for Shiva Yadav (SC21B055) and handed over on 29/01/2022.

9. Curriculum Feedback provided to IIST

Based on a request from IIST, an interaction was held with certain alumni to share their inputs on improvements required in the MA122 course at IIST. The online interaction was held on 12th February 2022 from 03:00 pm to 04:00 pm.

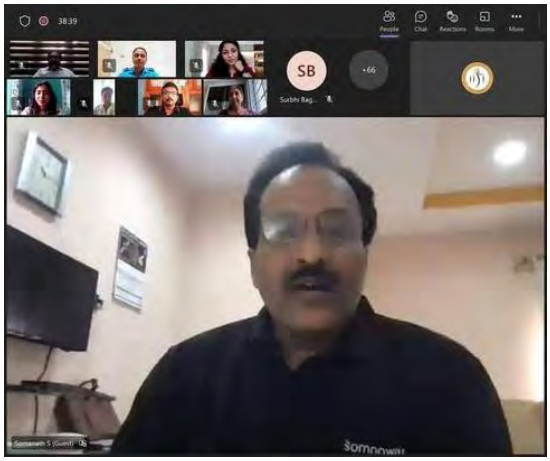
10. Mapping the Universe in 3D

Ahmedabad Chapter of IIST Alumni Association (IISTAA) organized a fascinating webinar on, "Mapping the Universe in 3D", on 26th February 2022. The discussion was led by Prof. Anand Narayanan, Professor, Department of Earth and Space Sciences at IIST. Members were taken on a tour of scientific discoveries made towards mapping the large scale structures of the Universe that lead us to understand our Universe in three dimensions, unlike the 2D images of sky that we see in various colourful astronomical images. The talk was followed by an open discussion and a brief question-answer session.



11. Women and Spaceflight: Charting the Future on 27th March 2022

IISTAA conducted an online Panel Discussion on Women and Spaceflight : Charting the Future, in connection with International Women's Day 2022, on 27th March 2022., Shri. S. Somanath, Chairman, ISRO, the Chief Guest and Keynote Speaker, Dr. V. R. Lalithambika, Former Director, DHSP, shared their views on the topic with the audience. The panelists, Group Captain Mona Dahiya (IAF), Wing Commander Kamaljeet Kaur (IAF), Dr. Dona Mathew (ISRO) and Smt. K. S. Smitha (ISRO), shared their wonderful insights and helped broaden the audience's perspective. Over 100+ alumni and students attended this 2 hour session from 10:00 - 12:00 IST.



Alumni Day & 15th Foundation Day of IIST

The alumni foundation day celebration was inaugurated by Prof. V. Radhakrishnan, Former Professor IIT Madras & IIST Trivandrum. Prof. Radhakrishnan in his Keynote Lecture on *Guidance and Control for a Rewarding Professional Career* metaphorically conceptualized the Profession Life of a person as a Road journey towards a destination. The talk started from the initial stages of life, observing the world as we grow up and entering into a professional career. It was inspiring as it covered all areas of a professional life: mentorship, leadership, importance of professional ethics and values and trying to always find a balance in what we choose to do. The talk was open to students, alumni and faculty. It was well appreciated and was followed by an active interaction session where the alumni could get more clarity regarding their own specific careers.

This was followed by Webinar on "*Challenges in Leadership*". Speakers were Dr. Dheeraj Aggarwal, Lecturer, University of Liverpool, Mr. Nakul Kukar, Co-founder and CEO of Cell Propulsion, Mr. Prakhar Agarwal, Graduate Student, ISAE-SUPAERO & Scientist/Engineer, ISRO. The professional paths of all the panellists were different: entrepreneurship, career in academia and career in ISRO and it gave an insight to the participants about the challenges that all of them faced on the way. It was also a proud moment to see how the alumni have spread their wings in different fields all around the world.

2nd Ankesh Mishra Memorial Quiz was conducted by Abhishek Panchal as Quiz Master. 21 teams comprising of IIST students and Alumni participated in the prelims online. 6 Teams qualified for the Finale which was held in the afternoon the same day. After 3 rounds of competition Rishin Aggarwal and Aman Naveen were winners with Sneha Gem Mathew and Bhavana Dinesh as 1st runner ups. Prabodh Katti and Siddharth Srivastav & Shishir Chandra and Siddharth Jha & Siddhartha K Jha shared a close 3rd place. The finale was live streamed on facebook and had more than 100 members as audience. Parents of Ankesh Mishra were also present for both the rounds to encourage the participants and felicitate the winners.

In the context of completion of 75 years of independent India and 15 years of IIST, the IISTAA invited alumni and students of IIST to share their perspective and experience regarding IIST's impact over the past 15 years and their vision of IIST in building the future of Indian Space ecosystem -*75th Years of Free India: IIST's Role in Making India a Space Powerhouse*. The top four entries, judged by a panel of jury, got an opportunity to present their submission in presence of the Director, IIST Shri. S. Somanath and Registrar, IIST Dr. Y. V. N. Krishnamurthy. Based on the presentation, two teams were awarded the first and second prize and the other two received consolation prizes.

With the end of the 2019-2021 term, an Investiture ceremony was conducted to announce the new office

bearers for the IISTAA Term 2021-2023. The programme started with the Welcome address by the President of the IISTAA followed by the announcement of election results. After the conclusion of the Investiture ceremony, Registrar IIST, Dr. Y. V. N. Krishnamurthy gave a special address highlighting the role of the Alumni as the Brand Ambassadors of the Institution. This was followed by the address by the newly elected President of IISTAA, Ms. Surbhi Baghotia. She acknowledged the contribution of the previous term and congratulated the members elected for the new term. Dr. Kuruvilla Joseph, Dean, Student Affairs, IIST addressed the gathering and congratulating the new team of office bearers. Dr. Shaijumon, Faculty Coordinator for the Alumni also shared his experience with the previous term and extended his best wishes to the members of the new term.

Achievements

Jhalkar Ukaye of 2013 pass out cleared the Indian Forest Services 2020 with an all India Rank of 85 and Aswin Kakumanu of 2018 pass out has cleared the Civil Services Exam 2021 with an All Indian Rank of 235.

Jhalkar Ukaye
B.Tech. in Aerospace Engineering

Aswin Kakumanu
B.Tech. in Aerospace Engi

Audit Report 2021-2022

10. Audit Report 2021-2022

BALAMURALI & ASSOCIATES

CHARTERED ACCOUNTANTS

"Thiruvathira" , T.C.50/100(2) , Kalady , Karamana.P.O- 695002
Ph- 91-9387496230 , ca.balamurali.tvm@gmail.com

INDEPENDENT AUDITOR'S REPORT

We have audited the accompanying financial statements of **INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY, Valiamala P.O., Thiruvananthapuram – 695547 which comprise the Balance Sheet as at 31 March 2022**and the Income and Expenditure Statement for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation of these financial statements that give a true and fair view of the financial position & financial performance of the Institute in accordance with the Accounting Standards issued by the Institute of Chartered A accountant of India. This responsibility includes the design, implementation and maintenance of internal control relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

Auditor Responsibility

Our responsibility is to express an option on these financial statements based on our audit. We conducted our audit in accordance with the Standards on auditing issued by the Institute of Chartered Accountants of India. Those Standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement,

Including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Institute's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of the accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Basis of Qualified Opinion.

1. Reconciliation of Fixed Assets with regard to quantity, location, cost is pending.
2. The balances in Sundry Creditors, Loans and advances and other personal accounts are subject to confirmation by respective parties.

Qualified Opinion

In our opinion and to the best of our information and according to the explanations given to us, subject to the above mentioned opinion, the financial statements give the information required by the Act in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India.

i. In the case of the balance sheet, of the state of affairs of the Institute as at 31st March 2022
ii. In the case of the Income and Expenditure statement, of the deficit for the year ended on that date.

Place: Thiruvananthapuram
Date: 30-09-2022

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

BALANCE SHEET AS AT 31ST MARCH, 2022

(Amount in Rs.)

	Schedule	As at 31.03.2022	As at 31.03.2021
CORPUS/CAPITAL FUND AND LIABILITIES			
Corpus / Capital Fund	1	2,19,40,77,563	1,98,69,75,536
Reserves and Surplus		2	2
Earmarked Funds / Endowment Funds	2	3,50,74,653	4,56,02,357
Long Term Liabilities and Provisions	3	29,28,67,843	28,73,29,857
Current Liabilities and Provisions	4	31,17,81,815	6,54,34,309
TOTAL		**2,83,38,01,876**	**2,38,53,42,061**
ASSETS			
Fixed Assets	5	1,77,62,01,645	1,88,95,21,884
Long Term Assets, Loans, Advances etc	6	14,12,70,066	13,68,22,837
Current Assets, Loans, Advances etc	7	91,63,30,165	35,89,97,340
TOTAL		**2,83,38,01,876**	**2,38,53,42,061**
Significant Accounting Policies & Notes on Accounts	18		

As per our report of even date attached.

For Balamurali & Associates
Chartered Accountants
FRN : 012374S

C.A. Balamurali C. V.
(Proprietor, Mem No. 223319)

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Dr. S. Unnikrishnan Nair
Director

R. Hari Prasad
Finance Officer

Place : Thiruvananthapuram
Date : 29th September, 2022

UDIN-22223319AXWECJ1893

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

(Amount in Rs.)

	Schedule	2021-22	2020-21
INCOME			
Grants / Subsidies	8	77,00,00,000	58,25,00,000
Fees / Subscriptions	9	5,74,60,593	4,29,38,851
Interest Income of IIST	10	75,13,433	63,09,814
Interest Earned on Grant & Retirement Funds	11	1,42,57,663	1,24,40,767
Other Income	12	29,16,634	34,78,138
TOTAL (A)		**85,21,48,323**	**64,76,67,570**
EXPENDITURE			
Establishment Expenses - Regular	13	41,28,79,727	32,85,15,430
Establishment Expenses - Support Services	14	15,85,82,114	13,67,93,154
Academic & Other Student Expenses	15	9,56,32,049	10,38,29,047
Other Administrative Expenses	16	9,47,86,121	6,61,22,517
Interest Refundable by IIST	17	1,42,57,663	1,24,40,767
Gross Deficit of Canteen Accounting Committee		13,91,208	21,09,667
Gross Deficit of Student Activities Account		0	163
Depreciation	5	21,75,24,515	23,08,67,886
TOTAL (B)		**99,50,53,397**	**88,06,78,631**
Excess of Income over Expenditure (A-B)		(14,29,05,074)	(23,30,11,061)
Less : Prior Period Items		**(7,101)**	**(1,02,23,201)**
Balance being Surplus/(Deficit) carried over to Corpus/Capital Fund		**(14,28,97,973)**	**(22,27,87,860)**
Significant Accounting Policies & Notes on Accounts	18		

As per our report of even date attached.

For Balamurali & Associates
Chartered Accountants
FRN : 012374S

C.A. Balamurali C. V.
(Proprietor, Mem No. 223319)

Place : Thiruvananthapuram
Date : 29th September, 2022

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Dr. S. Unnikrishnan Nair
Director

R. Hari Prasad
Finance Officer

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2022

(Amount in Rs.)

	As at 31.03.2022	As at 31.03.2021
Schedule 1 :: CORPUS / CAPITAL FUND		
Total Grant Received - Capital and Revenue (A)		
Opening Balance of Total Grant Received	9,94,63,09,987	9,25,38,09,987
Add : Grant received during the year	1,12,00,00,000	69,25,00,000
	11,06,63,09,987	9,94,63,09,987
Total transfer to Revenue Grant (B)		
Opening Balance of amount transferred to Revenue Grant	5,12,00,37,442	4,53,75,37,442
Add : Transfer to Revenue Grant of 2021-22	77,00,00,000	-
Add : Transfer to Revenue Grant of 2020-21	-	58,25,00,000
	5,89,00,37,442	5,12,00,37,442
Surplus / Deficit transferred from Income & Expenditure Account (C)		
Opening Balance of net income / (expenditure)	(2,83,92,97,009)	(2,61,65,09,149)
Add/Deduct : - Current Year Surplus / (Deficit)	(14,28,97,973)	(22,27,87,860)
	(2,98,21,94,982)	(2,83,92,97,009)
Balance at the year end (A - B + C)	**2,19,40,77,563**	**1,98,69,75,536**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2022

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	-14,67,089	-17,39,459	2,39,168	10,04,027	1,90,528	1,04,676	1,53,364
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	28,472	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	-14,67,089	-17,39,459	2,39,168	10,32,499	1,90,528	1,04,676	1,53,364
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	71,52,733	0	0	2,66,040	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	71,52,733	0	0	2,66,040	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	-3,100	8,93,468	0	1,14,667	0	0	56,129
- Rent/Consumables	9,56,657	0	0	3,24,975	0	0	0
- Other Administrative Expenses	4,558	21,271	0	0	0	0	0
Sub Total	9,58,115	9,14,739	0	4,39,642	0	0	56,129
iii) Fund Returned to the Funding Agency	0	0	0	4,027	0	0	0
Total (c)	81,10,848	9,14,739	0	7,09,709	0	0	56,129
Net Balance payable as at the year-end (a+b-c)	**0**	**0**	**2,39,168**	**3,22,790**	**1,90,528**	**1,04,676**	**97,235**
Net Balance receivable as at the year-end (c-a-b)	**95,77,937**	**26,54,198**	**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, 2022

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	8 IISU - Perf. of Ball Bearings - Dr. Jinesh KB	9 IPRC - Dr. Palash - 2018 - Hydrogen Sensor	10 ISRO-GBP - ABLN & C Project	11 ISRO -Dr. K G Sreejalekshmi - Gaganyaan	12 ISRO - MOM - Dr. Rajesh VJ	13 LPSC - Dr Dinesh N Naik	14 LPSC - Dr.Jinesh K B - Laser Ignition System
a) Opening balance of the funds	1,54,631	-44,820	7,23,170	19,45,322	6,16,323	-65,334	4,95,452
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)	1,54,631	-44,820	7,23,170	19,45,322	6,16,323	-65,334	4,95,452
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	3,04,647	0	16,78,852	26,018
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	3,04,647	0	16,78,852	26,018
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	0	7,44,020	0	1,90,640	65,456
- Rent/Consumables	0	0	0	4,93,639	0	0	20,706
- Other Administrative Expenses	0	0	0	14,365	0	0	6,247
Sub Total	0	0	0	12,52,024	0	1,90,640	92,409
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	0	0	0	15,56,671	0	18,69,492	1,18,427
Net Balance payable as at the year-end (a+b-c)	**1,54,631**	**0**	**7,23,170**	**3,88,651**	**6,16,323**	**0**	**3,77,025**
Net Balance receivable as at the year-end (c-a-b)	**0**	**44,820**	**0**	**0**	**0**	**19,34,826**	**0**

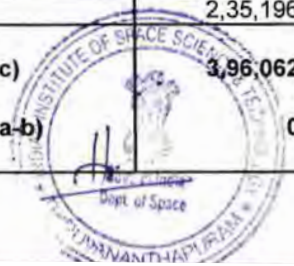
Note : Classified under Current Assets under Sch 7

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	15 LPSC - Dr. Jinesh K B - SDS	16 LPSC - Dr. Umesh K - Monte Carlo Model	17 LPSC - Dr. Umesh Kadhane	18 LPSC Dr. Umesh K - Plasma Thruster	19 LPSC - High Thrust EPS - Dr. Umesh K	20 NRSC - P R Sinha - Balloon Launching	21 SAC - NavIC (IRNSS) Gagan
a) Opening balance of the funds	6,31,258	-6,329	2,92,830	-1,13,754	2,22,324	0	2,23,681
b) Additions to the Fund							
i) Donation/Grants	0	0	0	0	0	1,03,425	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)	6,31,258	-6,329	2,92,830	-1,13,754	2,22,324	1,03,425	2,23,681
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	-24,413	0	0	2,60,092	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	-24,413	0	0	2,60,092	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	2,31,224	0	0	0	1,16,000	0	2,23,681
- Rent/Consumables	0	0	0	0	0	1,03,425	0
- Other Administrative Expenses	3,972	0	0	0	0	0	0
Sub Total	2,35,196	0	0	0	1,16,000	1,03,425	2,23,681
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	2,35,196	-24,413	0	0	3,76,092	1,03,425	2,23,681
Net Balance payable as at the year-end (a+b-c)	**3,96,062**	**18,084**	**2,92,830**	**0**	**0**	**0**	**0**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**1,13,754**	**1,53,768**	**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, 2022

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	22	23	24	25	26	27	28
	DBT - Dr. Palash - 2017-Liquid Biopsy for Cancer	DBT - Dr. Palash - Green House Gases	DBT - Dr. Shaiju - Ramalingaswami Fellowship	DBT-RamaRao (Rural Urban Interface)	DRDO - ARMREB - Dr. K. Prabhakaran	DRDO - SASE - Dr. Govindankutty M	DST - Dr. Rama Rao N
a) Opening balance of the funds	-3,97,398	4,44,067	9,93,064	20,00,000	-23,809	1,60,490	2,15,157
b) Additions to the Fund							
i) Donation/Grants	0	0	15,56,598	32,03,040	0	0	0
ii) Income from Investment made on account of Funds	0	5,869	21,415	1,21,796	3,788	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	-3,97,398	4,49,936	25,71,077	53,24,836	-20,021	1,60,490	2,15,157
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	1,18,196	6,04,544	18,88,612	4,06,000	0	0	1,62,400
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	0	0	6,67,398	1,06,256	0	0	0
Sub Total	1,18,196	6,04,544	25,56,010	5,12,256	0	0	1,62,400
iii) Fund Returned to the Funding Agency	42,480	0	77,662	0	0	0	0
Total (c)	1,60,676	6,04,544	26,33,672	5,12,256	0	0	1,62,400
Net Balance payable as at the year-end (a+b-c)	**0**	**0**	**0**	**48,12,580**	**0**	**1,60,490**	**52,757**
Net Balance receivable as at the year-end (c-a-b)	**5,58,074**	**1,54,608**	**62,595**	**0**	**20,021**	**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, 2022

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	29	30	31	32	33	34	35
	DST - CNRS - Dr. Palash Basu - 2020 - Biomarker	DST-Dr Jinesh KB- Atomic Layer Deposition	DST - KIRAN - WOS(A) - Pushpa K - Quantum	DST - NGP - A.M Ramiya - Smart Cities 3D	ICSSR - Dr. Shaijumon - 2020 - Tele Medicine Units	Mangrove Cell - Dr. Gnanappazham - 2018	Max-Planck - Dr. Jagadheep - 2017
a) Opening balance of the funds	14,23,535	87,85,760	8,91,718	21,56,325	2,15,260	10,64,616	26,14,553
b) Additions to the Fund							
i) Donation/Grants	0	0	0	1,89,655	3,90,000	0	0
ii) Income from Investment made on account of Funds	39,878	2,54,280	21,237	54,516	22,779	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	14,63,413	90,40,040	9,12,955	24,00,496	6,28,039	10,64,616	26,14,553
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	49,99,575	1,29,938	1,35,600	0	0	0
- Others	0	0	0	15,29,157	0	0	0
Sub Total	0	49,99,575	1,29,938	16,64,757	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	4,20,000	4,13,148	6,03,013	4,26,354	2,82,765	3,20,248	5,98,840
- Rent/Consumables	5,524	0	0	0	0	0	16,587
- Other Administrative Expenses	50,000	3,18,239	18,209	1,15,975	1,43,923	35,421	1,79,864
Sub Total	4,75,524	7,31,387	6,21,222	5,42,329	4,26,688	3,55,669	7,95,291
iii) Fund Returned to the Funding Agency	0	0	7,689	43,385	0	0	0
Total (c)	4,75,524	57,30,962	7,58,849	22,50,471	4,26,688	3,55,669	7,95,291
Net Balance payable as at the year-end (a+b-c)	**9,87,889**	**33,09,078**	**1,54,106**	**1,50,025**	**2,01,351**	**7,08,947**	**18,19,262**
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
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	36 MeitY SAMEER - Dr. Priyadarshnam	37 MoES - Dr. Govindankutty - Thunderstorms	38 SERB - 2018 - Dr. Anand N. - Baryons	39 SERB - Dr. Ashok - Quantum Communicatio	40 SERB - Dr. C S Narayanamurthy - Wavefront	41 SERB - Dr. Immanuel R - 5G Bands	42 SERB - Dr. Chinmoy Saha - 2020 - 5G Antenna
a) Opening balance of the funds	7,80,054	0	3,41,728	18,09,039	33,00,000	24,73,630	26,60,088
b) Additions to the Fund							
i) Donation/Grants	5,05,000	23,63,040	0	2,20,000	6,67,500	0	0
ii) Income from Investment made on account of Funds	0	47,826	2,987	26,405	0	57,306	55,898
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	12,85,054	24,10,866	3,44,715	20,55,444	39,67,500	25,30,936	27,15,986
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	7,72,965	0	18,15,463	0	16,68,607	10,26,148
- Others	0	0	0	0	0	0	0
Sub Total	0	7,72,965	0	18,15,463	0	16,68,607	10,26,148
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	7,50,258	2,62,933	1,40,833	0	2,01,967	0	3,43,499
- Rent/Consumables	0	0	3,741	0	0	0	1,76,788
- Other Administrative Expenses	0	86,595	27,274	6,382	1,59,500	1,34,935	4,103
Sub Total	7,50,258	3,49,528	1,71,848	6,382	3,61,467	1,34,935	5,24,390
iii) Fund Returned to the Funding Agency	0	0	1,72,867	0	0	0	0
Total (c)	7,50,258	11,22,493	3,44,715	18,21,845	3,61,467	18,03,542	15,50,538
Net Balance payable as at the year-end (a+b-c)	**5,34,796**	**12,88,373**	**0**	**2,33,599**	**36,06,033**	**7,27,394**	**11,65,448**
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
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	43 SERB - Dr Rajesh S - Variation in Biogas Fuel	44 SERB - Dr. Resmi L - 2017 - Gamma Rays	45 SERB - Dr Resmi L - Ultra Relativistic Jets	46 SERB - Dr. Sarita Vig - 2019 - Young Massive Stars	47 SERB - Dr. Sarvesh - 2020 - Virtual Element	48 SERB - Dr Sarvesh K - Novel Numerical	49 SERB - Dr. Seena V - Nanomechanical Sensor
a) Opening balance of the funds	0	6,10,500	0	5,49,162	75,598	0	5,39,443
b) Additions to the Fund							
i) Donation/Grants	34,54,133	0	2,20,000	3,00,000	1,50,000	7,86,800	0
ii) Income from Investment made on account of Funds	0	0	72	12,504	3,203	1,940	28,735
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	34,54,133	6,10,500	2,20,072	8,61,666	2,28,801	7,88,740	5,68,178
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	57,645	1,46,423	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	57,645	1,46,423	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	0	4,56,320	0	0	1,22,047
- Rent/Consumables	1,032	0	0	39,209	0	0	4,73,514
- Other Administrative Expenses	0	0	0	1,02,000	27,000	0	0
Sub Total	1,032	0	0	5,97,529	27,000	0	5,95,561
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	4,76,923
Total (c)	1,032	0	0	6,55,174	1,73,423	0	10,72,484
Net Balance payable as at the year-end (a+b-c)	**34,53,101**	**6,10,500**	**2,20,072**	**2,06,492**	**55,378**	**7,88,740**	**0**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**0**	**5,04,306**
Note : Classified under Current Assets under Sch 7							

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	50 SERB - Dr. Jayanthi S	51 SERB - 2018 - Dr. Umesh K. - PAH	52 SERB - Dr. Seena V	53 SERB - 2019 - Dr. Vineeth B S - Wireless ReLod	54 UGC - DAE - Dr. Kuntala B	55 DST Inspire - Dr. Mahesh S	56 DST Inspire - Dr. Basudev M
a) Opening balance of the funds	(1,551)	4,35,501	(8,981)	2,80,671	49,400	27,059	7,00,000
b) Additions to the Fund							
i) Donation/Grants	0	3,00,000	0	3,02,060	0	0	0
ii) Income from Investment made on account of Funds	0	2,762	0	1,524	0	0	0
iii) Other additions	1,551	0	0	0	0	0	0
Total (a + b)	0	7,38,263	-8,981	5,84,255	49,400	27,059	7,00,000
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	13,810	0	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	13,810	0	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	2,90,000	0	4,80,081	0	0	0
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	0	27,768	0	42,723	0	0	0
Sub Total	0	3,17,768	0	5,22,804	0	0	0
iii) Fund Returned to the Funding Agency	0	2,87,792	0	0	0	0	0
Total (c)	0	6,19,370	0	5,22,804	0	0	0
Net Balance payable as at the year-end (a+b-c)	**0**	**1,18,893**	**0**	**61,451**	**49,400**	**27,059**	**7,00,000**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**8,981**	**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, 2022

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	57 DST - Dr. Vikram Khaire	58 IPRC-Dr. Kuruvilla-Novel N2O4	59 IISU-Dr. Immanuel-High Performance	60 AICTE - INAE - Aswathy RV - 2017	61 AICTE - INAE - 2018 Batch	62 AICTE - INAE - 2019 - Nisha	63 KSCSTE - PDF - Dr. Linsha V - 2019
a) Opening balance of the funds	13,97,871	0	0	44,677	80,828	9,744	4,27,914
b) Additions to the Fund							
i) Donation/Grants	37,72,000	4,00,000	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)	51,69,871	4,00,000	0	44,677	80,828	9,744	4,27,914
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	3,37,130	0	30,45,000	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	3,37,130	0	30,45,000	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	16,38,064	2,09,476	0	0	0	0	4,27,914
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	53,865	4,559	0	0	11,265	0	0
Sub Total	16,91,929	2,14,035	0	0	11,265	0	4,27,914
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	20,29,059	2,14,035	30,45,000	0	11,265	0	4,27,914
Net Balance payable as at the year-end (a+b-c)	**31,40,812**	**1,85,965**	**0**	**44,677**	**69,563**	**9,744**	**0**
Net Balance receivable as at the year-end (c-a-b) *Note : Classified under Current Assets under Sch 7*	**0**	**0**	**30,45,000**	**0**	**0**	**0**	**0**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	64 KSCSTE - PDF - Dr. Prescilla - 2018	65 KSCSTE - PhD - Elizabeth George - 2018	66 KSCSTE - PhD - Haritha A - 2018	67 KSCSTE - PhD - Sanah Rahman K - 2021	68 SERB - PDF - Dr. Krishnaswamy R - 2017	69 SERB - TARE - Dr. Santhosh B	70 AICTE - ATAL - Dr.Rama Rao
a) Opening balance of the funds	8,191	3,123	20,000	0	1,86,299	25,912	0
b) Additions to the Fund							
i) Donation/Grants	0	3,46,877	0	3,10,400	0	3,20,000	93,000
ii) Income from Investment made on account of Funds	0	0	0	1,913	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	8,191	3,50,000	20,000	3,12,313	1,86,299	3,45,912	93,000
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	3,30,000	0	1,62,067	0	60,000	0
- Rent/Consumables	0	5,791	0	0	0	0	0
- Other Administrative Expenses	0	6,186	20,000	0	0	36,792	0
Sub Total	0	3,41,977	20,000	1,62,067	0	96,792	0
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	0	3,41,977	20,000	1,62,067	0	96,792	0
Net Balance payable as at the year-end (a+b-c)	**8,191**	**8,023**	**0**	**1,50,246**	**1,86,299**	**2,49,120**	**93,000**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	71	72	73	74	TOTAL	
	ATAL -AICTE - Life skills - Gigy Alex	DST -NGP -Dr A M Ramiya-Geospatial	DST - NGP - RamaRao-Geospatial	Antrix Corporation - Colloquium Sponsorship	2021-22	2020-21
a) Opening balance of the funds	0	2,00,000	6,00,000	4,626	4,17,33,833	4,02,88,760
b) Additions to the Fund						
i) Donation/Grants	93,000	0	0	0	2,00,46,528	3,56,62,754
ii) Income from Investment made on account of Funds	0	0	0	0	8,17,105	10,16,672
iii) Other additions	0	0	0	0	1,551	0
Total (a + b)	93,000	2,00,000	6,00,000	4,626	6,25,99,017	7,69,68,186
c) Utilisation/Expenditure towards objective of funds						
i) Capital Expenditure						
- Fixed Assets	0	0	0	0	2,38,12,273	1,19,63,438
- Others	0	0	0	0	15,29,157	4,99,701
Sub Total	0	0	0	0	2,53,41,430	1,24,63,139
ii) Revenue Expenditure						
- Salaries, Wages & Allowance	0	0	0	0	1,47,51,764	1,38,52,595
- Rent/Consumables	0	0	0	0	26,21,588	28,38,273
- Other Administrative Expenses	93,000	0	0	0	25,29,645	22,04,957
Sub Total	93,000	0	0	0	1,99,02,997	1,88,95,825
iii) Fund Returned to the Funding Agency	0	0	0	0	11,12,825	38,75,389
Total (c)	93,000	0	0	0	4,63,57,252	3,52,34,353
Net Balance payable as at the year-end (a+b-c)	**0**	**2,00,000**	**6,00,000**	**4,626**	**3,50,74,653**	**4,56,02,357**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**1,88,32,888**	**38,68,524**

Note : Classified under Current Assets under Sch 7

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2022

(Amount in Rs.)

	As at 31.03.2022	As at 31.03.2021
Schedule 3 :: LONG TERM LIABILITIES AND PROVISIONS		
a) Employee Provident Funds and Retirement Benefits		
- General Provident Fund	5,00,54,971	5,24,81,292
- Contributory Provident Fund	93,73,526	82,40,284
- New Pension Scheme	13,787	-
- Retirement Benefits - Provision	22,50,13,033	21,58,81,075
Sub Total (a)	**28,44,55,317**	**27,66,02,651**
b) Caution Deposit		
- Caution Deposit from Students	84,12,526	1,07,27,206
Sub Total (b)	**84,12,526**	**1,07,27,206**
TOTAL	**29,28,67,843**	**28,73,29,857**
Schedule 4 :: CURRENT LIABILITIES AND PROVISIONS		
a) Current Liabilities		
1. Sundry Creditors		
- For Goods		
Capital Goods	48,69,968	75,16,541
Revenue Expenditure	-	-
- For Services	1,92,72,011	1,42,79,300
2. Statutory Liabilities		
- Overdue	-	-
- Others	34,15,050	10,32,346
3. Other Current Liabilities		
- Interest refundable to DOS (received)	1,06,43,696	73,39,210
- Interest refundable to DOS (accrued)	13,40,599	1,92,051
- B.Tech Fees refundable to DOS	17,17,275	1,34,73,502
- SPCL-Interest on Mobilization Advance transferable to DOS	9,81,71,993	-
- SPCL-BG Invocation Balance transferable to DOS	14,75,33,007	-
- Others	2,48,18,215	2,16,01,359
Sub Total (a)	**31,17,81,815**	**6,54,34,309**
TOTAL	**31,17,81,815**	**6,54,34,309**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2022

(Amount in Rs.)

Schedule 5 :: FIXED ASSETS

Particulars	Gross Block (at cost) as at 01.04.2021	Additions		Transfer to Installed from Uninstalled	Deletions	Gross Block (at cost) as at 31.03.2022	Rate of Deprec-iation	Depreciation					Net Block as at 31.03.2022	Net Block as at 31.03.2021
		Installed	Under Installation					As at 01.04.2021	For the year	Prior Period	Deletions	As at 31.03.2022		
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	2,22,45,64,221	98,08,892	0	0	0	2,23,43,73,113	10.00%	1,05,33,58,166	11,81,01,497	0	0	1,17,14,59,663	1,06,29,13,450	1,17,12,06,055
Plant & Machinery	1,13,42,93,703	4,19,57,810	0	0	1,050	1,17,62,50,463	15.00%	72,47,87,909	6,77,19,427	0	291	79,25,07,045	38,37,43,418	40,95,05,794
Furniture & Fittings	19,06,42,906	46,79,215	0	0	0	19,53,22,121	10.00%	11,14,57,073	83,86,505	0	0	11,98,43,578	7,54,78,543	7,91,85,833
Ambulance	8,80,644	0	0	0	0	8,80,644	15.00%	6,76,672	30,596	0	0	7,07,268	1,73,376	2,03,972
Motor Cars & Bikes	1,67,45,834	0	0	0	0	1,67,45,834	15.00%	1,20,55,064	7,03,615	0	0	1,27,58,679	39,87,155	46,90,770
Motor Buses & Truck	1,36,04,639	0	0	0	0	1,36,04,639	15.00%	78,36,991	8,65,147	0	0	87,02,138	49,02,501	57,67,648
Computers	13,20,01,055	1,17,58,349	0	0	500	14,37,58,904	40.00%	11,87,42,339	1,00,06,704	0	200	12,87,48,843	1,50,10,061	1,32,58,716
Software	9,83,76,376	1,62,77,383	0	0	0	11,46,53,759	40.00%	9,10,48,512	72,34,802	0	0	9,82,83,314	1,63,70,445	73,27,864
Library Books	6,45,28,619	18,42,391	0	0	0	6,63,71,010	60.00%	6,34,29,898	17,64,667	0	0	6,51,94,565	11,76,445	10,98,721
Campus networking	4,76,50,136	22,51,657	0	0	0	4,99,01,793	40.00%	4,57,55,663	16,58,452	0	0	4,74,14,115	24,87,678	18,94,473
Canteen Equipments	2,17,56,936	8,47,453	0	0	0	2,26,04,389	15.00%	1,55,83,702	10,53,103	0	0	1,66,36,805	59,67,584	61,73,234
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	23,68,256	0	0	16,83,245	0	6,85,011	0.00%	0	0	0	0	0	6,85,011	23,68,256
Vehicles	0	0	14,42,397	0	0	14,42,397	0.00%	0	0	0	0	0	14,42,397	0
Computers	0	0	21,97,220	0	0	21,97,220	0.00%	0	0	0	0	0	21,97,220	0
TOTAL	**3,98,17,08,350**	**8,94,23,150**	**36,39,617**	**16,83,245**	**1,550**	**4,07,30,86,322**		**2,24,57,75,012**	**21,75,24,515**	**0**	**491**	**2,46,32,99,036**	**1,60,97,87,286**	**1,73,59,33,338**
Previous Year	**3,67,49,40,419**	**34,55,52,277**	**4,608**	**28,34,608**	**3,59,54,346**	**3,98,17,08,350**		**2,02,56,06,151**	**23,08,67,886**	**8,86,059**	**1,15,85,084**	**2,24,57,75,012**	**1,73,59,33,338**	**1,64,93,34,268**
Capital Work in progress	**15,35,88,546**	**0**	**2,34,65,668**	**1,06,39,855**	**0**	**16,64,14,359**		**0**	**0**	**0**	**0**	**0**	**16,64,14,359**	**15,35,88,546**
TOTAL													**1,77,62,01,645**	**1,88,95,21,884**

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SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2022

(Amount in Rs.)

	As at 31.03.2022	As at 31.03.2021
Schedule 6 :: LONG TERM ASSETS, LOANS, ADVANCES ETC		
a) Loans		
- Staff	1,13,77,107	72,29,878
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	55,92,959	52,92,959
TOTAL	**14,12,70,066**	**13,68,22,837**
Schedule 7 :: CURRENT ASSETS, LOANS, ADVANCES ETC		
a) Current Assets		
1. Inventories		
- Canteen inventories	8,75,128	6,19,720
2. Sundry Debtors		
- Debtors outstanding for a period exceeding six months		
- Others		
3. Cash Balances in hand (including cheques/drafts and imprest)	1,26,678	1,12,220
4. Bank Balances		
a) With Scheduled Banks		
- On Current Accounts	(1,56,20,864)	(1,55,35,649)
- On Deposit Accounts	70,28,36,132	13,41,85,366
- On Deposit Accounts [ISAT Funds]	8,85,07,033	8,42,53,582
- On Earmarked & Retirement Benefits Accounts	9,12,57,076	12,34,69,581
Sub Total (a)	**86,79,81,183**	**32,71,04,820**
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	1,66,823	3,65,769
- Prepayments	1,90,18,849	1,84,30,363
- Others	2,64,06,807	1,19,54,965
2. Income Accrued		
- On Bank Deposits	26,37,508	10,11,227
- On Other Deposits	1,18,995	1,30,195
Sub Total (b)	**4,83,48,982**	**3,18,92,520**
TOTAL (a+b)	**91,63,30,165**	**35,89,97,340**

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SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

(Amount in Rs.)

	2021-22	2020-21
Schedule 8 :: GRANTS / SUBSIDIES		
(irrevocable Grants & Subsidies Recovered)		
1. Central Government	77,00,00,000	58,25,00,000
TOTAL	**77,00,00,000**	**58,25,00,000**
Schedule 9 :: FEES / SUBSCRIPTIONS		
1. Entrance Fees	30,62,900	46,07,470
2. Annual Fees/Subscriptions	5,43,97,693	3,83,31,381
TOTAL	**5,74,60,593**	**4,29,38,851**
Schedule 10 :: INTEREST INCOME OF IIST		
1. On Term Deposit		
a) With Scheduled Banks	69,58,390	58,80,774
2. On Loans / Advances		
a) Employee/Staff	1,69,846	2,38,462
3. Others		
a) Interest on IT Refund	2,20,833	1,90,578
b) Interest Received - KSEB Caution Deposit	1,64,364	0
TOTAL	**75,13,433**	**63,09,814**
Schedule 11 :: INTEREST EARNED ON GRANT & RETIREMENT FUNDS		
1. On Term Deposit		
a) With Scheduled Banks	1,42,57,663	1,22,43,887
b) Others	0	1,96,880
TOTAL	**1,42,57,663**	**1,24,40,767**
Schedule 12 :: OTHER INCOME		
1. Rent Receipts	2,71,134	18,663
2. Sale of Tender Forms	16,500	13,995
3. Sale of Scrap / Vehicles / Trees	1,86,738	3,22,312
4. Miscellaneous Income	24,42,262	31,23,168
TOTAL	**29,16,634**	**34,78,138**

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SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

(Amount in Rs.)

	2021-22	2020-21
Schedule 13 :: ESTABLISHMENT EXPENSES - REGULAR		
1. Salaries & Allowances	35,62,05,842	28,86,61,918
2. Contribution to NPS	3,00,71,161	2,22,77,947
3. Contribution to CPF	2,68,920	2,68,920
4. Medical Expense- Staff	34,21,373	39,59,376
5. Expense on Employees Retirement & Terminal Benefits	2,13,76,658	1,26,59,713
6. Interest on PF Contribution	15,02,823	6,87,556
7. Staff Training Expense	32,950	0
TOTAL	**41,28,79,727**	**32,85,15,430**
Schedule 14 :: ESTABLISHMENT EXPENSES - SUPPORT SERVICES		
1. Consultancy & Manpower Charges	7,84,82,990	5,71,97,517
2. Remuneration to Contract Employees	58,90,366	63,92,293
3. CISF Expenses	7,42,08,758	7,32,03,344
TOTAL	**15,85,82,114**	**13,67,93,154**
Schedule 15 :: ACADEMIC & OTHER STUDENT EXPENSES		
1. Admission Expense	17,73,626	44,48,638
2. Assistanceship to Students	2,49,01,955	3,35,66,752
3. Library Services	2,08,64,069	2,15,30,184
4. Academic Expense	3,14,13,532	3,52,30,867
5. Supplies & Materials	1,64,07,778	87,84,219
6. Student Activities Expense	2,71,089	2,68,387
TOTAL	**9,56,32,049**	**10,38,29,047**
Schedule 16 :: OTHER ADMINISTRATIVE EXPENSES		
1. Maintenance & Upkeep		
Repairs & Maintenance - CMD	3,20,17,700	1,94,46,336
Repairs & Maintenance - Labs & Others	1,44,29,534	1,20,53,797
House Keeping Expense	7,19,565	8,35,730
Sub Total (a)	**4,71,66,799**	**3,23,35,863**
2. Professional Charges		
Audit Fees	1,90,550	1,89,050
Legal Expense	2,53,880	3,00,123
Sub Total (b)	**4,44,430**	**4,89,173**
3. Administrative Expenses - Others		
Vehicle Operating Expense	98,29,593	66,64,463
Electricity & Water Charges	1,93,55,511	1,63,08,901
Travelling Expense	4,66,039	75,099

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SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

(Amount in Rs.)

	2021-22	2020-21
Research & Development Expense	1,06,23,211	57,37,434
Printing & Stationery	16,04,089	17,97,089
Advertisement & Publicity	3,46,095	2,05,897
Hospitality Expense	7,73,793	9,18,133
Telephone & Internet Expense	25,61,832	18,19,957
Office and other Miscellaneous Expense	11,77,151	5,85,120
Recruitment & Review Expense	1,83,578	3,17,070
CEP & IPR Expenses	2,37,459	4,42,419
Bank Charges	56,175	33,009
GST - Input Tax Credit Utilized	-39,634	-16,07,110
Sub Total (c)	**4,71,74,892**	**3,32,97,481**
TOTAL	**9,47,86,121**	**6,61,22,517**

Schedule 17 :: INTEREST REFUNDABLE BY IIST		
Interest to CPF Fund [Expense]	3,75,464	3,07,675
Interest to DOS [Expense]	1,17,92,244	67,32,299
Interest to GPF Fund [Expense]	20,89,954	27,99,666
Interest to Retirement Fund [Expense]	0	26,01,128
TOTAL	**1,42,57,663**	**1,24,40,767**

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Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2022

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 31.03.2022.
   d. Software not having perpetual licenses are written off over the license period.
   e. Ebooks have been depreciated at rates applicable for software

5. Revenue Recognition
   a. Grant in aid received from the Department of Space, is accounted on accrual basis. Out of the total grant received, the amount received towards revenue expenditure is treated as Revenue Grant / income over the period necessary to match them with the costs for which they are intended to compensate, on a systematic basis. The remaining grant forms part of the Corpus Fund along with other grant received.
   b. Tuition fees, fines and other recoveries from underperforming students (as per the policy of the institute) are accounted on cash basis. As per Department of Space instructions, Fees received from B.Tech students (performing and non-performing students) who have joined the Institute prior to 2018 is not recognized as income and is shown as a liability payable to Department to Space after adjusting related costs. With respect to BTech students joining the Institute from 2018 onwards the Fees received is recognized as Income of the Institute.
   c. Interest income is accounted on accrual basis. Interest on deposits created out of grant received is refundable to Department of Space.

6. Fixed Assets
   a. Land – (i)The present activity of the Institute is in the Valiamala campus which has been handed over by LPSC vide letter no. VSSC/CMG/2010 dated 05.08.2010 and has been measured at 53.43 acres. No value has been separately provided in the books for this land. (ii) 20 acres of Land in Survey No. 4003 in Thennoor Village has been assigned and handed over to ISRO authorities on 31.12.2007 as per letter No. B8-85534/07 dated

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Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2022 (contd)

01.01.2008 of District Collector, Trivandrum subject to the condition that facilities stated by ISRO in their letter no. ISST-DIR-2007 dt 06.12.2007 should be set up in the property within 18 months. The said land should be used only for scientific and educational purposes. No value has been mentioned in the Land Assignment Order and hence the value of the property is taken at Re. 1/- for each property.

b. Building –Construction of buildings has been completed in 2020-21. Capitalisation has been done to the extent of bills received from the builder i.e 90%.
c. Plant and Machinery – It mainly constitutes Laboratory Equipment, Office Equipment, Electricals & Electronics and other Machinery.
d. Buildings and other Fixed Assets are carried at cost less accumulated depreciation. Cost comprises the purchase price or acquisition cost, installation charges and any attributable cost of bringing the assets to working condition for its intended use. Exchange differences arising on restatement / settlement of foreign currency payables relating to acquisition of depreciable fixed assets are adjusted to the cost of the respective assets and depreciated over the remaining useful life of such assets.
e. Capital Work-in-Progress pertains to construction in progress at Valiamala.
f. Assets that have been delivered to IIST up to 31.03.2022 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.

9. Employee Benefits
Employee benefits include General Provident Fund (GPF), Contributory Provident Fund (CPF), New Pension Scheme (NPS), and Group Insurance Scheme (GIS). The Institute's contribution to CPF and NPS are considered as defined contribution plans and are charged as an expense as they fall due based on the amount of contribution required to be made.
GPF and CPF funds are maintained separately by the Institute in Savings Bank Account and linked Flexi deposits. Annual Interest provision on GPF and CPF balance is made from Interest earned during the year from investment of such funds in flexi deposits. Interest earned over and above the provision made is transferred to an Interest Fluctuation Reserve and in the event of a shortfall in interest earned, the difference is met from such Reserve, and any balance shortfall after adjustment with Reserve is met by IIST.
Retirement Benefits consisting of pension fund, gratuity and leave encashment received from previous employers of employees joining from other Government organizations have been transferred to Department of Space. Funding of yearly requirement of pensionary & retirement benefits will be by Department of Space.

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Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2022 (contd)

10. Taxes on income
Being a non-profit institution existing solely for education purposes and being wholly financed by the Government of India, the income of the Institute is exempt under section 10[(23C)][iiiab] of the Income Tax Act, 1961.

11. Research and Development Expenses
Revenue expenditure pertaining to research is charged to the Income and Expenditure Account. Fixed assets utilized for research and development are capitalized and depreciated in accordance with the policies stated for Fixed Assets.

12. Provisions and Contingencies
A provision is recognised when the Institute has a present obligation as a result of past events and it is probable that an outflow of resources will be required to settle the obligation in respect of which a reliable estimate can be made. Provisions (excluding retirement benefits) are not discounted to their present value and are determined based on the best estimate required to settle the obligation at the Balance Sheet date. These are reviewed at each Balance Sheet date and adjusted to reflect the current best estimates.

B. Notes to the Accounts

1. Depreciation
Assets are depreciated at written down value method as per rates prescribed in the Income Tax Act, 1961 as recommended by the Office of the Principal Director of Audit, Scientific Departments, Bangalore. Software not having perpetual licenses are written off over the license period. Ebooks are depreciated at rates applicable for software.

2. Revenue
   a. Out of Grant of Rs. 1,12,00,00,000/-received during 2021-22, Rs. 77,00,00,000/- received specifically towards revenue expenditure has been transferred to Revenue Grant.
   b. Interest earned (actually received) on funds from grant-in-aid maintained in deposits is refundable to DOS. Interest of Rs. 1,06,43,696/- (excluding the interest received on the Provident Fund Accounts and Earmarked Funds) has been actually received on deposits during 2021-22 and the same has been shown as refundable to DOS.
   c. Fees received from B.Tech students (performing and non-performing students) who have joined the Institute prior to 2018 is not recognized as income and is shown as a liability payable to Department to Space after adjusting related costs. Based on the Department of Space Letter No. B. 12011/7/2015-Sec.2 dated 21.10.2015, "Fees paid back by students on receipt of Assistanceship package and receipts from non-performing students" are to be remitted back to Government Account. During 2021-22, an amount of Rs. 17,17,275/- has been shown as refundable to DOS after deducting related costs.
   d. With respect to BTech students joining the Institute from 2018 onwards the Fees received is recognized as Income of the Institute based on the decision of the Twelfth Finance Committee, IIST.
   e. Canteen Accounting Committee accounts is maintained separately and the gross deficit / surplus, which is exclusive of administrative cost, is recognised in the Income and Expenditure Account.

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2022 (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 a sum of Rs. 5,56,14,037/- towards project management and consultancy charges and service tax of Rs. 7,73,61,215/-, both pending for appropriation to fixed assets on final completion of all buildings.
   c. An amount of Rs. 43,24,628/- pertaining to assets that have been delivered to IIST before 31.03.2022 but under installation as on 31.03.2022 have been accounted as fixed assets & depreciation has not been charged on the same. Office Equipment worth Rs. 6,85,011/- procured from CMS computers has been uninstalled for 8 years.

4. Employee Benefits
   a. Employer and Employee contribution to New Pension Scheme is being transferred to NSDL.
   b. The Institute has entered into a Group Insurance Scheme (GIS) agreement with Life Insurance Corporation of India from 2011-12 onwards.
   c. Provision for interest on PF Contribution, at the rates prescribed, have been made and the corresponding expenditure has been adjusted against Interest earned on GPF and CPF funds parked in Savings Accounts (linked to flexi deposits) and the balance interest earned has been retained as Interest Fluctuation Reserve. Provision for Retirement Benefits [Pension, Gratuity & Leave Encashment] has been incorporated based on the actuarial valuation provided by Life Insurance Corporation during 2018-19. Provision for 2021-22 has been made by assuming a 10% hike in service cost of 2020-21. In addition, the retirement benefits from the previous employers for the members governed under the GPF have not been received in all cases. Funds received has been transferred to Department of Space as advised by them. By way of DOS Letter No. E.28015/1/2016-V dated 11.08.2020, IIST has been advised to continue to project the funds requirements towards Pension & Retirement Benefits through Grant-in-Aid till common guidelines are issued to Autonomous Bodies.

5. Prior Period Item
   Details of prior period items are as given below :-

Details	Prior period expenses
Transport Charges reversed	5,182
Total (A)	**5,182**

Details	Prior period income
Office expense attributable to External Funds	11,792.00
Depreciation reversal	491.00
Total (B)	**12,283.00**

Net prior period income (A-B) = Rs. 7,101.00

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2022 (contd)

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 2021-22, an amount of Rs. 2,49,01,955/- was disbursed as assistanceship.

9. Supplies and Materials
   Supplies and Materials mostly consist of lab consumables.

10. Salary
    Salary cost for the month of March 2022 has not been taken into the books of accounts for 2021-22 as March salary for a particular year for central government employees is released in April of that year only. Expenditure for March 2021 to February 2022 has been shown in 2021-22.

11. Bank balances
    The negative balance in the SBI and UBI Current Account represents the cheques issued on the closing date of the financial year which are not presented for payment. The Institute has sufficient balance to cover these cheques issued in the flexi deposits maintained with UBI. Hence, the negative balance does not represent any Overdraft.

12. Earmarked / Endowment Funds
    a. An amount of Rs. 154.18 lakhs pertaining to expenditure for Externally Funded projects has been met from IIST bank accounts and is to be transferred from the balance in Earmarked Funds bank accounts to IIST's main bank account.

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2022 (contd)

b. As on 31.03.2022, assets amounting to Rs. 9.93 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.

13. 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.

14. 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.

15. Inoperative Balances
An amount of Rs. 15 lakhs (credit balances) relates to balances that have been outstanding from prior to 01.04.2021.

16. Balances in personal accounts
Balances in personal accounts are subject to confirmation from respective parties.

17. Contingent Liabilities
a. The unexecuted portion of the contracts entered into by the Institute will form part of the current liability of the Institute. However, the same could not be quantified.
b. Interest earned on Earmarked / Endowment Funds held in a separate Current Account linked to Term Deposits has been taken as the Institutes Income. Interest claims in the future, if any, from the disbursing parties of such Earmarked / Endowment Funds will be met at the time of the claim based on the deposit rates prevailing during the period of holding of the respective Fund
c. In the case of buildings / structures completed by SPCL, only 90% has been billed by SPCL and subsequently paid by IIST. The balance 10% (approximately Rs. 24.22 crores) has not been billed and the same will be paid only on completion of the project. In case of all other works completed by SPCL and not billed as on 31.03.2022 provision has not been made in the books of accounts since the same is not quantifiable.

18. Building Construction:
The institute entered into a contract with SPCL, Mumbai on 27.08.2008 for Rs. 278.60 crores with a completion period of 18 months for setting up building and infrastructure at its campus in Valiamala on turnkey basis. The work was completed and the building handed over on 06.02.2021. The Institute was holding the following instruments as security with respect to the contract with SPCL

Nature of security	Amount (in crores)
Security Deposit – Bank guarantee	12.14
Performance Bank guarantee	12.14
Bank guarantee against Interim Advance	12.43

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2022 (contd)

Department of Space has directed the following recoveries with respect to the SPCL contract.

a. Liquidated Damages @ 10% of contract value towards compensation for delay – Rs.27.86 crores
b. Interest on retention of mobilisation advance beyond contractual period of 15 months - Rs.9.82 crores
c. Labour Welfare Cess – Deduction advised by C&AG – Rs.2.34 crores.

In order to effect the above recoveries, the Bank guarantees available were submitted to the respective banks for invoking the guarantees. Out of the total amount of Rs.36.71 crores of BG, Rs.24.57 crores was credited to IIST. An amount of Rs.9.82 crores was adjusted against the interest on retention of mobilisation advance beyond 15 months against the amount received and the same is held in a separate account which is payable to DOS. Further, the balance amount received through invocation of BG is held separately with State Bank of India. The amount of Rs. 9.82 crores towards interest on mobilisation advance and the balance of Rs. 14.75 crores of the BG invocation have been shown as transferable to DOS.

In between, SPCL has moved High Court of Kerala and honourable High court has put an injunction on invoking the bank guarantee of Rs.12.14 crores submitted as Security Deposit. Now the matter is pending with Honourable High Court for decision. The final bill for the above contract is yet to be submitted by SPCL.

19. Figures for the previous year
Figures for the previous year have been regrouped and/or reclassified wherever considered necessary.

As per our report of even date attached

For Balamurali & Associates
Chartered Accountants
FRN: 012374S

C.A. Balamurali C. V.
(Proprietor, Mem No. 223319)

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Dr. S. Unnikrishnan Nair
Director

R. Hari Prasad
Finance Officer

Place : Thiruvananthapuram
Date : 29th September, 2022

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2022

(Amount in Rs.)

Receipts	2021-22	2020-21	Payments	2021-22	2020-21
I. Opening Balance			**I. Expenses**		
a.Cash and DD's in hand	1,12,220	1,30,655	**a.Establishment Expenses - Regular**		
b.Bank Balances			Salaries & Allowances (admin & faculty)	35,59,50,051	28,90,27,787
In current accounts	-1,55,35,649	68,92,166	Contribution to NPS	3,00,71,161	2,22,77,947
In deposit accounts	21,84,38,948	24,24,39,005	Contribution to CPF	2,68,920	2,68,920
In earmarked/retirement benefits accounts	12,34,69,581	15,98,28,089	Medical Expense- Staff	31,56,479	39,79,043
			Employees Retirement Benefits	1,22,44,700	74,22,405
II.Grants Received			Interest on PF Contribution	15,02,823	6,87,556
a.From Government of India	1,12,00,00,000	69,25,00,000	Staff Training Expenses	32,950	0
III. Interest Received			**b.Establishment Expenses - Support Services**		
a. On Bank Deposits	60,20,017	67,20,925	Consultancy & Manpower Charges	7,57,59,671	5,75,91,492
b. On Other Deposits	1,75,564	0	Remuneration to Contract Employees	59,20,366	63,32,293
c. Loans, Advances etc	1,69,846	2,38,462	CISF Expenses	7,34,78,586	7,41,73,027
d. Others	2,20,833	1,90,578			
			c. Academic & Other Student Expenses		
IV. Other Income			Admission Expense	17,73,626	44,48,638
a. Entrance Fees	30,62,900	46,07,470	Assistanceship to Students	2,48,31,958	3,35,20,522
b. Annual Fees/Subscriptions	5,78,26,643	3,76,08,656	Library Services	2,08,27,338	1,96,74,068
c. Other Income	29,68,497	34,22,178	Academic Expense	3,14,18,991	3,48,28,539
			Supplies & Materials	1,59,93,265	90,40,196
V. Any other receipts			Student Activities Expense	2,65,661	2,68,387
a. MCF Hassan - ISRO	0	4,62,984			
b. Security Deposits received	19,33,395	18,90,942	**d. Other Administrative Expenses**		
c. Earnest Money Deposits received	1,320	11,52,729	Repairs & Maintenance	1,52,97,857	1,10,80,251
d. Performance Guarantee received	71,992	11,060	Repairs & Maintenance - CMD	3,20,93,103	2,04,73,098
e. Advance for Research & Seminars	2,08,65,184	3,66,79,426	House Keeping Expense	7,73,359	10,09,623
f. BTech Fees refundable to DOS	17,17,275	1,34,73,502	Audit Fees	1,90,550	1,89,050
g. Caution Deposit from Students	23,90,000	27,41,000	Legal Expense	2,21,928	3,00,123
h. Bond Amount received [Btech]	18,50,000	10,00,000	Vehicle Operating Expense	98,03,846	67,86,489
i. Stale cheques	63,981	95,126	Electricity & Water Charges	1,91,17,711	1,65,36,545
j. Canteen Accounting Committee	1,24,60,069	18,66,899	Travelling Expense	2,22,761	5,75,501
k. Interest received and payable to DOS	1,06,43,696	73,39,210	Research & Development Expense	1,06,02,309	58,78,672
l. Net addition to Statutory Liabilities(Staff)	0	1,08,32,809	Printing & Stationery	13,86,294	17,95,928

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2022

(Amount in Rs.)

Receipts	2021-22	2020-21	Payments	2021-22	2020-21
m. Unexplained credits - Banks	250	1,400	Advertisement & Publicity	3,52,846	1,99,146
n. Recovery of loans to staff	7,12,771	3,77,682	Hospitality Expense	7,62,280	8,97,669
o. Contingency advance	50,908	0	Telephone & Internet Expense	27,19,948	20,02,387
p. Increase in TDS, GST & Labour Cess	23,82,704	0	Office Expense	11,54,685	6,17,568
q. TDS refund from IT Department	29,28,819	29,24,898	Recruitment & Review Expense	2,10,631	2,93,086
r. IPRC - Honorarium received	0	1,500	CEP & IPR Expenses	2,37,459	4,42,419
s. SPCL-Interest on Mobilization Advance (to DOS)	9,81,71,993	0	Bank Charges	56,175	33,009
t. SPCL-BG Invocation Balance transferable to DOS	14,75,33,007	0	GST - Input Tax Credit Utilized	(1,34,742)	(1,93,697)
u. Sundry Creditors - Others - Net	2,90,459	0			
v. Sundry Debtors - Others - Net	94,401	0			
			II. Payments made against funds for various projects		
			DOS - Dr. Palash - HSP - Real TIme Gas Sensor	80,91,612	4,24,859
			DOS - MOM2 - RPA - Dr. Ambili KM	9,20,882	12,44,835
			DOS - Dr. Umesh - Planetary Exploration	6,61,619	0
			DOS - Dr. Rajesh V J (Spectral)	0	10,857
			VSSC - Dr. Natarajan E	0	1,28,440
			IISU - Dr. Umesh Kadhane - Proj Assistant	56,129	2,41,674
			IISU - Perf. of Ball Bearings - Dr. Jinesh KB	0	72,751
			IPRC - Dr. Palash - 2018 - Hydrogen Sensor	5,574	1,61,402
			ISRO -Dr. K G Sreejalekshmi -Gaganyaan	15,56,671	8,84,314
			ISRO - MOM - Dr. Rajesh VJ	0	-34,441
			LPSC - Dr Dinesh N Naik	18,99,822	14,61,204
			LPSC - Dr.Jinesh K B - Laser Ignition System	2,96,712	19,26,045
			LPSC - Dr. Jinesh K B - SDS	2,35,196	5,397
			LPSC - Dr. Umesh K - Monte Carlo Model	-24,413	0
			LPSC - High Thrust EPS - Dr. Umesh K	12,45,270	61,69,193
			NRSC - P R Sinha - Balloon Launching	1,03,425	0
			SAC - NavIC (IRNSS) Gagan	2,81,245	57,603
			DBT - Dr. Palash - 2017- Liquid Biopsy for Cancer	1,60,676	4,43,548
			DBT - Dr. Palash - Green House Gases	6,16,108	17,92,605
			DBT - Dr. Shaiju - Ramalingaswami Fellowship	27,23,042	13,19,598
			DBT-RamaRao (Rural Urban Interface) Phase-II	5,06,000	0
			DRDO - ARMREB - Dr. K. Prabhakaran	0	6,66,504
			DST - Dr. Rama Rao N	1,62,400	7,88,438

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2022

(Amount in Rs.)

Receipts	2021-22	2020-21	Payments	2021-22	2020-21
			DST - CNRS - Dr. Palash Basu - 2020 - Biomarker	4,75,524	3,18,423
			DST-Dr Jinesh KB- Atomic Layer Deposition System	57,30,962	0
			DST - KIRAN - Pushpa K - Quantum Mech	7,46,830	2,71,562
			DST - NGP - A.M Ramiya - Smart Cities 3D	22,50,471	6,04,901
			ICSSR - Dr. Shaijumon - 2020 - Tele Medicine Units	2,97,057	3,05,850
			Mangrove Cell - Dr. Gnanappazham - 2018	9,73,389	5,31,575
			Max-Planck - Dr. Jagadheep - 2017	7,95,291	7,35,614
			MeitY SAMEER - Dr. Priyadarshnam	7,50,258	16,13,896
			MoES - Dr. Govindankutty - Thunderstorms	11,01,472	0
			SERB - 2018 - Dr. Anand N. - Baryons	3,44,715	4,15,357
			SERB - Dr. Ashok - Quantum Communication	18,21,845	3,90,076
			SERB - Dr. C S Narayanamurthy - Wavefront	3,61,467	0
			SERB - Dr. Immanuel R - 5G Bands	17,87,591	0
			SERB - Dr. Chinmoy Saha - 2020 - 5G Antenna	15,26,928	1,60,000
			SERB - Dr Rajesh S - Variation in Biogas Fuel	1,032	0
			SERB - Dr. Resmi L - 2017 - Gamma Rays	0	51,504
			SERB - Dr. Sarita Vig - Young Massive Stars	6,53,527	5,00,441
			SERB - Dr. Sarvesh - 2020 - Virtual Element	1,69,240	1,51,257
			SERB - Dr. Seena V - Nanomechanical Sensor	9,90,376	14,94,932
			SERB - Dr. Jayanthi S	0	11,008
			SERB - 2018 - Dr. Umesh K. - PAH	11,31,864	24,83,478
			SERB - 2019 - Dr. Vineeth B S - Wireless ReLod	5,22,804	3,49,936
			UGC - DAE - Dr. Kuntala B	0	4,20,000
			DST - Dr. Vikram Khaire	20,24,209	8,02,129
			IPRC-Dr. Kuruvilla-Novel N2O4	2,14,035	0
			IISU-Dr. Immanuel-High Performance SAR	30,45,000	0
			AICTE - INAE - Aswathy RV - 2017	0	90,000
			AICTE - INAE - 2018 Batch	31,265	6,19,332
			AICTE - INAE - 2019 - Nisha	0	1,59,450
			KSCSTE - PDF - Dr. Linsha V - 2019	4,27,914	79,686
			KSCSTE - PDF - Dr. Prescilla - 2018	0	31,793
			KSCSTE - PhD - Elizabeth George - 2018	3,41,977	2,98,690
			KSCSTE - PhD - Haritha A - 2018	20,000	2,57,613
			KSCSTE - PhD - Sanah Rahman K - 2021	1,62,067	0
			SERB - TARE - Dr. Santhosh B	96,792	3,22,548

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2022

(Amount in Rs.)

Receipts	2021-22	2020-21	Payments	2021-22	2020-21
			ATAL -AICTE - Life skills - Gigy Alex	93,000	0
			ATAL - AICTE - Dr. Ramarao N.	0	93,000
			ATAL - AICTE - Dr. Chandrasekar	0	93,000
			DST - NRDMS - Dr. Ramarao N.	0	60,246
			TIFR - Dr. Resmi L (Travel)	0	1,80,648
			DST - Inspire Faculty - Dr. Sakthivel	0	12,612
			SERB - Dr. Roymon Joseph	0	70,139
			DBT - Dr. Rama Rao N	0	37,42,882
			SERB - PDF Priyanka	4,471	0
			III. Expenditure on Fixed Assets & Capital Work-in-Progress		
			a.Purchase of Fixed Assets	8,18,09,128	61,12,37,360
			b.Expenditure on Capital Work-in-progress	2,33,84,544	-50,57,21,158
			IV. Other Payments		
			Security Deposits (Asset) paid	3,00,000	0
			Security Deposits repaid to Contractors	19,44,885	16,89,512
			Earnest Money Deposits repaid	20,84,230	18,11,083
			Performance Guarantee repaid	80,673	4,41,669
			Contingency Advance to Staff	0	84,164
			Loans to staff	48,60,000	13,00,000
			Canteen Accounting Committee	1,41,06,685	39,18,398
			Charges recoverable from banks	8,027	4,752
			Stale Cheques - paid	0	12,482
			Decrease in TDS, GST & Labour Cess	0	18,40,388
			Employee recovery - Ex ISRO employees	7,554	2,74,424
			Tax deducted at source [from IIST]	20,84,039	14,61,960
			Tax collected at source [from IIST]	6,751	0
			Unexplained credits - Banks - transferred	700	38,231
			Btech Fees refunded to DOS	1,34,73,502	5,02,54,928
			Interest refunded to DOS	73,39,210	1,16,42,097
			MCF Hassan - ISRO - net	13,922	2,84,446
			Caution Deposit repaid to Students	47,04,680	5,18,000
			Student Activities Account payments	0	163

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2022

(Amount in Rs.)

Receipts	2021-22	2020-21	Payments	2021-22	2020-21
			Sundry Debtors - Others - Net	0	1,14,681
			Net decrease in Statutory Liabilities (Staff)	8,18,651	0
			Retirement funds paid to DOS	0	5,97,90,581
			IPRC - Honorarium released	1,500	0
			V. Closing Balances		
			a.Cash in hand	1,26,678	1,12,220
			b.Bank Balances		
			In current accounts	(1,56,20,864)	-1,55,35,649
			In deposit accounts	79,13,43,165	21,84,38,948
			In earmarked/retirement benefits accounts	9,12,57,076	12,34,69,581
Total	1,82,10,91,624	1,23,54,29,352	Total	1,82,10,91,624	1,23,54,29,352

Significant Accounting Policies & Notes on Accounts 18

As per our report of even date attached.

For Balamurali & Associates
Chartered Accountants
FRN : 012374S

C.A. Balamurali C. V.
(Proprietor, Mem No. 223319)

Place : Thiruvananthapuram
Date : 29th September, 2022

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Dr. S. Unnikrishnan Nair
Director

R. Hari Prasad
Finance Officer

IIST-148-IP-E-11-2022

Indian Institute of Space Science and Technology
Declared as Deemed to be University under Section 3 of the UGC Act, 1956
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