Indian Institute of Space Science and Technology

2018
2019

ANNUAL REPORT

Annual Report

2018 - 2019

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

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

Dr. K. Sivan
President, IIST Governing Body
Chairman, IIST Governing Council
Secretary, DoS /Chairman, ISRO

Dr. B. N. Suresh
Chancellor

Dr. Vinay Kumar Dadhwal
Director &
Chairman, Board of Management

Prof. Y V N Krishna Murthy
Senior Professor & Registrar

Prof. A. Chandrasekar
Dean
(Academic & Continuing Education)

Prof. Raju K. George
Dean
(Research & Development, IPR)

Prof. Kuruvilla Joseph
Dean
(Student Activities,
Student Welfare & Outreach Programme)





Contents





FOREWORD >>> Dr. V K Dadhwal, Director

The financial year 2018-19 had been an eventful one for IIST with several milestone activities. The twelfth annual report captures the myriad of activities in an ensemble and I am happy to present the same. This year witnessed an expansion in every frontier of our activities in academics, research and international co-operation. Our faculty, staff and students attempted to push the limits and achieve success with dedicated efforts and were ably supported by our leaders.

The institute continued to get the inspirational leadership and support of Dr. B N Suresh, Chancellor, IIST and Dr. K Sivan, President, Governing body, IIST. Their vision for the future of space technology and science is the bedrock on which the systems of IIST are built. The institute gratefully acknowledge their sincere efforts in guiding us to develop excellence in academics and research, chartering our own unique paths.

The president, Governing body, IIST had setup a Committee to review the progress of IIST and suggest visionary inputs to its growth. The panel was headed by Dr. P S Goel, Former Secretary, Ministry of Earth Sciences, Govt. of India. The Committee gave its report and the recommendations were deliberated in the institute. IIST places its gratitude to the Committee for the thorough review and the recommendations.

IIST was ranked 30th in the Engineering category in the year 2019 among all the Engineering institutions in the country in the National Institutional Ranking Framework (NIRF). The performance in the teaching learning part of the ranking evaluation continued to be excellent.

IIST developed a payload to study ionosphere using the PS4 platform offered by ISRO and the project was named ARIS (Advanced Retarding potential analyser for Ionospheric Studies). This project generated significant interest in the Institute and showcased the capability of faculty, students and staff to envisage, design, develop and realize a payload in a short period of time.

The Institute furthered its international collaborations significantly this year. There were collaborations for academic cooperation and projects. The AAReST project with Caltech/ JPL and the INSPIRE satellite project with University of Colorado are a few notable steps in this direction.

This year the infrastructure front also received a shot in the arm with significant progress in the construction of students activity centre, the entrance gate and the rain water harvesting project.

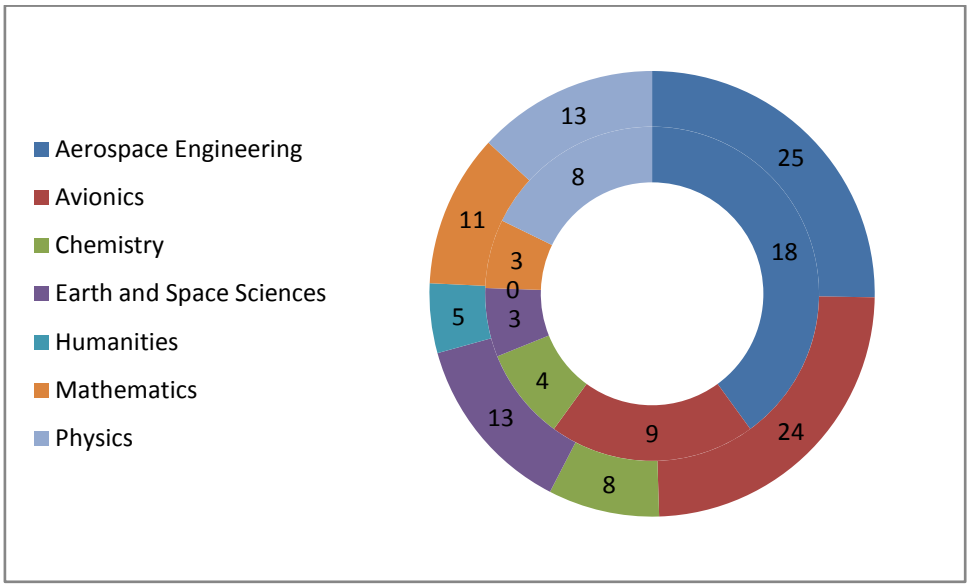
IIST graduated 111 B.Tech, 63 M.Tech and 16 PhD candidates in the 6th convocation conducted on 18th July, 2018.The Institute admitted 140 BTech, 77 MTech and 52 PhD students this year. ISRO offered placement for 69 BTech graduates and 37 BTech and MTech graduates received placement through the institute placement cell.

In the backdrop of the new national education policy (NEP 2019), the institute looks at the world stage with aims of a greater participation in science and technology education in the country with significant expansion and addition of expertise. The institute offers itself to be a melting pot of innovative ideas, policy formulations and modern technologies to set benchmarks for academics with focus on space science and technology.

IIST AT A GLANCE 2018-19

Departments and its Strength

Department	Academic Faculty	Technical/Scientific Staff
Aerospace Engineering	25	18
Avionics	24	9
Chemistry	8	4
Earth and Space Sciences	13	3
Humanities	5	0
Mathematics	11	3
Physics	13	8

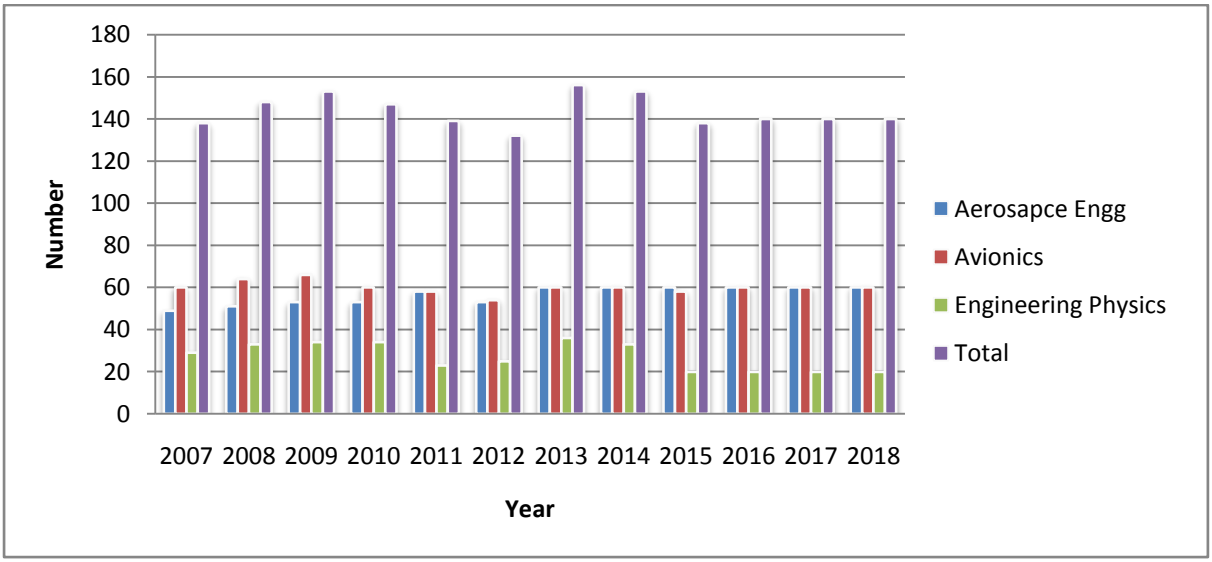


Administration

Officers	14
Administrative	9

B.Tech (Year Wise Enrollment)

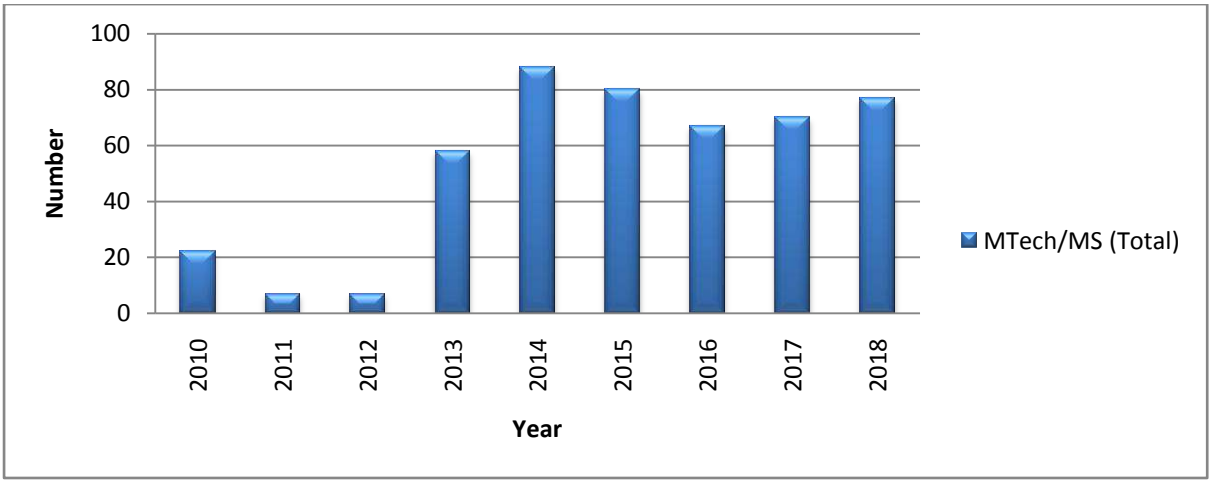
Admission Year	Aerospace Engineering	Avionics	Physical Science/Engineering Physics	Total
2007	49	60	29	138
2008	51	64	33	148
2009	53	66	34	153
2010	53	60	34	147
2011	58	58	23	139
2012	53	54	25	132
2013	60	60	36	156
2014	60	60	33	153
2015	60	58	20	138
2016	60	60	20	140
2017	60	60	20	140
2018	60	60	20	140
Total	617	660	307	1584



M.Tech. (Year Wise Enrollment)

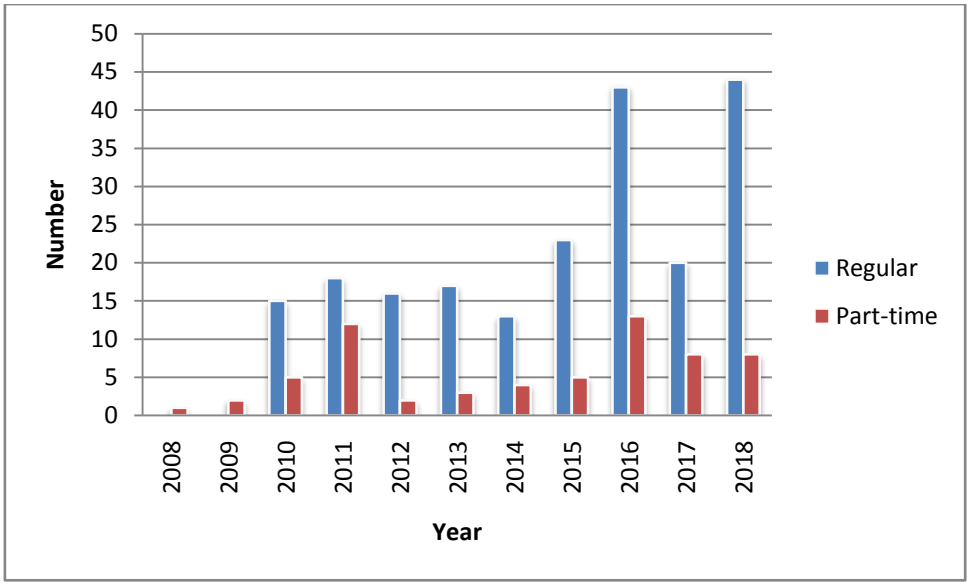
Admission Year	SC&ML	CS	OE	SST	MST	ESS	GI	A&AP	A&FM	T&P	S&D	CS	DSP	PE	VLSI&MS	RF&ME	Total
2010	14	8															22
2011	2	5															7
2012	3	4															7
2013	4	-	5	3	3		3	4	4	7	3	6	6		4	6	58
2014	6	-	6	4	7	5	5	4	7	8	8	6	8		7	7	88
2015	4	-	5	5	6	3	5	6	7	7	8	5	5		9	5	80
2016	5	-	5	5	6	4	4	5	3	4	5	3	6	4	3	5	67
2017	6	-	1	0	6	3	5	3	6	7	8	5	2	5	8	5	70
2018	5	-	3	0	6	4	8	3	6	8	6	7	5	6	6	4	77
Total	49	17	25	17	34	19	30	25	33	41	38	32	32	15	37	32	476

(**ML+C**- Machine Learning and Computing, **CS**- Control Systems, **OE**- Optical Engineering, **SST**- Solid State Technology, **MST**- Materials Science and Technology, **ESS**- Earth System Science, **GI**- Geoinformatics, **A&AP**- Astronomy and Astrophysics, **A&FM**- Aerodynamics and Flight Mechanics, **T&P**- Thermal and Propulsion, **S&D**- Structures and Design, **DSP**- Digital Signal Processing, **PE**- Power Electronics, **VLSI & MS-** VLSI and Microsystems, **RF&ME**- RF & Microwave Engineering)



PhD (Year Wise Enrollment)

Admission Year	Students Admitted	
	Full Time	Part Time
2008	0	1
2009	0	2
2010	15	5
2011	18	12
2012	16	2
2013	17	3
2014	13	4
2015	23	5
2016	43	13
2017	20	8
2018	44	8
Total	209	63
Grand Total	**272**	



Other Details

Post Doctoral Scholars	
No. of Research Projects	65
No. of Journal Papers	169
No. of Conference Papers	181
No. of Books Published	5
No. of PhD Thesis Accepted	16
No. of Patents	3
Visit Abroad(Faculty)	15
Visit Abroad(Students)	13
Placement(BTech- ISRO)	69
Placement(BTech- Placement Cell)	12
Placement(MTech- Placement Cell)	25
Internship Offered	61

2

Institute Lectures	35
Conferences/ Seminars/Workshops	8
New Books/E-books/Reports Added in the library	3644

RTI Status

From April 2018 to December 2018 (Information given through CPIO, ISRO/DOS)

Application Received through CPIO and otherwise	Information forwarded to CPIO	Appeal	CIC Hearing
40	40	01	Nil

From January 2019 to March 2019 (Decentralised the processing of applications under RTI and CPIO, IIST has been disseminating the information directly to the applicants)

Application Received	Information given	Appeal	CIC Hearing
18	18	Nil	Nil

Vigilance Status

Number of Vigilance Cases : NIL

1. THE INSTITUTE

Indian Institute of Space Science and Technology (IIST), situated at Thiruvananthapuram, a Deemed to be University under Section 3 of the UGC Act 1956, established by Department of Space (DoS), Government of India, in 2007 has moved to its twelfth year with renowed vigour and achievements. IIST offers various undergraduate and postgraduate programmes in areas that are relevant to space studies. The academic programmes have been tailored to strengthen the fundamentals, experience the realities through practical work, and enhance the knowledge and understanding in the areas relevant and related to space. The major feature of the undergraduate program is the liberal offer of assistanceship to meritorious students, rendering the education “completely free”, to those students securing a stipulated minimum academic requirement, and upon completeion of the degree, those are absorbed by various centers and labs of ISRO/DoS.

Dr. K. Sivan, Chairman, ISRO and Secretary DoS, constituted a peer review Committee, headed by Dr. P S Goel, Former Secretary, Ministry of Earth Sciences, Govt. of India to comprehensively review Indian Institute of Space Science and Technology, Thiruvananthapuram in terms of its academic output relevant to space programs, as it has already completed 10 years since its inception in September 2007. The other members of the Committee are i) Prof. Majumdar, Dy. Director, IIT Bombay, Mumbai ii) Prof. K P J Reddy, Dept. of Aerospace, IISc, Bangalore, and iii) Dr .Gangan Pratap, Outstanding Scientist , CSIR .

The peer review Committee has visited IIST on 31st October 2018 and 1st November 2018 to conduct an indepth review of IIST. The Committee report lauded the research activities going on in IIST and emphazized the need to have more focused research, seamlessly intergrating with the research activities of ISRO.

Peer Review Committee headed by Dr. PS Goel

Road Map of IIST

Fully committed to build on the platform of 10 yrs of success and achievements, IIST, has created a draft roadmap for the next decade focussing on Basic Research for Space Sciences, Space Technology and Applications, Education, Infrastructure, Governance and Collaboration. This strategic plan identifies the means by which the institute intends to advance in the coming year and establish itself as an Institute of National importance. IIST would also be the 3rd centre of the UN training centre and this is expected to provide an international outreach in areas of remote sensing, development of small satellites, satellite and lightwave communications and so on.

NIRF 2019

In the year 2018-19, according National Institutional Ranking Framework (NIRF) set up by the Ministry of Human Resource Development (MHRD), Government of India, IIST was ranked as 30th in the Engineering category in year 2019 among all Engineering institutions in the country.

The composition of the statutory bodies of the institute is summarized here.

1.1 THE GOVERNING BODY

K. Sivan	|	Secretary, DOS /Chairman ISRO **President**
Anoop Srivastava	|	Joint Secretary & FA, DOS
P. G. Diwakar (till 31.07.2018) **R. Umamaheswaran** (01.08.2018 onwards)	|	Scientific Secretary ISRO Headquarters
S. Somanath	|	Director, VSSC
V. Narayanan		Director, LPSC
Tapan Mishra (till 18.07.2018) **D.K.Das** (19.07.2018 onwards)	|	Director, SAC
Santanu Chowdhury	|	Director, NRSC
M.S Chandrasekar	|	Director (till 31.05.2018) Personnel Policy and Programme Management (PP&PM) ISRO Headquarters
Vinay Kumar Dadhwal	|	Director, IIST **Secretary**

1.2 IIST GOVERNING COUNCIL

K. Sivan	|	Secretary, DOS /Chairman ISRO **Chairperson**
Anoop Srivastava	|	Joint Secretary & FA, DOS
S. Kumaraswamy	|	Joint Secretary (Personnel), DOS
Chintamani Manohar Sane	|	Joint Secretary (Finance), DOS
P. G. Diwakar (till 31.07.2018) **R.Umamaheswaran** (01.08.2018 onwards)	|	Scientific Secretary ISRO Headquarters
Vinay Kumar Dadhwal	|	Director, IIST **Secretary**

1.3 IIST BOARD OF MANAGEMENT

Vinay Kumar Dadhwal	|	Director, IIST **Chairman**
S. Kumaraswamy	|	Additional Secretary (In Charge) Department of Space
P. G. Diwakar (till 31.07.2018) **R. Umamaheswaran** (01.08.2018 onwards)	|	Scientific Secretary, ISRO Headquarters
V. Narayanan	|	Director (LPSC)
Santanu Chowdhury	|	Director (NRSC)
Partha Pratim Chakraborti	|	Director, IIT Kharagpur
Bhaskar Ramamurthi	|	Director, IIT Madras
A. Ajayaghosh	|	Director, NIIST
Anil Bharadwaj	|	Director, PRL
A. Chandrasekar	|	Dean (Academics), IIST
Kuruvilla Joseph	|	Dean (Student Activities), IIST
C S Narayana Murthy	|	Senior Professor, Department of Physics, IIST
Nirmala Rachel James	|	Professor &Head Department of Chemistry, IIST
Harsha Simha M. S.	|	Assistant, Professor Department of Avionics, IIST
A. Chandrasekar (till 28.10.2018) **Y. V. N. Krishna Murthy** (29.10.2018 onwards)	|	Registrar, IIST **Secretary**

1.4 IIST FINANCE COMMITTEE

Vinay Kumar Dadhwal	|	Director, IIST **Chairman**
Anoop Srivastava	|	Joint Secretary, FA Department of Space
Bijay Kumar Behera	|	Associate Director, BEA ISRO Headquarters
A.Chandrasekar	|	Dean Academics and CE
Raju K. George	|	Dean (R&D) and (Student Welfare), IIST
A. Chandrasekar (till 28.10.2018) **Y. V. N. Krishnamurthy** (29.10.2018 onwards)	|	Registrar, IIST
Sivanandan G	|	Sr. Head Accounts / IFA LPSC, Valiamala
R. Hari Prasad	|	Deputy Registrar (Finance) / Finance Officer - **Member Secretary**

1.5 IIST ACADEMIC COUNCIL

Vinay Kumar Dadhwal	|	Director, IIST
A. Chandrasekar	|	Dean, Academic & CE
Raju K. George	|	Dean, R & D and IPR
Kuruvilla Joseph	|	Dean, Student Activities, Students Welfare & Outreach
K. Sudhakar	|	Former Professor IIT Bombay
K. R. Ramakrishnan	|	Former Professor IISc Bangalore
A. Ajayaghosh	|	Director NIIST Trivandrum
K. Kurien Issac	|	Dean, IPR & CE (till 13.06.2018) Senior Professor
C. S. Narayanamurthy	|	Senior Professor Department of Physics
N. Sabu	|	Professor & Head (from 16.12.2018) Department of Mathematics
Nirmala Rachel James	|	Professor, Department of Chemistry
Anandmayee Tej	|	Professor Department of Earth and Space Sciences

K. S. S. Moosath	|	Professor Department of Mathematics
C. V. Anilkumar	|	Professor Department of Mathematics
A. Salih	|	Professor Department of Aerospace Engineering
B. S. Manoj	|	Professor & Head Department of Avionics
Manoj T. Nair	|	Associate Professor & Head Department of Aerospace Engineering
K. Prabhakaran	|	Associate Professor & Head (from 16.12.2018) Department of Chemistry
Lekshmi V. Nair	|	Associate Professor & Head (from 16.12.2018) Department of Humanities
Samir Mandal	|	Associate Professor & Head (from 16.12.2018) Department of Earth and Space Sciences
Umesh R. Khadane	|	Associate Professor & Head (from 16.12.2018) Department of Physics
N. Selvaganesan	|	Associate Professor Department of Avionics
Pradeep Kumar P.	|	Associate Professor Department of Aerospace Engineering
Naveen Surendran	|	Assistant Professor Department of Physics
S. Murugesh	|	Associate Professor & Head (till 15.12.2018) Department of Physics
V. Ravi	|	Associate Professor & Head Department of Humanities (till 15.12.2018)
A. Chandrasekhar	|	Dean (Academics & CE), IIST, Secretary

ACADEMIC DEPARTMENTS

2. ACADEMIC DEPARTMENTS

The academic programmes of the institute are run by seven departments comprising of two engineering, four scientific and a humanities department. Faculty, scholars, laboratories and other relevant details are provided here.

2.1 DEPARTMENT OF AEROSPACE ENGINEERING

IN NUMBERS

25 Faculty Members
42 Research Scholars
39 M.Tech Students
18 Laboratory Staff/Technical Staff

Aerospace Engineering deals with the design and development of machines that can fly. These machines could be aircraft that fly within Earth's atmosphere such as gliders, fixed-wing aeroplanes and helicopters, or spacecraft that fly outside Earth's atmosphere.

The department offers one undergraduate degree (BTech) in Aerospace Engineering, three postgraduate degrees (MTech), and a PhD programme. Aerospace engineering requires in-depth skills and understanding in physics, mathematics, aerodynamics, flight mechanics, propulsion systems and materials science. In the undergraduate programme, the students develop a basic understanding of these core areas. The postgraduate programmes are offered in three specialisations:

a) aerodynamics and flight mechanics, b) thermal and propulsion, c) structures and design. These courses further strengthen the knowledge in the respective streams. The postgraduate courses give equal emphasis on research and design with the students having the option of taking advanced electives and design courses.

Faculty & Core Research Areas

Head of Department

Manoj T Nair | Aerodynamics, Computational Fluid Dynamics.
PhD(IIT, Kanpur)

Senior Professor

Kurien Issac K
PhD (IIT, Madras)
| Kinematics, Dynamics and Robotics.

Adjunct Professors

Ramanan R V
PhD (University of Kerala)
| Space Missions: Optimal Trajectory/Manouvre Design.

Raveendranath P
PhD (IIT, Kharagpur)
| Advanced Finite Element Method.

Professors

Abdusamad Alias Salih
PhD (IIT, Kharagpur)
| Numerical solution of multiphase flows.

Associate Professors

Anup S
PhD (IIT, Madras)
| Mechanics of biological and bio-inspired composites.

Aravind.V
PhD (University of Florida, USA)
| Laser Diagnostics, Combustion.

Chakravarthy P
PhD (IIT, Madras)
| Fundamental and applied research in Combustion.

Deepu M
PhD (NIT, Calicut)
| Computational fluid mechanics, heat transfer, and combustion.

Girish B S
PhD (Anna University, Chennai)
| Sequencing and scheduling issues in manufacturing systems and Air traffic management, vehicle routing and scheduling issues in supply chains.

Prathap C
PhD (IIT, Delhi)
| Fundamental and applied research in Combustion.

Shine S R
PhD (IIST, Thiruvananthapuram)
| Heat transfer in Space Applications.

Vinoth B R PhD (IIT, Kanpur)	Aerodynamics, Aeroacoustics, Unsteady flows, Flow instability, Experimental methods.
Pradeep Kumar P PhD (IIT, Bombay)	Two-phase flow and heat transfer, Electronic cooling in micro and macro scale.
Praveen Krishna I R PhD (IIT, Madras)	Nonlinear Dynamics, Fluid Structure Interaction, Acoustics.

Assistant Professors

Arun C O PhD (IIT, Madras)	Structural mechanics, Computational Mechanics-Meshfree, methods, Finite element method, Stochastic mechanics, Structural reliability,Sloshing of liquid in tanks, Design of steel structures, Thin-walled structures etc.
Bijudas C R PhD (IIT, Bombay)	Structural Health Monitoring.
Dhayalan PhD (IIT, Kanpur)	Flight Dynamics, Aircraft System Identification.
Devendra Prakash Ghate PhD (University of Oxford, UK)	Multidisciplinary optimisation.
Mahesh S PhD (IIT, Kanpur**)**	Jet/Swirl flame characteristics, Micro combustion**.**
Manu K V PhD (IISc, Banglore**)**	Fluid Dynamics.
Rajesh S PhD (University of Karlsruhe, Germany)	Optical and Laser Diagnostics, Combustion.
Satheesh K PhD (IISc, Bangalore)	High Temperature Aerodynamics.

Sooraj V S PhD (IIST, Thiruvananthapuram)	Machining and Precision Manufacturing.

Reader (on Contract)

Sam Noble M.Tech. (University of Kerala)	Robotics, optimisation.

Laboratory Facilities

Vibration Lab

Micro Raman for structural Measurements

Health Monitoring Lab

Major lab facilities established under Department of Aerospace Engineering include

- Engineering workshop
- Strength of Materials Lab
- Engineering Drawing Lab

- Thermal and Propulsion Lab
- Fluid Mechanics Lab
- Heat Transfer Lab
- Computer Aided Design and Analysis Lab
- Metrology and Computer Aided Inspection Lab
- Manufacturing Processes Lab
- Materials Characterization lab
- Aerospace Structures Lab
- Aerodynamics Lab
- Flame Diagnostics Lab
- Flight Mechanics Lab

The manufacturing processes lab and Engineering workshop under Department of Aerospace Engineering does effectively support many of the project and research related activities in IIST, encompassing all the departments in IIST.

During 2018-19 various equipments that were added to the laboratoriesinclude: Electro-dynamic shaker units, Data acquisition system with software, Impact hammer, accelerometers, stereo microscope, condenser microphones, high speed LED light, tuned diode laser, high speed camera, dynamic and unsteady pressure transducer, digital delay pulse generators and 6 workstations and A mini CNC platform for lab scale testing/ experimentation purposes.

2.2 DEPARTMENT OF AVIONICS

IN NUMBERS

24 Faculty Members
50 Research Scholars
02 Post Doctoral Fellows
61 M Tech Students
09 Laboratory/Technical Staff

The Avionics department ensures the deeper understanding of the fundamentals and advanced courses of Avionics with a special thrust to enhance research capability of students to undertake the challenges in the field of avionics engineering. The department offers undergraduate course in Electronics and Communication with specialization in Avionics and post graduate courses in RF and Microwave Communication, Digital Signal Processing, Control Systems and VLSI & Microsystems and Power Electronics Moreover, the department also offers Ph.D. in various disciplines of Avionics/ Electrical/ Electronics/ Communication/ Computer Science Engineering/interdisciplinary areas.

Faculty & Core Research Areas

Head of Department

Manoj B S
PhD (IIT, Madras)

| Computer networks, internet security, next generation internet, wireless networks, ad hoc wireless networks, wireless mesh networks, sensor networks, complex networks, and cyber security

Satish Dhawan Professor

Madhav Vasudeo Dhekane

|Space transportation - Mission design and Analysis,Launch vehicle Dynamics Modeling, Digital Autopilot Design

Adjunct Professors

Sam K Zachariah
Ph.D (IIST, Thiruvananthapuram)

| Autonomous locomotion control of biped humanoid robot. Nonlinear mathematical modeling, compensator design and simulation of electro mechanical and electro hydraulic servo actuation systems and components. Digital autopilot design of launch vehicles and realization of mechatronic systems.

Associate Professors

Basudeb Ghosh
PhD (IIT, Roorkee)

| Computational electromagnetics, fractal , waveguide passive components, aperture antennas, Frequency Selective Surfaces (FSS), Electromagnetic Band Gap (EBG) structures, Substrate Integrated Waveguide (SIW).

Chinmoy Saha
PhD (University of Calcutta)

| Multifunctional UWB Antennas/Reconfigurable Antennas. Antennas for SDR and CDR Applications. Dielectric resonator based WPT system.

Deepak Mishra
PhD (IIT, Kanpur)

| Computer vision and graphics, image processing, deep learning and artificial neural networks, biometrics, machine learning, soft computing, computational neuroscience, nonlinear dynamics.

Lakshmi Narayanan R PhD (IIT, Madras)	Estimation, detection and signal processing algorithms.
Palash Kumar Basu PhD (Jadavpur University, Kolkata)	Nanotechnology based Gas Sensor, THz devices, biosensor and flexible electronics.
H Priyadarshnam PhD (IIT, Bombay)	Design, modeling and development of satellite systems and control systems.
Rajeevan Puthan Purayil PhD (IISc, Bangalore)	Power electronics – power converters – topologies and PWM techniques, control of multiphase drives, power quality, and renewable energy.
Rajesh Joseph Abraham PhD (IIT, Kharagpur)	Control systems and applications. Power systems control guidance and navigational control. Robust control and applications.
Seena V PhD (IIT, Bombay)	Micro/Nanoelectronics, MEMS and sensors, polymer MEMS.
Selvaganesan N PhD (Anna University, Chennai)	System identification and adaptive control, fractional order control, fault detection and diagnosis.
Sheeba Rani J PhD (Anna University, Chennai)	Computer vision and pattern recognition, image analysis and understanding. Design and performance evaluation of hardware solutions for signal and image processing techniques.

Assistant Professors

Anindya Dasgupta PhD (IIT, Kanpur)	Modelling and control of power electronic (PE) converters, PE topologies and applications in distributed generation.
Anoop C S PhD (IIT, Madras)	Measurements and instrumentation, interface electronics, direct-digitizers, analog signal processing, biomedical electronic systems.

Basudev Majumder PhD (IIT, Bombay)	Planar antenna and passive system design. Application of metamaterials and meta surfaces in antenna design. Reconfigurable antenna design.
Chris Prema S PhD (IIST, Thiruvananthapuram)	Wideband spectrum sensing in CR, Multirate signal processing. Sub-nyquist techniques for spectrum sensing, and FBMC systems for 5G communication.
Harsha Simha M S PhD (IIT, Bombay)	Nonlinear dynamical systems and control.
Sooraj R PhD (GIST, South Korea)	Semiconductor optoelectronics and photonics, optical sensors, semiconductor nano-structures, optical interconnects and integrated circuits, photovoltaics, plasmonics.
Sudharshan Kaarthik R PhD (IISc, Bangalore)	Power electronics, multilevel converters, electric drives, modulation and switching techniques, power hardware in-the-loop emulation, grid connected systems, analog and digital circuit design.
Vineeth B S PhD (IISc, Bangalore)	Applied probability & stochastic processes, stochastic control and optimization for computing and communication systems, queueing theory, machine learning, performance analysis and optimization.
Vani Devi M PhD (IIST, Thiruvananthapuram)	Signal processing in 5G communication, Massive MIMO channel estimation and decoding algorithm, NOMA – SCMA receiver design, MIMO-OFDM system, Error control coding – LDPC, TURBO decoder and real time RF communication in RTL-SDR.
Immanuel Raja* PhD (IISc, Bangalore)	Broad area of analog, mixed-signal and RF IC design. Developing low-power, efficient transmitters and receivers for RF communication

Visiting Faculty

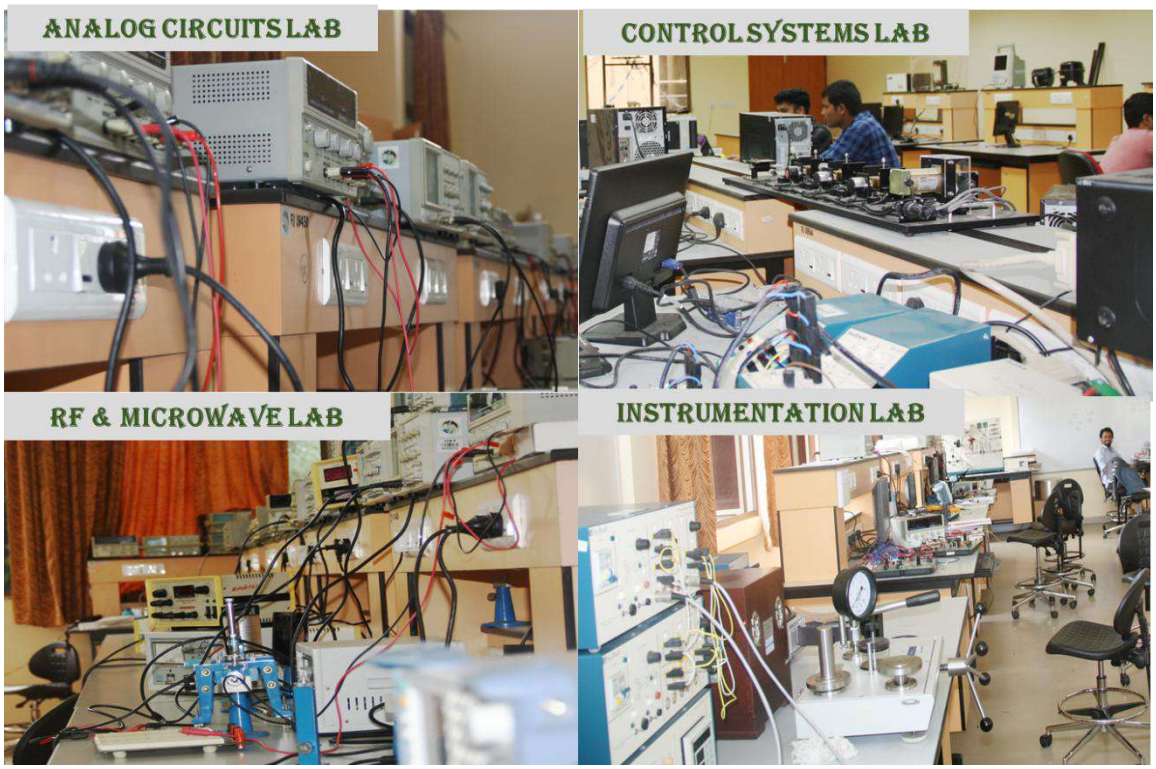
Naveen Kadayinti joined as visiting faculty on 15/01/2018 and relieved on 18/05/2018
*Immanuel Raja joined as assistant professor on 20/02/2019

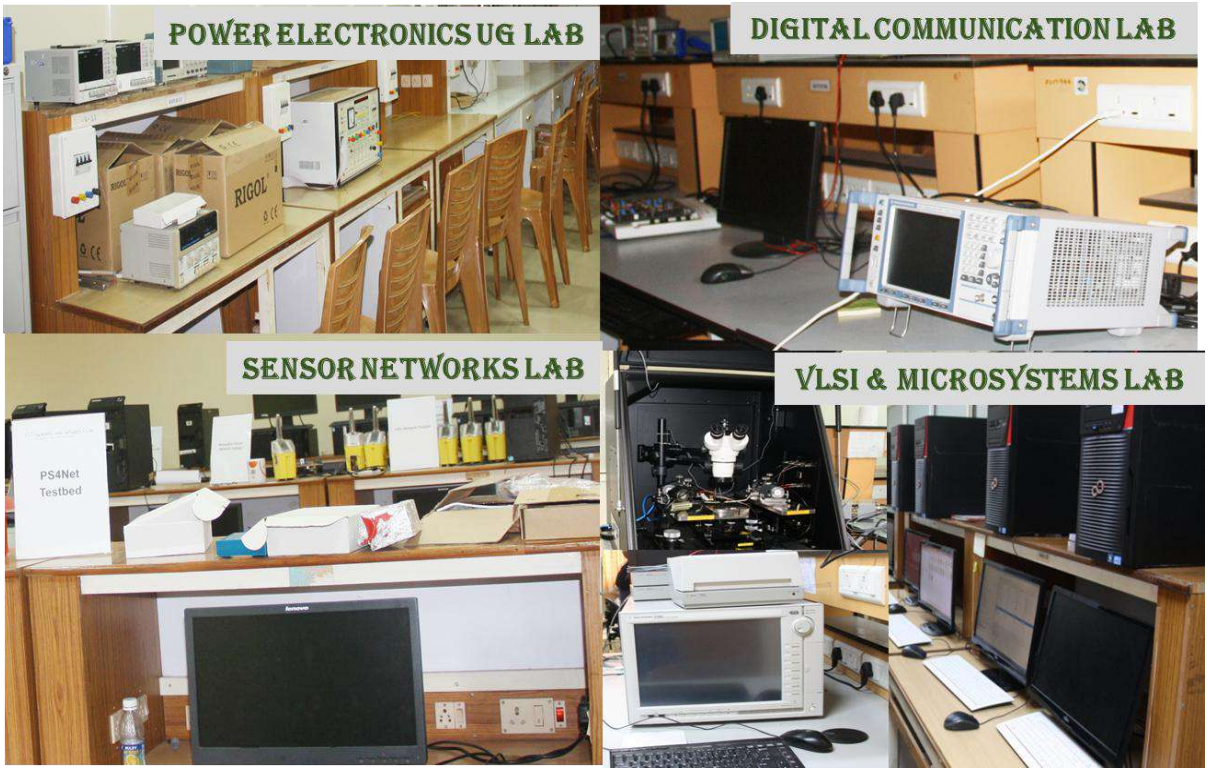
Laboratory Facilities

The department has excellent laboratory facilities and state-of-the-art software tools in various disciplines of electrical engineering, electronics and communications engineering, and computer science and engineering.

The department has moved to a new building D3, Avionics during the year 2017-18. The following teaching and instructional laboratories are in the process of completing the setup in the new building.

1. Analog Electronics Lab
2. Basic Electrical Lab
3. Basic Electronics Lab
4. Computer Networks Lab
5. Control System Lab
6. Digital Communication Lab
7. Digital Electronics Lab
8. Digital Signal Processing Lab
9. ECAD Lab
10. Instrumentation and Measurement Lab
11. Micro Processor Lab
12. Navigation Systems and Sensor Lab
13. Power Electronics Lab
14. RF and Microwave Lab
15. VLSI and Microsystem Lab
16. Micro/Nanosystem Characterization Lab





Some of the Instructional Laboratories in the Department of Avionics

Research & Development labs

The department of Avionics has a strong focus on excellence in education through fundamental and applied research activities carried out by the faculty members and students. Hence the department is in the process of establishing various research laboratories to support these activities. The research laboratories in various areas are being shifted to D3, Avionics building. Details of some of the laboratories are provided below: -

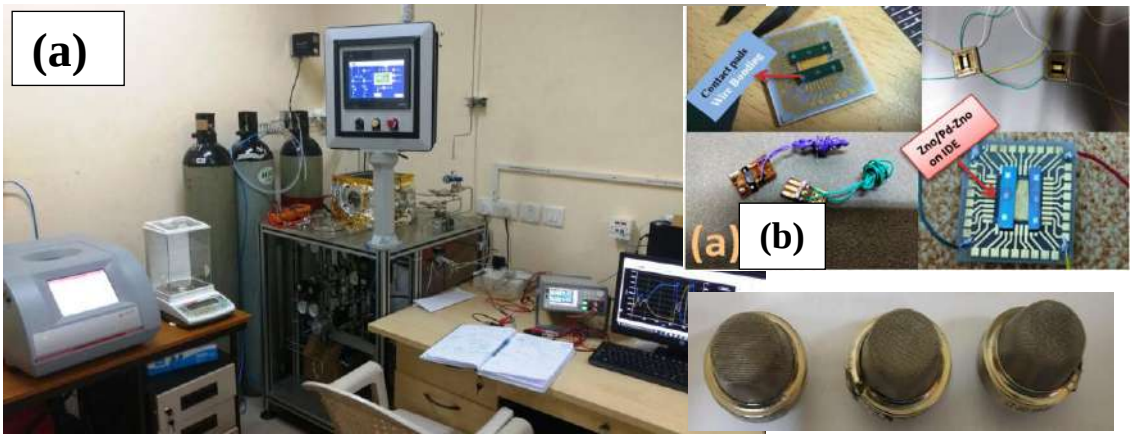
GAS SENSOR FACILITY

The facility is equipped with gas calibration facility to calibrate different in-organic gases mainly H2, CH4 ,CO, CO2, NOx etc along with equipment to synthesis nanomaterials for sensor. The main activity of this facility is to investigate low weight, high performance nanostructure based gas sensor array at room temperature where each element of the array will be functionalized by required nano materials (metal Oxide with catalyst) to enhance the performance of the sensor

- **State of Gas calibration System:** After fabrication of the sensor, the calibration system is mandatory to find out the performance of the devices. This setup is capable to generate the desire concentration of the gas in the chamber and the chamber can be heated depending on the sensor requirements. The Set up includes the monitoring of electrical signals (based

on the sensor) of the sensor at different concentration of gas. Necessary up gradation is going to handle eleven gases together to qualify the sensors for space applications.

- **Materials for Gas sensor:** The performance of the sensor can be enhanced by introducing nanomaterials. This system is generating different form of nanomaterials by different methods (Microwave Synthesis/Sol-Gel/Hydrothermal etc). The facility is capable to generate materials for Sensor application.



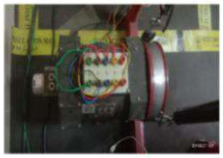
- **Figure: (a) Gas sensor facility and (b) developed sensor for H_2 and CO.**

POWER ELECTRONICS RESEARCH LAB

This lab incorporates the research work of B. Tech, M. Tech and PhD students in the area of power Electronics. Research works are done in the area of electric drives, multilevel inverters, grid connected systems and DC-DC converters. Research for improved performance of drives through different control schemes such as Direct Torque Control and space vector based PWM schemes for five phase machines and conventional three phase machines have been implemented. Works based on innovative control of series and parallel connection of six phase permanent magnet machines are being carried out in the lab. Research works on grid connected systems include sensor less control scheme for single phase integrated battery charger and Integrated battery charger using three phase supply with split phase induction machines. Multilevel inverters based on dodecagonal space vector modulation schemes using cascaded H-bridges were implemented. Research on power quality improvement using STATCOM with novel control techniques have been performed. Project works on the control strategies for BLDC motors and Hub motors are also being carried out in the lab. Low power high efficiency isolated DC-DC power supply with both voltage control and current control mode was designed, built and tested in

lab. Distribution system based Solid state transformer hardware is being developed and currently some developed modules are under test.

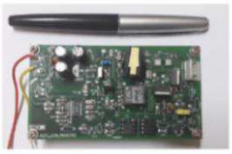
4 leg 2 level inverters



5 phase 1 hp OEWIM

Series connected 6 phase PMSMs

Developed Voltage Control isolated DC-DC power supplies



Developed Current Control isolated DC-DC power supplies

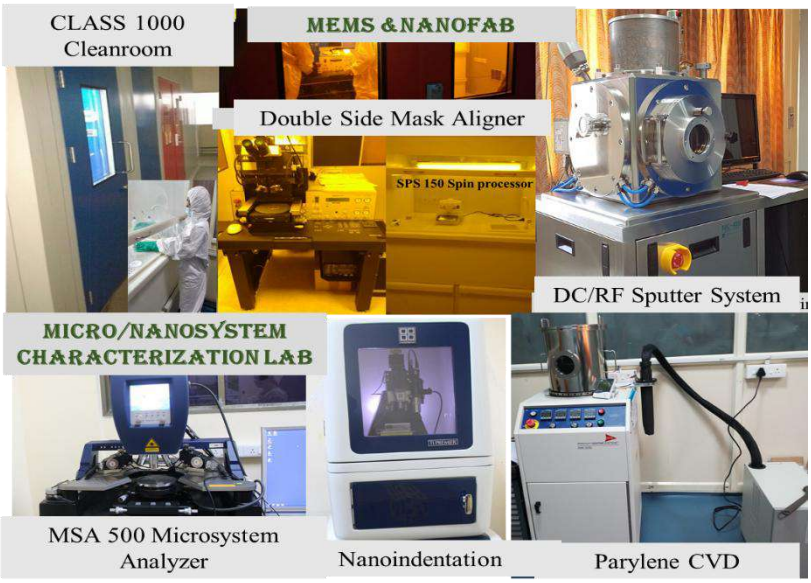
MEMS & NANOFABRICATION LABORATORY

Department of Avionics 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 electromechanical systems (MEMS/NEMS), devices and technologies across all departments in IIST. These laboratories also support the R&D activities in the area of MEMS and Microsystems for ISRO.

The facilities include the deposition tools such as DC/RF Sputtering for thin films, Double side mask aligner for photolithography, ParyleneLabcoater as well as characterization tools such as Wafer probe station, Semiconductor Parametric Analyzer, MSA-500 Microsystem Analyzer LDV, and Nanoindentation system.

Masters and PhD students carry out their academic and research projects in these laboratories for the development of MEMS and Microscale sensors for applications ranging from environmental sensing to space applications.

Gas Sensors and Bio Sensors (Design and Characterization), Silicon MEMS Accelerometers (Design and Characterization), Polymer MEMS Sensors (Design, fabrication and characterization), Nanomechanical Sensors (Design, fabrication and characterization) etc. are some of the sensors being developed using these laboratories. The facilities are currently being used for R&D projects funded by ISRO as well as external funding agencies such as SERB, DST and DBT



2.3 DEPARTMENT OF CHEMISTRY

IN NUMBERS
08 Faculty Members
16 Research Scholars
02 Post Doctoral Fellows
11 M Tech Students
04 Laboratory/Technical Staff

Department of Chemistry undertake teaching in the undergraduate and postgraduate level where strong foundations are laid facilitating the design and development of novel materials and processes to meet future technological challenges. The department offers Chemistry courses (core as well as electives) for B.Tech programmes of the institute, M.Tech programme in Materials Science and Technology and PhD programs.

Faculty & Core Research Areas

Head of Department

Prabhakaran K | High temperature materials, materials for environmental applications, ceramic powder processing
PhD (CSIR-NIIST, University of Kerala)

Senior Professor, Dean (Student Activities)

Kuruvilla Joseph | Polymer nanocomposites for electronic and structural applications, Bio-nanosensors for biomedical applications, Elastomers and blends, Bio-composites.
PhD(CSIR-NIIST, MG University)

Professor

Nirmala Rachel James
PhD (CSIR-NCL, Pune University)

| Step growth polymers, Polymers for medical applications, Hydrogels for tissue engineering. Nanofibers for biomedical applications, polysaccharide based nanomaterials for drug delivery applications, light emitting polymers, nanocomposites.

Associate Professors

Gomathi N
PhD (IIT, Kharagpur)

| Surface modification, nanomaterials, sensors.

Jobin Cyriac
PhD (IIT, Madras)

| Chemical Sensors, Nanomaterials, Mass Spectrometry.

Sandhya K Y
PhD (CSIR-NIIST, University of Kerala)

| Electrochemical Energy storage and sensing, photocatalysis, Adsorption-Removal of pollutants from water.

Sreejalekshmi K G
PhD (University of Kerala)

| Computational and Synthetic Organic Chemistry.

Mary Gladis J
PhD (CSIR-NIIST, University of Kerala)

| Energy storage materials:Metal-Sulfur batteries and supercapacitors, Trace and ultratrace analysis.

Laboratory Facilities

Nano Science LabMaterial Characterization lab

Department has established lab facilities for synthesis, processing and characterization of nanomaterials, polymers, high temperature materials and organic materials.Facilities for fabrication and testing of batteries and OLED fabrication lab

including glove box, spin coater, UV-ozone cleaner and evacuator, spectrometer with CCD based detector, I-V measurement and life time measurement systems for OLED and four point probe system for measuring sheet resistance is established in department of chemistryduring 2018-19.

Battery/ OLED fabrication and testing lab

2.4 DEPARTMENT OF EARTH AND SPACE SCIENCES

IN NUMBERS

13 Faculty Members
25 Research Scholars
00 Post Doctoral Fellows
25 M Tech Students
23 Dual Degree
03 Laboratory/Technical Staff

The department is inter-disciplinary in nature, bridging gaps between technology and its application to fundamental research areas in physical sciences. The faculty of the department tcarry out research in four broad areas: (i) Astronomy & Astrophysics, (ii) Atmospheric Sciences, (iii) Geology and (iv) Remote Sensing. It offers two Dual degree Masters programs (Astronomy & Astrophysics, Earth System Science). It also offers post-graduate programs in Astronomy & Astrophysics, Earth System Science and Geoinformatics. In addition, PhD programs are offered in the main areas of research, namely, Astronomy & Astrophysics, Atmospheric Sciences, Geology and Remote Sensing.

Faculty & Core Research Areas

Head of Department

Samir Mandal
PhD (Jadavpur University, Kolkata)
| High Energy Astrophysics.

Outstanding Professor, Dean (Academics)

A Chandrasekar
PhD (IISc, Bangalore)
| Mesoscale modeling, data assimilation

Professor

Anandmayee Tej
PhD (Gujarat University)
| Understanding the formation of high-mass stars and their influence on the surrounding interstellar medium.

Associate Professors

Anand Narayanan
Ph D (Pennsylvania State University, USA)
| Spectroscopic observations of galaxies and intergalactic medium

Gnanappazham L
PhD (University of Madras)
| Remote sensing and coastal resources management, monitoring of mangroves using satellite data

GovindanKutty M
PhD (IIT, Kharagpur)
| Atmospheric Modelling, Data Assimilation, Predictability

Jagadheep D
PhD (Cornell University, USA)
| Massive star formation, 6.7 GHz methanol masers, HII regions

Rajesh V J
PhD (Yokohama National University, Japan)
| Mineralogy, Igneous Petrology, Geochronology & Planetary Geology

Rama Rao Nidamanuri
PhD (IIT, Roorkee)
| Hyperspectral and LiDAR remote sensing.

Resmi L
PhD (IISc, Bangalore)
| Gamma Ray Bursts, Gravitational Wave Astronomy, High Energy Astrophysics

Sarita Vig
PhD (TIFR, Mumbai)
| Massive star formation, Protostellar jets, Hots stars in globular clusters

Assistant Professors

A M Ramiya
PhD (IIST, Thiruvananthapuram)

| Automated processing of LiDAR point cloud, Applications related to natural and man-made resource management.

Puna Ram Sinha
PhD (TIFR Balloon Facility, Hyderabad /Pt. Ravi Shankar Shukla University, Raipur)

| Balloon-borne and ground-based measurements of aerosols, Aerosol-cloud interaction.

Laboratory Facilities

Geology LabAstronomy & Astrophysics Lab

Atmospheric Science Lab

The department has developed various facilities across sub-disciplines for research and Under Graduate / Masters courses.

Atmospheric Science Lab

Atmospheric science lab is equipped with start-of-the art field instrumentation for the measurement of aerosol optical/physical properties and cloud microphysics along with meteorological variables for constraining important processes associated with aerosol-cloud interactions to develop robust aerosol models for air quality and climate research. These instruments are also extensively used for teaching courses. The lab also has the computing facilities for weather data processing and analyses.

Astronomy & Astrophysics Lab

This group has set up an experimental and computational lab alongwith the Astronomical Observatory. A CCD characterisation experiment set-up is routinely used for the UG and PG courses. In addition, the lab is equipped with a blackbody, infrared photometer and a spectrograph, used in teaching and outreach. The lab includes computing facilities for Astronomical Data Analysis and Computational Astrophysics courses. Two telescopes, a 14-inch Cassegrain and a 8-inch Newtonian, are housed in the Observatory. These are extensively used for teaching and outreach.

Geology Lab

The geology lab has a geological museum with good collection of rock samples, ore minerals, rock forming minerals, precious and semi-precious minerals, and various faunal and floral fossils. The lab also has variety of terrestrial analogue minerals and rocks to study the geological conditions and evolution of Moon and Mars. 3D models of various geomorphological features are available to teach students about the basic geological concepts. The lab hosts an advanced petrologicaltrinocular microscope (Nikon Eclipse LV100 optical microscope) and a dedicated petrological microscope equipped with heating freezing stages for the fluid inclusion study. The research on planetary geosciences includes processing and interpretation of satellite data from Moon and Mars for terrain morphology and spectral characterization of various rocks and minerals to understand the evolutionary processes. The softwares required for carrying out the scientific studies on planetary data are also available in the lab.

Remote Sensing Lab

Remote sensing lab is installed with updated set of remote sensing and image processing software for multispectral, hyperspectral and LIDAR data of field/ air/ space borne data and and GIS softwares for 3D geospatial data analysis. Good amount of satellite data archive is available as repository which is also used for the regular lab sessions, internships and projects of B. Tech and M Tech students. Further research activities on various fields of geospatial technology are supported by necessary field data collection equipments such as spectro-radiometer, Plant

canopy analyser, Differential Global Positioning System, hyperspectral imager,Terrestrial Laser Scanner etc. benefiting the research scholars.

2.5 DEPARTMENT OF HUMANITIES

IN NUMBERS

05	**Faculty Members**
11	**Research Scholars**
01	**Laboratory/Technical Staff**

The Humanities department plays a unique and distinctive role in IIST where the ethos of science and technology prevails. The department tries to bring in an holistic education that necessitates the study of the language, management and social sciences so that the application of the sciences for the improvement of the quality of life is aware of humanitarian and social concerns. In addition to the carefully designed undergraduate programs (core as well as electives), the department offers opportunities and facilities for the pursuit of research in Economics, English, Management and Sociology.

Faculty & Core Research Areas

Head of Department

Lekshmi V Nair
PhD (University of Kerala) | Science, Technology and Society.

Associate Professors

Ravi V
(Head of the Dept from 14-09-2015 to 14-12-2018)
PhD (IIT, Delhi) | Operations Management, Supply Chain Management, Quantitative modelling, General Management

Assistant Professors

Babitha Justin | Gender and Travel, Cultural Studies

PhD (University of Hyderabad)

Gigy J Alex
PhD (M G University) | Cultural Studies, Gender Studies, Science Fiction

Shaijumon C S

PhD (University of Kerala) | Technology diffusion and development, Space Economics and Development Economic, Macro Economy, Climate change and economic development

Laboratory Facilities

Audio Visual Lab

Department of Humanities offers a course in Communication Skills which uses both theory and practical classes for learning and teaching language in one semester so as to equip students of engineering and technology with effective communication skills in English.

Last year lab practices were divided into two categories as "English Language Lab" where listening comprehension, reading comprehension and vocabulary and speaking tests were conducted, and "Career Lab" where writing tests on Resume/Report preparation and Letter writing were conducted. The students were also given training in presentation, group discussion and interview skills.

Audio Visual Lab

The Audio Visual Lab is intended to be utilized for creating audio and video modules, study materials, to create content generation for lectures (both online and offline), documentaries, etc, by the faculty members, students and the administrative fraternity of the Institute It has

- Multiple Camera Setup
- Support equipment
- Editing Facilities
- Multicolor backdrop chroma curtain
- DVD Authoring facilities for Programme distribution

The main objectives of the Studio are to:

- Creation of courseware video lectures in line of Stanford 'Openclassroom', MIT 'Opencourseware', IIT-M initiative NPTEL, Virtual Labs of MHRD, etc
- Hardspots graphics/animation/video creation: Multimedia enriched Audio Visual Learning
- For Enhancing Communication Skills of the students by Multimedia Feedback system (MFS)
- Content and Materials Development
- Recording of Interviews, talks of Dignitaries, expert lectures, etc
- Offline lecture content: To Create a Virtual Learning Environment at IIST for Societal needs (to study the impact of satellite communication in the society)

2.6 DEPARTMENT OF MATHEMATICS

IN NUMBERS

11 Faculty Members
16 Research Scholars
12 M Tech Students
03 Laboratory/Technical Staff

Department of Mathematics offers courses at undergraduate and post graduate level for Aerospace and Avionics Engineering branches. Department also runs an M.Tech programme in Machine Learning and Computing. Research in the department mainly focus on various areas of pure as well as applied mathematics including: Control Theory, Numerical analysis, Partial Differential Equations, Commutative Algebra, Machine Learning, Differential Geometry, Stochastic Modelling & Analysis, Queuing Theory and Time Series Analysis etc.Faculty members have strong research collaboration with reputed Indian institutions such as IITs and IISc etc. and international institutions include: University of Oxford, UK, University of

Concepcion, Chile and University of Bio-Bio, Chile. Moreover, department is also actively engaged in other activities like organizing training/nurture programme in mathematics for undergraduate/postgraduate students as well as seminars/workshops by renowned scientist from various parts of the world.

Faculty & Core Research Areas

Head of Department

Sabu N
PhD (University of Madras)
| Partial Differential Equations, Homogenization.

Senior Professor, Dean (Research& Development and Students Welfare)

Raju K George
PhD (IIT, Bombay)
| Mathematical Theory of Control, Machine Learning, Industrial Mathematics

Professors

Anilkumar C V
PhD (CUSAT)
| Nonlinear Dynamics and Chaos, Time series Analysis.

Subrahamanian Moosath K S
PhD (University of Hyderabad)
| Differential Geometry and Applications.

Associate Professors

Deepak T G
PhD (CUSAT)
| Probability theory and Stochastic processes.

Kaushik Mukherjee
PhD (IIT, Guwahati)
| Numerical Analysis of Singularly Perturbed Differential Equations.

Prosenjit Das
PhD (Indian Statistical Institute, West Bengal)
| Commutative Algebra and its applications to Affine Algebraic.

Sarvesh Kumar
PhD (IIT, Bombay)
| Computational Partial differential equations, finite element methods, finite volume methods, virtual element methods.

Natarajan E
PhD (IIT, Madras)
| Numerical analysis.

Sumitra S | Machine Learning and Data Mining.
PhD (Sheffield University, England)

Assistant Professors

Sakthivel K | Control and Inverse Problems of Partial Differential Equations
PhD (Bharathiar University, Coimbatore)

Laboratory Facilities

Programming Lab

Soft Computing Lab

The following laboratory facilities are available to support the teaching programme for the undergraduate students of IIST and the M.Tech students of the department of Mathematics, IIST.

- Programming Lab

- M.TechSoftcomputing Lab

The detailed information about the above mentioned Labs are furnished below:

Programming Lab

- 50 Desktop Computers with Internet facility.
- Dual Operating Systems (Windows and Linux).
- C, C++, MATLAB courses.

Soft Computing Lab

- 10 Desktop Computers with Internet Facility.
- 4 High-end Workstations, 8 Core Xeon Processor with 80 GB RAM, 2.4 Ghz Speed, 20MB Cache, NVIDIA Quadro K4200 Graphics and 24 inch LED Monitor.

Artificial Neural Networks, Pattern recognition and Machine Learning, Modelling and Simulation Lab courses.

2.7 DEPARTMENT OF PHYSICS

IN NUMBERS

13 Faculty Members
22 Research Scholars
11 M Tech Students
08 Laboratory/Technical Staff

The Department of Physics offers a five-year dual-degree programme where the students receive a B.Tech. in Engineering Physics and a Master of Science in Solid State Physics or Master of Technology in Optical Engineering. The department also offers independent M. Tech. programmes in Solid State Technology and in Optical Engineering. The members of the department are actively involved in research in diverse areas of phyiscs, which is supported by a flourishing Ph. D. programme.

Faculty & Core Research Areas

Head of Department

Umesh R Kadhane | Atomic and Molecular Physics.
PhD (Tata Institute of Fundamental Research, Mumbai)

Senior Professor

Narayanamurthy C S | Applied and Adaptive Optics.
PhD (IIT, Madras)

Associate Professors

Apoorva Nagar | Nonequilibrium Statistical Mechanics and Biological Physics.
PhD (Tata Institute of Fundamental Research, Mumbai)

Kuntala Bhattacharjee | Experimental condensed matter physics.
PhD (Institute of Physics, Bhubaneshwar)

Jinesh K B
PhD (University of Twente, Netherlands) |Semiconductor and device physics.
PhD (Leiden University, Netherlands)

Murugesh S
PhD (Institute of Mathematical Sciences, Chennai) | Nonlinear dynamics: Integrable systems and solitons. Applications to spintronics.

Solomon Ivan J
PhD (Institute of Mathematical Sciences, Chennai) | Classical Optics, Quantum Optics, Quantum Information.

Sudheesh Chethil | Quantum Information, Quantum Optics and Nonlinear Dynamics.
PhD (IIT, Madras)

Assistant Professors

Asok Kumar | Experimental Quantum Optics
Physical Research Laboratory, Ahmedabad

Dinesh N Naik | Spectrally resolved incoherent holography for space based imaging.
PhD (The University of Electro-Communication, Tokyo)

Jayanthi S | Nuclear Magnetic Resonance, pulse sequence development and applications.
PhD (IISc, Bangalore)

Naveen Surendran | Condensed matter theory.

PhD (Institute of Mathematical Sciences, Chennai)

Sourin Mukhopadhyay
PhD (Tata Institute of Fundamental Research, Mumbai)

| Spectroscopic studies on correlated electrons systems.

Laboratory Facilities

Atomic and Molecular Physics Lab

Modern Physics Lab

Applied and Adaptive Optics Lab

Electronic Materials and Devices Lab

Space-Technology Innovations Lab

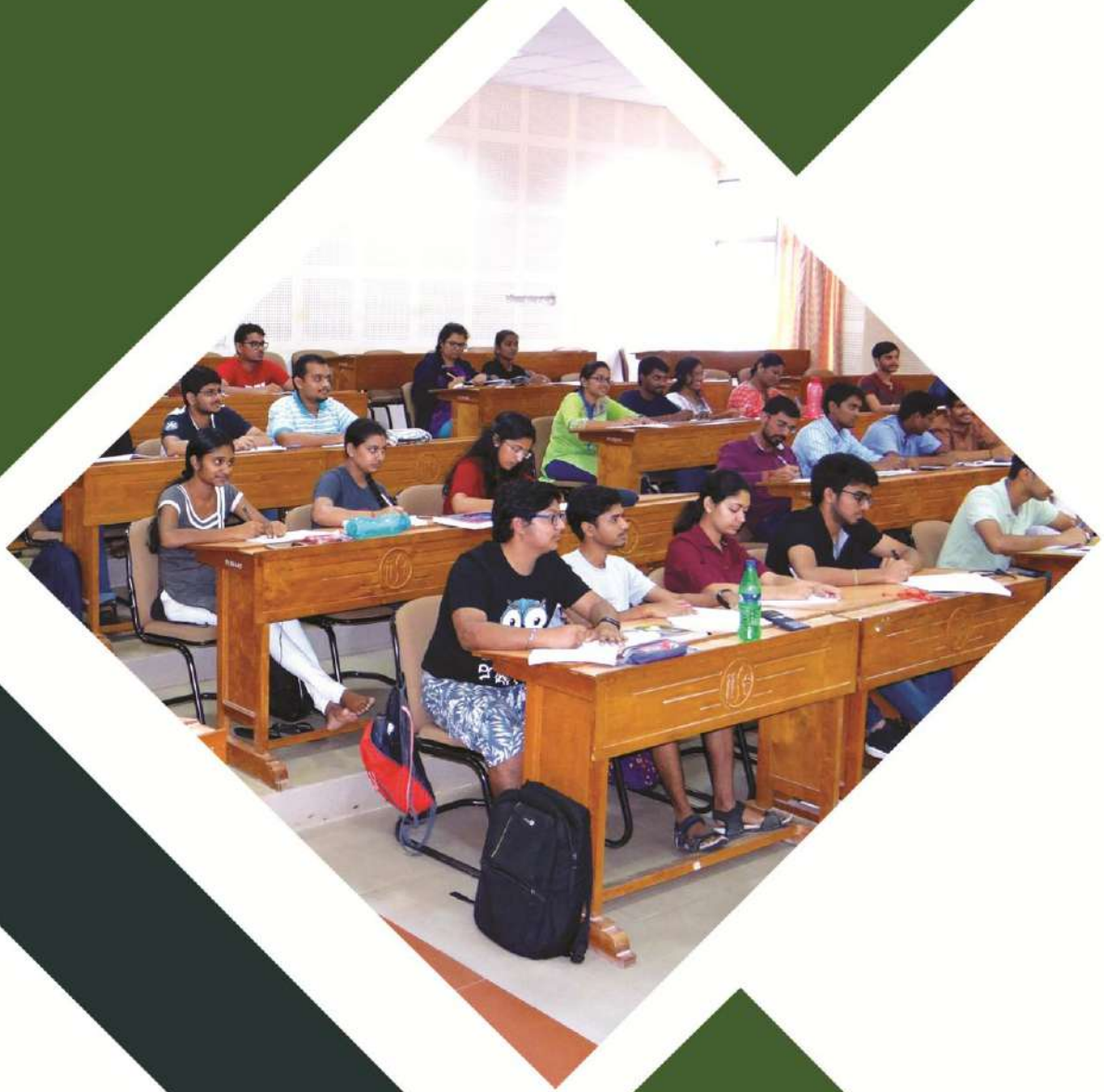
Solid State Technology Lab

Electric Propulsion Diagnostic Lab

The following laboratories with state-of-the-art facilities support the research and teaching programmes of the department.

- Applied and Adaptive Optics
- Atomic and Molecular Physics
- Computational Physics
- Electronic Materials and Devices (EMERALD)
- General Physics
- Lasers and Photonics
- Modern Physics
- Optics
- Solid State Technology Lab
- Space technology Innovations and Characterization Lab
- Electric Propulsion Diagnostic Lab

ACADEMIC PROGRAMMES



3 . ACADEMIC PROGRAMMES

This Chapter presents details of the courses offered at UG and PG levels, student enrolment, degrees awarded in the 6th Convocation and student placements. Students of two undergraduate programmes, fifteen postgraduate programmes, and the doctoral students were graduated in this convocation. Currently, institute offers two undergraduate programmes, four Dual Degrees, fifteen post-graduate programmes, and full-time/part-time Ph.D.programmes. The undergraduate program comprises of BTech in Aerospace Engineering and BTech in Electronics and Communication Engineering (Avionics), each with 60 seats annually and a Dual Degree program with BTech in Engineering Physics with 20 seats. Students of the Dual Degree programme spend an additional fifth year to acquire Master of Technology degree in Optical Engineering or Earth System Science, or Master of Science in Astronomy & Astrophysics or Solid-State Physics.

3.1 ADMISSION

The following are the enrolment details of the undergraduate programmes offered by the institute and for the year 2018-19

UG Programme	General	OBC	SC	ST	PD General	PD OBC
Aerospace Engineering	30	16	9	5	0	0
Electronics and Communication Engineering (Avionics)	30	16	10	4	0	0
Dual Degree	9	5	3	2	1	0

The Institute currently offers 15 Master of Technology/Master of Science programmes. Admissions to the programmes are based on the performance in national level examinations such as GATE or JEST, followed by an interview. Category-wise details of students admitted during the reporting period across various M.Tech and Master of Science Programmes of IIST are as follows:

Admission 2018-2019							
Sl.No.	Name of the M.Tech. and Master of Science Programme	Gen	OBC	SC	ST	Sponsored from DOS/ISRO	Total
1	Thermal and Propulsion	3	1	1	1	2	8
2	Aerodynamics and Flight Mechanics	3	2	1	0	0	6

3	Structures and Design	2	2	1	0	1	6
4	RF and Microwave Engineering	2	2	0	0	0	4
5	Digital Signal Processing	3	2	0	0	0	5
6	VLSI and Microsystems	3	1	1	1	0	6
7	Control Systems	3	1	1	1	1	7
8	Power Electronics	2	2	1	0	1	6
9	Machine Learning and Computing	3	1	1	0	0	5
10	Materials Science and Technology	3	1	0	0	2	6
11	Earth System Science	3	0	1	0	0	4
12	Geoinformatics	3	2	1	0	2	8
13	Astronomy and Astrophysics	3	0	0	0	0	3
14	Optical Engineering	3	0	0	0	0	3
15	Solid State Technology	0	0	0	0	0	0
Total		**39**	**17**	**9**	**3**	**9**	**77**

Doctoral Programmes

To enhance research output, the institute continues to strengthen Ph.D.programme. Admissions were held in January and July based on test and interview and is restricted to those candidates who qualified GATE/UGC/CSIR NET-JRF/JEST or equivalent exams. During this period, 52 students registered for Ph.D., the details of which are given below:

Department	**Full Time**	**Part-Time**	**Total**
Aerospace Engineering	6	1	7
Avionics	16	2	18
Chemistry	3	3	6
Earth and Space Sciences	8	0	8
Humanities	3	1	4
Mathematics	1	1	2
Physics	7	0	7
Total	**44**	**8**	**52**

3.2 SUCCESSFUL COMPLETION DETAILS OF ACADEMIC PROGRAMMES

111 BTech students and 63 MTech students passed out in the Academic Year 2017-18. There was no passing out batch of the dual degree programme during this year.

3.2.1 B.Tech

Degree	Discipline	Number of Students Passed out
Bachelor of Technology	Aerospace Engineering	54
	Electronics and Communication Engineering (Avionics)	57

3.2.2 M.Tech/Master of Science

Degree	Discipline	Number of Students Passed out
Master of Technology	Aerodynamics and Flight Mechanics	2
	Structure and Design	5
	Thermal and Propulsion	2
	Control Systems	3
	Digital Signal Processing	6
	Power electronics	4
	RF and Microwave Engineering	4
	VLSI and Microsystems	3
	Material Sciences and Technology	6
	Earth System Science	3
	Geoinformatics	5
	Machine Learning and Computing	5
	Optical Engineering	5
	Solid State Technology	5
Master of Science	Astronomy and Astrophysics	5
Total		**63**

3.2.3 Ph.D. Thesis accepted / published (16)

16 students had completed their Ph.D.programme and successfully defended their thesis during the report period.

1 **ManjunathaGaniga**
Synthesis, Photophysical Studies and Chemical Sensor Applications of Luminescent Carbon Dots.
Department: Chemistry / Guide: Dr. Jobin Cyriac / Defense on: 14/05/2018

2 **Shaik Latheef Ahmed**
Studies of Multi- functional Printed and Dielectric Resonator Antennas using Split Ring Reasonators and Metalic Structures.
Department: Avionics / Guide: Dr. Chinmoy Saha/ Defense on: 28/05/2018

3 **Abhishek Chakraborty**
On the Evolution of Finite Sized Complex Networks.
Department: Avionics / Guide: Dr. B. S. Manoj / Defense on: 24/05/2018

4 **Sachin P C**
The Study of Diffuse Warm-Hot Gas Using Quasar Absorption Line Spectroscopy.
Department: ESS/ Guide:Dr. Anand Narayanan/ Defense on: 31/05/2018

5 **Swagat Ranjan Das**
Observational Studies of Galactic Star-Forming Regions.
Department: ESS / Guide: Dr. Anandmayee Tej /Defense on: 01/06/2018

6 **Veena V S**
IRDCs to Star Clusters: In Depth Study of the Structures, Evolution and Kinematics of Few Southern Massive Star Forming Regions.
Department: ESS / Guide: Dr. Sarita Vig / Defense on:01/06/2018

7 **Jayalekshmi N. S**
Constructing India: Cultural Identity and Politics of Representing Shashi Kapoor in the Select Merchant Ivory Filims.
Department: Humanities/ Guide:Dr. Babitha Justin/ Defense on: 28/06/2018

8 **Lavanya J**
Controlled Aggregation of Graphene Nanostructures Using Novel Functionalization Techniques and their Application in Electrochemical Biosensors.
Department: Chemistry/ Guide: Dr. Gomathi N/ Defense on: 26/06/2018

9 **Deepak M**
Frequency Regulation in Conventional, Deregulated and Wind Integrated Power Systems.

Department: Avionics / Guide: Dr. Rajesh Joseph Abraham / Defense on: 18/06/2018

10 **Rakesh. R**
Computation Assisted De Novo Design and Development of Combinatorial Flurophore Library for Theranostics.
Department: Chemistry/ Guide:Dr. K. G. Sreejalekshmi /Defense on: 25/06/2018

11 **Pooja Dutt**
Weak Stability Boundary Transfers to Moon and Mars.
Department: Mathematics / Guide: Prof. Raju K. George / Defense on: 06/07/2018

12 **Dibyendu Adak**
Virtual Element Method for Time Dependent Problems on Polygonal Meshes.
Department: Mathematics / Guide: Dr. E. Natarajan / Defense on: 06/07/2018

13 **Sabu M**
ICT Tools Diffusion, Determinants, and its Economic Performance on Small-Scale Motorised Fishing Boats in Kerala: A Case Study.
Department: Humanities / Guide:Dr. C. S. Shaijumon / Defense on: 04/02/2019

14 **Shiju. S. S**
Formulation of Multiple Kernel Learning using Composite Architectures.
Department: Mathematics / Guide: Dr. Sumitra S. Nair / Defense on: 14/02/2019

15 **Sam K Zachariah**
Hybrid State Driven Autonomous Control for Planar Bipedal Locomotion.
Department: Avionics/ Guide: Dr. Thomas Kurian/ Defense on:01/03/2019

16 **Vijayakumar**
Studies on Controllability of Dynamical Systems with Impulses and Time-Delay Controls.
Department: Mathematics/ Guide:Prof. Raju K. George / Defense on 29-03-2019

3.3 CONVOCATION

The 6thConvocation of IIST was conducted on July 18, 2018, at Dr. Srinivasan Auditorium in VSSC premises. The Chief Guest of the day was Prof. K VijayRaghavan, Principal Scientific Adviser to GOI and the ceremony was presided over by Dr. B. N. Suresh, Honourable Chancellor, IIST. During the convocation, 111 BTech students, 63 MTech students and 19 Ph.D.students were received their respective degrees. Institute medals were given to the best academic performers; the toppers of the undergraduate and post-graduate programmes. Separate cash awards were given to

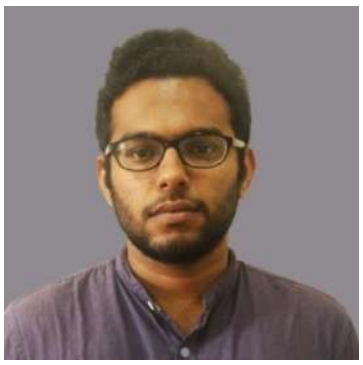
best all-rounder among the two BTech stream andthe topper in the B Tech. Aerospace Engineering.

Dignitaries on the stage during convocation

Dr. V K Dadhwal, Director and Chairman, BoM, IIST in his welcome speech elaborated on the achievements of IIST over the past one year in various fields. In his convocation address, Chief Guest Prof. K VijayRaghavan, the Principal Scientific Advisor to Government of India, has congratulated all the graduating students and elaborated on the creative role played by DOS/ISRO in nation building especially in telecommunications, navigation, meteorology, remote sensing, agriculture, disaster management, healthcare and education over several years. He praised IIST model as unique in this country as deserving students admitted to its UG program receive full financial support and then join in ISRO. Dr. K Sivan, Chairman ISRO, and Chairman, Governing council IIST, congratulated all the graduating students and their proud parents. He elaborated the challenges awaiting in ISRO and mentioned about the importance of nation building.

Institute Medals of Excellence

Mr. Prashant G Iyer
Best Academic Performer for Undergraduate Programmes



Mr. S Gokul
Best Academic Performer for Postgraduate Programmes

Cash awards

Mr. M R Srivatsa
B.Tech in Aerospace Engineering
Best All-Rounder

Mr. Padmanabha Prasanna Simha
B.Tech in Aerospace Engineering
Topper in B.Tech in Aerospace Engineering

3.4 PLACEMENT

All students who have completed their BTech programme in IIST with a CGPA of 7.5 are absorbed in the different centres of ISRO. Other BTech and MTech students are placed through the placement of IIST.

3.4.1 ISRO Placement for BTech

Out of successful B.Tech students, 69 (out of 108 conferred degrees) were offered placement in ISRO in 2018.

ISRO/ DoS absorption data (2011-2018)

Year	AE	AV	PS	Total
2011	41	54	22	117
2012	42	52	30	124
2013	39	54	29	122
2014	35	43	26	104
2015	44	45	13	102
2016	43	39	21	103
2017	39	42	23	104
2018	36	33	-	69
Total	**283**	**329**	**164**	**845**

3.4.2 Non-ISRO Placement for UG, PG & Others

List of Students placed Through IIST Placement cell

B.Tech Batch (2015-2019) and M.Tech Batch (2017-2019)

Sl No	Name of the Student	Course	Company
B.Tech			
1	Sai AvinashSattiraju	Avionics	M/s Subex Ltd
2	Kalpita Mandal	Avionics	M/s Subex Ltd
3	Rohit Gandikota	Avionics	M/s Subex Ltd
4	Aditya Krishnan	Avionics	M/s Subex Ltd
5	Kumari Pooja	Avionics	M/s Subex Ltd
6	Sai Ram Kakumanu	Avionics	M/s Subex Ltd
7	Pratik Wankhede	Avionics	M/s ESSI Integrated Pvt Ltd
8	Pratabidya Panda	Avionics	M/s Mahindra & Mahindra
9	Ramanan J	Avionics	M/s Mahindra & Mahindra
10	Manasvi G	Avionics	M/s SatSure Analytics
11	SanjuthaIndrajit	Avionics	M/s SatSure Analytics
12	Shravan Kumar	Avionics	M/s Mahindra & Mahindra
M.Tech			
1	Silpa V S	Machine Learning & Computing	M/s Tata Consultancy Services
2	Anju Sebastian	VLSI & Microsystems	M/s Cypress Semiconductors
3	Soumya Sara John	Digital Signal Processing	M/s Flytxt
4	Adarsh K	Machine Learning & Computing	M/s Flytxt

5	Navneet Agarwal	Machine Learning & Computing	M/s Subex Ltd
6	Anagha P	Geoinformatics	M/s Subex Ltd
7	PiruthviChendur P	Control Systems	M/s Agnikul Cosmos
8	Neethu M	Control Systems	M/s Agnikul Cosmos
9	Neethu M	Power Electronics	M/s Delta Electronics
10	Arpita	Power Electronics	M/s Delta Electronics
11	Hari Krishna	Power Electronics	M/s Delta Electronics
12	Archit Asthana	Power Electronics	M/s Delta Electronics
13	Shubham Agarwal	Geoinformatics	M/s Quantela Technologies
14	Jitendra Kumar Kushwaha	Machine Learning & Computing	M/s SatSure Analytics
15	Neeraj Varma	Geoinformatics	M/s SatSure Analytics
16	Jalluri Chaitanya	Geoinformatics	M/s Climate Connect Ltd
17	Siraj Un Nabi	Geoinformatics	M/s Climate Connect Ltd
18	Jayakrishnan K U	Earth System Science	M/s Climate Connect Ltd
19	Shahan K	VLSI & Microsystems	M/s Ignitarium
20	Vijaya Kumar S	VLSI & Microsystems	M/s Ignitarium
21	Animesh Kumar	Machine Learning & Computing	M/s Innovation Incubator
22	Ramdeep T N	Control Systems	M/s Mercedes Benz
23	SaikatBhowmick	Control Systems	M/s Mercedes Benz
24	Ashwin Ashok	Thermal and Propulsion	M/s Bellatrix Aerospace
25	Swathi VV	Thermal and Propulsion	M/s Bellatrix Aerospace

RESEARCH & DEVELOPMENTS


IIST/PEL

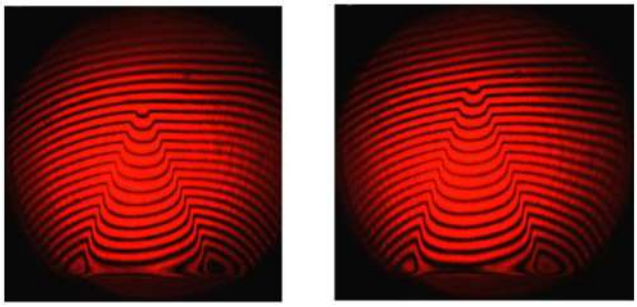
4. RESEARCH & DEVELOPMENTS

Research & development in various areas of space science, space technology and its applications as well as related areas of basic science and relevant humanities topics is undertaken at IIST through its faculty, visiting researchers and collaborators, post-doctoral fellows and project-funded junior research fellows and project engineers. The R&D ecosystem is strongly supported by PhD scholars as well as PG and UG students in their project/internship semesters. While majority of research is funded from the institute, faculty are encouraged to obtain competitive research grants from funding agencies as well as consultancy project funds from ISRO and other industries. This is managed under Dean (R&D) through a institute level Research Council.

During its twelve years of growth, IIST has developed good number of research laboratories, and centers of excellence. IIST constantly enhances its research facilities, by procuring and developing several innovative and ground breaking technologies. Research scholars and teachers are actively involved in research, and this is evident in the increase in number of patents, publications and in their research output. To nurture a research culture among students and teachers, it provides financial support to participate in conferences, workshops, and seminars.

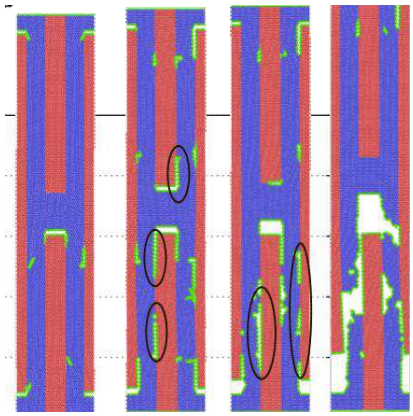
4.1 SNAPSHOTS OF RESEARCH

Department of Aerospace Engineering



Mach Zehnder Interferrometry was used to measure the flame temperature of premixed methane air flames. It is a non intrusive technique. It consisted of continuous Helium Neon laser (632.8 nm), beam expander and CCD camera (30 Hz). Fringes were recorded in the absence and presence of flame. Fourier transform applied to remove noise in both images respectively. Inverse Fourier transform was applied to obtain the phase data of both images.Phase difference was estimated. Phase unwrapping was done using Goldstein method. Either fringe counting method or Abel inversion was used to obtain refractive index from phase difference information. Then flame temperature was estimated using Lorentz-Lorenz or Gladstone-dale equation.

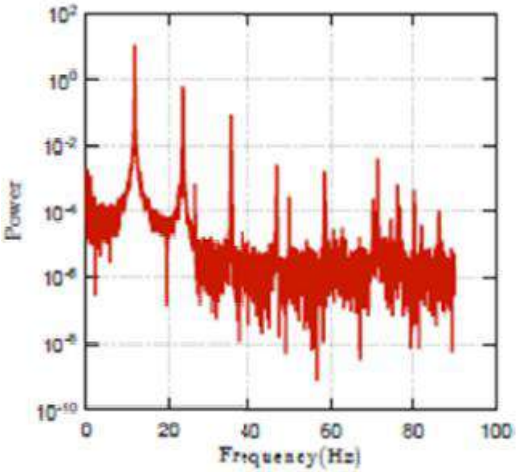
A. A. Konnov, A. Mohammad, V. RatnaKishore, N. I. Kim, **C. Prathap** and S. Kumar. (2018). A comprehensive review of measurements and data analysis of laminar burning velocities for various fuel+air mixtures. Progress in Energy and Combustion Science 68, 197-267.



A model of a bio-inspired composite is simulated employing molecular dynamics (MD). A simple LJ potential is used to model the interaction between atoms. The deformation mechanisms, size effects and way in which overall mechanical properties vary with respect to various parameters are studied. The ways in which bio-inspired composites achieve excellent properties were also studied by Molecular Dynamics, Analytical and FE methods.The type of structural arrangement influences the deformation mechanisms such as bulk matrix plasticity and platelet pullout. The knowledge gained from this study paves new way for the development of bio-inspired ceramic-matrix composites with improved mechanical properties.

Mathiazhagan, S., & **Anup, S.** (2019). Effect of interface strength on the mechanical behaviour of bio-inspired composites: A molecular dynamics study. *Mechanics of Materials*, *132*, 93-100.

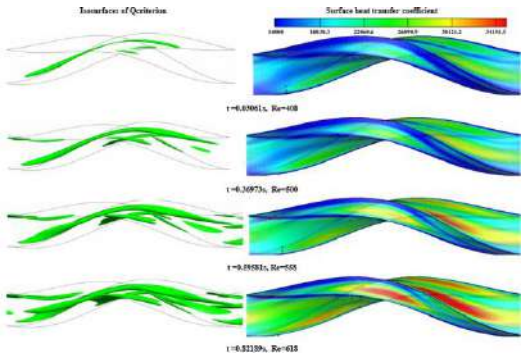
When the globally unstable jet flames (circular and elliptic) are excited near the fundamental frequency, both flames get locked into forcing frequency through quasi--periodic state with increase in forcing amplitude. However, if the forcing is away from the natural frequency, the flame gets in to quasi-periodic state but never gets locked with the forcing frequency in the range of forcing amplitude studied in this work.



PriyDevvrat Singh, **B.R. Vinoth, Mahesh S**, (December, 2018) Acoustic Excitation of self- excited Elliptic JetDiffusion Flame, National Propulsion Conference (NAPC 2018), IIT Kharagpur

---

Numerical simulation of three dimensional laminar incompressible flow through a novel sinusoidal rectangular channel with progressive twist has been performed for various flow rates and heat transfer condition. Twisted wavy channels offer better heat transfer performance than sinusoidal wavy for all levels of flow rates and thermal boundary conditions analysed in the study. Asymmetry of flow and enhanced mixing of fluid streams are found to be the major reasons for enhancement of heat



transfer. Analysis of flow structures and their effects show that spatially periodic formation of an asymmetric corner vortex and its amplification helps to maintain higher heat transfer coefficient.

Fahd Bin Abdul Hasis, P.M. Mithun Krishna, G.P. Aravind, **M. Deepu, S.R. Shine**. (2018). Thermo hydraulic performance analysis of twisted sinusoidal wavy microchannels. International Journal of Thermal Sciences 128, 124–136.

The current research focuses on Scramjet combustion, model burners for aero-engine applications and the development of sensors for combustion applications using Tunable Diode Laser Absorption Spectroscopy (TDLAS). In addition, Thermal power generation where the efforts are concentrated in the development of clean combustion systems is also a focus area. A novel, ultra-lean, non-premixed, and swirl stabilized model GT burner (IIST-GS1) is developed and the current efforts are aimed at understanding the flame stabilization mechanism and pollutant emissions at different burner operating conditions.

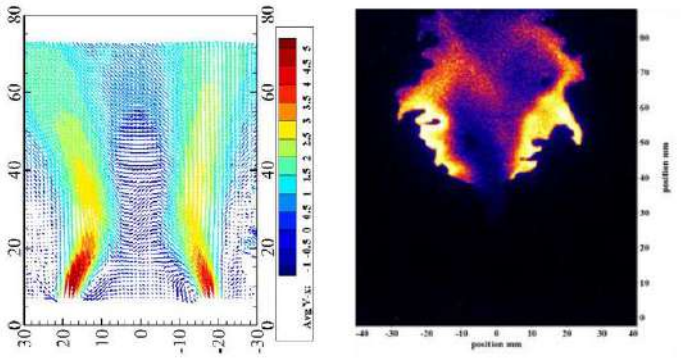
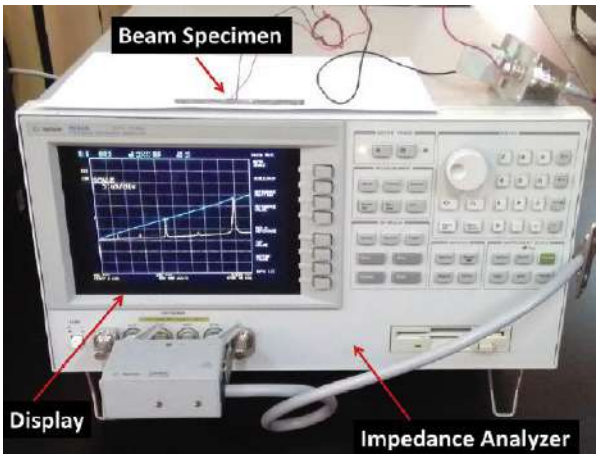


Figure: Laser diagnostic measurements in a swirl stabilized non-premixed burner (IIST-GS1): Time averaged axial velocity ($V_{ax,avg}$) profile along the axial plane under isothermal conditions (left); Instantaneous OH-PLIF instantaneous image under stoichiometric conditions (right);

Sadanandan, R., Chakraborty, A., Arumugam, V.K., Chakravarthy, S.R. (2018). Optical and Laser Diagnostic Investigation of Flame Stabilization in a Novel, Ultra-lean, Non-premixed Model GT Burner. Combustion and Flame 196, 466-477.

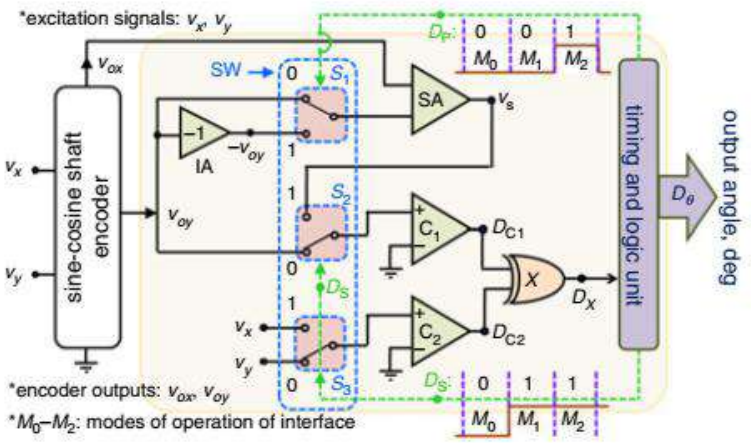
Adhesive bonded structures are gaining attention in engineering and research communities due to their advantages over conventional joining methods. Non-destructive testing and health monitoring of adhesive bonded structures are challenges requiring focused research. Piezoelectric transducers are used for the actuation and sensing purposes in structural health monitoring procedures. These



transducers which are adhesive bonded, get disbonds from the host structure during their service period. Presence of a transducer disbond between the transducer and host structure can be inferred as structural disbond and may produce false alarms. It is necessary that both the types of disbonds are distinguished from each other so that an integrated health monitoring procedure can be developed. This work presents the use of electromechanical admittance technique for the integrated health monitoring of adhesive bonded beams using surface bonded piezoelectric patches.

Rautela, M., **Bijudas, C. R.** (2019). Electromechanical admittance based integrated health monitoring of adhesive bonded beams using surface bonded piezoelectric transducers. International Journal of Adhesion and Adhesives, 94, 84-98

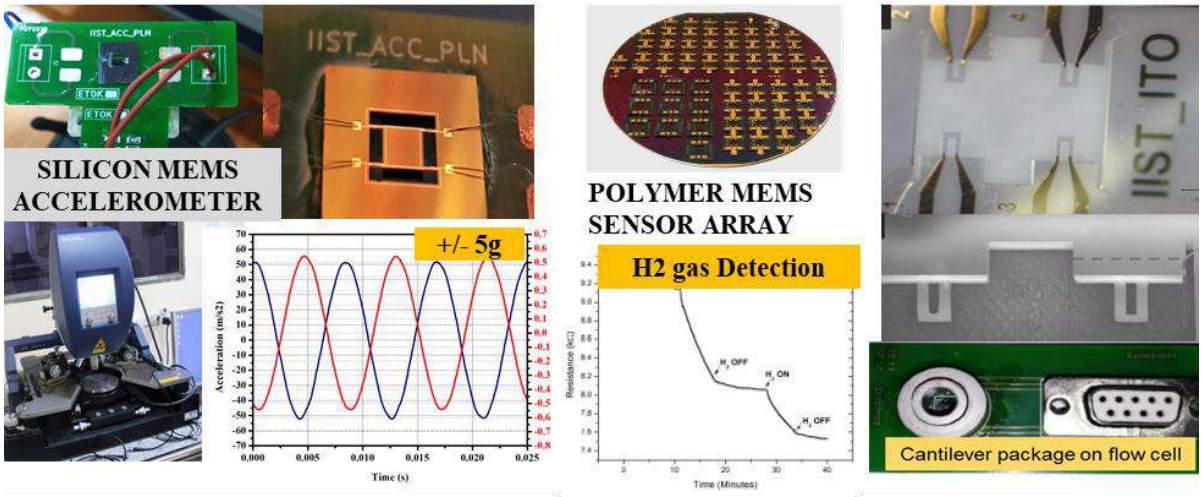
Department of Avionics



Efficient digital front-ends for sinusoidal encoders: The front-ends rendered a linearized solution, compensated for the effect of multiple non-ideal parameters. In particular, the digital high-accuracy interface for sine–cosine shaft encoders offered a simplified solution that has minimal dependence on many circuit non-idealities including the phase error of quadrature oscillator. The performance of the interface is verified using simulation and emulation-based studies. The interface also possesses features such as low-component count, high linearity, direct-digital output etc. The performance of the developed circuit was tested and quantified using multiple experimental studies and shown to be better than the existing works. Other proposed interfacing circuit-based works (for GMR sensors, capacitive-, bio- and resistance-based sensors) was also shown to exhibit excellent performance.

Nandapurkar Kishor Bhaskarrao, **Anoop C. S**., Pranab K. Dutta,(2018) Accurate digital interface with low-component count for sine-cosine shaft encoders, IET Electronics Letters, 54 (25), 1419 - 1420.

Developed low cost polymer MEMS nanomechanical hydrogen sensors with low thermal budget. Work is in progress towards integration of 2-D material based transistors with polymer MEMS for next generation ultra-sensitive sensor platform.

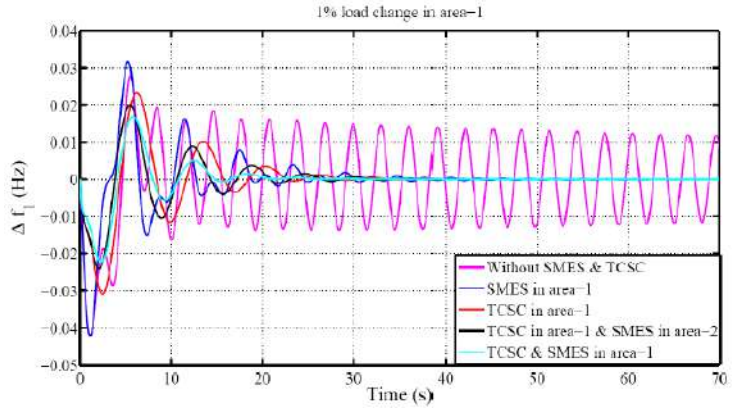


Dr. V Seena, SERB Extra Mural Research Funding.

Micro ring resonator based optical switches are highly promising for future photonic integrated circuits and optical communication systems due to its unique properties such as narrow band filtering, high quality factor, and compactness. These devices support only certain wavelengths called as the “resonant wavelengths” whose value is an integral multiple of the radius of the ring. Our research focuses on ring resonator based optical switches and modulators implemented by using III-V semiconductor material whose spectral response can be altered by changing the absorption or the refractive index of the rings through an external voltage. We focus on understanding the transient behavior of these devices when operated at high speeds. Our research also focuses on designing and developing semiconductor nanostructures that can be used in increasing the light absorption in photovoltaic cells.

K W Park, **Sooraj Ravindran**, Seokjin Kang, Jung-Wook Min, Hyeong-Yong Hwang, Young-Dahl Jho, Yong-Ryun Jo, Bong-Joong Kim, Jongmin Kim, Yong-Tak Lee. (2018). Detailed carrier recombination in lateral composition modulation structure. Applied Physics Express 11(8), 95801

Using a coordinated combination of SMES and TCSC at a time to damp out the low frequency oscillations in frequencies and tie-power following a sudden load perturbation in a multi-source power system has not been attempted so far. The results are compared to those with SMES alone, with TCSC alone and withoutSMES-TCSC combination. Optimum integral gain settings in all the cases are obtained using



integral squared error (ISE) technique and the performance index considered comprises frequency deviations in both areas as well as deviations in inter area tie-linepower flow.

Deepak M**, Rajesh Joseph Abraham.** (2019). Improving the Dynamic Frequency Regulation of a Multisource Power System considering GRC and Deadband with TCSC and SMES. International Journal of Power and Energy Conversion 10(1), 51-75.

A modified Weighted Ensemble Transform Kalman Filter-based data assimilation technique is proposed for accurate flow vector estimation at each pixel directly from satellite generated infrared images of clouds/cyclones. One of the contribution, possibly unique to proposed approach, is in providing forecasts of AMVs and robustness to missing data cases. One of the key abilities of proposed method is in forecasting applications and also for generating motion vectors in the absence of data in real scenarios. Estimated AMVs are validated using state-of-the-art European Centre for Medium-range Weather Forecasting (ECMWF) analysis data. The results obtained demonstrate the efficacy of proposed method over other existing methods.

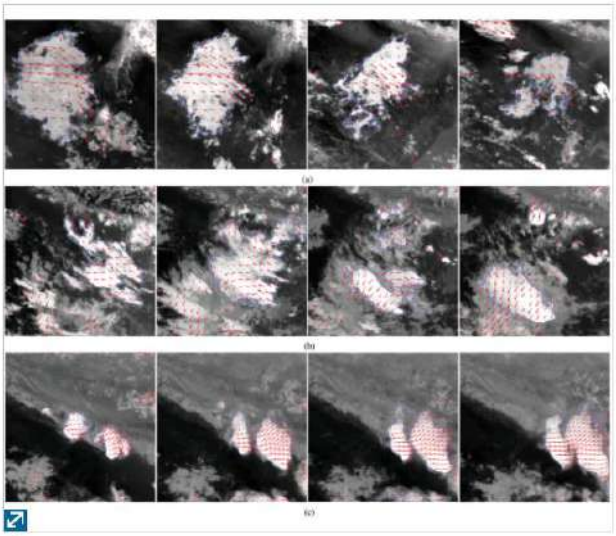
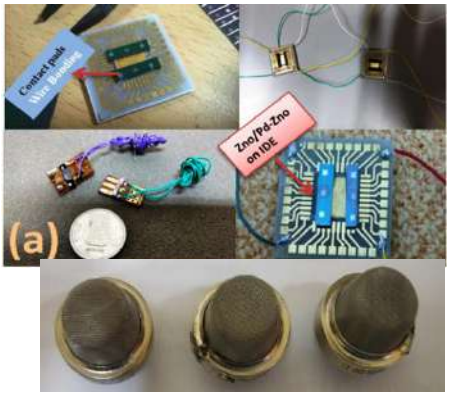


Fig. 7.
(a) Estimated AMVs for sequence of cloud images on June 12, 2014 using mWETKF. (b) AMVs demonstrating splitting of clouds on June 27, 2014. (c) AMVs indicating merging of clouds on June 9, 2014.

K. Mounika, **S. Rani J, G. Kutty** and S. S. R. K. Gorthi,(2019) Consistent Robust and Recursive Estimation of Atmospheric Motion Vectors From Satellite Images,*IEEE Transactions on Geoscience and Remote Sensing*, vol. 57, no. 3, pp. 1538-1544**.**

The group worked on the research in the development of nano technology-based gas sensors and biosensors. The availability of gas sensors suitable for space applications is very limited. In this context, our group is trying to investigate low weight, high performance nanostructure gas sensor array on flexible substrate at room temperature

Working actively with IPRC to develop the suitable H_2 sensor for leak detection and it has demonstrated superior performance as compared to the available sensor in the market. The validation and signal processing is going on with IPRC. The phase 1 of this project completed successfully. The phase 2 initiated jointly with IPRC.

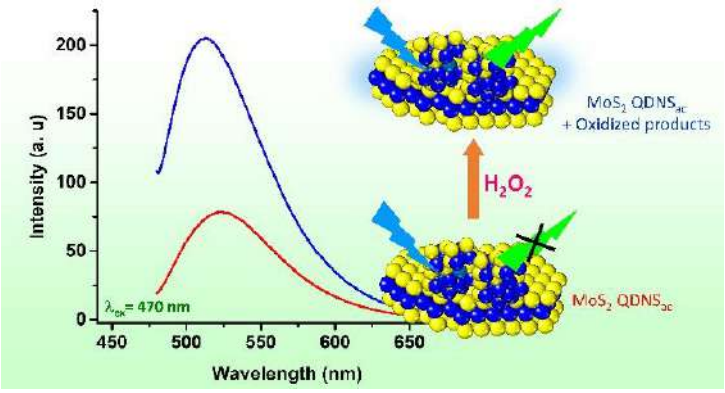


Dr. Palash Basu, Project sponsored by IPRC, DoS

Department of Chemistry

The growing environmental and health concerns necessitates the development of a simple, reliable, sensitive and selective detector for mercury. Conventional Hg^{2+} detection methods are time consuming and require expensive instrument and highly precise and tedious sample preparation. Fluorescence nanosensors have advantages of rapid response, simplicity, high sensitivity and selectivity towards the detection of Hg^{2+}. Fluorescence based detection of Hg^{2+} ions using CdTe quantum dots performs as both signalling and analyte specific material.

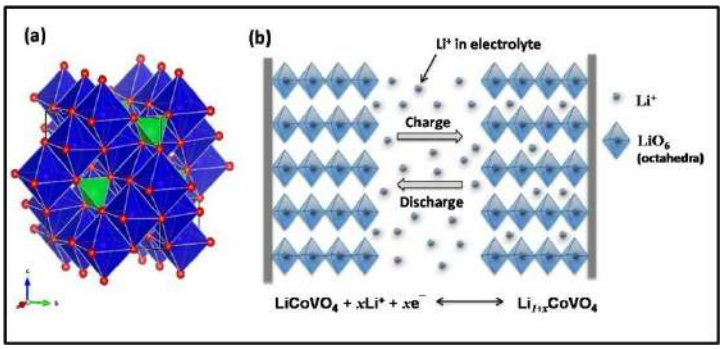
YS Choudhary, **N Gomathi,**(2019) Branched mercapto acid capped CdTe quantum dots as fluorescence probes for Hg2+ detection, Sensing and Bio-Sensing Research, 23, 100278



We have developed a fluorescence strategy for the detection of H_2O_2 and indirect detection of glucose with high selectivity and sensitivity. MoS_2nanohybrid material composed of MoS_2 QDs dispersed over MoS_2nanosheets (MoS_2 QDNS) was prepared by a facile hydrothermal synthetic route in the presence of NaOH. The PL of MoS_2QDNS$_{ac}$ recovered in the presence of H_2O_2. In the presence of GOx, the

$MoS_2QDNS_{ac}$was found to be highly specific towards the detection of glucose over other saccharides

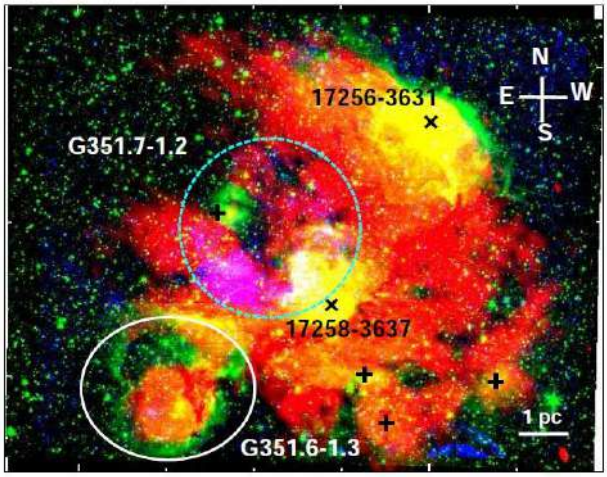
Neema PM, **JobinCyriac.** (2019). pH-sensitive response of a highly photoluminescent MoS_2nanohybrid material and its application in the nonenzymatic detection of H_2O_2. Analytical and Bioanalytical Chemistry, 1-8



Intercalation pseudocapacitance has been recognized as a new class of capacitive charge storage mechanism in crystalline metal oxides, in which Li^+ intercalation is extended to the bulk crystalline framework of the material. Recently, we reported the Li^+ storage via intercalation pseudocapacitive property of nanocrystalline inverse spinel $LiCoVO_4$ in aqueous electrolyte benefited from its small crystallite size with highly exposed Li^+ selective crystallographic pathways towards electrolyte.

Haritha H., Reshma C. and **Mary Gladis J.** (2018). Micro- and Nanocrystalline Inverse Spinel LiCoVO4 for Intercalation Pseudocapacitive Li+ Storage with Ultrahigh Energy Density and Long-Term Cycling. ACS Applied Energy Materials 1(2), 393-401.

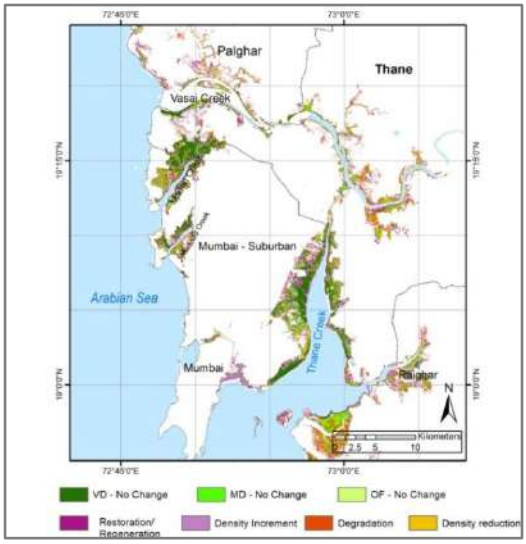
Department of Earth and Space Sciences



A supernova remnant (SNR) candidate was detected for the first time using low frequency wide band radio observations (300 – 500 MHz) of the star forming complex G351.7–1.2. This was observed with the upgraded Giant Metrewave Radio Telescope (uGMRT), India. Combining the radio with the optical, infrared and submillimeter data, we analysed the large scale diffuse radio emission associated with the region that exhibits a broken shell morphology. The spectral index of the emission in the shell is – 0. 8, indicating non-thermal emission. Hα emission that mimics the morphology of the radio shell on a smaller scale was also detected here. Based on the non-thermal emission from the radio shell and the presence of its optical counterpart, we classified G351.7–1.2 as a candidate supernova remnant. A gamma-ray source is located towards the south-west

of the radio shell and could have a possible origin in the interaction between high velocity particles from the SNR and the ambient molecular cloud.

Veena, V. S., **Vig, S.**, Sebastian, B., Lal, D. V., **Tej, A.,** Ghosh, S. K.. (2019). Nonthermal emission from massive star-forming regions: a possible SNR candidate G351.71.2? Monthly Notices of Royal Astronomical Society (MNRAS) 482(4), 4630.

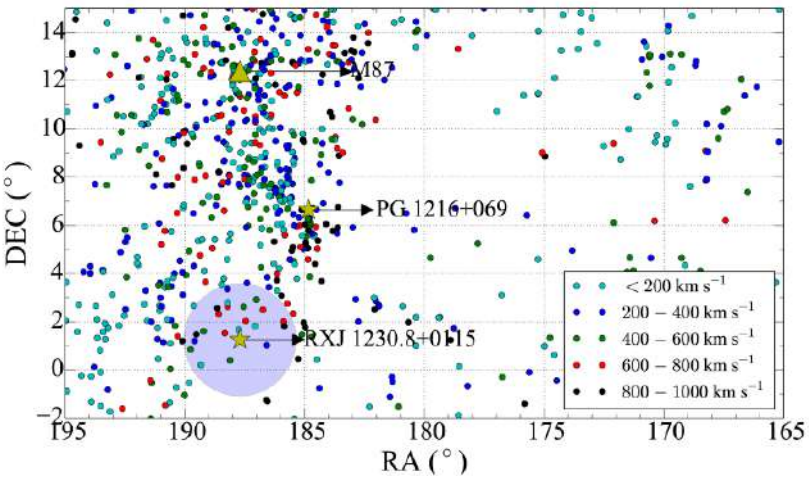


Monitoring the mangrove extent of the state of Maharashtra using Landsat series open satellite data shows the area under mangrove vegetation has increased from 359 sq.km to 444 sq.km with a net increment of 85 sq.km from 2009 to 2017.

Gnanapazhan, Project funded by Department of Forests, Government of Maharashtra

---

Galaxy clusters are the largest gravitationally bound structures in the universe. Nearly all galaxy clusters are pervaded by very hot diffuse plasma at temperatures of ten million Kelvin and higher. It has been suggested that galaxy clusters should also harbor cold gas clouds

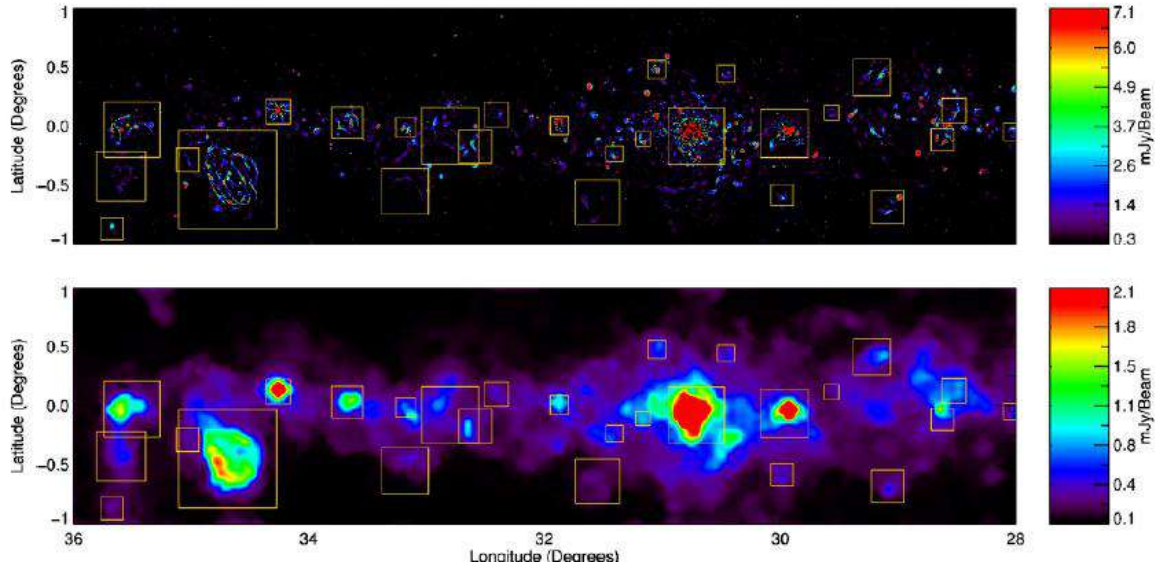


that result from the interplay between galaxies and the hot gas that belong to the cluster. In an attempt to detect such cold gas in galaxy clusters, We undertook a study using the Hubble Space Telescope to search for cold gas clouds in galaxy over density regions. They found out clear evidence for the presence of such gas in nearby cluster environments. The presence of such cold gas is interesting asbulk of gas in galaxy clusters is expected to be shock-heated to very high temperatures. They concluded that the coldclouds could be tracing gas that is stripped off from galaxies that belong to the cluster environment through galaxy-galaxy interactions. The study added a

new level of detail to the ongoing efforts within the astrophysical community to understand the physical state of gas outside of galaxies.

Dr. Anand Narayanan, ESS Depatment

The GLOSTAR (Global View of Star Formation in the Milky Way) survey is a blind survey of theGalactic Plane in the 4 – 8 GHz range of frequencies using the Karl G. Jansky Very Large Array.The data are taken with the telescope being in both D and B configurations in order to get goodresolution along with sensitivity at large angular scales.



Dr. Jagdeep, ESS Dept, GLOSTAR Survey

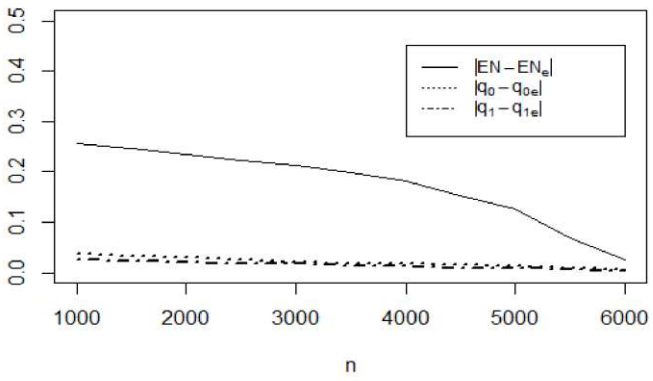
Department of Humanities

The study was conducted to survey and compare across states, the influence of applications of space technology (Telecommunication - Mobile phone, and ISD services, Broadcasting services – DTH, Television - Doordarsan, Business Purposes– Fishery, Banking and Others-Tele education, Tele medicine, Disaster management system (DMS), Village resource centers) in the social and economic life of households in South India. The sample consisted of 6000 households belonging to Kerala (n=750), Telengana (n=500), Puducherri (n=250), Tamilnadu (n=1750), Andhrapradesh (n=1250), and Karnataka (n=1500). It has been found that S&T tools revolutionalized the life of people both personal and socio-economic.

Space Technology and its Penetration into the Socio Economic Space of the Households of India, **Dr.Shaijumon C S and Dr. Lekshmi V Nair,** IIST-ISRO Project

---

Department of Mathematics



We propose a model to study the queueing characteristics of nodes in a wireless network in which the channel access is governed by the well known binary exponential back off (BEB) rule. By offering the general phase type (PH) distributional assumptions to channel idle and busy periods and assuming Poisson packet arrival processes at nodes, we represent the model as a quasi birth death process (QBD) and analyse it by using matrix analytic methods. Stability of the system is examined. Several important queueing characteristics that help in efficient design of such systems are derived. Extensive simulation analysis is performed to establish the validity of our theoretical results. It is shown that both the simulated and theoretical results agree on some important performance measures. Some real life data has been used to get approximate PH representations for channel idle and busy period variates, which in turn are used for numerical illustrations.

Dey, S., & **Deepak, T. G.** (2019). A matrix analytic approach to study the queuing characteristics of nodes in a wireless network. *OPSEARCH*, *56*(2), 477-496.

Exponential family with +-1 - connection plays an important role in information geometry. Amari proved that a submanifold M of an exponential family S is exponential if and only if M is a $\nabla 1$- autoparallel submanifold. We show that if all $\nabla 1$-autoparallel proper submanifolds of a +-1– flat statistical manifold S are exponential then S is an exponential family. Also shown that the submanifold of a parameterized model S which is an exponential family is a $\nabla 1$ – autoparallel submanifold.

Mahesh T V and **K S Subrahamanian Moosath**. (2019). Submanifolds of Exponential Families. Global Journal of Advanced Research on Classical and Modern Geometries 9(1), 18-25.

Current research direction is to develop efficient parameter-uniform numerical methods for time-dependent singularly perturbed parabolic convection-diffusion problems with smooth and non-smooth data, which has application for numerous physical problems in engineering and applied mathematics.

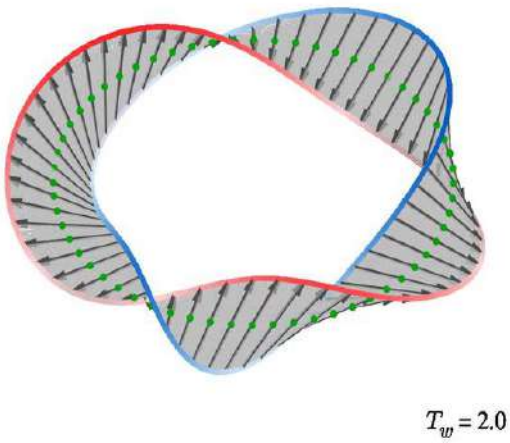
Kaushik Mukherjee and Srinivasan Natesan. (2019). Parameter-uniform fractional step hybrid numerical scheme for 2D singularly perturbed parabolic convection–diffusion problems. Journal of Applied Mathematics and Computing 60(1-2), 51-86.

The current research focus is on the development of discontinuous finite volume method and virtual element methods for the approximation of coupled flow-transport problems, immiscible displacement problems, Stokes equations, nonlinear hyperbolic conservation laws and optimal control problems. Recently, we have design new numerical techniques for the numerical approximation of control problems, and the details of this work are as follows: Fluid control problems are highly important in diverse fields of science and engineering. Recently, with Dr. Ricardo Ruiz-baier, we have introduced a discontinuous finite Volume method for the approximation of distributed optimal control problems governed by the Brinkman equations

Sarvesh Kumar, Ricardo Ruiz-Baier and Ruchi Sandilya. (2019). A priori error estimates for discontinuous finite volume discretizations of the Brinkman optimal control problems. Journal of Scientific Computing 78, 64-93.

Department of Physics

Recently we discovered *knot* soliton solutions to the Non-linear Schrödinger equation (NLSE). The NLSE arises a good approximation in various physical systems: describing the propogation of light in non-linear media, vortex filament motion in inviscid fluids, evolution of a ferromagnetic spin chain, to name a few. Under certain approximations it can also describe the wave function of a Bose Einstein condensate. There exists a clear and exact mapping of the complex field satisfying NLSE to a moving curve in 3-D. Within fairly good limits this curve imitates the motion of a thin vortex filament in fluids or superfluids. We have recently obtained a *breather* soliton solution to the NLSE, whose corresponding curve in 3-D carries a knot. A possible interpretation of these knots in light propogation in non-linear media is explored.



Rahul O R and **S Murugesh.** (2018). Knot soliton solutions for the one-dimensional non-linear Schrödinger equation,. Journal of Physics Communications 2, 55033.

4.2 RESEARCH PROJECTS

IIST support the research of its faculty members through various schemes such as Fast Track projects for newly joined faculty, IIST Projects and IIST-ISRO Projects, coordinated by IIST Research Council headed by Dean (R&D) and Advanced Space Technology Development Cell (ASTDC). The faculty members are also working on projects funded by other external funding agencies such as DST, CSIR and UGC. Currently, 65 research projects are in progress in IIST.

ARIS

An ionospheric probe called Advanced Retarding potential analyser for Ionospheric Studies (ARIS), which measures the prevailing plasma parameters in the ionosphere was scheduled to be launched on the PS4 operational platform on PSLVC45. ARIS was realised under active inter-department R&D by Dr V S Sooraj (Aerospace), Dr Umesh R Kadhane (Physics), Dr C S Anoop and Dr R Sudharshan Karthik (Avionics). Research on this probe for laboratory-based research was going on for several years at IIST. With that experience, IIST is actively working on making payloads for future Mars and Venus missions by ISRO. On the basis of home grown know-how, IIST built a probe specically configured for earth's Ionospheric conditions. The payload was realised and qualified in a very short time of just 49 days. This was possible only due to the combined effort of many faculty, scientists and engineers from IIST, IISU and VSSC. Swift and coordinated actions were taken under the guidance of Prof. Dhekane, Satish Dhawan Professor, IIST and every procedure was expedited by Dr. Y.V.N. Krishna Murthy, Registrar, IIST.

Important highlights of the mission:

1) First ever space mission of IIST and achieved better than expected performance
2) Complete in house knowhow and development
3) Realisation of full hardware in just 49 days
4) Excellent team work across multiple ISRO centres and IIST
5) Multiple innovations in the electronics:
   (a) Current measurement for a high dynamic range (104) for very low currents of 100 nA to 10 pA
   (b) Bias current offset correction for improving accuracy of low current measurement
   (c) High frequency noise/interference rejection implemented in measurement scheme
   (d) Dynamic ranging and scaling of the data acquisition unit
   (e) Hardware was qualified for -20 degrees to +60 degrees Celsius operation

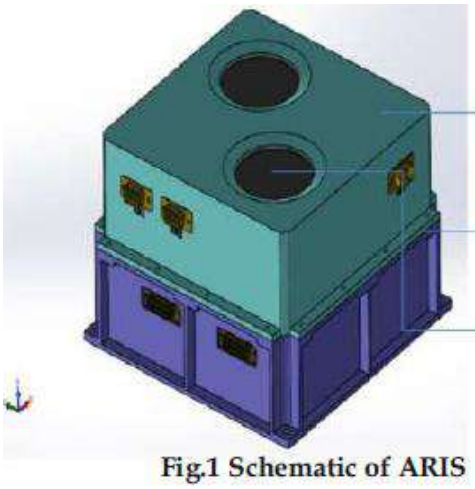


Fig.1 Schematic of ARIS

Fig.2 ARIS payload launched in PSLV C-45 flight

Autonomous Assembly of Reconfigurable Space Telescope (AAReST)

Initiated in 2017, the Autonomous Assembly of Reconfigurable Space Telescope (AAReST) is a collaborative technological development project between Caltech University, USA, University of Surrey, UK and Indian Institute of Space Science and Technology. As part of this, IIST is involved in the development of a Mirror Sat consisting of the following subsystems: Structures, On Board Computer, Electrical Power System, Attitude determination and control system, cold gas butane propulsion system. Furthermore, IIST as part of its responsibilities will be developing the structures for the mirrorsat of University of Surrey. The AAReST mission is expected to be delivered to the launch vehicle by Dec. 2019.

IIST Projects

Sl.No.	Name of the Project	Investigator(s)
1.	Hydrodynamic instabilities in Solid Rocket Motors.	**Dr. Manu K. V**
2.	Intrinsically conducting Polyimide composites with CNT/graphene without compromising optical properties	**Prof. Kuruvilla Joseph**
3.	Reluctance-Hall EffectBbased Through-shaft Angular position Sensors- Finite Element Studies and Development	**Dr. Anoop C. S.**
4.	Development of rapid network stack development tools for internet-of-things operating systems.	**Dr. Vineeth B. S.**
5.	Subsystems for INSPIRE sat 1	**Dr. Priyadarshanam** **Dr. Harsha Simha M. S.**
6.	Mirror Satellite for Autonomous Assembly of Reconfigurable Space Telescope.	**Dr. Priyadarshanam** **Dr. Harsha Simha M. S.**
7.	Electrical Power System for Small-Spacecrafts	**Dr. Sudharshan Kaarthik R**
8.	Decoupled Control Scheme for Dual Permanent Magnet Machine Actuators	**Dr. Sudharshan Kaarthik R**
9.	Development and Analysis of Image Fusion Techniques for Satellite Images	**Dr. Deepak Mishra**
10.	Space Technology and its Penetration into the Socio Economic Space of the Households of India(25 lakhs),	**Dr.Shaijumon C S** **Dr. Lekshmi V Nair**
11.	Assessment of the contributions made by IIST alumni in the ISRO programmes	**Dr. V. Ravi**
12.	Development and analysis of image fusion techniques for satellite images	**Dr. Sarvesh Kumar** (Co-PI)
13.	Electric Propulsion	**Dr. Sourin Mukhopadhyay**
14.	Optical Interferometry based sensor for structural displacement/ deformation measurement of materials.	**Dr. Dinesh Naik**

IIST-ISRO Projects

Sl.No.	Name of the Project	Investigators
1.	Optimisation of regenerative cooling channels of liquid rockets engines.	**Dr. Shine S R** **Mr. J. C. Pisharady**
2.	Simulation of non equilibrium hypersonic flow in a shock tunnel nozzle.	**Dr. Satheesh K.** **Dr. Devendra Ghate** **Dr. K. Srinivasan**
3.	Development of an in-house CFD code for the performance prediction of cryogenic and semi-cryogenic engines.	**Dr. Deepu** **Mr. K. N. Dileep**
4.	Studies on crack propagation in composites by micro Raman spectroscopy	**Dr. Anup S**
5.	Experimental Investigation of Thermoacoustic Instability in Confined Swirl Coaxial Jet Flames	**Dr. Mahesh S.**
6.	Laser Sheet Droplet Sizing for Spray Studies	**Dr. Aravind V.**
7.	Modeling and Development of N2O4 (oxidant used in rocket engines) Scrubber System	**Dr. A. Salih**
8.	Experimental and numerical study of stationary flat flames	**Dr. Prathap C.** Dr. Assiz M P
9.	Experimental investigation of laminar burning velocity of premixed Isrosene/air/oxygen mixtures using freely expanding spherical flames	**Dr. Prathap C.** Dr. Assiz M P
10.	Development of Laser Ignition Systems	**Dr. Jinesh** Dr. C. Prathap
11.	Performance Characterization of cavitating venture	**Dr. Pradeep Kumar P.**
12.	Spaceflight-induced changes in kidney stone formation in Drosophila Melanogaster- Microgravity science payload for Gaganyaan - first development flight	**Dr. K. G. Sreejalekshmi**
13.	Study of Silicon -Polymer Nanofibers as Anode Material for Lithium Batteries	**Dr.K.Y.Sandhya** Dr. Nirmala Rachel James

14.	Development of novel N2O4 scrubber system	**Prof. Kuruvilla Joseph** Dr. S.A. Sali Dr.K. Prabhakaran
15.	Superionic conductor as electrolytes for all solid-state-lithium sulfur batteries	**Dr. Mary Gladis**
16.	N-doped mesoporous carbon-sulphur composite based cathode materials for advanced lithium-sulfu batteries	**Dr. Mary Gladis**
17.	Plasma Functionalized CNT-polymer nanocomposites for Satellite	**Dr. N. Gomathi,** Prof. Kuruvilla Joseph, Dr.C. Gouri
18.	Design and Development of Brushless DC Motor	**Dr. N. Selvaganesan**
19.	Development of MEMS Accelerometer with Ultra-Sensitive Transductions for Space Applications	**Dr. Seena V.**
20.	Retarding Potential Analyser for Electron and Ion concentration measurement in Martian Atmosphere Retarding Potential Analyser for Ionospheric Studie (ARIS 101F) - A scientific payload on PS4 orbital platform onboard PSLV C45	**Dr. Sudharshan Kaarthik R**

ISRO Consultancy/Funded Projects

1.	Spectral Characterization and morphology of Olivine-pyroxene spinel bearing lithologies on Moon: implications for lunar endogenic process.	**Dr. V. J. Rajesh** SSPO/Chandrayaan-I AO
2.	A comprehensive study on crustal dichotomy and extensional tectonics in and around valles marineris, mars	**Dr. V. J. Rajesh** SSPO/MOM-I -AO
3.	Algebraic Multigrid method for solving sparse system	**Dr. E. Natarajan** **Dr. Sarvesh Kumar** VSSC
4.	Advanced Retarding Potential Analyzer for Martian Ionospheric Studies (ARIS)	**Dr. Ambili K. M.** SSPO/MOM
5.	Diagnostic system for testing 300MN SPT	**Dr. Umesh R Kadhane** LPSC
6.	Surface engineering techniques for improving the life performance of ball bearings in ISRO spacecraft mechanisms.	**Dr. Jinesh K. B.** IISU

7.	A Study on the effects of Ionospheric variabilities on the usability of NavIC/GAGAN using observations and models	**Dr. Priyadarshanam** SAC
8.	Development of Surface Discharge Sparkplugs	**Dr. Jinesh K. B.** LPSC
9.	Development of Laser Ignition Systems	**Dr. Jinesh K. B.** LPSC
10.	Development and Implementation of Diagnostic tools for High Thrust Electric Propulsion System	**Dr. Umesh R Kadhane** LPSC
11.	Design and development of High Performance Hydrogen Sensor	**Dr. Palash Kumar Basu** IPRC
12.	Above ground volume/biomass estimation and validation using airborne S- and L-band NISAR data and radiative transfer modelling	**Dr. Rama Rao** (Co-PI) SAC-Ahmedabad

Other External Funded Projects

Sl. No.	Title	Investigators/ Funding Agency
1.	Development of PZT Ceramic Foams.	**Dr. K. Prabhakaran** DRDO
2.	Monitoring the health of mangroves of Maharashtra state using near real time satellite remote sensing data	**Dr. L Gnanappazham** Mangrove Foundation, Dept. of Forest, Govt. of Maharashtra
3.	Integrating air and space borne spectroscopy and laser scanning to assess structural and functional characteristics of crops and field margin vegetation	**Dr. N. Rama Rao, S.** Nautiyal ISEC
4.	Spectral biochemical analysis of forest species using hyperspectral remote sensing – a case study from Eastern Ghats forest ecosystems	**Dr. N. Rama Rao** DST
5.	Development of a standalone atmospheric correction module for hyper spectral data for Indian context	**Dr. N. Rama Rao** DST
6.	Understanding the Physical Conditions of Baryons Outside of Galaxies in the Low Redshift Universe	**Dr. Anand Narayanan** DST
7.	Max Planck Partner Group for Galactic Star Formation	**Dr. Jagadheep D.** Max Planck Institute for Radio Astronomy

8.	Physics of radio Bright Gamma Ray Burst After glows	**Dr. Resmi Lakshmi** SERB (DST)
9.	Deep crustal processes during the evolution of archaean Nilgiri block, southern India	**Dr. Rajesh V J** MoES
10.	Arc accretion in the past and present and its bearing on metallogeny	**Dr. Rajesh V.J.** DST-JSPS India-Japan bilateral project
11.	Improving Operational forecast of SASE using four dimensional variational data assimilation technique	**Dr. Govindankutty M.** SASE (Snow and Avalanche Establishment)
12.	Design and Development of NavIC Receiver	**Dr. Priyadarshanam** SAMEER, Ministry of Electronics & Information Technology
13.	Investigation of Transition Metal Dichalcogenides based Thin filim transistors for Ultra Sensitive nanomechanical Bio/chemical Sensor.	**Dr. Seena V.** SERB (DST)
14.	SERB Women Excellence Award	**Dr. V.Seena** Funding: SERB, DST (Completed Aug 2018)
15.	Investigating the Nanomaterial based Exosome Sensor for Cancer Prognostic: An Approach towards Liquid Biopsy for Cancer	**Dr. Palash Kumar Basu** Dept. Of Biotechnology, Ministry of Science and Technology
16.	LOC approaches for Separation and Analysis of Exosome Derived Biomarker for Cancer Prognostic	**Dr. Palash Kumar Basu** IFCPAR, CEFIPRA
17.	Wireless-Relod- Wireless Reliable , Low Latency Networks for IIoT and Fieldbus replacent	**Dr. Vineeth B. S.** DST-SERB project
18.	To investigate the growth and the local electronic properties of two dimensional stanene on transition metal dichalcogenide (TMDC) and on topological insulator (TI) surface by LEED, STM and STS	**Dr. KuntalaBhattacharjee** UGC-DAE CSR
19.	Study of Dynamics induced by very small amounts of water molecules through Deuterium MAS solid state NMR and molecular dynamic simulation	**Dr. Jayanthi S.** DST

4.3 CENTRES OF EXCELLENCES

Advanced Propulsion and High Speed Flows

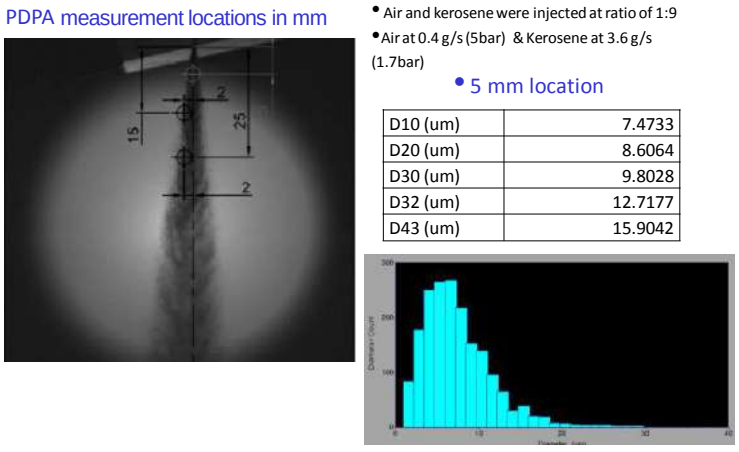
(Department of Aerospace Engineering)

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 compliment ISRO's ongoing technological development activities. In this regard the following ongoing research activities are compiled

As part of the ongoing research activities in academic year 2018-19, the following major studies were carried out:

(i) Liquid injection behind pylon for future scramjet missions. The optimum injectionangle and the pylon height for effective disintegration of the liquid sheet break up into droplets were identified. (ii) Passive suppression of aero-acoustic noise supersonic cavity flow by effectively implementing plated subcavities that resulted in an OASPL reduction of around 10 dB. (iii) Characterization of heated jet injected at chamber conditions that varied from sub critical to supercritical. This is performed to mimick the behavior of supercriticail injection of hydrogen into the rocket combustion chamber (iv) Annular liquid film characterization using PLIF visualization. This can be extended to optimize the performance of liquid film cooling in rocket engines.

One of the activities involved the characterization aerated kerosene injector for scramjet combustion. This was based on the request from VSSC and the details of the tests are briefly discussed here. The droplet measurements were carried out using PDPA techniques and the effective droplet size were found to be of the order of 12 micrometre as per the design requirement of VSSC.



D10 (um)	7.4733
D20 (um)	8.6064
D30 (um)	9.8028
D32 (um)	12.7177
D43 (um)	15.9042

Droplet size measurement result

Small Spacecraft and Payload Centre (SSPACE)

(Department of Avionics)

The Small-spacecraft Systems and PAyload CEnter (SSPACE) is being established at IIST to promote interdisciplinary research and development activities in the area of space science and spacecraft engineering providing hands on training for the students and Faculty members. The SSPACE center is involved in realisation of payloads, related electronics, small satellites, assembly, integration, testing and ground station to carryout mission operations. The laboratories proposed under SSPACE would have facilities for design and realisation of small-spacecraft and small payloads for the ISROs space science missions. The SSPACE is spread out in the form of three laboratories, consisting of payload realisation lab, spacecraft engineering lab, and ground station.

At present the center is carrying out many activities both inhouse and international collaborative projects, viz.,

1. ARIS on the PS4 has been successfully flown
2. Inhouse IIST small satellite
3. RPA payload for ISRO's MOM-2 mission
4. RPA and small satellite payload for proposed ISRO's Venus Mission
5. Mirror Satellite for Autonomous Assembly of Reconfigurable Space Telescope (AAReST) in collaboration Caltech/JPL, USA and University of Surrey, UK
6. INSPIRE series of satellites starting with InspireSat1 in collaboration with University of Colorado, USA

Towards the international collaborative projects IIST has signed, and are in the advanced stage of discussion for entering into, MoUs/Agreements with international partners for carrying out the collaborative projects. IIST has already entered into MoUs with University of Colorado, Boulder, USA,CalTech University, USA, University of Surrey, UK and Nanyang Technical University, Singapore.

Computer Vision and Virtual Reality Lab (CVVR lab)

(*Department of Avionics)*

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

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

Brief Description: Founded in 2010, the primary research focus of CVVR CoE lies mainly in the development of effective virtual reality, computer vision and deep learning based algorithms that help in both space and non-space applications. The lab currently is housed in Room No. L-204, D4-building, under the Department of

Avionics, Indian Institute of Space science and Technology. 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. The current working members of the lab include research scholars, project fellows, and PG and UG students working on their academic projects. The members actively publish their works in reputed national and international conferences and journals.

The entire development of proposed CoE was planned in three phases. The first phase consists of desktop VR lab which consists of the high-end workstation with latest graphics capabilities, 3D monitors, 3D vision-pro glasses and application software such as Vizard, Blender, Google Sketch, Adobe Master Suite collection, 3ds Max and Maya. The facility will be upscale by creating an immersive studio type Virtual reality centre in phase 2 and 3 which is planned in 2020-21. The proposed facility will be supported by advanced haptic devices, sensors and force feedback systems for various real-life application such as navigation, fly through etc.

Current Infrastructure:

Computing Resources,Imaging devices: GiGe Vision cameras, DSLR camera, Thermal Camera, etc.) VR/visualization Devices (Data Gloves, HTC Vive HMD, Nivdia Active stereo goggles, 3 D display monitors, Big display Unit etc.)

Featured Work (Flood flow simulation using augmented reality, computer vision tracking (Single object and multi object), satellite Image fusion, deep learning techniques for computer vision and image processing.

Centre of Advance Research in Nanoscience and Technology

(Department of Chemistry)

Centre 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 centre 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 centre 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.

Multi-disciplinary Computing Centre

Multidisciplinary Computing Centre in the institute is a resource of high-performance computers, storage and know-how of computational science. The aim of the centre is to become a centre of excellence in computational techniques and computer simulations for science and engineering and provide expertise in big Data Analysis, Climate Modelling, Computational Fluid Dynamics, Computational Structural Mechanics, Computation-Assisted Materials Science, Computer Vision and Virtual Reality, Machine Learning, Network Science and Engineering, Nonlinear Dynamics, Optimisation, Geoinformatics, Monte Carlo Simulations. A new HPC with GPU, servers and parallel computing power of 18 teraflops has become functional in this year.

4.4 NEW FACILITIES FOR RESEARCH

Facility for fabrication and testing of batteries including glove box is established in Department of Chemistry. OLED fabrication lab was set up with the facilities for fabrication and characterization of organic light emitting diodes. The facilities include Glove box, spin coater, UV-ozone cleaner and evacuator, spectrometer with CCD based detector, I-V measurement system for OLED and OLED life time measurement system and four point probe system for measuring sheet resistance.

Department of Mathematics has established a lab for “Machine Learning” especially to enhance the research facilities to M. Tech and PhD students

Human Space Flight Program (HSP)

The huge scope for Science and Technology development ensuing the announcement of Gaganyaan and subsequent HSPs, kindles the spirit of unique responsibility and reaffirms our critical roles in supporting country’s most prestigious organisation in achieving the mission objectives and carrying it forward. IIST marked a beginning in a learner’s mode. Discussions were held with Directorate of HSP (DHSP), ISRO HQ on the possible areas of research/academic contributions. Currently, the institute is actively working towards contributing to the prestigious program in terms of formulating science experiments, research projects and most importantly academic programs/research in the broad area of Bioastronautics with a long term goal of Capacity building in Space Biosciences.

A large number of proposals were presented to two Committees of ISRO and the proposal to fly Drosophila has been selected for the experimental flight. in Addition, a proposal for a crew module gas sensor has been recomented to fly procured as well as IIST develpoed sensor for evaluations / acceptence.

- Humanoid Development
- Space Robotics
- Space Rendezevous & Docking
- Antenna Development
- Sensor Development
- Wireless Communication for Crew Module
- Material Development
- Spaceflight Hardware Design
- Life Sciences Under μ-G
- Control System for Rendezevous & Docking
- Fault Diaganosis & Prognosis
- Fire and Smoke Suppression
- Flame Behaviour
- Green Propellants
- Economics of HSF
- Food for Indian Astronauts
- Communication (for Astronauts)

ExoWorlds

IIST and the University of Cambridge had proposed for a space telescope ExoWorlds, designed to study the atmosphere of exoplanets. IIST hosted the ExoWorlds Team Meeting form January 4 to 6, 2019. The largest dedicated Exoplanet mission in the world, the mission is expected to make major scientific breakthroughs in Exoplanet science and bring India to the forefront in this emerging field.

4.5 ADVANCED SPACE TECHNOLOGY DEVELOPMENT CELL (ASTDC)

Advanced Space Technology Development Cell (ASTDC) has beenestablished in IIST in October 2015 to develop and implement programs in planetary exploration, Earth science, space-based astronomy and technology development required by the various centres of ISRO, while applying its capabilities to technical and scientific problems of national significance. The ASTDC facilitates and monitors IIST-ISRO joint projects, and helps in identifying areas wherein different ISRO/DOS units and IIST could work together. Currently thirty two projects are in various stages of execution in IIST, in collaboration with several ISRO centres particularly, Semi Conductor Laboratory, Space Applications Centre, NRSC, ISAC, VSSC, IISU, LPSC and IPRC.

4.6 MEMORANDUM OF UNDERSTANDING

IIST has signed various MOU in three categories, namely (i) with various universities and research organisations to cooperate in the field of education, undertake joint research, exchange faculty and students, (ii) with specific agencies and industries and ISRO to undertake a research project and deliver specific design or product, and (iii) framework MOU, to participate in national and international multi-institutional research programs.

During this year new MOU signed/initiated include:

- International Satellite Program in Research and Education (INSPIRE)/ InspireSat-1
- Autonomous Assembly of Reconfigurable Space Telescope (AAReST)
- Nanyang Technical University, Singapore
- The InstitutSupérieur de l'Aéronautique et de l'Espace (ISAE-SUPAERO)
- National Central University (NCU), Taiwan and Nigata University Japan

4.7 PATENTS & IPR

Institute's policy is to protect its intellectual property, and contribute to the country's industrial growth by facilitating commercial exploitation of such property through transferring technology and licensing its patents. Such activities started formally within IIST by 2014, and are being coordinated by Dean IPR & Continuing Education.

In the year 2018-19 IIST filed 3 more patent applications,

Sl. No.	Title	Application No.	Inventors
1	Water Soluble Complex of Fullerenes and Process for Preparation Thereof	Indian Patent No. 299379	K.Y. Sandhya and MuhamedMukthar Ali:
2	Substituted 4 Hydrazinothiazoles and Processes for their Preparation	Indian Patent No. 302079	KG Sreejalekshmi and Sarah Titus
3	A Method of Preparation of Macroporous Ceramics with Wide Range of Porosities.	Indian Patent No. 305530	K. Prabhakaran and SujithVijayan

ACHIEVEMENTS & AWARDS

5. ACHIEVEMENTS & AWARDS

5.1 FACULTY

5.1.1 Awards

The Global Pioneer Award by INCOSE for the year 2018

The Global Pioneer Award by International Council for System Engineering (INCOSE) is the highest award, which recognizes outstanding engineer for pioneer-applications of systems engineering in the development of successful products or services for the benefit of the society. For the year 2018, this award was bestowed on Dr. B N Suresh, Chancellor, IIST for his pioneer work in Space Systems Engineering which is the backbone of successful launches by ISRO. He is an outstanding practitioner and researcher in Systems Engineering of Complex Space Systems such as Control, Actuation, Simulation, Test and Launch Vehicle Systems. As a thought leader, he has made significant contributions to Design, Mission planning and R&D Management for the Indian space program. This award was received by him at Washington DC in the annual convention of INCOSE in July 2018, in the presence of more than 1000 delegates from all over the globe.

Dr. B N Suresh, Chancellor, IIST receiving Global Poineer Award

Teaching Innovator Award

Prof. B. S. Manoj, Head of Avionics Department, IIST was recognized as a Teaching Innovator by MHRD through its Pandit Madan Mohan Malavia National Program on Teachers and Teaching (PMMMNPTT) on 4th January 2019, for developing and using the Multi-Track Modular Teaching (MT2) method. MT2 is a multi-modal technique meant for accomplishing deeper and all-round learning in class-room pedagogy. In a function conducted in New Delhi, the then MHRD minister, Shri. Prakash Javadekar handed over the certificate.

Prof. B S Manoj receiving Teaching Innovator Award from then HRD Minister Shri Prakash Javadekar in a function at New Delhi

ISTE Best Teacher Award

Associate Professor, from Department of Avionics was awarded the 2018 Prof VKM John Award for the Best Engineering College Teacher of Kerala State instituted by the Indian Society for Technical Education (ISTE) in recognition of his outstanding contribution to the academic community and students. The award was presented to him on 20th March 2019 during the 48th ISTE Annual Faculty Convention at Viswesvaraya Technical University (VTU), Belgaum.

Dr. Rajesh Joseph Abraham receiving Prof. V K M John Award

Members of the faculty have won numerous awards, both in the national and international level, in recognition of their research and development work which are listed below:

- **B S Girish** Aerospace Engg OMEGA best reviewer 2018' from Elsevier journal, OMEGA.
- **Chakravarthy P** Aerospace Engg Review of the book 'shape memory materials' appeared in the IEEE Electrical Insulation Magazine, Vol 35, Issue 1, 2018
- **Deepu M** Aerospace Engg Gokul Anugrah, R. V. Aswathy, M. Deepu and T. John Tharakan, Numerical Studies On Thrust Augmentation In Nuclear Thermal Rocket By Secondary Injection, National conference on 2018 'Future Directions in Propulsion' ASET 2018, Thiruvananthapuram. (Best paper award for the session "Future Trends in Propulsion")
- **K G Sreejalekshmi** Chemistry Rakesh R, Vishnu A, Bhavya B.S and K G Sreejalekshmi. Dual state multicolour emissions from single molecular core: Synthesis and photophysical studies on 5-(2-diphenylamino)-4-arylthiazol-5-yl)thiophene-2-carbaldehyde “International Conference on Recent Trends in Materials Science and Technology (ICMST-2018), October 10-13, ATF Area, Kerala, India (BEST POSTER AWARD)
- **J. Mary Gladis** Department of Chemistry, **Best paper awards**
    - Ionic Shield for Polysulfides Towards High-Performance Lithium-Sulfur Battery, Haritha H. and Mary Gladis J., Indian Institute of Metals Trivandrum Chapter - Research Scholars Symposium on Materials Science and Engineering, CSIR-NIIST Trivandrum, 6 April 2018 (Oral)
    - Bifunctional Separator as a highly efficient polysulfide mediator for Li-S batteries, Haritha H. and Mary Gladis J., International Conference on Advanced Materials and Manufacturing Processes for Strategic Sectors (ICAMPS 2018), Thiruvananthapuram, 25-27 October 2018 (Poster).
    - Iron, Nitrogen and Oxygen Co-Doped Hierarchically Porous Carbon for Long Cycle Life Lithium Sulphur Battery” Reshma C. and Mary Gladis J, International Conference on Chemistry andPhysics of Materials(ICCPM 2018), St. Thomas College, Thrissur, 19 –21 December, 2018 (Oral).
    - Polyelectrolyte Decorated Separator to Prolong Lithium-Sulfur battery life, Haritha H. Sreekala K. and Mary Gladis J., National Conference on Emerging Trends in Science, Technology & Application of Electron Microscope (STAEM 2018), CSIR-NIIST Trivandrum, 19-21 December 2018 (Oral)
    - Modified Separator Performing Dual Functions to Inhibit the Shuttle of Polysulfides for Lithium-Sulfur Batteries Haritha H. Sreekala K. and Mary Gladis J., Twelfth International Symposium on Advances in

Electrochemical Science and Technology (iSAEST-12), Organized by Society for Advancement of Electrochemical Science and Technology (SAEST), at Chennai, 8-10 January,2019 (Oral)

- **Nirmala Rachel James** Chemistry Best poster award: 'Theoretical Model to Enhance the Hole mobility in Polymer based LED devices' (Sanu Xavier and Nirmala R James) Best poster award for the poster presented in International Conference on Polymer Science and Technology (SPSI-MACRO-2018) held in IISER Pune, during December 18-22, 2018
- **Anandmayee Tej** Earth and Space Science Corresponding member of the Liège Royal Society of Sciences, Belgium
- **Rajesh V.J.** Earth and Space Science **Best paper awards**
  - Best Paper Presentation Award – Asif Iqbal Kakkassery and V.J. Rajesh (2019) "Implications for fluvial and glacial processes From Eos Chaos region of Valles Marineris, Mars" " in 2nd International Conference on Geology: Emerging Methods and Applications (GEM 2019), Department of Geology and Environmental Science, Christ College, Irinjalakuda, Thrissur, Kerala (17-19 January, 2019)
  - Third Best Poster Presentation Award- Sam Uthup, Toshiaki Tsunogae, V.J. Rajesh, Yusuke Takamura, M. Santosh, and Yukiyasu Tsutsumi (2018) "Petrology, geochemistry and geochronology of mafic-ultramafic rocks along the Bhavani Suture Zone, South India" in 15th International Conference on Gondwana to Asia, Xi'an, China (24-28 September 2018)
- **Sudharshan Kaarthik R** Electronics and Communication Engg February 2019 - Outstanding IEEE - Industry Applications Society Student Branch Chapter Award (Gold) for the year 2018, October 2018 - Granted International Travel Support from DST-SERB for attending 44th Annual Conference of the Industrial Electronics Society (IECON-2018) at Washington DC, USA.
- **Rajesh Joseph Abraham** Electronics and Communication Engg Prof VKM John Award for the Best Engineering College Teacher of Kerala State 2018
- **Deepak Mishra** Electronics and Communication Engg One student got INAE best BTP award
- **Lekshmi V Nair** Humanities Lekshmi V Nair, Best Paper Published. Kerala Sociological Society, 2018
- **K.Sakthivel** Mathematics Full travel grant award to participate in the International Congress of Mathematicians (ICM 2018) held at Rio de Janeiro, Brazil, Aug. 1-9, 2018
- **Deepak.T.G** Mathematics Received international travel support from DST-SERB to present a paper in the "Tenth International Conference on Matrix Analytic Methods in Stochastic Models", organised by University of Tasmania, Hobart, Australia, during 13-15 February 2019.

5.1.2 Visits Abroad

Faculty members have visited countries abroad as part of their research, partially or fully funded by IIST

Sl No	Name	Programme/Course/ Internship	Country/ Organization visited and Period of conference/ Workshop
1	Dr. Sarvesh Kumar	For research collaboration with Dr Ricardo Ruiz-Baier, Mathematical Institute, University of Oxfor, UK. Dr Kumar has also delivered an invited talk on "On the convergence of finite volume element methods".	UK 20.5.2018 to 09.06.2018
2	Dr. Rajesh S	To visit Physikalisch-Technische Bundesanstalt Braunschweig, Germany as part of collaborative research in the area of turbulent combustion using optical and laser diagnostic techniques.	Germany 28.05.2018 to 06.07.2018
3	Dr. Chinmoy Saha	To carry out research work	Montreal, Canada 08.06.2018 to 07.07.2018
		To attend 2018 IEEE International Symposium on Antennas and propagation and USNC- URSI Radio Science Meeting	Royal Military College, Canada 08.07.2018 to 13.07.2018
		To participate in COSPAR Scientific Assembly	Boston, USA 13.07.2018 to 22.07.2018

4	Dr. Seena V	To deliver an Invited talk at 12th international conference on Ceramic materials and components for Energy and Environmental Applications (CMCEE 2016)	Singapore 22.07.2018 to 27.07.2018
5	Dr. Priyadarshnam	InspireSat1 Critical Design Review	University of Colorado, Boulder, USA 22/07/2018 to 28/07/218
6	Dr. K Sakthivel	To deliver a talk in the International Congress of Mathematicians (ICM-2018)	Rio de Janeiro, Brazil 01.08.2018 To 09.01.2019
7	Dr. Sarita Vig	To attend International Meeting on 'The Scientific Heritage of Matcom Walmsley'	Florence, Italy 05.10.2018 To 29.11.2018
8	Dr. Anandmayee Tej	To deliver a seminar on 04.10.2018 organized by Institute of Astrophysics and Astronomy, Liege University, Belgium and to attend and give a talk in the Belgium-Indian Network for Astronomy and Astrophysics (BINA)	Belgium 09.10.2018 to 12.10.2018
9	Dr. Sarita Vig	To participate as team leader of the students representing india by National Steering Committee on Science and Astronomy Olympiads of the Homi Bhabha Centre for Science Education (HBCSE)	Beijing, China 03.11.2018 to 11.11.2018
10	Dr. N Selvaganesan	To present research paper in the IEEE Conference on Decision and Control (CDC 2018)	Florida, USA 17.12.2018 to 19.12.2018

11	Dr. R Sudharshan Kaarthik	To present two papers in the 44th Annual Conference of the IEEE Industrial Electronic Society (IECON 2018)	Washington DC, USA 21.10.2018 to 23.10.2018
12	Dr. Praveen Krishna I R	To present two papers in the 10th IFToMM International conference on Rotordynamics	Rio de Janeiro, Brazil 23.09.2018 to 27.09.2018
13	Dr. Kuruvilla Joseph	To attend JEC Asia 2018 and to deliver a lecture introducing the composite research activities in IIST.	Hanyang University, South Korea 12.11.2018 to 16.11.2018
14	Dr. Deepak T.G	10 th Int. conf. on Matrix Analytic methods (MAM 10)	University of Tasmania, Hobart, Australia 13.02.2019 to 15.02.2019
15	Dr. Rajesh V J	Japan-India forum for advanced study in Earth Science	Japan 07.03.2019 to 16.03.2019

5.2 STUDENTS

5.2.1 Awards

Research scholars and students achieved excellence by winning various awards as listed below. These being in addition to awards where both students and faculty jointly achieved.

- Aditya Manuwal, Masters Student in the Astronomy & Astrophysics program of the Department of Earth & Space Sciences was awarded the International Centre for Radio Astronomy Research's doctoral scholarship and the Scholarships for International Research (SIRF) which enabled him to start his doctoral studies at University of Western Australia.

- Jayadev Pradeep, dual degree student of astronomy & astrophysics in the Department of Earth & Space Sciences, was selected for the LEAPS program (Leiden and European Space Agency Astrophysics Program for Summer students), which allowed him to spend three months at Leiden University Netherlands for research.

- Veena V. S, doctoral student in the department won the Alexander von Homboldt postdoctoral fellowship to pursue post-doctoral research at University of Cologne, Germany. She joins in April 2019. She also received K. D.

- Abhayankar Best Thesis Award at the XXXVII Astronomical Society of India meeting held in Bangalore on Feb 2019.
- Ameen Yasir, Research Scholar in the department of physics secured 1st prize in oral presentation in optical society of India's "International Symposium on Optics" at IIT Kanpur during Sep 19-22, 2018.

5.2.2 Internship/Conference Abroad

The research scholars and students of IIST had excellent opportunities to visit countries abroad for attending seminars/conferences or for doing research internships.

Sl No	Name	Details of Conference/Workshop	Period of Conference/ Workshop
1	Shri. Kumar Rishav (Engineering Physics)	To doing final year project at Stuttgart University, Germany	June 2018 to April 2019

2	Shri. Jayadev Pradeep (Engineering Physics)	To attend LEAPS 2018 Summer Research Programme as a Summer Research Training student at Leiden University, Netherlands	02.06.2018 to 10.08.2018
3	Shri. Gokul G Nair (Engineering Physics)	Attend Siegmen International School on Lasers	27.07.2018 to 04.08.2018
		visit Technical University of Denmark for discussion on project related matter	04.08.2018 to 16.08.2018
		attend SPIE Optics + Photonics 2018 Conference and the student Leadership Program at San Diego, California, USA from	17.08.2018 to 23.08.2018
4	Shri. Sanjay V Gorur (Aerospace Engineering)	for doing eight week summer internship at Jet Propulsion Laboratory (JPL), CALTECH, USA	01.06.2018 to 20.07.2018
5	Kum. Srinika Selvam (Avionics)		
6	Kum. Jigyasa Nigam (Engineering Physics)		
7	Shri. Surya Kumar Gautam (Physics)	To attend and present a paper in the Student Leadership Conference (SLC) and OSA Annual Meeting to be held at Washington, DC, USA	14.09.2018 to 20.09.2018
8	Shri. Pramod Panchal (Physics)	To attend and present a paper in the Student Leadership Conference (SLC) and OSA Annual Meeting to be held at Washington, DC, USA	14.09.2018 to 20.09.2018
9	Shri. Prabith K (Aerospace Engineering)	To attend and present a paper in the 10^{th} IFToMM International Conference on Rotordynamics to be held at Rio de Janeiro, Brazil	23.09.2018 to 27.09.2018

10	Shri. Chalumuri Avinash (Avionics)	To attend five day training programme under JNTUK – CSU INDO – US 21st Century Knowledge initiative grant to be held at Chicago, USA	17.09.2018 to 21.09.2018
11	Shri. Ankit Verma (Avionics)	To pursuing VIIth Semester Project at University of Colorado, Boulder, USA	07.01.2019 to 23.08.2019
12	Shri. Divyang Arora (Avionics)	to pursuing VIIIth Semester Project at Innovative Solutions in Space (ISIS), Delft, Netherland	20.01.2019 to 01.05.2019
13	Kum. Aswathy Sebastian (Avionics)	to attend and present a paper in the SFB1143 workshop on “Frustration and Topology to be held at Dresden, Germany on	11.02.2019

PUBLICATIONS

6. PUBLICATIONS

With a view to increase the credibility of research and share the knowledge with the academic community and society at large, faculty members and scholars of IIST had publications in journals (169), had 181 conference papers and 7 book chapters. Members of the faculty have published 5 books in the areas of engineering, literature and mathematics.

6.1 BOOKS (5)

- Arun, D. I., **Chakravarthy, P.,** Kumar, A., & Santhosh, B. (2018). *Shape memory materials*. CRC Press, ISBN 9780815359692.
- Abhirami, G. S., and **Babitha, M. J**. (2019) *Salt and Pepper and Silver Linings Celebrating our Grandmothers*. Readme Books, ISBN : 9788193915820.
- **Babitha, M. J**. (2019) *Sabarimala enne Christianiyaakkiyappol. Sabarimalayum Streekalum*. Eka Books
- **Saha, C.,** Halder, A., & Ganguly, D. (2018). *Basic Electronics: Principles and Applications*. Cambridge University Press, ISBN: 9781108225663.
- **Saha, C.,** Siddiqui, J. Y., & Antar, Y. M. M. (2019). *Multifunctional Ultrawideband Antennas: Trends, Techniques and Applications*. CRC Press, *ISBN* 9781138553545.

6.2 JOURNAL PUBLICATIONS (169)

Director

- Chandrasekhar, P, Mouli KC, Rao DP, **Dadhwal VK** (2018) Subsurface geological structure and tectonics as evidenced from integrated interpretation of aeromagnetic and remote sensing data over Kutch sedimentary basin, western India. Current Science, 114(1): 174-185.
- Krishnapriya M, Chandra AB, Nayak RK, Patel, NR, Rao PVN, **Dadhwal VK** (2018) Seasonal and inter-annual variability of atmosphere CO2 based on NOAA Carbon Tracker analysis and satellite observations. *Journal of the Indian Society of Remote Sensing*, 46(2):309-320.

- Kumar N, Velmurugan A, Hamm NAS, **Dadhwal VK** (2018) Geospatial mapping of soil organic carbon using regression kriging and remote sensing. *Journal of the Indian Society of Remote Sensing*, 46(5): 705-716.
- Mahesh P, Sreenivas G, Gharai B, Prijith SS, Rao PVN, Choudhury SB, Raghavendra KV, **Dadhwal VK** (2018) Influence of meteorological parameters on atmospheric CO2 at Bharati, the Indian Antarctic research station. *Polar Research*, **37**(1), 1442072.

Department of Aerospace Engineering

- Fahd, B. A. H., Mithun, K.P.M., Aravind, G.P., **Deepu, M., Shine, S.R.** (2018). Thermo hydraulic performance analysis of twisted sinusoidal wavy microchannels. International Journal of Thermal Sciences 128, 124–136.
- Nandakrishnan, S. L., **Deepu, M., Shine, S.R.** (2018). Numerical investigation on heat transfer enhancement in dimpled diverging microchannel with AL2O3-water nanofluid. Journal of Enhanced Heat Transfer 25(4), 347-365.
- Mithun, K.P.M., **Deepu, M., Shine, S.R.** (2018). Numerical investigation of wavy microchannels with rectangular cross section. Journal of Enhanced Heat Transfer 25(4), 293-313.
- Aravind, G. P., Gokul, S. and **Deepu, M.** (2019). Numerical study on convective heat transfer enhancement by vortex interactions. Computational Thermal Sciences 11(3), 255-268.
- Anugrah,G., Raja, P., **Deepu, M. and R. Sadanandan**. (2019). Experimental and Numerical Studies of Secondary Injection in Nozzle Divergence for Thrust Augmentation. Journal of Applied Fluid Mechanics 12(5), 1719-1728.
- Parvathi, S. P. and **Ramanan, R. V**. (2018). Iterative Analytical technique for the design of interplanetary direct transfer trajectories including perturbations. Advances in Space Research 61(12), 3002-3019.
- Parvathi, S. P. and **Ramanan, R. V**. (2018). Direct interplanetary trajectory design using a Precise Vinfinity targeting technique. Journal of Guidance, Control and Dynamics 41(10), 2293-2299.
- Padmanabha, P. S. and **Ramanan, R. V**. (2018). Optimal Interplanetary Transfers using Electric Propulsion. Journal of Spacecraft Technology 29(2), 21-30.
- Mathiazhagan, S., &**Anup, S.** (2019). Effect of interface strength on the mechanical behaviour of bio-inspired composites: A molecular dynamics study. *Mechanics of Materials*, *132*, 93-100.

- Mathiazhagan, S., &**Anup, S.** (2018). Atomistic Simulations of Length-Scale Effect of Bioinspired Brittle-Matrix Nanocomposite Models. Journal of Engineering Mechanics, 144(11), 04018104.
- Vadlamani, S., **Arun, C. O.** (2019). A Background Cell Based Numerical Integration For B-Spline Wavelet On The Interval Finite Element Method. Engineering Computations 36(2), 569-598.
- Vadlamani, S., **Arun, C. O.** (2019). Construction of Beam Elements Considering Von Kármán Nonlinear Strains using B-spline Wavelet on the Interval. Applied Mathematical Modelling 68, 675-695.
- **Sadanandan, R**., Chakraborty, A., Arumugam, V.K., Chakravarthy, S.R. (2018). Optical and Laser Diagnostic Investigation of Flame Stabilization in a Novel, Ultra-lean, Non-premixed Model GT Burner. Combustion and Flame 196, 466-477.
- **Mahesh, S**., Mishra, D.P. (2019). Effect of Air Jet Momentum on the Topological Features of Turbulent CNG Inverse Jet Flame. Fuel 241, 1068-1075.
- **Mahesh S**., Gopakumar, R., Rahul, B.V., Dutta, A.K., Mondal, S., Chaudhuri. S. (2018). Instability Control by Actuating the Swirler in a Lean Premixed Combustor. Journal of Propulsion and Power 34(3), 708-719.
- Arun, G.N., **Manoj, T. N.** (2018). Hyperbolic Runge-Kutta Method using Genetic Algorithm. Journal of Computational and Nonlinear Dynamics 13(10), 101003
- Panigrahi, C., **Vaidyanathan, A. and Manoj, T. N.** (2019). Effects of subcavity in supersonic cavity flow. Physics of Fluids 31, 036101.
- Arun, D.I., Santhosh, S., Satheesh, K., **Chakravarthy, P.**, Santhosh, B. (2019). High Tg Polyurethene-Carbon Black based Electro-active SMP nanocomposite system for aerospace applications. Materials science and Technology 35(5), 596-605.
- Arun, D. I., **Chakravarthy, P.,** Girish, B. S., Shankar, S., & Santhosh, B. (2019). Experimental and Monte Carlo simulation studies on percolation behaviour of shape memory polyurethane carbon black nanocomposite. *Smart Materials and Structures 28*(5), 055010.
- Lad, K.A., Vinil Kumar, R.R., and **Vaidyanathan, A.,** (2018). Experimental Study of Subcavity in Supersonic Cavity Flow. AIAA Journal 56(5), 1965-1977.
- Ninish, S., **Vaidyanathan, A.,** and Nandakumar, K.,. (2018). Spray Characteristics of Liquid-Liquid Pintle Injector. Experimental Thermal and Fluid Science 97, 324-340.

- Ayyappan, D., **Vaidyanathan, A.,** Muthukuamaran, C.K., and Nandakumar, K.,. (2018). Transition of subcritical liquid jets in single and multicomponent systems. Physics of Fluids 30(10), 104106 .
- Jishnu, C. R., and **Salih, A.** (2019). A modified equation of state for water for a wide range of pressure and the concept of water shock tube. Fluid Phase Equilibria 483, 182-188.
- Amarnath, M., & **Krishna, I. P.** (2019). Experimental Investigations to Assess Surface Contact Fatigue Faults in the Rolling Contact Bearings by Enhancement of Sound and Vibration Signals. *Journal of Nondestructive Evaluation*, *38*(1), 34.
- **Shine, S. R.,** Shri Nidhi S., (2018). Review on lm cooling of liquid rocket engines. Propulsion and Power Research 7(1), 1-18.
- Ullekh, P., Chacko, M. J., **Shine, S. R.** (2018). Short survey of SRM Plume radiation modelling. Computational thermal sciences 10(2), 1-14
- Manas, M. P., & **Shine, S. R.** (2018) Characterization of Tandem Airfoil Configurations of Axial Compressors. *International Journal of Turbo & Jet-Engines* doi:10.1515/tjj-2018-0018.
- Konnov, A. A., Mohammad, A., Kishore,V. R., Kim, N. I., **Prathap, C.** and Kumar, S. (2018). A comprehensive review of measurements and data analysis of laminar burning velocities for various fuel+air mixtures. Progress in Energy and Combustion Science 68, 197-267.
- Saxon, M., **Pradeep, K. P., Aravind, V.** (2018). Computational study of heat transfer characterisitics of supercritical methane flow in the coolant channel of a rocket engine. High temperature Material Processes 22 (2-3), 141-159.
- Rautela, M., **Bijudas, C. R.** (2019). Electromechanical admittance based integrated health monitoring of adhesive bonded beams using surface bonded piezoelectric transducers. International Journal of Adhesion and Adhesives, 94, 84-98
- Guha, A. and **Bijudas, C.R.** (2018) Influence of modal characteristics of a partially debonded piezoelectric transducer in higher and subharmonic modes generated in Lamb wave. Structural Control and Health Monitoring, 25(10), 2239.

Department of Avionics

- Amitkumar, K. S., **Kaarthik, S.R.** and Pillay, P. (2018). A Versatile Power-Hardware-in-the-Loop-Based Emulator for Rapid Testing of Transportation

Electric Drives. IEEE Transactions on Transportation Electrification 4(4), 901-911.

- Akiror, J. C., **Kaarthik, S.R.,** Wanjiku, J., Pillay, P. and Merkhouf, A. (2018). Closed-Loop Control for a Rotational Core Loss Tester. IEEE Transactions on Industry Applications 54(6), 5888-5896.
- **Deepak, M., Abraham, R. J.** (2019). Improving the Dynamic Frequency Regulation of a Multisource Power System considering GRC and Deadband with TCSC and SMES. International Journal of Power and Energy Conversion 10(1), 51-75.
- George**,** G. R. and **Prema, S. C.** (2019). Cyclostationary Feature Detection Based Blind Approach for Spectrum Sensing and Classification. Radioengineering 27(1), 298-303.
- Sarkar**,** C., **Saha, C.,** Ahmed, L., Siddiqui, J.Y. and Antar, Y.M.M. (2018). Frequency Notched Balanced Antipodal Tapered Slot Antenna With Very Low Cross-Polarized Radiation. IET Microwave Antennas and Propagation 12(11), 1859-1863 .
- **Saha**,**C.,** Sarkar, C., Ahmed, L., Siddiqui, J.Y. and Antar, Y.M.M. (2018). Ultra-Wideband Antipodal Tapered Slot Antenna With Integrated Frequency Notch Characteristics. IEEE Transaction on Antennas and Propagation 66(3), 1534-1539.
- Ahmed,L., **Saha**,**C.,** Siddiqui, J.Y. and Antar, Y.M.M. (2018). An antenna advance for Cognitive Radio: Introducing Multilayered Split Ring Resonator Loaded Printed Ultra-Wideband Antenna with Multi-Functional Characteristics. IEEE Antennas and Propagation Magazine 60(2), 20-33.
- **Saha,C.,** Muntha, R., Ahmed, L., Siddiqui, J.Y. and Antar, Y.M.M. (2018). A dual Reconfigurable Printed Antenna: Design Concepts and Experimental Realization. IEEE Antennas and Propagation Magazine 60(3), 66-74.
- Park, K. W., **Ravindran**, **S.,** Kang, S., Min, J.W., Hwang, H.Y., Jho, Y.D., Jo, Y.R., Kim, B.J., Kim, J., Lee, Y.T.(2018). Detailed carrier recombination in lateral composition modulation structure. Applied Physics Express 11(8), 95801
- Sathishkumar, P., **Selvaganesan, N.** (2018). Fractional Controller Tuning Expressions for a Universal Plant Structure. IEEE Control Systems Letters 2(3), 345-350.
- Anand, N., Babu, S. and **Manoj, B. S.** (2018). "On detecting compromised controller in Software Defined Networks,".Elsevier Computer Networks 137, 107-118.

Department of Chemistry

- Deeraj, B.D.S., Saritha, A., **Joseph**, **K.** (2019). Electrospun styrene-butadiene copolymer fibers as potential reinforcement in epoxy composites: Modeling of

rheological and visco elastic data. Composites Part B: Engineering 160, 384-393.

- Rasana, N., Jayanarayanan, K., Deeraj, B.D.S., **Joseph**, **K.** (2019). The thermal degradation and dynamic mechanical properties modeling of MWCNT/glass fiber multiscale filler reinforced polypropylene composites. Composites Science and Technology 169, 249-259.
- Joy, J., Winkler, K., **Joseph, K.,** Anas, S., Thomas, S. (2019). Epoxy/Methyl methacrylate acrylonitrile butadiene styrene copolymer (mabs) blends: reaction induced viscoelastic phase separation, morphology development and mechanical properties. New Journal of Chemistry 43, 9216-9225.
- Joseph, S., Jose, A. J., Wilson, R., Thomas, S., **Joseph**, **K.** (2019). Molecular transport of aromatic solvents through oil palm micro fiber filled nitrile rubber composites. Materials Today: Proceedings 9, 266-278.
- Jayan, J. S., Saritha, A., **Joseph**, **K.** (2018). Innovative materials of this era for toughening the epoxy matrix: A review. Polymer Composites 39(S4), E1959-E1986.
- Mishra, R. K., Thomas, M. G., Abraham, J., **Joseph**, **K.** Thomas, S. (2018). Electromagnetic Interference Shielding Materials for Aerospace Application: A State of the Art. Advanced Materials for Electromagnetic Shielding: Fundamentals, Properties, and Applications , 327-365.
- Mishra, R. K., Mishra, P., Verma, K., **Joseph**, **K.** (2018). Manipulation of thermo-mechanical, morphological and electrical properties of PP/PET polymer blend using MWCNT as nano compatibilizer: A comprehensive study of hybrid nanocomposites. Vacuum 157, 433-441.
- Mathew, M. S., Sukumaran, K., **Joseph**, **K.** (2018). Graphene Carbon Dot Assisted Sustainable Synthesis of Gold Quantum Cluster for Bio-Friendly White Light Emitting Material and Ratiometric Sensing of Mercury (Hg2+). ChemistrySelect 3(33), 9545-9554.
- George, G., **Joseph, K.,** Saritha, A., Nagarajan, E.R. (2018). Influence of fiber content and chemical modifications on the transport properties of PP/jute commingled biocomposites. Polymer Composites 39, E250-E260.
- Konnola, R., Deeraj, B.D.S., Sampath, S., Saritha, A., **Joseph, K.** (2018). Fabrication and Characterization of Toughened Nanocomposites Based on TiO2 Nanowire-Epoxy System. Polymer Composites *40*(7), 2629-2638
- Kizhisseri, D. R., Venugopal, G., Lekshmi, C. L., **Joseph**, **K.** Sankarapillai Mahesh. (2018). Photoresponse modulation of reduced graphene oxide by surface modification with cardanol derived azobenzene. New Journal of Chemistry 42(22), 18182-18188.
- Nair, K. S., Saritha, A., Jayan, J. S., Geethu, S., Neeraja, J., Pillai, L. V., Dilip, G. S., Venu, G., **Joseph, Kuruvilla.** (2018). Elucidation of degradation kinetics of CIIR nanocomposites by varying the structure of the anchoring surfactant

groups, Materials Today: Proceedings. Materials Today: Proceedings 5(9), 20631-20635.

- Mathew, M. S., Davis, J., **Joseph, K.** (2018). Green synthesis of a plant-derived protein protected copper quantum cluster for intrauterine device application. Analyst 143(16), 3841-3849.
- Deeraj, B. D. S., Jayanarayanan, K., **Joseph, K.** (2018). High Performance In-Situ Composites Developed from Polypropylene/Nylon 6/Carbon Nanotube Blend Systems. Journal of Siberian Federal University. Biology11(2),157-165.
- Ganiga, M., Neema, P.M., **Cyriac, Jobin.** (2018). Synthesis of Organophilic Carbon Dots, Selective Screening of Trinitrophenol and a Comprehensive Understanding of Luminescence Quenching Mechanism. ChemistrySelect, 2018, 3, 4663-4668.
- Neema, P.M., **Cyriac, Jobin.** (2019). pH-sensitive response of a highly photoluminescent MoS2 nanohybrid material and its application in the nonenzymatic detection of H2O2. Analytical and Bioanalytical Chemistry, 1-8.
- Radhakrishnan, R., **Sreejalekshmi, K.G.** (2018). Computational Design, Synthesis, and Structure Property Evaluation of 1,3-Thiazole-Based Color-Tunable Multi-heterocyclic Small Organic Fluorophores as Multifunctional Molecular Materials. The Journal of Organic Chemistry 83(7), 3453-3466.
- Erekkath, S., **Sreejalekshmi, K.G.** (2019). Theoretical predictions on microphase separation in polyurethane: Combinatorial design, synthesis and demonstration of shape memory property. Materials Today Communications 16, 71-80.
- Haritha, H., Reshma, C. and **Gladis, J.M.** (2018). Effect of crystallite size on the Intercalation pseudocapacitance of lithium nickel vanadate in aqueous electrolyte.. Journal Solid State Electrochemistry 22(1), 09-01-2019.
- Haritha, H., Reshma, C. and **Gladis, J.M.** (2018). Micro- and Nanocrystalline Inverse Spinel LiCoVO4 for Intercalation Pseudocapacitive Li+ Storage with Ultrahigh Energy Density and Long-Term Cycling. ACS Applied Energy Materials 1(2), 393-401.
- Wilson, P., Vijayan, S., **Prabhakaran, K.** (2018). Waste-Fish-Derived Nitrogen Self-Doped Microporous Carbon as Effective Sorbent for CO2 Capture. Chemistry Select 3, 9555-9563.
- Chithra, A., Wilson, P., Rajeev, R., **Prabhakaran, K.** (2018). Nitrogen-doped microporous carbon with high CO2 sorption by KOH activation of black gram,. Materials Research Express 5, 115606.
- Chithra, A., Wilson, P., Vijayan, S., Rajeev, R., **Prabhakaran, K.** (2018). Robust thermally insulating carbon-gehlenite composite foams from newspaper waste and sucrose by filter-pressing. Materials & Design 160, 65-73.

- Vijayan, S., Wilson, P., **Prabhakaran, K.** (2018). Alumina foam microspheres by emulsion drop-casting in aqueous ammonium chloride solution. Ceramics International 44, 12547-12554.
- Wilson, P., Vijayan, S., **Prabhakaran, K.** (2018). Low-density microcellular carbon foams from sucrose by NaCl particle templating using glycerol as a plasticizing additive,. Materials & Design 139, 25-35.
- Nair, S.L., Krishnan, R., Vijayan, S., Wilson, P., **Prabhakaran**, **K.** (2019). MgO calcination for easy direct coagulation casting of aqueous alumina slurries,. Ceramics International 45, 5717-5723.
- Wilson, P., Vijayan, S. and **Prabhakaran, K.** (2019). Thermally Conducting Microcellular Carbon Foams as a Superior Host for Wax-Based Phase Change Materials,. Advanced Engineering Materials, 21(4), 1801139.
- Ramachandran, A., **Yesodha, S. K.** (2019). Polyaniline Derived Nitrogen-Doped Graphene Quantum Dots for the Ultra Trace Level Electrochemical Detection of Trinitrophenol and the Effective Differentiation of Trinitrophenol and the Effective Differentiation of Nitroaromatics: Structure Matters. ACS Sustainable Chem. Eng 77, 6732-6743.
- Nair, J.S.A., Aswathi, R., **Sandhya, K.Y.** (2019). Reverse micelle assisted hydrothermal reaction route for the synthesis of homogenous MoS2nanospheres. SN Applied Sciences 1(5), 508.
- Gopika, M.S., Bindhu, B., **Sandhya, K.Y.,** Reena, V.L. (2019). Impact of surface-modified molybdenum disulphide on crystallization, thermal and mechanical properties of polyvinylidene fluoride. Polymer Bulletin 1, 17.
- Ali, M.M., Nair, J.S.A., **Sandhya, K.Y.** (2019). Role of reactive oxygen species in the visible light photocatalytic mineralization of rhodamine B dye by P25–carbon dot photocatalyst. Dyes and Pigments 163, 274-284.
- Aswathi, R., **Sandhya, K. Y.** (2018). Ultrasensitive and selective electrochemical sensing of Hg(II) ions in normal and sea water using solvent exfoliated MoS2: affinity matters. J. of Materials Chemistry A 6(30), 14467-76.
- Ramachandran, A., Sarojiniamma, S., Varatharajan, P., Appusamy, I.S., **Sandhya**, **K.Y.** (2018). Nano Graphene Shell for Silicon Nanoparticles: A Novel Strategy for a High Stability Rechargeable Battery Anode. ChemistrySelect. 3(40), 11190-11199.
- Aswathi, R., Panda, S., **Sandhya, K. Y.** (2018). Physiological Level and Selective Electrochemical Sensing of Dopamine by a Solution Processable Graphene and its Enhanced sensing property in general. Sensors & Actuators: B. Chemical 256, 488-497.

Department of Earth and Space Sciences

- Rodriguez-Kamenetzky, A, Carrasco-González, C, González-Martín, O., Araudo, A., Rodríguez, L. F. **Vig, S.,** Hofner, P. (2019). Particle acceleration in the

HerbigHaro objects HH80 and HH 81. Monthly Notices of Royal Astronomical Society (MNRAS) 482(4), 4687.

- Veena, V. S., Vig, S., Sebastian, B., Lal, D. V., **Tej, A.,** Ghosh, S. K.. (2019). Nonthermal emission from massive star-forming regions: a possible SNR candidate G351.71.2? Monthly Notices of Royal Astronomical Society (MNRAS) 482(4), 4630.
- Nambiar, S., Das, S., **Vig, S.,** Gorthi, R. S. S. (2019). Star cluster detection and characterization using generalized Parzen density estimation. Monthly Notices of Royal Astronomical Society (MNRAS) 482(3), 3789.
- Vinitha, M. V., Najeeb, P. K., Kala, A., Bhatt, P., Safvan, C. P., **Vig, S., Kadhane, U.** (2018). Plasmon excitation and subsequent isomerization dynamics in naphthalene and azulene under fast proton interaction. Journal of Chemical Physics 149(19), 4303.
- Mathew, B., Manoj, P., Narang, Mayank, Banerjee, D. P. K., Nayak, Pratheeksha, Muneer, S., **Vig, S.,** Pramod, K. S., Paul, K. T., Maheswar, G.. (2018). Excitation Mechanism of O I Lines in Herbig Ae/Be Stars. Astrophysical Journal 857(2), 30.
- Das, S. R., **Tej, A., Vig, S.,** Liu, T., Ghosh, S. K., Chandra, C. H. I.. (2018). Radio and infrared study of southern H II regions G346.0560.021 and G346.0770.056. Astronomy & Astrophysics 612, 36.
- Maud, L. T. and 30 coauthors including **Vig, S.** (2018). Chasing discs around Otype (proto)stars. ALMA evidence for an SiO disc and disc wind from G17.64+0.16. Astronomy & Astrophysics 620, 31.
- Moscadelli, L. and 22 coathors including **Vig, S.** (2018). The feedback of an HC HII region on its parental molecular core. The case of core A1 in the star-forming region. Astronomy & Astrophysics 616, 66.
- Mounika K., **Sheeba, R. J., Kutty, G.,** Gorthi, S. S. R. K. (2019). Consistent Robust and Recursive Estimation of Atmospheric Motion Vectors From Satellite Images. IEEE Transactions on Geoscience and Remote Sensing 57(3), 1538 - 1544.
- Indu, K.D., Das, S., **Mandal, S** (2018). Properties of two-temperature dissipative accretion flow around black holes. Monthly Notices of Royal Astronomical Society (MNRAS) 475(2), 2164-2177.
- Nandi, A., **Mandal, S.** and 7 coauthors. (2018). Accretion flow dynamics during 1999 outburst of XTE J1859+226—modeling of broadband spectra and constraining the source mass. Astrophysics and Space Science 363(5), 12.

- Radhika, D., Sreehari, H., Nandi, A., Iyer, N., **Mandal, S.** (2018). Broad-band spectral evolution and temporal variability of IGR J17091-3624 during its 2016 outburst: SWIFT and NuSTAR results. Astrophysics and Space Science 363(9), 23.
- Sreehari, H.,Iyer, N., Radhika, D., Nandi, A., **Mandal, S.** (2019). Constraining the mass of the black hole GX 339-4 using spectro-temporal analysis of multiple outbursts. Advances in Space Research 63(3), 1374-1386.
- Gopalakrishnan, D., **Chandrasekar, A.** (2018). On the Improved Predictive Skill of WRF Model with Regional 4DVar Initialization: A Study with North Indian Ocean Tropical Cyclones. IEEE Transactions on Geoscience and Remote Sensing 56(6), 3350-3357.
- Muzahid, S., Fonseca, G., Roberts, A., Rosenwasser, B., Richter, P., **Narayanan, A.,** Churchill, C., Charlton, J. (2018). COS-Weak: probing the CGM using analogues of weak Mg II absorbers at z < 0.3. Monthly Notices of Royal Astronomical Society (MNRAS) 476(4), 4965-4986.
- **Narayanan, A.,** Savage, B. D., Mishra, P. K., Wakker, B. P., Khaire, V., Wadadekar, Y. (2018). Detection of low-metallicity warm plasma in a galaxy overdensity environment at z = 0.2. Monthly Notices of Royal Astronomical Society (MNRAS) 475(3), 3529-3542.
- Singh, M., **Rajesh, V.J.,** Kannan, B., Bhattacharya, S. (2018). Spectral and chemical characterization of gypsum-phyllosilicate association in Tiruchirapalli, South India, and its implications. Geological Journal 153(5), 1685-1697.
- Aarthi, A.D. and **Gnanappazham, L.** (2019). Comparison of Urban Growth Modeling Using Deep Belief and Neural Network based Cellular Automata Model—A Case Study of Chennai Metropolitan Area, Tamil Nadu, India.. Journal of Geographic Information System 11, 1-16.
- Devendran, A.A. & **Lakshmanan, G.** (2019). Analysis and Prediction of Urban Growth Using Neural-Network-Coupled Agent-Based Cellular Automata Model for Chennai Metropolitan Area, Tamil Nadu, India. Journal of Indian Society of Remote Sensing , 47(9), 1515-1526.
- Anand, N., Shahid, M., **Resmi, L.** (2018). Merger delay time distribution of extended emission short GRBs. Monthly Notices of Royal Astronomical Society (MNRAS) 481, 4332.
- Lamb, G., Mandel, I., **Resmi, L.** (2018). Late-time evolution of afterglows from off-axis neutron star mergers. Monthly Notices of Royal Astronomical Society (MNRAS) 481, 2581.

- **Resmi, L.,** Schulze, S., Ishwara-Chandra, C. H, et al. (8 more co-authors). (2018). Low-frequency View of GW170817/GRB 170817A with the Giant Metrewave Radio Telescope. Astrophysical Journal (ApJ) 867 (1), 57.
- Ohata, S., Kondo, Y., Moteki, N., Mori, T., Yoshida,A., **Sinha, P. R.** and Koike, M. (2019). Accuracy of black carbon measurements by a filter-based absorption photometer with a heated inlet. Aerosol Science & Technology (AST) *53*(9), 1079-1091.
- Schacht, J., Heinold, B., Quaas, J., Backman, J., Cherian, R., Ehrlich, A., Herber, A., Huang, W.T. K., Kondo, Y., Massling**,** A., **Sinha, P. R.,** Weinzierl, B., Zanatta, M. and Tegen, I. (2019). The importance of the representation of air pollution emissions for the modeled distribution and radiative effects of black carbon in the Arctic. Atmospheric Chemistry and Physics (ACP) *19*(17), 11159-11183.
- Veena, V.S., **Vig, S.**, Sebastian, B., Lal, D.V., **Tej, A.**, Ghosh, S.K. (2019). Nonthermal emission from massive star-forming regions: a possible SNR candidate G351.71.2?**.**Monthly Notices of Royal Astronomical Society (MNRAS), 482(4), 4630.
- Srirag, N., Das, S., **Vig, S.**, Gorthi, R. S. S. (2019). Star cluster detection and characterization using generalized Parzen density estimation. Monthly Notices of Royal Astronomical Society (MNRAS), 482(3), 3789.

Department of Humanities

- Gayathri, G. , **Babitha, J.** (2018). Framing the Marginalized: A Critique on the Portrayal of Physically Challenged Female Characters in Selected Malayalam Movies.. Indian Scholar: An International Multidisciplinary e- Journal. 5(I), 21-28.
- Gayathri, G. , **Babitha, J.** (2018). Exploring Fat Lives: A Critical Analysis and Comparitive Reading of Two South Indian Movies; Da Thadiya and Inji Iduppazhagi. Research Guru: Online Journal of Multidisciplinary Subjects, 12(3), 344-54.
- Gayathri, G. , **Babitha, J.** (2018). Mad Women in the Attics of Malayalam Cinema: A Study on the Representation of Feminine Psychic Space. Littcrit: An Indian Response to Literature 44(86), 144-49.
- Rajkumar, R., and **Shaijumon, C. S.** (2019). Vulnerability: A Note on the Concept, Measurements and Application in Indian Agriculture, International Journal of Social Science and Economic Research 4(3),

- **Shaijumon, C. S.** (2018). Role of Space Technology in creating Social Capital for Agriculture Development,. Kerala Sociologist, 46(2), 146-154.
- Sabu, M ,**Shaijumon, C. S.** (2018). Adoption of ICT tools among small scale motorized fishing crafts in Northern Kerala, Journal of Indian Fisheries Association, 44(1), 47-50.
- **Shaijumon, C.S.** (2018). Social learning in information diffusion and capability of farmers,. International Journal of Social Economics, 45(4), 602-613.
- Muhammed, S. K. M. & **Nair, L.V**. (2018). Revisiting the Concept of Tribe: A Critical Evaluation of Existing Discourses with Reference to Kerala. 3 (9)
- Muhammed, S. K. M., Mumitha, M. & **Nair, L.V**. (2018). Role Of Gulf Migration In Accelerating Technological Diffusion: A Study Of The Malabar Region. 46(1)
- Anu, K. & **Gigy, J. A**. (2018). Queering Space, (Trans) Forming Kerala: An Analysis of the Cultural Politics in the Emergent Queer Pride Parades and Allied Trans - Beauty Pageants. 44(2), 88-96.
- Monisha, M. & **Gigy J. A.** (2018). Of Grove and Lore: Dichotomic Spaces of Sacred Grove in Ananthabhadram. 8 (1), 86 -97.

Department of Mathematics

- Krishnasamy, R., **Raju, K. G.** (2019). Stochastic stability of mode-dependent Markovian jump inertial neural networks. The Journal of Analysis 27(1), 179–196.
- Shah, V., **Raju, K. G.**, Sharma, J., Muthukumar, P. (2018). Existence and Uniqueness of Classical and Mild Solutions of Generalized Impulsive Evolution Equation. Int. J. Nonlinear Sci. Numer. Simul 19(7-8), 775–780.
- Muni, V.S., Venkatesan, G., **Raju, K. G.** (2018). Controllability of fractional order semilinear systems with a delay in control. Indian J. Math. 60(2), 311–335.
- Muni, V.S., **Raju, K. G.** (2018). Controllability of semilinear impulsive control systems with multiple time delays in control. IMA Journal of Mathematical Control and Information 36(3), 869–899.
- Govindaraj, V., Balachandran, K., **Raju, K. G.** (2018). Numerical Approach for the Controllability of Composite Fractional Dynamical Systems. Journal of Applied Nonlinear Dynamics 7(1), 59-72.

- Govindaraj V., **Raju, K. G.** (2018). Trajectory Controllability of Fractional Integro-Differential Systems in Hilbert Spaces. Asian Journal of Control 20(5), 1994–2004.
- Dubey, B., **Raju, K. G.** (2018). On the Controllability of Linear and Semilinear Impulsive Systems. Numerical Functional Analysis and Optimization 39(8), 843–864.
- Muni, V. S, **Raju, K. G.** (2018). Controllability of linear impulsive matrix Lyapunov differential systems with delays in the control function. Kybernetika (Prague) 54(4), 664–698.
- Pooja, D., Anilkumar, A. K., **Raju, K. G.** (2018). Design and analysis of weak stability boundary trajectories to Moon. Astrophysics and Space Science 363(8),
- Job, M. and **Sabu, N.** (2018). Asymptotic analysis of dynamic problem for shallow shells with variable thickness. Indian Journal of Mathematics 61(1), 9-25.
- Nandakumar, M. and **Moosath, K. S. S.** (2018). Rank one critical points of the momentum maps of Integrable Hamiltonian systems with two degrees of freedom. Bulletin of Kerala Mathematical Association 15(2), 155-160.
- Sitaramayya, M. and **Moosath, K. S. S.** (2018). Geometry of an infinite dimensional Lie group and applications. Ganita 68(3), 5-32.
- Mahesh, T. V. and **Moosath, K. S. S.** (2019). Submanifolds of Exponential Families. Global Journal of Advanced Research on Classical and Modern Geometries 9(1), 18-25.
- **Kumar, S.,** Ruiz-Baier, R. and Sandilya, R. (2019). A priori error estimates for discontinuous finite volume discretizations of the Brinkman optimal control problems. Journal of Scientific Computing 78, 64-93.
- **Kumar, S.,** Ruiz-Baier, R. and Sandilya, R. (2018). Mixed and discontinuous finite volume element schemes for the optimal control of immiscible flow in porous media. Computers and Mathematics with Applications 76, 923-937.
- Adak, D., **Natarajan, E. and Kumar, S.** (2019). Convergence analysis of virtual element methods for semilinear parabolic problems on polygonal meshes. Numerical methods for partial differential equations 35, 222-245.
- Adak, D., **E. Natarajan, E. and Kumar, S.** (2019). Virtual element methods for semilinear hyperbolic problems on polygonal meshes. International Journal of Computer Mathematics 96(5), 971-991.

- **Mukherjee, K.** and Srinivasan, N. (2019). Parameter-uniform fractional step hybrid numerical scheme for 2D singularly perturbed parabolic convection–diffusion problems. Journal of Applied Mathematics and Computing 60(1-2), 51-86.
- Sweta, D. and **Deepak, T.G.** (2019). A matrix analytic approach to study the queueing characteristics of nodes in a wireless network. OPSEARCH 56(2), 477-496.
- Suja, E., Asokan, K., Kumar, K. S., Ramamohan, T. R. and **Anil, K. C. V**. (2018). Comparison of Variations of TEC at Disturbed and Quiet Time Using Nonlinear Dynamics. Journal of Geophysical Research: Space Physics 123(9), 7740-7754.

Department of Physics

- Binu, P. T., S. Pillai, A. & **Narayanamurthy, C. S.** (2019). Photoelastic digital holographic polariscope. Journal of Modern Optics 66(8), 817-828.
- Rahul, O. R. and **Murugesh, S.** (2018). Knot soliton solutions for the one-dimensional non-linear Schrödinger equation,. Journal of Physics Communications 2, 55033.
- Rahul, O. R. and **Murugesh, S.** (2019). Rogue breather modes: Topological sectors, and the belt-trick, in a one-dimensional ferromagnetic system. Chaos Solitons and Fractals 112, 262.
- Matta, S., Pramitha, V., **Dinesh, N. N.** and Nirmal, K. V. (2018). Evolution of phase singularities from fork-shaped phase grating in the near-field. Journal of Optics 20(7), 75604.
- Mishra, S., Surya, K. G., **Dinesh, N. N.**, Chen, Z., Pu, J. and Rakesh, K. S. (2018). Tailoring and analysis of vectorial coherence. Journal of Optics 20(12), 125605.
- Meghana, S. and **Ivan, J. S.** (2018). Free space optical communication using shape parameter. European Journal of Physics Plus 133(341)
- Sagnik, G. and **Ivan, J. S.** (2018). Gaussian channels that are eventually entanglement breaking yet asymptotically nonclassicality saving. Physical Review A 98(5), 52353.
- Karthika, S. and **Nagar, A.** (2019). The effect of boundaries and impurity on a system with non-local hop dynamics. Journal of Physics A: Mathematical and Theoretical 52(8), 85003.
- Randeep, N. C. and **Surendran, N.** (2018). Topological entanglement entropy of the three-dimensional Kitaev model. Physical Review B 98, 125136.

- Vinitha, M.V., Najeeb, P.K., Kala, A., Bhatt, P., Safvan, C.P., **Vig, S., Kadhane, U.** (2018). Plasmon excitation and subsequent isomerization dynamics in naphthalene and azulene under fast proton interaction. The Journal of chemical physics 149(19), 194303.
- Reshmi, S., Akshaya, M. V., Satpati, B., **Basu, P. K.** and Bhattacharjee, K. (2018). Structural stability of coplanar 1T-2H superlattice MoS2 under high energy electron beam. Nanotechnology 29, 205604.

6.3 BOOK CHAPTERS (7)

Department of Aerospace Engineering

- Rafi, K. M. M., Fahd, B. A. H., **Deepu, M.,**& Rajesh, G. (2017, July). Experimental and Numerical Studies on the Plume Structure of Micro-nozzles Operating at High-Vacuum Conditions. In *International Symposium on Shock Waves* (pp. 927-936). Springer, Cham.

Department of Avionics

- **Sreekantan, A. C.,**& George, B. (2018). Magnetic sensors and industrial sensing applications. In *Smart Sensors and MEMs* (pp. 131-150). Woodhead Publishing.
- Nirala, S., **Mishra, D.,** Sagayam, K. M., Ponraj, D. N., Vasanth, X. A., Henesey, L., & Ho, C. C. (2018). Image fusion in remote sensing based on sparse sampling method and PCNN techniques. *Machine Learning for Big Data Analysis*, *1*, 149.

Department of Chemistry

- Choudhary, Y. S., &**Gomathi, N.** (2018). Metamaterials as Shielding Materials. *Advanced Materials for Electromagnetic Shielding: Fundamentals, Properties, and Applications*, 367-391.
- **Nageswaran, G.,** Jothi, L., & Jagannathan, S. (2019). Plasma Assisted Polymer Modifications. In *Non-Thermal Plasma Technology for Polymeric Materials* (pp. 95-127). Elsevier.
- Jothi, L., &**Nageswaran, G.** (2019). Plasma Modified Polymeric Materials for Biosensors/Biodevice Applications. In *Non-Thermal Plasma Technology for Polymeric Materials* (pp. 409-437). Elsevier.

Department of Earth and Space Sciences

- Unnithan, S. L. K., **Gnanappzham, L.** (2018) Estimation of PM2.5 from MODIS Aerosol Optical Depth over the Indian subcontinent, *Applications of Geomatics in Civil Engineering: Select Proceedings of ICGCE 2018*, Springer.

6.4 CONFERENCE PROCEEDINGS (181)

Department of Aerospace Engineering

- Anugrah, G., Aswathy**,** R. V., **Deepu, M.** and Tharakan. T. J. (May, 2018). Numerical Studies On Thrust Augmentation In Nuclear Thermal Rocket By Secondary Injection. National conference on 2018 'Future Directions in Propulsion' ASET 2018,, Thiruvananthapuram.
- Jayakrishnan,S. and **Deepu, M.** (May, 2018). Off-Design Performance Evaluation of a Dual Throat Nozzle. National conference on 'Future Directions in Propulsion' ASET 2018, Thiruvananthapuram.
- Ciya, V., Hemanth, D. and **Deepu, M.** (November, 2018). Numerical Studies on Laminar Fluid Flow and Heat Transfer in Twisted Helical Four Lobe Channel. Asian Joint Workshop on Thermophysics and Fluid Science (AJWTF 7), Thiruvananthapuram.
- Aravind, G. P. and **Deepu, M.** (November, 2018). Effects of Asymmetrical vortex interactions by variable swept vortex generator (VSVG) on heat transfer enhancement. Asian Joint Workshop on Thermophysics and Fluid Science (AJWTF 7), Thiruvananthapuram.
- Gokul, S. and **Deepu, M.** (November, 2018). Numerical studies on fluid flow and heat transfer in an annulus air gap of coaxial cylinders with inner cylinder rotating. Asian Joint Workshop on Thermophysics and Fluid Science (AJWTF 7), Thiruvananthapuram.
- Swathi, V. V., Gokul, S. and **Deepu, M.** (December, 2018). Heat transfer characteristics of Taylor- Couette flow in wavy annulus. 7th International Conference & 45th National Conference on Fluid Mechanics and Fluid Power(FMFP-2018), IIT Bombay.
- Hemanth, D. and **Deepu, M.** (December, 2018). Thermal performance estimates for twisted spiral tube of elliptical cross section. 7th International Conference & 45th National Conference on Fluid Mechanics and Fluid Power(FMFP-2018), IIT Bombay.
- Aravind, G. P. and **Deepu, M.** (December, 2018). Effects of unsymmetrical vortex interaction by coupling lateral sweep vortex generators with dimpled surface on mass transfer enhancement. 7th International Conference & 45th

National Conference on Fluid Mechanics and Fluid Power(FMFP-2018), IIT Bombay.

- Swathi, V. V., Gokukl, S., Aravind, G. P. and **Deepu, M.** (April, 2019). Heat Transfer Characteristics of Taylor-Couette Flow in Wavy Conical Annulus. 4TH Thermal and Fluids Engineering Conference, Las Vegas, NV, USA.
- Aravind, G. P. and **Deepu, M.** (April, 2019). Effects of Asymmetrical Vortex Interaction by Variable Swept Vortex Generator (VSVG) on Mass Transfer Enhancement. 4TH Thermal and Fluids Engineering Conference, Las Vegas, NV, USA.
- Rithwik, N and **Ramanan, R. V.** (April, 2018). Halo Orbit Design Around Lagrangian Points Using Gradient and Non Gradient Based Optimization Techniques. International Conference on Frontiers in Industrial and Applied Mathematics (FIAM-2018), Hamirpur, India..
- Padmanabha, P.S. and **Ramanan, R. V**. (June, 2018). Optimal transfers to Geostationary orbits using Electric propulsion. Conference on South Asian Satellite (GSAT-9), Bangalore, India.
- Rithwik, N., Jayasurya, K. and **Ramanan, R. V. (**January, 2019). Analysis of Halo Orbits around Sun-Earth L2 for the ExoWorld mission. ExoWorld Team Meet, Thiruvananthapuram, India.
- Garima, A. and **Ramanan, R. V.** (February, 2019). Optimal Multiple Finite Burn Strategies for Trans-Lunar and Trans-Planetary Maneuvers. International Conference on Small Satellites, Hyderabad, India.
- **Ramanan, R. V.** (Plenary Talk). (June, 2018). Space Missions with Low thrust propulsion systems',. Conference on South Asian Satellite (GSAT-9), Bangalore, India.
- Deepak, K. and **Anup, S.** Stress Concentration Factor around a Hole in a Nacre like Composites.
- Abhirami, A. J. and **Anup, S.,** Elastic properties of non-self-similar two hierarchical bio-inspired unidirectional composites.
- Unnikrishnan, K. R., **Krishna, I.R.P., Arun, C. O.** (March, 2019). Free vibration analysis of pre-stressed membrane using element free Galerkin method. International Conference on Emerging Trends in Engineering, University College of Engineering Osmania University.
- Ranjan, R**., Sadanandan, R.,** Kadhane, U.R., Nath, P. (23-26th February 2019). Simulation of 3D Plasma Flow and Plasma Detachment in Magnetic Nozzle. 12th International Conference on Thermal Engineering: Theory and Applications, Gujarat, India.
- Mohammed, S., Gupta, N., Mishra, D., **Sadanandan, R.** (7-8th March 2019). Application of digital image processing method for spray characterisation. 6th

International Conference on Signal Processing and Integrated Networks, Noida, India.

- Oamjee, A., **Sadanandan, R.** (10-12th December 2018). Mixing enhancement studies on pylon-cavity aided fuel injection in supersonic combustors. 7th International Fluid Mechanics and Fluid Power Conference, Mumbai, India..
- Kumar, S., **Sadanandan, R.** (10-12th December 2018). Computational Simulations of Flame Stabilization in a Scramjet Combustor with Single Lobed Strut Injector. 7th International Fluid Mechanics and Fluid Power Conference, Mumbai, India..
- Prakash, R.S., **Sadanandan, R.** (21-24th November 2018). Flame characteristics and pollutant emissions of a non-premixed swirl burner with annular swirling fuel injection. 7th Asian Joint Workshop on Thermophysics and Fluid Science, Trivandrum, India.
- Prakash, R.S., **Sadanandan, R.** (17-19th December 2018). Effect of fuel injection angle on the flame stabilization and emission characteristics of a non-premxed, model GT burner. National Aerospace Propulsion Conference, Kharagpur, India.
- **Sadanandan, R.,** Chakraborthy, A., Chakravarthy, S.R. (17-19th December 2018). Effect of Confinement on the Flame Structure of a Non-premixed Swirl Burner. National Aerospace Propulsion Conference, Kharagpur, India.
- Dhanesh A., Muthukumaran, C.K., **Vaidyanathan, A.,** and Nandakumar, K. (Dec 10-12, 2018). Temperature Effects on the Instablity Nature of Liquid Jets at Subcritical and Supercritical Chamber Conditions. 7th International and 45th National Conference on Fluid Mechanics and Fluid Power (FMFP), IIT Bombay,
- Panigrahi, C., **Vaidyanathan, A.,** and Nair, M.T. (Aug 9-10, 2018). Cavity Induced Pressure Oscillations within a subcavity. 20th Annual CFD Symposium, NAL Bangalore.
- Ahmed, A., **Vaidyanathan, A.,** and Srinivasan, K. (May 11-12, 2018). Experimental and Numerical Investigation of Impinging Jets. National conference on Future Directions in Propulsion, LPSC Valiamala.
- Prajith, K. K.P., Takhur, B., Kumar, S.A., and **Vaidyanathan, A**. (May 11-12, 2018). Study of Impinging Liquid in Scramjet Engine using Deep Learning Techniques. National conference on Future Directions in Propulsion,, LPSC Valiamala.
- Sashidar, W., Vinil Kumar, R.R., Kumar, P.P., and **Vaidyanathan, A.** (May 11-12, 2018). Planar Laser-Induced Fluorescence (PLIF) Visualisation of Two Phase Annular flow. National conference on Future Directions in Propulsion, LPSC Valiamala.

- Kumar, S.A., Ninish, S., **Vaidyanathan, A.,** and Tharakan, J.T. (May 11-12, 2018). Effect of Blockage Factor on Liquid-Liquid Cross Flow Pintle Injector Spray Characteristics. National conference on Future Directions in Propulsion, LPSC Valiamala.
- Maharshi, G.K., **Vaidyanathan, A.,** Muthukumaran, C.K., and Nandakumar, K. (May 11-12, 2018). Quantification of Hydroxyl(OH) radicals in Laminar Flat Flame and Inverse Diffusion Flame of Coaxial Injector. National conference on Future Directions in Propulsion, LPSC Valiamala.
- Jishnu, C. R. and **Salih, A.** (December 10-12, 2018). Equivalence of Density-Based and a Customized Pressure-Based Approach for Compressible Modelling of Instant Valve Closure in Irrigation Pipes. 7th International Conference on Fluid Mechanics and Fluid Power, IIT Bombay.
- Balaji, N. N. and **Krishna, I. R. P.** (Sep 23-27, 2018). Coupled simulation of rotor systems supported by journal bearings. Proceedings of the 10th International Conference on Rotor Dynamics – IFToMM. IFToMM 2018, Rio de Janeiro, Brazil .
- Prabith, K. and **Krishna, I. R. P.** (Sep 23-27, 2018). A modified model reduction technique for the dynamic analysis of rotor-stator rub.. Proceedings of the 10th International Conference on Rotor Dynamics – IFToMM. IFToMM 2018, Rio de Janeiro, Brazil .
- Devvrat, S.P., **Vinoth, B. R. and Mahesh, S.** (17-19th December 2018). Acoustic Excitation Of Self-Excited Elliptic Jet Diffusion Flame. National Aerospace Propulsion Conference, Kharagpur, India.
- Nitish, K. L. N. S. and **Vinoth**, **B. R.** (Dec 10-12, 2018). Numerical Simulations of Low-Density Planar Jets. 7th International and 45th National Conference on Fluid Mechanics and Fluid Power (FMFP), IIT Bombay, .
- Pratyush, P. S. B., Priyatham, B. K., **Shine, S. R.** (December 10-12). A Novel Double-jet Configuration for Gas Turbine Film Cooling. FMFP 2018, .
- Ashok, A., **Shine, S. R.** (November 29-December 1). Review of casing treatments for axial compressors. SAROD 2018, .
- Parashar, K., **Pradeep, K. P.**, **Shine, S.R.,** Chacko, M. J. (December 10-12). Analysis of Looped Heat Pipe for Electronic Cooling in a Space Vehicle. FMFP 2018.
- Bhardwaj, A., **Shine, S. R.** (11-12 May 2018). Investigation of the effect of varying relative waviness on Microchannel heat transfer. National Conference on Future directions in Propulsion, ASET 2018,
- Aswathi, K., Muniraja, T. **Prathap, C.** (17-19th December 2018). Generation Of Homogeneous Isotropic Turbulence Inside Fan Stirred Vessel. National Aerospace Propulsion Conference, Kharagpur, India.

- Meghasham, K., **Prathap, C.,** Chakravarthy, S.R., Chakraborthy, A., Karthikeyan, R. and Shrey, W. (17-19th December 2018). Characteristic Study of stationary flames using Flat flame Burner. National Aerospace Propulsion Conference, Kharagpur, India.
- Manavi, A., Lipi, R., **Issac, K. K.** (16-17th, November, 2018). Novel concept for a steerable and anchorable tumbleweed rover. 11 th National Conference and Exhibition on Aerospace & Defense Related Mechanisms, ARMS-2018, Hyderabad, India.
- Anuja, V., Siddarth, S., **Pradeep, K. P.** (Dec 10-12, 2018). On the predicatbility of Cavitating Zone in Cavitating Venturi. 7th International and 45th National Conference on Fluid Mechanics and Fluid Power (FMFP), IIT Bombay , India.
- Craig, Pellegrino, **Priyadarshan, Harsha** et al., **Sooraj.** (Oct 01-05, 2018). AAReST Autonomous Assembly Reconfigurable Space Telescope Flight Demonstrator. 69th International Astronautical Congress (IAC), Bremen, Germany.
- Angshuman, B., Deepak, Peter, **Sooraj, V. S., Shine, S. R.**(2018),. (May 11-12, 2018). Investigation of the effect of varying relative waviness on Microchannel heat transfer,. National Conference on Future directions in Propulsion, ASET, LPSC Trivandrum, India.
- Rautela, M. S., **Bijudas, C.R.** (2018, May) Influence of piezoelectric transducer damage and disbonds on structural damage signatures using E/M method, ASCE-EMI, MIT Cambridge
- Shaifalee, S., Jayesh,P., **Bijudas, C.R.,** Rautela, M.S., Vivek, S.A. (2018, December) Enhanced online damage detection using frequency mixed and time reversed guided waves in doubly curved shells, Second international conference on structural integrity, IIT Madras

Department of Avionics

- Athira, G. S., **Kaarthik, R. S.** and **Rajeevan, P. P.** (December, 2018). An Open End Winding Induction Generator System for Simultaneous Supply of Power to DC-link Loads and Frequency Insensitive AC Loads with Voltage Regulation. 2018 IEEE International Conference on Power Electronics, Drives and Energy Systems (PEDES), Chennai, India.
- Gupta, N. and **Kaarthik, R. S.** (December, 2018). Decoupled Control of Two Series Connected Split-Phase Synchronous Machines From a Single Six-Phase Inverter. 2018 IEEE International Conference on Power Electronics, Drives and Energy Systems (PEDES), Chennai, India.

- Dash, S. K. and **Kaarthik, R. S.** (December, 2018). Decoupled Control of Dual-Split-Phase IMs for Full Power Range Using Capacitive Filters. 2018 IEEE International Conference on Power Electronics, Drives and Energy Systems (PEDES), Chennai, India.
- Hegde, A., Athira**,** G. S., **Rajeevan, P. P. and Kaarthik, R. S..** (December, 2018). Current Error SVPWM based Speed Sensorless IM Drive with Stator Resistance Estimation. 2018 IEEE International Conference on Power Electronics, Drives and Energy Systems (PEDES), Chennai, India.
- Archana, C. M., **Rajeevan, P. P. and Kaarthik, R. S.** (December, 2018). Series Compensated Open-end Winding Induction Generator System for DC loads and AC linear, Non-linear and Unbalanced loads. 8th IEEE India International Conference on Power Electronics (IICPE), JAIPUR, India.
- Dash, S. K. and **Kaarthik, R. S.** (December, 2018). Space Vector PWM Techniques for Parallel Connected Dual-Split-Phase IMs for Full Power Range Using Capacitive Filters. 8th IEEE India International Conference on Power Electronics (IICPE), JAIPUR, India.
- Gopika, T. G., Gupta, N. and **Kaarthik, R. S.** (December, 2018). Modeling, Simulation, and Analysis of Series-Connected Split-Phase Synchronous Motor Drive. 8th IEEE India International Conference on Power Electronics (IICPE), JAIPUR, India.
- Athira, G. S., **R. Kaarthik, R. S. Rajeevan, P. P.** (November, 2018). An Induction Generator Scheme with Series Compensation for Frequency Insensitive Loads in HEVs. 44th Annual Conference of the IEEE Industrial Electronics Society (IECON 2018), Washington DC, USA.
- Ranjith, S., **Kaarthik, R. S.** (November, 2018). An Integrated EV Battery Charger With Retrofit Capability. 44th Annual Conference of the IEEE Industrial Electronics Society (IECON 2018), Washington DC, USA.
- Ujjwala, B., **Prema, S. C.** (6-8 Dec. 2018). Reduction of PAPR in FBMC: A Comparative Analysis. 2018 IEEE Recent Advances in Intelligent Computational Systems, Thiruvananthapuram, India.
- Sneha, G. M., **Prema, S. C.** 4-6 April 2019). A Fine Spectrum Sensing Procedure based on Modulated Wideband Converter. International Conference on Communication and Signal Processing (ICCSP), Chennai, India.
- Kumar, A. P., **Vineeth, B. S.** (20-23 Feb 2019). Signal Design and Detection Algorithms for Quick Detection Under False Alarm Rate Constraints. National Conference on Communications (NCC), Bangalore, India.

- Chakraborty, A., **Vineeth, B. S, Manoj, B. S.** (16-19 Dec 2018). On the Evolution of Finite-Sized Complex Networks with Constrained Link Addition. Advanced networking and telecommunication (ANTS), Indore, India.
- Ramesh, A., **Vineeth, B. S.** (16-19 Dec 2018). Empirical Delay Models for 802.11 under Deterministic Convergecast Traffic. Advanced networking and telecommunication (ANTS), Indore, India.
- **Vineeth, B. S.,** Chandramani, S. (May, 2018). Stability properties of delay tolerant networks with buffered relay nodes. International Workshop on Content Caching and Delivery in Wireless Networks (CCDWN), Shangai, China.
- Sandip, S. R., Mane, S.B., Nagasekhar, T., Kumar, M. N. and **Saha, C.** (December, 2018). Dual Band (S/Ka) Composite Dual Polarized Monopulse Feed for LEO Satellite Tracking. IEEE Indian Conference on Antennas and Propagation (INCAP 2018), Hyderabad, India.
- Mane, S.B., Sandip, S. R., Agarwal, N., Nagasekhar, T., **Ghosh, B.,** Kumar, M. N. and **Saha, C.** (December, 2018). Design of Multimode Ka Band Hybrid DielectricRod as a Monopulse Tracking Feed for LEO Satellite Ground Station", in Proc. IEEE INCAP, Hyderabad ,India Dec 16-19, 2018.. IEEE Indian Conference on Antennas and Propagation (INCAP 2018), Hyderabad, India.
- Elizabeth, G., Vigneshram, R., Satya, B. S., Mukundan, K.K., **Saha, C.** and Apren, T J. (December, 2018). Dual Feed Circularly Polarized Antenna for S-Band Applications. IEEE INAE Workshop on Electromagnetics (IIWE 2018) 2018, Trivandrum, India .
- Sandip, S. R., Mane, S.B., Nagasekhar, T., Padmavathy, C. S., Kumar, M. N. and **Saha, C.** (December, 2018). Development of Phase Matching Technique for LEO Satellite Tracking. IEEE INAE Workshop on Electromagnetics (IIWE 2018) 2018, Trivandrum, India .
- Divya, R., Chittajit, S., **Saha, C.** and Siddiqui, J.Y. (December, 2018). Spur Line Loaded UWB Inserted DRA With Frequency Notched Characteristics. IEEE INAE Workshop on Electromagnetics (IIWE 2018), Trivandrum, India .
- Chittajit, S., **Saha, C.** and Siddiqui, J.Y. (December, 2018). Ultra-wideband MIMO monopole antenna with WLAN band rejection. IEEE INAE Workshop on Electromagnetics (IIWE 2018) 2018, Trivandrum, India .
- Dalavi, K., Uttam, B., **Saha, C., Ghosh, B.,** Apurba, B. and Ananat, S. (December, 2018). LTCC Transition Structures for Millimeter-wave System-in-Package. IEEE INAE Workshop on Electromagnetics (IIWE 2018) 2018, Trivandrum, India .

- **Saha, C.,** Antar, Y., Tao, Y and Xiao, G. (August, 2018). Circularly Polarized Microstrip Antenna on Ultrathin PET Substrate for UHF RFID Applications. IEEE International Flexible Electronics Technology Conference, Ottawa, Canada.
- Sandip, S.R., Mane, S.B., Nagasekhar, T., Kumar, M. N., Antar, Y.M.M. and **Saha, C.** (July, 2018). Side Launched Dual Circularly Polarized MonopulseTracking Feed Element for LEO Satellites. IEEE AP-Symposium and USNC-URSI Radio Science Meeting, Boston, USA.
- Elnanggar, S.A., **Saha, C.,** and Antar, Y. (01-06-2018). An Electromagnetic Induced Transparency-like Scheme for Wireless Power Transfer in Contained Aqueous Solutions. IEEE Wireless Power Transfer Conference (IEEE WPTC), Montreal, Canada.
- **Saha, C.,** Elnanggar, S.A. and Antar, Y. (June, 2018). Effect of Detuning on the Performance of DR-Loaded Split Cavity Resonator Based Wireless Power Transfer Scheme. IEEE Wireless Power Transfer Conference (IEEE WPTC), Montreal, Canada.
- Ayisha, B. S., **Saha, C.,** and Sherly Joy. (March, 2018). Design of Cascadable S-band Amplifier using Tunable Equalizer. IEEE ICDCS,, Coimbatore, India.
- Fayza, K.A. and **Sooraj, R.** (July, 2018). Transient Analysis of GaAs based ring resonator modulator with carrier cnjection as the modulation mechanism. Summer school in Optics and Photonics, IISc Bangalore .
- Fayza, K.A., **Sooraj, R.,** Park, K., Gopinath, M., Lee, Y.T. (Nov 30-Dec 2 2018). Design Optimization of Quantum Confined Stark Effect Based Ring Resonator Optical Switches. International Symposium on Semiconductor Material and Devices, VNIT Nagpur.
- Fayza, K.A., **Sooraj. R.,** Park, K., Kim, J.M. (Feb 7-9 2019). Variable optical true time-delay using cascaded ring resonator switches activated by electroabsorption for satellite communications. International Conference on Small Satellites 2019, RCI Hyderabad.
- **Sooraj, R.** (Mar 23-24 2019). III-V semiconductor based microring resonator optical switch activated through electroabsorption. Optics and Photonics: Theory and Computational Techniques-2019, IIT Delhi.
- Sathishkumar, P., **Selvaganesan, N.** (Dec. 17-19, 2018). Fractional Controller Tuning Expressions for a Universal Plant Structure. IEEE Conference on Decision and Control (CDC), Miami Beach, FL, USA.

- Ramdeep, N., Sathishkumar, P., and **Selvaganesan, N.** (Dec. 27-29, 2018). Limit Cycle Prediction Using Higher Order Harmonics : Signal Processing Approac. National System Conference (NSC-2018), VSSC, Trivandrum.
- Fasil, M. and **Selvaganesan, N.** (Dec. 27-29, 2018). Interval Lyapunov Function for Uncertain Plant using Model Reference Adaptive Control. National System Conference (NSC-2018), VSSC, Trivandrum.
- Deepa, P. S., Sathishkumar, P. and **Selvaganesan, N.** (Jan 5-7, 2019). Novel adaptive control scheme for plant with separable nonlinearity. IEEE- Fifth Indian Control Conference (ICC), IIT Delhi.
- Vamshi, G. P., Tina**,** B.S., **Seena, V.** (October 28-31, 2018). Polymer Based Hybrid Membrane-Flexure Nanomechanical Piezoresistive Sensor. IEEE Sensors 2018, Delhi.
- **Seena, V.,** Rithika, R. K. & Shikha, M. (July 22-27, 2018). Polymer MEMS with Embedded Functional Ceramic Thin Films for Environmental Sensing/Energy Harvesting. 12th International Conference on Ceramic Materials and Components for Energy and Environmental Applications, Singapore.
- Nisanth, A., Suja, K.J., **Seena, V.** (October 28-31, 2018). Design and Simulation of MEMS AlN Piezoelectric Vibration Energy HarvesterArray for Improved Power Density. IEEE Sensors 2018, Delhi.
- **Seena, V.,** (October 10-13, 2018). Polymer MEMS: A Paradigm Shift in Ultra-Sensitive Microsystems. International Conference on Recent Trends in Materials Science and Technology, Materials Research Society of India.
- **Seena, V.** (January, 2018). Polymer MEMS for Environmental Sensing to Space Applications. DST-UKIERI Workshop Micro-and Nanotechnologies for Environmental Sensing, IIT Bombay.
- Mohanasruthi, M., Abhishek, C., Thanudas, B., Sreelal, S., and **Manoj**, **B. S.** (December, 2018). ACTM: API Call Transition Matrix-based Malware Detection Method. Proceedings of IEEE ANTS 2018, Indore, India.
- Abhishek, C., **Vineeth, B. S, and Manoj**, **B. S.** (December, 2018). On the Evolution of Finite-Sized Complex Networks with Constrained Link Addition. Proceedings of IEEE ANTS 2018, Indore, India.
- Vinod, K. P. and **Ghosh, B.** (December, 2018). Characteristic Mode Analysis of Linear to Circular Polarization Conversion Metasurface. IEEE INAE Workshop on Electromagnetics (IIWE 2018) 2018, Trivandrum, India .

- Vinod, K. P. and **Ghosh, B.** (December, 2018). A Cross Slot Linear to Circular Polarization Conversion Metasurface. IEEE INAE Workshop on Electromagnetics (IIWE 2018) 2018, Trivandrum, India .
- Vinod, K. P. and **Ghosh, B.** (December, 2018). A Dual-Band Multi-layer Metasurface Lens. IEEE Indian Conference on Antennas and Propagation (INCAP 2018), Hyderabad, India.
- Priya, M. R., **Deepak, M.,** Rama Gorthi, R. K. S.S. (December, 2018). Bag of Visual Words based Correlation Filter Tracker(BoVW-CFT). 11th Indian conference on computer vision, graphics and image processing (ICVGIP'18), IIIT Hyderabad.
- Litu, R., Priya, M. R., **Deepak, M.,** Gorthi, R. K. S.S. (December, 2018). Learning Rotation Adaptive Correlation Filters in Robust Visual Tracking. In Proceedings: 14th Asian Conference on Computer Vision (ACCV) 2018., Perth, Australia.
- Swetha, V., **Deepak, M.,** Gorthi, R. K. S.S. (December, 2018). Scale and Rotation Corrected CNNs (SRC-CNNs) for Scale and Rotation Invariant Character Recognition. 11th Indian conference on computer vision, graphics and image processing (ICVGIP'18), IIIT Hyderabad. .
- Litu, R., **Deepak, M.,** Gorthi, R. K. S.S. (Sept. 2018). WAEF: Weighted Aggregation with Enhancement Filter for Visual Object Tracking",. In Proceedings: Computer Vision -European Conference on Computer Vision (ECCV) 2018, Visual object Tracking Workshop, Germany.
- Litu, R., **Deepak, M.,** Gorthi, R. K. S.S. (Sept. 2018). Visual Object Challenge Results 2018. In Proceedings: Computer Vision - European Conference on Computer Vision (ECCV) 2018, Visual object Tracking Workshops, Ranked 13, Germany.
- Priya, M. R., **Deepak, M.,** Gorthi, R. K. S.S. (Sept. 2018). Visual Object Challenge Results 2018. In Proceedings: Computer Vision - European Conference on Computer Vision (ECCV) 2018, Visual object Tracking Workshops, Ranked 33, Germany.
- Aswathy, P., **Deepak, M.** (Jan., 2019). Deep GoogLeNet Features for Visual Object Tracking. 2018 IEEE 13th International Conference on Industrial and Information Systems (ICIIS), Ropar, India.
- Litu, R., Sidhartha, Gorthi, R. K. S.S., **Deepak, M.** (2018). Rotation Adaptive Visual Object Tracking with Motion Consistency. IEEE Winter conference on Applications of Computer Vision (WACV), USA.

- Mohammed, M.N., Sahal, **Deepak. M.,** Namya, G., **Rajesh, S.** (2019). Application of Digital Image Processing Method for Spray Characterization. 6th International Conference on Signal Processing and Integrated Networks (SPIN), Noida.
- Arnab, K., **Deepak, M., Tej, A.** (2018). Stellar Cluster Detection using GMM with Deep Variational Autoencoder. 2018 IEEE Recent Advances in Intelligent Computational Systems (RAICS), Trivandrum, India .
- Deepan, D., **Deepak, M.** (2018). Unsupervised Anomalous Trajectory Detection for Crowded Scenes. 2018 IEEE 13th International Conference on Industrial and Information Systems (ICIIS), Ropar.
- Kishor, B. N., **Anoop, C. S.,** Pranab, K. D. (December, 2018). An Accurate Digital-Interface for TMR-based Angle Sensor with 180° Range. Proc. 15th IEEE India Council International Conference, Coimbatore, India.
- Rinu, P. B., and **Anoop, C. S.** (December, 2018). A Simple Interface Circuit Using Phase-based Measurement Technique for Offset-Ridden Capacitive Sensors. Proc. 15th IEEE India Council International Conference, Coimbatore, India.
- Anjalidevi, S. and **Anoop, C. S.** (December, 2018). Analog and Direct-Digital Front-End Circuits Suitable for Low-Valued Resistive Sensors. Proc. 15th IEEE India Council International Conference, Coimbatore, India.
- Elangovan, K., and **Anoop, C. S.** (December, 2018). Analysis and Performance Verification of an Efficient Digital Converter for Resistive Sensors. Proc. 15th IEEE India Council International Conference, Coimbatore, India.
- Tapabrata, S., **Anoop, C. S.,** Siddhartha, S. (December, 2018). Efficacy Studies of a Novel Field Feedback Circuit for Giant Magnetoresistance Sensors. Proc. 12th IEEE International Conference on Sensing Technology, Limerick, Ireland.
- Abhrajit, R. and **Anoop, C. S.** (December, 2018). A Direct-Digitizer Interface Based on Dual-Slope Technique for Giant Magneto-Resistance Sensors. Proc. 8th IEEE India International Conference on Power Electronics (IICPE), JAIPUR, India.
- Deepshikha, and **Vanidevi, M.** (December, 2018). Modified SCMA Decoder for 5G Uplink System. Proceedings of the 15th IEEE India Council International Conference, Coimbatore, India.
- Thomas, J. T., Anupama, **Sheeba, R. J.**, (July, 2018). Compressed Sensing Recovery using Modified Newton Gradient Pursuit Algorithm and its Application to ECG with Denoising. Proceedings of International Conference on Signal Processing and Communication,SPCOM 2018,, IISc Bangalore.

- Anupama, Thomas, J. T., **Sheeba, R. J.**, Gorthi, R.K.S.S. (Dec 18-22, 2018). Variable Patch Dictionaries for efficient compressed sensing based MRI Reconstruction.. Proceedings of 11th Indian conference on Computer Vision Graphics and Image Processing, ICVGIP 2018, IIIT Hyderabad.
- Hemambhar, B. V., **Sheeba, R. J.** (December, 2018). Denoising of ECG Signals using Fuzzy based Singular Spectrum Analysis,. 2018 IEEE Recent Advances in Intelligent Computational Systems (RAICS), IEEE Kerala Secttion,Trivandrum.

Department of Chemistry

- Rakesh, R., Vishnu, A., Bhavya, B.S. and **Sreejalekshmi, K. G.** (October, 2018). Dual state multicolour emissions from single molecular core: Synthesis and photophysical studies on 5-(2-diphenylamino)-4-arylthiazol-5-yl)thiophene-2-carbaldehyde. International Conference on Recent Trends in Materials Science and Technology (ICMST-2018), ATF Area, Kerala, India .
- Haritha, H. and **Gladis, J.M.** (April, 2018). Ionic Shield for Polysulfides Towards High-Performance Lithium-Sulfur Battery. Research Scholars Symposium on Materials Science and Engineering, CSIR-NIIST, Trivandrum.
- Reshma, C. and **Gladis, J.M.** (October, 2018). Heteroatom Doped Porous Carbon Material Modified separator for high performance lithium-sulphur battery. International Conference on Advanced Materials and Manufacturing Processes for Strategic Sectors (ICAMPS 2018), Thiruvananthapuram.
- Reshma, C. and **Gladis, J.M.** (October, 2018). Hierarchical porous carbon material derived from honeycomb as a polysulphide blocking interlayer for the enhanced cycling stability of lithium–sulphur battery. International Conference on Materials Science and Technology (ICMST 2018), ATF Area, VSSC, Thiruvananthapuram.
- Haritha, H. and **Gladis, J.M.** (October, 2018). Bifunctional Separator as a highly efficient polysulfide mediator for Li-S batteries. International Conference on Advanced Materials and Manufacturing Processes for Strategic Sectors (ICAMPS 2018), Thiruvananthapuram.
- Haritha, H. and **Gladis, J.M.** (October, 2018). Functional Separator as an Effective Ionic Shield for Polysulfides Towards High Performance Li-S Batteries. International Conference on Materials Science and Technology (ICMST 2018), ATF Area, VSSC, Thiruvananthapuram.
- Reshma, C. and **Gladis, J.M.** (December, 2018). Iron, Nitrogen and Oxygen Co-Doped Hierarchically Porous Carbon for Long Cycle Life Lithium Sulphur Battery. International Conference on Chemistry and Physics of Materials(ICCPM 2018), St. Thomas College, Thrissur.
- Haritha, H. and **Gladis, J.M.** (December, 2018). Polyelectrolyte Decorated Separator to Prolong Lithium-Sulfur battery life. National Conference on

Emerging Trends in Science, Technology & Application of Electron Microscope (STAEM 2018), CSIR-NIIST, Trivandrum.

- Aniket, S. R., Haritha H, and **Gladis, J.M.** (December, 2018). Nanostructured lithium cobalt vanadate as electrode material for supercapacitors. National Conference on Emerging Trends in Science, Technology & Application of Electron Microscope (STAEM 2018), CSIR-NIIST, Trivandrum.
- Haritha, H. and **Gladis, J.M.** (December, 2018). Inhibiting Polysulfide Shuttling with a Polyelectrolyte Decorated Separator for High Performance Li-S Batteries. International Winter School on Frontiers in Materials Science 2018, JNCASR Bengaluru.
- Reshma, C. and **Gladis, J.M.** (January, 2019). Quadruple Confinement Effect of Intrinsically Functionalized Hierarchically Porous Carbon with Iron, Nitrogen and Oxygen onto sulphur/lithium polysulphides towards High-Performance Lithium-Sulphur Battery. Twelfth International Symposium on Advances in Electrochemical Science and Technology (iSAEST-12), Chennai
- Haritha, H. Sreekala K. and **Gladis, J.M..** (January, 2019). Modified Separator Performing Dual Functions to Inhibit the Shuttle of Polysulfides for Lithium-Sulfur Batteries. Twelfth International Symposium on Advances in Electrochemical Science and Technology (iSAEST-12), Chennai .
- Sanu, X. and **Nirmala Rachel James.** (December, 2018). Theoretical Model to Enhance the Hole mobility in Polymer based LED devices'. International Conference on Polymer Science and Technology (SPSI-MACRO-2018) held in IISER Pune,, IISER Pune.
- Neema, P.M. and **Jobin, C.** (December, 2018). A Label-Free Fluorescence Sensing Approach for Selective and Sensitive Detection of Picric acid Using WS2 nanodots Synthesized by One pot Hydrothermal Reaction. International Conference on Frontiers in Materials Science, JNCASR Bengaluru.
- Neema, P.M. and **Jobin, C.** (2018). One Pot Hydrothermal Synthesis Of Molybdenum Based Nanohybrid Material and its Application as H2O2 Sensor. International Conference on Recent Trends in Material Science & Technology-ICMST, Thiruvananthapuram.
- Neema, P.M. and **Jobin, C.** (October, 2018). Controlled Synthesis of Luminescent WS2 Nanomaterials and Their Chemical Sensor Application. International Conference on Advanced Materials and Manufacturing Process for Strategic Sectors (ICAMPS 2018), Thiruvananthapuram.
- Neema, P.M. and **Jobin, C.** (April, 2018). Synthesis, Characterization and Chemical Sensor Applications of Molybdenum based Nanoparticles. IM-Thiruvananthapuram Chapter Research Scholars Symposium on Materials Science and Engineering, Thiruvananthapuram.

- Nisha, B., Temina, M. R., Jayalatha, T., **Jobin, C.,** Dona, M. (October, 2018). Synthesis of stable mixed metal halide perovskites: Structure and optical properties. International Conference on Recent Trends in Material Science & Technology- ICMST, Thiruvananthapuram.
- Mini, V., Neema, P,M. and **Jobin, C.** (March, 2019). Hybrid 0D-2D AgNP-WS2 NS Nanocomposite for Enhanced Degradation of Halocarbons. National Seminar on Advanced Functional Materials, Kerala University.
- Wilson, P., Vijayan, S. and **Prabhakaran, K.** (October, 2018). Conducting carbon foam as host for Phase Change Materials. International Conference on Recent trends in Materials Science and Technology (ICMST-2018), Thiruvananthapuram.
- Wilson, P., Vijayan, S. and **Prabhakaran, K.** (August, 2018). Sucrose-derived carbon-graphite composite foams for thermal energy storage systems. Su-Chem 2018, IICT-Hyderabad.
- Wilson, P., Vijayan, S. and **Prabhakaran, K.** (April, 2018). Development of Microcellular foams for thermal management. The Indian Institute of Metals, Trivandrum chapter, Thiruvananthapuram.
- Linsha,V., Wilson, P., **Prabhakaran, K.** (March, 2018). An environmentally friendly carbon aerogels derived from waste tissue paper for high performance electromagnetic shielding and CO2 capture. Hydrogen Energy and Advanced Materials [HEAM SCIENTIST 2018],Thiruvanathapuram .
- Deeraj, B. D. S., and **Joseph, K.**(December 19-22, 2018). Rheological and Visco-elastic Performance Evaluation of SBC Electrospun nanofiber/Epoxy Composites: Experimental data Vs Models. SPSI MACRO 2018, IISER Pune.

Department of Earth and Space Sciences

- Preethi, P,M., **Ramiya, A. M.** and **KDadhwal**, **V.** (29-31 October 2018). 3D modelling of IIST campus using terrestrial laser scanning data. 38th INCA International Congress on Emerging Technologies in Cartography, Hyderabad.
- Jayaraj, P. and **Ramiya, A. M.** (November 2018). 3D CityGML building modelling from LiDAR point cloud data. Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLII-5, 175-180, Dehradun.
- Deepak, G. and **Chandrasekar**, **A.** (October 2018). Sensitivity of the WRF-4DVar Assimilation System to the Control Variables: A Case Study on Uttarakhand Heavy Rainfall Event. TROPMET 2018 National Symposium on. Understanding Weather and Climate Variability: Research for Society, Varanasi.

- Muhammed, S., **Chandrasekar**, **A.** (January 2019). Verification of Land Surface Variables produced by Land Surface Model using Observations over Indian Region. Natonal Space Science Symposium, Pune.
- Deepak, G. and **Chandrasekar, A.** (March 2019). Improved 4DVar simulation of Uttarakhand heavy rainfall event using the WRF model. International Workshop on Modeling Atmospheric Oceanic Processes for Weather and Climate Extremes, New Delhi.
- Asif, I. K. and **Rajesh**, **V.J.** (April 2018). Western Eos Chaos on Mars: A Potential Site for Future Landing and Returning Samples. 2nd International Mars Sample Return Conference, Berlin, Germany.
- Thesniya, P.M. and **Rajesh**, **V.J.** (July 2018). Olivine rich exposures in the Grimaldi basin on the nearside of the Moon: Implications for lunar endogenic processes. 42nd COSPAR Scientific Assembly, Pasadena, USA.
- Asif, I. K. and **Rajesh**, **V.J.** (July 2018). Mineralogy and Morphology of Eos Chaos Region in Eastern Valles Marineris, Mars: Implications for Diverse Geological Processes. 42nd COSPAR Scientific Assembly, Pasadena, USA.
- Paramanick, S., Bhattacharya, S. **Rajesh, V. J**., Praveen, N. M., Sajin, K. K. S. (July 2018). Spectral and Chemical Analyses of probable Martian chemical analogue minerals, Copiapite and Rozenite of Wayanad in Southern India: Implications for hydration processes on Mars. 42nd COSPAR Scientific Assembly, Pasadena, USA
- Sam, U., Toshiaki, T., **Rajesh**, **V.J.,** Yusuke, T., Santosh, M. and Yukiyasu, T. (September 2018). Petrology, geochemistry and geochronology of mafic-ultramafic rocks along the Bhavani suture zone, South India. 15th International Conference on Gondwana to Asia, Xi'an, China.
- Thesniya, P.M. and **Rajesh**, **V.J.** (October 2018). Remote spectral and chemical characterization of Mare basalts in the Grimaldi basin on the nearside of the Moon. National Seminar on 'Advances in Earth and Environmental Sciences, University of Kerala, Thiruvananthapuram.
- Jappji, M., Thesniya, P.M. and **Rajesh**, **V.J.** (October 2018). Morphological and mineralogical characterization of Das crater on the farside of the Moon. National Seminar on 'Advances in Earth and Environmental Sciences, University of Kerala, Thiruvananthapuram.
- Asif, I. K., Ruksana and **Rajesh**, **V.J.** (October 2018). Structural and mineralogical studies of re-entrant Valley near Kasei Valles on Mars. National Seminar on 'Advances in Earth and Environmental Sciences, University of Kerala, Thiruvananthapuram.

- Saranya, R.C., Asif, I. K. and **Rajesh**, **V.J.** (October 2018). Morphology and Mineralogy of Calydon Fossa, Mars: Implications for diverse geological processes. National Seminar on 'Advances in Earth and Environmental Sciences, University of Kerala, Thiruvananthapuram
- Sam, U., Toshiaki, T., **Rajesh**, **V.J.** Yusuke, T., Santosh, M. and Yukiyasu, T. (December 2018). Neoarchean arc magmatism in Bhavani suture zone, South India: Insights from geochemistry and zircon U-Pb geochronology. NIPR 9 th symposium on Polar Science, Tokyo, Japan.
- R.C. Saranya, P.M. Thesniya, **V.J. Rajesh** and Sajeev Krishnan. (December 2018). Chemical and Spectral characterization of chromites from Sittampundi Anorthosite Complex, South India: Implications for remote observations of spinels on Moon. NIPR 9 th symposium on Polar Science, Tokyo, Japan.
- Asif, I. K. and **Rajesh**, **V.J.** (January 2019). Implications for fluvial and glacial processes From Eos Chaos region of Valles Marineris, Mars. 2nd international Conference on Geology: Emerging Methods and Applications (GEM 2019), Christ College Irinjalakkuda, Kerala.
- Thesniya, P.M., **Rajesh, V.J**. (January 2019). Earth's Moon: Geology and research highlights. 2nd international Conference on Geology: 2nd international Conference on Geology: Emerging Methods and Applications (GEM 2019), Christ College Irinjalakkuda, Kerala.
- Thesniya, P.M., Benhur, I.S. J. and **Rajesh, V.J**. (January 2019). Chemistry and morphology of olivine occurrences from the Ohm crater on the farside of the Moon: Insight into their origin. 2nd international Conference on Geology: Emerging Methods and Applications (GEM 2019), Christ College Irinjalakkuda, Kerala.
- Jappji, M., Thesniya, P.M and **Rajesh, V.J**. (January 2019). Morphological and Mineralogical Characterization of Das crater on the Farside of the Moon. 2nd international Conference on Geology: Emerging Methods and Applications (GEM 2019), Christ College Irinjalakkuda, Kerala.
- Asif, I. K. and **Rajesh**, **V.J.** (January 2019). Mineralogy, Structure and Morphology of Western Eos Chaos Trough of Valles Marineris, Mars. 20th National Space Science Symposium, Savitribai Phule Pune University, Pune.
- Thesniya, P.M., **Rajesh**, **V.J.** (January 2019). Deriving the Chemical History of Maria Basaltic units in the Grimaldi Basin on the Nearside of the Moon using Chandrayaan-1 data. 20th National Space Science Symposium, Savitribai Phule Pune University, Pune.

- **Rajesh**, **V.J.,** and Arai, S. (March 2019). Petrogenesis, Tectonics and Economic Significance of Neoarchean Alaskan-type Ultramafic Rocks in Palghat Cauvery Suture Zone, southern India. JSPS-DST Japan-India Forum for Advanced Study in Earth and Planetary Sciences, Niigata University, Japan.
- **Rajesh**, **V.J.,** Arai, S. and Santosh, M. (March 2019). Petrogenesis, geochronology and tectonic significance of Fe-Ti-P Gabbro in Achankovil Shear Zone, southern India. JSPS-DST Japan-India Forum for Advanced Study in Earth and Planetary Sciences, Nagoya University, Japan.
- Thesniya, P.M., **Rajesh, V.J**., and Benhur, J. (March 2019). Evidences for late stage volcanic activity from the Ohm crater on the farside of the Moon. 50th Lunar and Planetary Science Conference, Houston, USA.
- Asif, I. K. and **Rajesh**, **V.J.** (March 2019). Local glacial features on Eastern Valles Marineris trough wall: Implications for glacial processes on low latitudinal Mars. 50th Lunar and Planetary Science Conference, Houston, USA.
- Arun, P. K. and **Gnanappazham, L**. (October 2018). Estimation of above ground biomass using high resolution multispectral worldview-2 image. 38th INCA International Congress on Emerging Technologies in Cartography, Hyderabad.
- Abdul, A. S., **Gnanappazham, L**., Muraleedharan, K.R, Revichandran, C., Sebin, J., Seena, G. (October 2018). A study on tidal dynamics and its impact on mangrove ecosystem of Mumbai, west coast of India. 38th INCA International Congress on Emerging Technologies in Cartography, Hyderabad.
- Deshwani, E. and **Gnanappazham, L**. (October 2018). Assessing the vegetation health of mangroves of Maharashtra coast. 38th INCA International Congress on Emerging Technologies in Cartography, Hyderabad.
- Sushma, K. and **Gnanappazham, L**. (October 2018). Spatio-temporal effects on streamflow prediction in Vaigai basin using SWAT model. 38th INCA International Congress on Emerging Technologies in Cartography, Hyderabad.

Department of Humanities

- **Lekshmi, V. N.** (December, 2018). Awaz. International Conference on Voice of the Change Makers, Department of Sociology, University of Kerala.
- **Lekshmi, V. N.** (9-11 October, 2018). 45th Annual Meet and National Seminar, SreeSankaracharya University of Sanskrit, Kalady.

- **Lekshmi, V. N.** (27- 29 December, 2018). Reconstructing Sociological Discourse in India: Perspectives from the Margins. 44th All India Sociological Conference, St. Philomena's College at Mysuru.
- **Gigy, J. A.** (3-5 December, 2018). Culinary Memories : A Sociopolitical Reading of Select malayalam Short Storeies. International Colloquium on Literature, Theory & the History of Ideas, MSM College, Kayamkulam.
- **Gigy, J. A.** (5-7 January 2019). Kerala Cookbooks and alternative Modernities : Analysis of Select Food writings from Kerala. International Conference - Print Modernities, St. Thomas College, Thrissur.
- **Gigy, J. A.** (14-15 March, 2019). The Differing Semiotics of Food in Contemporary Malayalam Cinema. National Seminar on Malayalam Cinema : Contested Screens, Contending Economies, Institute of English, University of Kerala .
- **Shaijumon, C. S.** (22-23 March 2019.). Prospering Economy and Sinking Government: Development Paradox of Kerala Economy. International Round Table Conference on 'Rebuilding Kerala Economy: Time for a Paradigm Shift, Institute of New Economic Thinking New York and Centre for Public Policy Research Institute Cochin.
- **Shaijumon, C. S.** (21st March, 2019.). Sustainable Fiscal Consolidation: The Way Ahead. Seminar on Kerala State Finances: Performance, Challenges & The Way Ahead, St. Michael's College, Cherthala.
- Pavanam, T. & **Shaijumon, C. S.** (15-16 March, 2019.). India China Bilateral Trade and Economic Relations. International Conference on Engaging the Rising China: Strategic Options for the Emerging India, Institute of Contemporary Chinese Studies, Mahatma Gandhi University, Kerala .

Department of Mathematics

- Pavithra, C.R. and **Deepak, T.G.** (13-15 February 2019). On Fisher information of some functions of phase type variates. Tenth International conference on Matrix analytic methods in stochastic models (MAM10), University of Tasmania, Hobart, Australia.
- Jogender, S. and **Anil, K. C. V.** (5-11 December 2018). Dynamics of periodically forced spheroids in a quiescent fluid at low Reynolds number. International Workshop and Conference on Topology and Applications, Rajagiri School of Engineering & Technology, Cochin, Kerala, INDIA.

Department of Physics

- Manu, M., Vipin, K. S., Sudipta, R.B., **Bhattacharjee, K.** (Dec. 18-22,2018). Local Electronic Structure of UHV Cleaved WS2 surface: In- situ STM and STS Studies. 63rd DAE Solid State Physics Symposium (DAE SSPS-2018), Guru Jambheshwar University of Science and Technology, Hisar, Haryana, India.
- Gauthami, V., Reshmi, S., Sachidanand, P. S., Manu, M., **Bhattacharjee, K.** (August 16-18, 2018). Electrical Characterization of Tailored MoS2 Nanostructures. 3rd International Conference on Advances in Materials and Manufacturing Applications (IConAMMA 2018), Amrita Viswa Vidyapeetham, Bengaluru Campus, India
- Sachidanand, P. S., Sreelal, M. M., Reshmi, S., Gauthami, V., Manu, M., Surya, K. G., Rakesh, K. S., **Bhattacharjee, K.** (October 4-6 2018). MoS2 Nanostructures as transparent material: Optical transmittance measurements. International Conference on nanoscience and Engineering Applications (ICONSEA 2018), JNTU Hyderabad.

6.5 INSTITUTE PUBLICATIONS

Surabhi: Journal of Arts and Literature is a bi-annual art and creative journal 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. The current edition is Vol 10 No.2.

IIST Newsletter: is published bi-annually to share and widelly circulate covering all the important events at the institute. Vol. 4 No. 1 January 2019 is the current issue.

6.6 IN-HOUSE PUBLICATIONS

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

6.7 LITERAY PUBLICATIONS

- **Babitha, M. J**. (2018). Tedious Transits to Modernity: the Story of Some women Entrepreneurs in the Garo Hills, Meghalaya
- **Babitha, M. J**. (2018). Oscar. Eclectica Poetry 22(3)
- **Babitha, M. J**. (2018). The Art of Forgetting. Silver Needle Press.
- **Babitha, M. J**. (2018). Ä Slim Shroud Called Home. Rise Up Review
- **Babitha, M. J**. (2018). Tengchi. The Punch Magazine
- **Babitha, M. J**. (2018). Aakkulam Lake and Your Orchards.. Roots and Resistance Issue, About Place Journal
- **Babitha, M. J**. (2018). Silk Threads, Amma and My Brother's Garden. The Write Launch
- **Babitha, M. J**. (2018). I cook my own Feast.. The Esthetic Apostle
- **Babitha, M. J**. (2018). Christmas in the Garo Hills.. Adolphus Press
- **Babitha, M. J**. (2018). An Anthem for Brown. The Scriblerus
- **Babitha, M. J**. (2018). Savings. Chaleur Magazine
- **Babitha, M. J**. (2018). Snore Catcher and Easter Eggs. The Paragon Press: Lago Journal
- **Babitha, M. J**. (2018). Thoughts on a Priest's Cassock. constellations-lit.com, 8
- **Babitha, M. J**. (2019). Mummy's Sarees. inlandiajournal.com, 9
- **Babitha, M. J**. (2019). Blue-eyed brown Aunt. Two Sisters Writing and Publishing
- **Babitha, M. J**. (2019). Superwoman. Not Very Quiet Journal
- **Babitha, M. J**. (2019). Rebirth. Trampset
- **Shaijumon, C.**S. (2019) Popular Budget in an Election Time: Union Budget 2019-20, Mathrubhumi GK & Current Affairs, Mathrubhumi Publishers, March 2019, pp 4-8.
- **Shaijumon, C.**S. (2018) Economic Rebuilding of Kerala, The New Indian Express, December 25, 2018
- **Nikhil Eyeroor** (December 2018) Are You Superstitious?, Surabhi magazine, IIST Journal of Arts and Literature. Vol.10, No.2, pp 14-16.

FACILITIES & OTHER UNITS

7. FACILITIES & OTHER UNITS

7.1 FACILITIES

7.1.1 Library & Information Services

Library continued its support for academic & research activities of the Institute by acquiring various types of information sources, by subscribing to electronic resources and providing various information services.

Collection Development

Resources	Addition during 18-19	Total as on 31st March 2019
Books	1170	21830
Book Bank Books	108	10453
E-Books	1817	1817
Print Journals	5	90
Online Journals	2	9
Online Databases	Nil	13
Bound Volumes	386	770

CD / DVD	5	1028
Maps	5	122
Reports	163	955

During the reporting period, library has spent Rs. 28 Lakh for books, Rs.58 lakh for print journals, and Rs. 235 lakh for online resources. Library subscribed to the following online e-databases: ACM Digital Library, AIP, AMS, APS, ASME, IEEE-IEL, JSTOR, Optics Infobase, OUP, RSC and MathSciNet and got access to SPIE and AIAA through Antariksh Gyaan.

Books on Desk Service: New service started for faculty members to get their books ready for issue at the front desk, in response to telephone / e-mail call, by the time they reach to the library.

IIST Virtual Library (IVL): Library continued to provide this services to enable users to access subscribed from a single portal, irrespective of palce and time.

Current Awareness Service : (a) Total 214 people registered for Journal TOCs from IIST during the reporting period and the total number of users is 655 (b) content pages of 656 print journals scanned, linked and uploaded to library portal (c) Lists of new books purchased were uploaded to the library portal every fortnightly (d) Latest articles / books / posters by IIST faculty / student displayed in the library.

Shodhganga Co-ordination: Soft copies of 9 Ph D theses were uploaded to Shodhganga repository.

Book Grant Facility : Library has processed bills for 1950 books, costing Rs.9.82 lakh, purchased by the B. Tech students by using the book grant.

Plagiarism Checking Facility: Library acted as the central point for checking plagiarism in articles, reports and theses. Campus wide access to the plagiarism checking software was enabled for faculty.

Graphic Design Facility: During the reporting period, this central facility was used for designing various documents such as Institute brochure, calendar, magazine, proceedings, annual reports etc. Around 148 documents were designed from this facility for various purposes.

Reprographic Facility: This facility met photocopying and printing requirements of the Insttitue for the academic and administrative purposes of the Institute.

Binding Facility: More than 1700 documents bound in this facility during last year. The facility was extended for students for their personal purpose on payment basis.

Resource Awareness Programme (REAP): Library has conducted 5 REAPs on various topics such as JTOCs, Turnitin, IVL and Use of E-resources.

Library Week Celebration: Library week was celebrated in IIST during 14-20 November 2018. Dr YVN Krishna Murthy, Senior Professor and Registrar, inaugurated the programme. Talks on 'How to write quality technical paper' (Dr Dhanu Pattanashetty, IEEE), 'How to avoid plagiarism'(Shri Akshay Prasanna, IEEE) and'Tools for Information Management (Shri Abdunnasar. A, IIST) were organised as part of the programme. A book fest was organised for faculty and students to select books for library.

Book Donation Campaign: Library has organised a 'Book donation campaign for flood affected library' during November 2018. About 2000 books were collected from the academic community of IIST and collected books were given to Govt. Engineering College, Munnar.

Internship Programme: Nine L&IS PG students done their internship training programme in IIST Library.

7.1.2 Software Support Group

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 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 limited time constraint with accuracy. SSG plays an important role in providing software solutions based on Institute demand.

SSG Activities – A quick walk through

a. **Software tools developed for various activities in the Institute:**
   Analysis, Design, Coding, Implementation, Maintenance and Enhancement
   1. ePay – Online payment system implemented for undergraduate admissions
   2. IIST Admission Software – For registration to U.G., P.G. and Ph.D. Programmes
   3. Online Counselling Software – For U.G. and P.G. admissions
   4. iCampus – Manages academic functions in IIST campus
   5. Academic Portal – Student view for academic activities in IIST
   6. Placement Software – For placement assistance
   7. ISRO Absorption Counselling Software – For ISRO absorption
   8. Convocation Portal – For registration and posting convocation related information

9. Alumni Portal - For managing the alumni specific information
10. Online Election System – For alumni NIAEC election
11. Material Management System – For Stores, Construction and Maintenance Division
12. Online Application Submission for Recruitment – For Appointment on Short-term Contract Basis and Technical Assistant
13. CHSS Monitoring System – For employee beneficiary details.
14. Conference Travel Management System - For submitting nominations to seminar/conferences
15. Student Activity Board – Event Management System
16. Card Generation System – For printing identity cards and canteen cards
17. Access Control System – For tracking BACS - IN-OUT status of students
18. Gate Pass Management System – For managing student, guest, vehicle pass
19. Payment Information System – For tracking budget details
20. Student/Staff Directory – Manages student and staff details
21. Complaint Registration System – For logging complaints regarding grievance and caste discrimination
22. Online Registration for conferences and workshops

b. Customized Applications:

Implementation, Maintenance and Enhancement

1. COWAA IIST MIS
2. Canteen Management System
3. TOMD for Transport
4. Personal Information System
5. Cheque Printing
6. Diarising System

c. Software Support:

Technical and User support

1. IIST Website
2. COWAA Database support, backup and trouble shooting

d. Other Activities:

1. Website design for seminars/workshops on request
2. Record keeping and document preparation
3. Analyze and provide various reports and charts based on requirement
4. Query response for admissions through email.
5. Uploading and version control of applications in server.

e. Current Software Development:

Analysis, Design, Coding, Integration and Testing

1. Medical Management System
2. Online Transcript Request
3. Online Payment Interface Integration
4. Canteen Booking System
5. Online Examination System
6. IIST/IIST-ISRO Project Tracking
7. Budget Compilation System

7.1.3 Medical Facilities

Permanent staff are covered under Complementary Health Service Scheme (CHSS) of DOS. As a residentialcampus, health care of students is extended at the MedicalFacilities functioning at HostelDhanishta where two Doctors, four Nurses areengaged on contract. The students are also covered under Group Medi ClaimInsurance Policy and Accident Insurance Policy. For specialized treatment, lab examinations etc., students are referred to outside hospitals recognized under the Insurance agency. Conveyance facility including a fully equipped Ambulance and alight vehicle are available to meet emergency situations. Manpower engaged oncontract is covered under Employees' State Insurance Scheme which is managed bythe manpower supply agencies. Those persons engaged under contract directly under IIST are advised to take medical insurance coverage, the premium of which ispaid by IIST.

A well experienced professional counsellor engaged on contract by IIST provideshelp and guidance for students with personal issues or challenges. The counsellingservices is open also to parents and teachers in required cases.

7.1.4 Halls of Residence

The residential facilities for students are spread across 11 Hostels (08 for Men & 03 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, LCD television with satellite connection,centralizedfitness facility with

modern fitness equipments. safe drinking water (both hot and cold) and 24 hr uninterrupted power supply with generator backup. Neat and tidy upkeep of the hostel rooms are the responsibilities of the students. All hostels are Wi-Fi enabled with high speed access to the internet, digital library and other digital learning resources.

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.

7.1.5 Canteen Service

Canteen Services of IIST caters to the need of more than 800 inmates of the Institute hostels as well as to the regular population of more than 300 people which includes faculty members, officers and staff. Student Dining Halls viz. '**Aditi**' and '**Akshaya**' has a capacity of 150 each which caters to the auxiliary staff also. '**Tripthi**' and '**Subhiksha**' is for faculty members and VIP services respectively. Menu is finalized by the Canteen Committee which includes student representatives. In addition to this, Canteen Management Committee, Canteen Procurement Committee and Canteen Accounting Committee are constituted to assist the smooth functioning of the Canteen Services.

Private run cafeterias are present in Aerospace building, Physical Science building and near the gate complex. A juice outlet is also available. All necessary requirements of stationery and other toiletries are met by the stationery counter operational along with the cafeteria.

7.1.6 Bank / Financial Serviece

The Institute houses the Union Bank of India along with its ATM, near the student residential area for easy access for students.

7.1.6 Security Services

Campus Security services is entrusted to CISF personnel. A CISF contingent including Assistant Commandant and 109 officials keep vigil for 24 x 7 in the residential campus. Ordinary security personnels are also employed in all buildings of the campus.

7.1.7 Scholarships & Financial Support

DOS B.Tech Assistance Programme

Department of Space Assistanceship covers full cost of education (ie, course fee, Hostel fee, Books & Hostel charges and medical expenses) for all undergraduate students who score a CGPA of 7.5 and above.

1	Statutory Semester Fee	Rs.20,000/-
2	Students Amenity Fee	Rs.4000/-
3	Hostel charges including dining	Rs.14,400/-
4	Establishment charges	Rs.8,000/-
5	Medical Cover	Rs.2000/-
6	Book Grant	Rs.3000/-
Total Amount		**Rs. 51,400/-**

M.Tech and Ph.D students were given scholarships and fellowships as perGovernment of India norms.

7.2 ADMINISTRATION & OTHER UNITS

7.2.1 Administration

Academics

Dr. Vinay Kumar Dadhwal | Director

Deans

Dr. A Chandrasekar | Academics , Continuing Education

Dr. Raju K George | Research and Development & IPR

Dr. Kuruvilla Joseph	Students Activities , Student Welfare & Outreach
Officers	
Dr. A Chandrasekar (till 28.10.2018) **Prof. YVN Krishna Murthy** (29.10.2018 onwards)	Registrar
Dr. Sennaraj V	Deputy Registrar (Academics)
Shri. R Hari Prasad	Deputy Registrar (Finance)
Smt. Bindya K R	Deputy Registrar (Administration)
Shri. Mohan Sukumar	Scientist/Engineer 'SF' (Computer System Group)
Shri. Ramanathan S	Senior Administrative Officer
Shri. Subash Chandran M B **Shri. Rakesh R Menon**	Deputy Registrar (Purchase) Senior Purchase & Stores Officer
Shri. Vinod Kaimal K P	Senior Manager- Canteen Services
Shri. Pradeep Kumar K R	Administrative Officer (In Charge of Hostel & Transport)
Smt. Rajeena Beegam S **Smt. Reny Thomas**	Senior Accounts Officers
Shri. Jayapal R	Senior Hindi Officer
Shri. Abdunnasar A	Library Officer-D

7.2.2 Placement Cell

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. Deepak Mishra, Associate Professor, Department of Avionics and Dr. Pradeep Kumar P, Associate Professor, Department of Aerospace Engineering.

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 endeavors 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 April2018 to March 2019 includes, M/s Agnikul Cosmos, M/s Flytxt Mobile, M/s Intel Technology, M/s Mercedes Benz, M/s Cypress Semiconductors, M/s Subex Ltd, M/s Delta Electronics, M/s System Control, M/s Continental Automotive, M/s, M/s SatSure Ltd, M/s Ignitarium, M/s Bellatrix Aerospace, M/s Quantela Technology. The list of M.Tech students placed at various industries is given in the following tables. For the year April 2018 to March 2019, the maximum package [CTC] was 14.5 Lakhs for M.Tech students and 8.1 Lakhs for B.Tech students. The average package for M.Tech students is 10.5 Lakhs and 6.5 Lakhs for B.Tech students.

Internship for M.Tech (Batch : 2018-2020) Project work outside IIST

SL NO	Name of the Company	Name of the Students	Course
1	M/s INTEL	Pragati Agarwal	VLSI and Microsystems
2	M/s Mercedes Benz	Ajeet Kumar	RF and Microwave Engineering
3	M/s Quantela	Amitesh Sharma	Machine Learning and Computing
4	M/s Robert Bosch	Srujan K Darshanam	Machine Learning and Computing
5	M/s IISC, Bangalore	Durgesh K Singh	Machine Learning and Computing
6	M/s Alpha ICS (I) Pvt Ltd	Sanjay G	Digital Signal Processing
7	M/s ST Microelectronics	SanjukthaGanguly	Digital Signal Processing
8	M/s KPIT Technologies	Gokul P N	Digital Signal Processing
9	M/s VSSC, TVM	Ashwathy S Ashok	Digital Signal Processing
10	M/s SAC, Ahmadabad	MallikaSomanath	RF and Microsystems
11	M/s SCL, Chandīgarh	VaibhavAdhikari	RF and Microsystems

List of Students placed in IIST

B.Tech Batch (2015-2019) and M.Tech Batch (2017-2019)

Sl. No.	Name of the Student	Course	Company
B.Tech			
1	SaiAvinashSattiraju	Avionics	M/s Subex Ltd
2	KalpitaMandal	Avionics	M/s Subex Ltd
3	RohitGandikota	Avionics	M/s Subex Ltd
4	Aditya Krishnan	Avionics	M/s Subex Ltd
5	KumariPooja	Avionics	M/s Subex Ltd
6	Sai Ram Kakumanu	Avionics	M/s Subex Ltd
7	Pratik Wankhede	Avionics	M/s ESSI Integrated Technology
8	Pratabidya Panda	Avionics	M/s Mahindra & Mahindra
9	Ramanan J	Avionics	M/s Mahindra & Mahindra
10	Shravan Kumar	Avionics	M/s Mahindra & Mahindra
11	Manasvi G	Avionics	M/s Satsure Analytics
12	SanjuthaIndrajit	Avionics	M/s Satsure Analytics
M.Tech			
13	Silpa V S	Machine Learning & Computing	M/s Tata Consultancy Services
14	Anju Sebastian	VLSI & Microsystems	M/s Cypress Semiconductors
15	Soumya Sara John	Digital Signal Processing	M/s Flytxt
16	Adarsh K	Machine Learning & Computing	M/s Flytxt
17	Navneet Agarwal	Machine Learning & Computing	M/s Subex Ltd
18	Anagha P	Geoinformatics	M/s Subex Ltd
19	PiruthviChendur P	Control Systems	M/s Agnikul Cosmos
20	Neethu M	Control Systems	M/s Agnikul Cosmos
21	Ranjith S	Power Electronics	M/s Delta Electronics
22	Arpita	Power Electronics	M/s Delta Electronics
23	Hari Krishna	Power Electronics	M/s Delta Electronics
24	ArchitAsthana	Power Electronics	M/s Delta Electronics
25	Shubham Agarwal	Geoinformatics	M/s Quantela Technologies
26	Jitendra Kumar Kushwaha	Machine Learning & Computing	M/s SatSure Analytics
27	NeerajVarma	Geoinformatics	M/s SatSure Analytics
28	JalluriChaitanya	Geoinformatics	M/s Climate Connect Ltd
29	Siraj Un Nabi	Geoinformatics	M/s Climate Connect Ltd
30	Jayakrishnan K U	Earth System Science	M/s Climate Connect Ltd

31	Shahan K	VLSI & Microsystems	M/s Ignitarium
32	Vijaya Kumar S	VLSI & Microsystems	M/s Ignitarium
33	Animesh Kumar	Machine Learning & Computing	M/s Innovation Incubator
34	Ramdeep T N	Control Systems	M/s Mercedes Benz
35	Saikat Bhowmick	Control Systems	M/s Mercedes Benz
36	Ashok Ashwin	Thermal and Propulsion	M/s Bellatrix Aerospace
37	Swathi VV	Thermal and Propulsion	M/s Bellatrix Aerospace

7.2.3 Official Language Cell

HINDI SECTION AND OFFICIAL LANGUAGE IMPLEMENTATION

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 **13th and 14th June, 2018** (for the Employees of Technical areas), on **September 12th, 2018** (for the faculty members), on **20thand 21st December, 2018** (for the Employees of Administrative areas) and on **March 18th, 2019** for the Executives (all Deans, HoD's, Division Heads and Officers of Administrative areas) of the Institute.

- Four Quarterly meetings of the OLIC were conducted on (20.06.2018, 28.09.2018, 17.12.2018 and 29.03.2019) 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 Month** Celebrations were held in the institute from **September 03rd to 28, 2018.** During this month various programmes were organized. Hindi Software Training Programme was organized for the employees of administrative and technical areas on **3rd September**. A Hindi Day lecture was delivered by Dr R. Jayachandran, Registrar of Kerala University on **14thSeptember** highlighting the

importance of Hindi Day. Various competitions were conducted in Hindi for both Students and Staff members of IIST. Merit certificates and cash prizes were awarded to the winners of Hindi Competitions in a prize distribution function held on **November 30, 2018**.

- In connection with the **World Hindi Day Celebrations - 2019** in IIST various Hindi competitions were conducted for the employees on **17th & 18th January, 2019** and for the students of IIST on **16th, 17th & 21st January, 2019.** Merit certificates and cash prizes were awarded to the winners on January 26th, 2018.

- **Publication of the second issue of the Hindi House Journal of IIST named 'Antarish Dhaaraayen'**

  The second issue of Hindi House Journal of IIST named **'Antarish Dhaaraayen'** was released in a Prize Distribution Function during the **Republic Day Celebrations** on **26th January, 2019.** The magazine contains articles, stories, poems, reports of major functions and creative works of students and personnels of IIST in Hindi.

- **Hindi Technical Seminar**

  A two day Hindi Technical Seminar on the topic **'Recent Advances In Space Science And Technology**' was organized in IIST on **30th and 31st October, 2018** in collaboration with VSSC, LPSC, IPRC, IISU and APEP. During this seminar, an official language session was also conducted on the topic **'Changing Dimensions of Official Language Hindi'**. Dr. B. N. Suresh, Honourable Chancellor, IIST delivered the inaugural address and Shri. M. V. Dhekane, Professor Satish Dhawan Professor, IIST delivered the keynote address of the technical session of the seminar. Professor B. Y. Lalitamba, Hindi scholar and member of Joint Hindi Advisory Committee for DOS and DAE gave the invited talk. A total of 36 articles from VSSC, LPSC, IPRC, IISU, APEP and IIST were presented during the two-day seminar which included six articles from IIST. Four technical sessions and one official language session were held. Prizes were given to the best paper presenters of both Hindi speaking and Non Hindi-speaking categories of each session. All the articles were well condensed, organized and presented effectively. The seminar deliberated on very informative topics and it was very interactive, which benefitted all the participants enormously.

- Telephone Directory, Course Record, Record of Degrees conferred, Provisional Certificates, Degree Certificates and all other certificates such as certificate of participation/ certificate of merit etc., were prepared, printed and issued in

bilingual format (both Hindi and English). Institute Brochure, Annual Report 2017-2018 were printed in Hindi.

- Standard forms used in various Administrative and other Departments were bilingualised, visiting cards, name boards and rubberstamps were prepared in bilingual format.

- 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.

- Sr. Hindi Officer, IIST provided faculty assistance for the conduct of OL workshops in various Central Government Offices in Thiruvananthapuram viz. VSSC, IISU, LPSC and CPWD.

PARTICIPATION IN VARIOUS PROGRAMMES:-

- 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 Hindi Fortnight Celebrations** organized under the auspices of the TOLIC and **Dr. Sarita Vig**, Associate Professor, Department of Earth and Space Sciences won **first prize** in the **Hindi Recitation**, **Smt. Reny Thomas**, Sr. Accounts Officer won **second prize** in **Hindi Recitation** and **first prize** in **Hindi Extempore Speech**, **Dr. Ravi V,** Associate Professor, Department of Humanities won **consolation prize** in **'What does the picture speak'** competition, **Shri. R. Hari Prasad**, Deputy Registrar (Grade-II) Finance and **Shri. Rakesh R. Menon**, Senior Purchase and Stores Officer won **consolation prize** in **Quiz Competition**, **Smt. Sreeja J. J**., Senior Technical Assistant won **third prize** in **Noting and Drafting**, **Smt. Ancy Austin**, Library Assistant won **consolation prize** in **Translation Competition**. The employees of our Institute also participated in the **lnter TOLIC Patriotic Song Competition** organized in connection with World Hindi Day Celebrations.

- Shri. R. Jayapal, Sr. Hindi Officer and Shri. Abhay Jain, Sr. Assistant attended the Official Language Orientation Programme conducted by Department of Space on 7th December, 2018 at SCL, Chandigarh**.**

- Shri. R. Jayapal, Sr. Hindi Officer attend the Regional OL Conference held at KUSAT, Kochi on 14.02.2019.

- Shri. Abhay Jain, Sr. Assistant and Shri. Md. Sajin, Sr. Technical Assistant 'B' attended the one day workshop on Hindi Gyan Prabandhan Application conducted by SAC Ahemedabad on 14th March, 2019.

- Shri. R. Jayapal, Sr. Hindi Officer and Smt. Cimy Asaf, Sr. Hindi Translator attended the State Level Inter TOLIC Technical Seminar held at HLL Lifecare Ltd, Peroorkada, Thiruvananthapuram on 15th March, 2019.

- Shri. R. Jayapal, Sr. Hindi Officer and Smt. Cimy Asaf attended the Joint Hindi Workshop held in the Office of the Accountant General, Kerala on 21st March, 2019.

PAPERS PRESENTED IN SEMINARS / CONFERENCES DURING THE YEAR 2018 - 19

Sl. No.	Name of the Presenter /	Seminar / Venue / Date	Title of the paper presented
1	Shri. R. Jayapal	Presented paper in Hindi Technical Seminar - 2018, IIST, Thiruvananthapuram, 31st October, 2018	राजभाषा हिंदी का बदलता स्वरूप एक अवलोकन -
2	Shri. R. Jayapal	Department Level Official Language Orientation Programme on 7th December, 2018 at SCL, Chandigarh.	तकनीकी संस्थानों में राजभाषा कार्यान्वयन की समस्याएं एवं समाधान
3	Smt. Cimy Asaf	Translated three Technical Articles for the Hindi Technical Seminar 2018 IIST , Valiamala 30th & 31st October, 2018	1. अंतरिक्ष विज्ञान एवं प्रौद्योगिकी में यंत्र अधिगम प्रवृत्ति
			2. आईआईएसटी शैक्षिक प्रबंधन प्रणाली में वेब सुरक्षा
			3. अंतरिक्ष अनुप्रयोग आंकडे के लिए क्लाउड कंप्यूटिंग प्लैटफॉम का उपयोग करते हुए डेटा संचय इष्टतमीकरण

7.2.4 SC/ ST Cell

Dr. Ananthakumar, Chief Guest addressing the audience during 127th birthday celebrations of Dr. B. R. Ambedkar

The Scheduled Caste/Scheduled Tribes Cell in the institute promotes the special interests of employees and students in the reserved category. It is expected to provide special inputs in areas where the students experience difficulties. It also functions as a Grievances Redressal Cell for the Grievances of SC/ST students and employees of the institute and renders them necessary help in solving their academic as well as administrative problems. 128th Birth Anniversary of 'Bharat Ratna' Dr.B.R.Ambedkar organized on 18th April, 2018 in IIST, Valiamala. Dr. Ananthakumar, Sr. Principal Scientist, NIIST, Thiruvananthapuram, was the chief guest of the function.

7.2.5 Public Information Office

The Institute adopted the Right to Information Act, 2005 and has disseminated required information in a time bound manner. Shri S. Ramanathan, Senior Administrative Officer (Recruitment and Review) is the Assistant Public Information Officer (APIO).

RTI Status

From April 2018 to December 2018 (Information given through CPIO, ISRO/DOS)

Application Received through CPIO and otherwise	Information forwarded to CPIO	Appeal	CIC Hearing
40	40	01	Nil

From January 2019 to March 2019 (Decentralised the processing of applications under RTI and CPIO, IIST has been disseminating the information directly to the applicants).

Application Received	Information given	Appeal	CIC Hearing
18	18	Nil	Nil

Vigilance Status
Vigilance cases pending and disposed off in the year 2018-2019 - Nil

7.2.6 Gender Sensitization Cell

Director, IIST inaugurating the International Women's Day celebrations

Dr. Lalithambika V R, Chief Guest delivering the speech

The Gender Sensitization Committee of the Institute organised International Women's Day celebrations on March 20th, 2019. Dr. V. K Dadhwal, Director, IIST inaugurated the function and addressed the gathering. Dr. Lalithambika V. R, Director, Human in Space Programme, ISRO was the chief guest of the function. Dr. Lalithambika recounted her experiences as a scientist and her talk was very inspiring to the students and staff members. IIST honoured **Padma Shri Awardee Smt. Lakshmikutty Amma** (Traditional medical practitioner) during the function. Theme based cultural programme by IIST students added colour to the function. Photography and painting competitions were organised in connection with celebrations on themes 'Balance for Better' and 'Sky is the Limit' respectively. Ethnic food stall by 'Ayalkoottam' an NGO run by women, exhibition of hand crafted jewellery and paper art work by IIST staff members were also part of the celebrations.

EVENTS, VISITS & OUTREACH


Dr. A. P. J. Abdul Kalam Lecture Series
Inaugural Lecture by Dr. V. K. Saraswat
Member, NITI Aayog
on

8. EVENTS, VISITS & OUTREACH

IIST organised a number of Seminars, Conferences and Workshops to disseminate research findings as well as to provide opportunity for IIST students and scholars to participate and learn from such events. In addition, a large number of national festivals and other earmarked days were celebrated with great fervour.

8.1 Dr. APJ ABDUL KALAM LECTURE SERIES

Dr. APJ Abdul Kalam Lecture series was launched by IIST in April 2018 in the fond memory of its 1st Chancellor, Dr. APJAbdul Kalam. The first lecture was given by Dr. V K Saraswat, Member, NITI Aayog on 14.4.2018 on 'New Frontiers in Engineering'

Dr. V. K Saraswat delivering the inaugural lecture of Dr. APJ Abdul Kalam Lecture Series on 14th April 2018

The second lecture in this series was organised on 5th September 2018 by Prof. Mustansir Barma, DAE – Homi Bhabha Chair Professor, TIFR, Hyderabad on 'Random Questions in Science'. Prof. Mustansir Barma is one of the most eminent Physicists from India and an important name in the world of Statistical Physics. In a scintillating lecture, he introduced the topic of stochastic processes using easily understandable models and daily life phenomena. "Random walks" is a simple to define, yet paradigmatic stochastic model which holds many surprises and is applicable to a large number of phenomena across the disciplines.

Prof. Mustansir Barma delivering the 2nd Dr. APJ Abdul Kalam Lecture Series on 5th September 2018

The third Dr. A P J Abdul Kalam lecture was delivered by Prof. Anil Sahasrabudhe, Chairman, AICTE at 9.30 hrs on IIST Foundation Day on 14th September 2018. The programme started by invocation followed by welcome address by Dr. V. K. Dadhwal, Director, IIST. The title of the talk was 'Innovation and Excellence in Technical Education: A Roadmap and Vision for the Future'.

Prof. Anil D Sahasrabudhe delivering the 3rd Dr. APJ Abdul Kalam Lecture on 14th September 2018

8.2 OPEN DAY

School students of 8th to 12th standards of nearby schools in and around Thiruvananathapuram were invited to visit labs and facilities in IIST on 14th Spetember 2018. All Departments and Various Clubs in IIST organized experiments, demonstrations, poster presentations, robotics, solar system demonstration, laser experiments etc. for the school children from 11: hrs to 16: 30 hrs.

Lab visits by students

8.3 IIST ALUMNI MEET

IIST Alumni Meet was organised on 14th September 2018. Twenty four alumni from various ISRO Centres attended the alumni meet. Dr. V. K. Dadhwal, Director, IIST chaired the meeting and in his address he stressed the importance of developing an alumni network for the benefit of IIST and advised to develop a structured alumni forum. During the interaction with the Director, Registrar and Faculty, the alumni has given various suggestions for fruitful interaction between IIST students and alumni for organising workshops and lectures, assisting in identifying research problems in ISRO Centres for IIST students.

IIST Alumni with Director, Registrar and Faculties of IIST

8.4 CONFERENCE, WORKSHOP, TRAINING ORGANISED BY IIST

Last year, IIST had organized 8 national level workshops and conferences in various areas of space science, space technology, culture and humanities with a cumulative participation of over 350 students and active researchers.

Sl No	Title	Duration	Department
1	Awareness Programme on IEEE and Activities of IEEE AP-Society	14th September, 2018	Avionics
2	IEEE-INAE Workshop on Electromagnetics (IIWE 2018)	6-8 December 2018	Avionics
3	IEEE Technical Poster Competition on Antennas for Space Application	12th November, 2018	Avionics
4	International Conference on Recent Trends in Materials Science and Technology (ICMST 2018)	10 -13 October,2018	Chemistry
5	Annual Astronomy and Astrophysics school	December 10 – 19, 2018	Earth and Space Sciences
6	Programming in Python	23-25 October, 2018.	Avionics
7	Colloquium on System Engineering and Institutions Building	9th February 2019	IIST, VSSC
8	YTN-Programme	14-26th May 2018	Mathematics

Young Talent Nurture Programme

The Department of Mathematics, IIST, has been conducting "Young Talent Nurture" (YTN) programme in different levels since 2013. The aim of the programme was to nurture young mathematical talents through promotion of pathological questioning, logical and critical thinking, and problem solving. This year YTN programme was conducted in its second level, targeting the students who had completed 2nd year or 3rd semester B.Sc./B.Tech./Integrated M.Sc. during 14th May - 26th May 2018. The programme helped the students to understand the fundamentals of Mathematics, and overall serve the basic needs to pursue higher studies in Mathematics.

Astronomy School

Department of Earth & Space Sciences, IIST conducted the annual astronomy and astrophysics school from December 10 – 19, 2018. The school had 45 participants from various colleges across India.

Participants of Astronomy School

Participation in the International Olympiad program

Dr. Sarita Vig, Associate Professor, Dept. of Earth & Space Sciences, IIST participated as team leader of the Indian team at the 12th IOAA: The International Olympiad program provides a platform to the secondary and higher secondary school students to engage and compete in an amicable atmosphere at the highest level. In India, the Olympiad programs are coordinated by the Homi Bhabha Centre for Science Education (HBCSE-TIFR), Mumbai and students selected through national level tests. The International Olympiad on Astronomy and Astrophysics (IOAA) is a competition for higher secondary school students which involve an assessment of both theoretical and observational skills in Astronomy and Astrophysics. Every year, IOAA is hosted by a different country.

Colloquium on System Engineering and Institutions Building

A one day colloquium on “System Engineering and Institution Building” was organised jointly by IIST and VSSC in association with Aeronautical Society of India, Indian Society for System Science and Engineering and System Society of India on 9th February 2019 at Dr. Srinivasan Auditorium, VSSC, Thiruvananthapuram.The colloquium was organised to honor and felicitate Dr. B N Suresh, Chancellor and Founding Director, IIST, who has completed 75 years of age and has served ISRO / IIST for about 50 years since 1969. Dr. B. N. Suresh, is known for his expertise on

System Engineering and building of a world class institute IIST at Thiruvananthapuram. The symposium was inaugurated by Dr. K Radhakrishnan, former Chairman, ISRO and former Director VSSC. Dr. G Ayyappan, Project Director, VSSC and Chairman organizing committee welcomed the gathering.

Dr. B N Suresh receiving felicitation (Left to Right) Dr. V K Dadhwal, Dr. G Ayyappan, Shri. S Somanath and Dr. B N Suresh

8.5 VISITS & LECTURES BY FOREIGN DISTINGUISHED GUESTS

32 distinguished guests of national and international *importance* visited the institute during the last year. They had visited to give lectures and to further collaborative endeavours. Such interactions provide a forum to enhance scholarly and scientific learning and to stimulate the intellectual climate of IIST.

Sl. No.	Name and Address	Date of Visit	Purpose of Visit
1	Dr. Pellegrino Sergio JPL, CalTech	10th to 11th April, 2018	Cal- Tech -JPL Academic collabration programme
2	Dr. Sarohia Verendra JPL, USA		
3	Prof. Mathew Malcolm Colless Director, ANU, Australia	18th April, 2018	Acadamic discussion
4	Prof. Mitsuo Takeda Fellow of Optical Society of America and fellow SPIE, Japan	28th April to 02nd June, 2018	Acadamic discussion
5	Prof. Narayana Komerath Georgia Institute of Technology , USA	3rd July 2018	Interaction with faculties and students

6	Prof. Takanori Nomura Dept. of Opto-Mechatronics, Faculty of System Engineering, Wakayama University, Japan	17th to 20th September 2018	For lecture and discuss with student members of SPIE
7	Prof. Eder Gerhard Institute of Polymer Science Johannes Kepler University, Austria	08th to 14th October 2018	For attending ICMST Conference
8	Prof. Abdella Ajji Polytechnique Montreal, Canada		
9	Prof. Ludek Frank Institute of Scientific Instruments, CZECH Academy of Science, Czech Republic		
10	Prof. John Thomas Prabhakar Bangor University, Bangor, UK		
11	Prof. Sung Kya Ha Centre for Structure & Composites, Hanyang University, Seoul, South Korea		
12	Dr. Simon Joseph Antony Senior Lecturer School of Chemical and Process Engineering University of Leeds, UK	10th to 13th October 2018	
13	Prof. Olander Jason B Applied Test Systems 154 East Brook Lane, Butler PA 16002, USA	11th to 13th October 2018	
14	Dr. Ruiz Baier Ricardo Esteban Mathematical Institute, University of Oxford, UK	12th to 20th December 2018	Academic Purpose
15	Dr. Phee Soo Jay Louis Nanyang Technical University (NTU), Singapore	21st November 2018	To discuss the possibility of internship and PhD for IIST students as part of activities of MoU signed between NTU and IIST
16	Prof. Bruin Hendrik Pieter Department of Mathematics, University of Vienna, NLD Nederlandse	04th, December 2018	For a lecture to students
17	Prof. Craig Ian Underwood University of Surrey, UK	10th to12th December 2018	For initial discussion of AAReST project by IIST along with Caltech/JPL
18	Prof. Sergio Pellegrino		

	Caltech University, USA		and University of Surrey
19	Dr. Charles Sommer Caltech University, USA		
20	Dr. Virendra Sarohia Caltech University, USA		
21	Smt. Greengrass Sara Debora, US University, USA	19th, December 2018	For discussions on Research and Collaborations of IIST with US Universities
22	Dr. Tapajyoti Dasgupta, EPFL, Lausanne, Switzerland	19th, December 2018	Talk on Self-assembly of nanostructured glass metasurfaces via templated fluid instabilities
23	Prof. Damodaran Murali NUS, Singapore	20th December 2018	For Academic Purpose
24	Dr. Ricardo Ruiz-baier, University of Oxford, UK	12 - 20 December, 2018.	Talk on Mixed finite element methods for stress-assisted diffusion problems
25	Dr. Parry Ian Robert University of Cambridge, UK	04th to 06th January 2019	For attending the ExoWorlds Team Meeting at IIST
26	Dr. Burger Raimund Klaus University of Concepcion, Chile	06th to 16th January 2019	For research collaboration and interaction with faculty
27	Prof. Henrik Hasson, Associate Stockholm University, Svensk Swedish	28th January 2019	Meeting with director, IIST
28	Prof. Adhikari Rana Caltech, USA	3rd March 2019	For attending Conscientia -2019
29	Dr. Virendra Saroha JPL, Caltech	4th to 5th March 2019	
30	Dr. James Larry Dean Deputy Director, JPL, Caltech	4th to 5th March 2019	
31	Prof. De Becker Michael Denis E University of Liege, Belgium.	14th & 15th March 2019	To deliver a lecture and collaborative work.
32	Dr. Axisa Duncan Aerosol Scientist, Droplet Mesurement Technique (DMT) USA	20th March 2019	For discussion

8.6 EVENTS / DAY CELEBRATIONS

8.6.1 Independence Day and Republic Day

IIST celebrated Independence Day at 9 am on 15th August 2018 with patriotic fervour and enthusiasm. Dr. V. K. Dadhwal, Director, IIST hoisted the national flag and inspected the guard of honour. Students, faculty and staff joined in the celebration with their family members. In his Independence Day speech, Director has emphasised on the responsibilities that have to be shouldered by the younger generation for the progress of the county and reminded them that the county has high hopes from the current generation.

Dr. V K Dadhwal, Director, IIST inspecting the guard of honour

IIST observed Republic Day by organising various programmes in the campus. The celebration was started by hoisting the National Flag by the Director, IIST. Director addressed the students, faculty, staff and their family members on this occasion. Following the address, various events were held for IIST students, employees and children of employees. A talent show contest for children of employees was held where children displayed an array of programmes such as patriotic song, mimicry, dance, speech and fancy dress portraying national leaders.

8.6.2 Library Week Celebration

Library week was celebrated in IIST during 14-20 November 2018. The celebration was inaugurated by Prof. Y V N Krishna Murthy, Senior Professor and Registrar, IIST. He has delivered a talk on ISRO’s Space Programmes and how it helped to improve common man life. Talks on 'How to write quality technical paper' (Dr. Dhanu pattanshetty, IEEE), 'How to avoid plagiarism' (Shri. Akshay Prasanna, IEEE) and 'Tools for Information Management' (Shri. Abdunnasar, IIST) were conducted.

Director, IIST receiving 'Certificate of Appreciation' from Dr. P. Ramesh, HoD, Department of Electronics & Communication, Govt. Engineering College, Munnar for Book Donation Programme

8.6.3 Holi

The vibrancy of colors is something that brings in a lot of positivity in our lives and Holi being the festival of colours was actually a day worth rejoicing. On the day of Holi students of IIST played with colours with their friends in the campus followed by special lunch. To make it more eco friendly, use of chemical colours, burning of wood and wasting of water was avoided.

8.6.4 Swachh Bharat Programme

Inauguration of Swachhta Pakhwada February 2019 was done by Director IIST, Registrar IIST and Dean (Student Affairs). The inauguration was continued by a mass Swachhta Shapath (pledge) involving students as well as staff of the Institute.

Canteen and cleaning drive was conducted on 4th February 2019 as part of Swachhta Pakhwada February 2019. Canteen Mess cleaning was conducted wherein interior and outdoor areas of canteen were given a new look by the canteen staff.


Swath Bharath activities: Cleaning of the Campus, planting of sapling by director

To increase awareness in IIST about the problems associated with the environment such as open dumping of solid wastes and about healthy practices, posters were made by the students of IIST, Department of Aerospace taking the lead on 7th February, 2019

The photographs and reports pertaining to the Swachhta Pakhwadas conducetd in IIST can be seen in the website ofIIST using the link : **https://iist.ac.in/swachhbharat** It is planned to regularly update all information including photographs, good practices, innovative ideas and Swachhta Pakhwada reports under the Swachh Bharat campaign, in the portal.

Swachh Bharat Implementation Committee and Sports Committee organized a campus cleaning programme on Mahatma Gandhi's birth day i.e 2nd October 2018. The programme started at 8 am. Enthusiastic students, faculty and staff cleaned the Volleyball Court and Magudagiri Ground. The cleaning drive went up to 2:30 pm.


IIST Students, Staff and Faculty cleaning Magudagiri ground of IIST under Swatch Bharat Abhiyan

A talk on the topic 'Waste Management - Current Scenario and Challenges ahead' was delivered by Dr. V Ravi, Associate Professor, Department of Humanities, IIST on 13th February, 2019

Employees of IIST displayed their love and affection for the environment by planting and adopting saplings. The virgin ground came alive with tree saplings planted all along the boundary of the ground, by more than 30 IIST employees.

8.6.5 International Yoga Day

On 21st June 2018, the International Day of Yoga was organised in IIST. The yoga practice session ended with a Sankalpa followed by Shanti Path. This session was carried out under the guidance of well-trained yoga instructor, Shri. Praveendas and his associate, Mr. Anoop Chandran. The Director of our Institute, Dr.V.K.Dadhwal officially inaugurated the International Yoga Day Celebration at 10:00 am. An interactive session on "Yoga: Art and Science of Living" was delivered by Dr.Niyas Meeran in Seminar Hall, D4 Building from 10:15 am to 12:15 pm.

8.7 INVITED TALKS BY IIST FACULTY

Director

Dadhwal V K,

- 'Remote Sensing & Geospatial Applications'. In "ISRO Induction Training Program, VSSC, 2 Apr, 2018
- 'Imaging from Space: Realizing Myriad Applications'. In' IIST@Schools:Beyond the Horizon, Sargaksetra Cultural & Academic Centre, Changanacherry, 28 June, 2018
- 'Remote Sensing & Geospatial Applications'. In "ISRO Induction Training Program, VSSC, 8 Nov, 2018
- 'Metaheuristics and its applications' TKM college of engg Kollam, December 2018

- 'Modeling terrestrial primary productivity with remote sensing data: Indian case studies on assessment, validation and applications'. In'ISPRS-GEOGLAM-ISRS International Workshop on EARTH OBSERVATIONS for AGRICULTURAL MONITORING', Feb 19, 2019, IARI, New Delhi
- 'Remote Sensing Applications for planning and development'. In 'Harnessing Space Science and Technology for the Development of Kerala State', Organised by ISRS-Thiruvananthapuram Chapter & Sree Chitra Thirunal College of Engineering, Trivandrum Feb 28, 2019
- 'Role of forests in Indian Carbon Cycle'. In 'Workshop on Climate Change and Technology-based Planning, Monitoring and Evaluation', TN Forest Dept, Kodaikanal, 13 March, 2019

Department of Aerospace Engineering

Anup S,

- 'Bio-Composites/Analysis of Biological and Bio-inspired composites', , Short term course on Recent Trends in Tribology and surface Characterisation, College of Engineering Trivandrum, 19 April 2018
- 'Development of Bio-inspired Composites', Second International Conference on Recent Trends in Materials Science and Technology, ATF, VSSC, Thiruvananthapuram,12 October 2018

Girish B S,

- 'Metaheuristics and its applications'TKM college of engg Kollam, December 2018

Chakravarthy P,

- 'Materials for Rocketry' Osmania University, 28th April 2018,
- 'Space materials', summer course on introduction to space technology, 25th June 2018.
- 'Mechanical characterization'workshop Materials testing and characterisation, NIT Trichy, 14th December, 2018

Deepu M,

- 'Heat transfer enhancement in microchannels', Workshop on Heat transfer Applications in Space systems, St Thomas Institute for Science and Technology, 26th February 2019
- 'Application of heat transfer in propulsion systems', Workshop on Heat transfer in Space Applications, St. Joseph's College of Engineering & Technology, Pala, 30th March 2019

Prathap C,

- "Introduction to combustion, flames and its applications" at "Mepco Schlenck Engineering college", Sivakasi, 27-28th December, 2018 (12h Lectures to BTech students)

Department of Avionics

Seena V,

- 'Polymer MEMS for Environmental Sensing to Space Applications', DST-UKIERI Workshop Micro-and Nanotechnologies for Environmental Sensing, VMCC, IIT Bombay, January 2018
- 'Polymer MEMS: A Paradigm Shift in Ultra-Sensitive Microsystems', International Conference on Recent Trends in Materials Science and Technology, Materials Research Society of India (MRSI), Thiruvananthapuram,October 10-13, 2018
- 'Polymer MEMS with Embedded Functional Ceramic Thin Films for Environmental Sensing/Energy Harvesting', 12th International Conference on Ceramic Materials and Components for Energy and Environmental Applications (CMCEE 2018), Singapore, 22-27 July 2018

N.Selvaganesan,

- 'Shaping Limit Cycle Performance of Fractional-Order Controllers for system with Backlash/Relay Non-linearity', NIT, Rourkela, 14th December, 2018

Vineeth B. S,

- 'Bits to packets' - Faculty developement programme, College of Engineering, Aranmula January 2019
- Bayesian inference for data analytics - tutorial at International Conference on Control, Communication, and Computing, College of Engineering, Trivandrum, July 2018.

Sudharshan Kaarthik R,

- 'Recent Trends in Power Electronics and Control' at Faculty Development Program,GEC Thrissur , December 2018.

Department of Chemistry

Gomathi N,

- 'Plasma Surface Modification to Enhance the Performance of Electrochemical Biosensorat', 2nd National conference on Advances in Plasma Science and Technology organized by Sri Shakthi Institute of Engineering and Technology, Coimbatore, 25th October, 2018

- 'Surface modification of nanostructured materials and their application in detection of biomolecules and heavy metals', One-Week Workshop on Processing & applications of functional materials, 22nd January 2019

Nirmala Rachel James,

- 'Hydrogel Scaffold for 3 D hepatic spheroid culture', National Conference on Advanced Functional Materials organized by St. Hindu College Nagercoil, SPSI (Trivandrum Chapter) and MRSI (Trivandrum Chapter)

Jobin Cyriac,

- 'Surface Enhanced Raman Scattering (SERS) as an Analytical Tool', Govt. College, Koyilandy, Kerala, October 16, 2018.
- 'Extending boundaries of Mass Spectrometry', Govt. College, Koyilandy, Kerala, October 17, 2018.
- 'Dual Analyte Fluorescent Sensor based on MoS 2 Nanohybrid Material', International conference on Frontier areas of chemistry (ICFAC), American College Madurai, TN, July 17-19, 2018.
- 'Introduction to Raman Spectroscopy', Annai Velankanni College, Tholayavattam Feb 07, 2019.
- 'Surface Enhanced Raman Spectroscopy Concept and Applications', Central University of Tamilnadu (CUTN), Thiruvarur, February 22, 2019.
- 'Applications of MS/MS in Biomolecule Analysis', School of Biosciences, Mahatma Gandhi University, Kottayam, March 15, 2019.

Sreejalekshmi K G,

- 'Materials Research : From Gravity to Microgravity: Space Manufacturing Becoming a Reality?', National Seminar on Neoteric Advances in Chemical Sciences (NACS 2018), Department of Chemistry, University of Kerala, October 12, 2018
- 'Fundamentals of Computational Modeling', two day Workshop on Computational Modeling and Drug Design organised by SN College, Chengannur, 4-5 April 2018
- 'From Molecules to Materials: The Multiobjective Optimisation Problems in Materials Science and Engineering', International Conference on Recent Trends in Materials Science and Technology (ICMST-2018), Thiruvananthapuram Oct 10-13, 2018.
- मानवअंतरिक्षकार्यक्रम (एचएसपी): चुनौतियांऔरअनुसंधानकेअवसर

  शून्यगुरुत्वाकर्षणऔरमानवजीवविज्ञानपरइसकाप्रभाव. Lecture (in Hindi) delivered during Hindi Technical Seminar on Recent Advances in Space Science and

Technology, ISRO centres meet, Indian Institute of Space Science and Technology, Thiruvananthapuram , 30-31 October 2018.

- 'Molecular Hybridisations in the Design of Modern Materials, National Conference on Advanced Functional Materials', Hindu College Nagercoil, February 25-27, 2019.
- 'One core, many colours: Thiazolylthiophene core for the design of dual state multicolour emitters', International conference on optoelectronic and nano materials for advanced technology (icONMAT2019), CUSAT, Kochi, Jan 03-05, 2019.

Department of Earth & Space Sciences

A Chandrasekar,

- 'Numerical Modelling and Forecasting of Desert Storms and Cloud Burst (NUMCLOUDS)', SERB training School, Central University of Rajasthan, 15 Feb 2019 (Two Lectures)

Anand Narayanan,

- Invited lecture at the Department of Physics, Government Women's College, Thiruvananthapuram on October 26, 2018
- Invited lecture at the online resource initiatives of the Department of Collegiate Education, University of Kerala on December 13, 2018
- Invited lecture at the mini-school on cosmology jointly organized by IUCAA and Providence College, Kozhikode, on February 8, 2019

Anandmayee Tej,

- Centre Spatial de Liege Université de Liège, Belgium, 4 October 2018
- Invited Public Lecture at Planetarium, Trivandrum, 22 February 2019

L Gnanappazham,

- Remote sensing and Geographic Information System for aquaculture management, Central Institute for Brackish water Aquaculture, Chennai, 14 March 2019

Resmi Lekshmi,

- Invited plenary talk at the 30th meeting of the Indian Association of General Relativity and Gravitation (IAGRG), BITS Goa campus, 3rd to 5th Jan 2019
- Invited talk at the meeting Multi-messenger Astronomy in the era of LIGO-India (LIMMA), Organized by IUCAA Pune, 14th to 18th Jan 2019

Rajesh V. J.,

- 'A Passage through the Origin and Evolution of our Earth's Moon', DST-INSPIRE Residential Science Camp at St. Mary's College, Wayanad, Kerala (26-30 December, 2018)
- 'Earth's Moon: Geology and research highlights', 2nd International Conference on Geology: Emerging Methods and Applications (GEM 2019), Department of Geology and Environmental Science, Christ College, Irinjalakuda, Thrissur, Kerala (17-19 January, 2019)
- **'Petrogenesis, geochronology and tectonic significance of Fe-Ti-P Gabbro in Achankovil Shear Zone, southern India' in JSPS-DST Japan-India Forum for Advanced Study in Earth and Planetary Sciences, Nagoya University, Japan (8 March 2019)
- **'Petrogenesis, Tectonics and Economic Significance of Neoarchean Alaskan-type Ultramafic Rocks in Palghat Cauvery Suture Zone, southern India' in JSPS-DST Japan-India Forum for Advanced Study in Earth and Planetary Sciences, Niigata University, Japan (15 March 2019)

A M Ramiya,

- 'Satellite based positioning and applications', the induction programme for project fellows at Kerala State Remote Sensing Center, September 2018**.**

Department of Humanities

Ravi V,

- 'Manufacturing strategies in Business', for M.B.A students at National Institute of Technology, Tiruchirappalli on 10-8-2018.
- 'Operations Management for competitive advantage', for M.B.A students at CET School of Management on 26-11-2018.

Lekshmi V Nair,

- 'Changing Discourses in Sociology', 45th Annual Meet and National Seminar, SreeSankaracharya University of Sanskrit, Kalady. 9-11 October 2018
- 'Teaching Social Science in a technology Institute, Reconstructing Sociological Discourse in India: Perspectives from the Margins', 44th All India Sociological Conference. St. Philomena's College at Mysuru. December 27- 29, 2018

Babitha Justin,

- 'Theorising Praxis', International Symposium on Cultural Studies, Institute of English, Thiruvananthapuram, 11th October 2018.
- 'Women's Writings of the Twenty First Century: Perspectives and Challenges', Sadakkuthullah Appa College, Thirunelveli 12th October, 2018.

- 'Ways to Good Writing', MG University, Kottayam, 9th November, 2018.
- Women Artists of Kerala, Resource Person in the international Conference of Writers and Artists. Kanjiramkulam Government College. Trivandrum, 12th November, 2018.
- 'Gender Rights and Empowerment', Principles of Good Communications, Orientation Programme for Asianet Trainees. Asianet News Communication. Trivandrum, 12th November and 22nd November 2018.

Shaijumon C S,

- 'Challenges and Opportunities of Present Indian Economy', Department of Economics, St. Dominic's College, Kanjirapally, 22nd January, 2019
- 'Challenges and Opportunities of Present Indian Economy', Department of Economics, HH M S P B N S S College for Women, Neeramankara, Thiruvananthapuram, 12 December,2018.
- 'Global Economic Changes and its reflections on Indian Economy', NSS College, Pandalam, 09 November, 2018.
- 'The art of Motivated Teaching', Academic Staff College, University of Kerala, Thiruvananthapuram, 30 July ,2018.
- 'Economic Reforms in India', Central University of Kerala, Kasargod, 20-21 March, 2018.

Gigy J Alex,

- 'Cultural memory as a Curator in Food writings from Kerala', School of Letters, MG University, 8 September 2018.
- ''Kitchen Narratives: The Politics of Cuisine in Kerala',International Symposium on Cultural Studies: Theorizing Praxis, Institute of English, Kerala University, 11 October 2018.

Department of Mathematics

Sumitra S,

- 'Machine Learning and its Applications', One Week Short Term Course on Research Issues and Challenges in Data Science and Big data Analytics, Department of Information Technology, Thiagarajar College of Engineering, Madurai, on 20 March 2019.
- 'Advanced Machine Learning', 5 Day Workshop on Artificial Intelligence and Machine Learning, Organized by Additional Skill Acquisition Programme (ASAP), at Barton Hill College of Engineering, Trivandrum, on 25 February, 2019.

- 'Machine Learning', Refresher Course in Mathematics and Statistics, Organized by the UGC-Human Resource Development Center, Bharathiar University, Coimbatore, on 23 February 2019.
- Fundamental Algorithms in Machine Learning and its Research Perspectives: Talk delivered in Faculty Development Programme on Research Trends in Biomedical and Satellite Image Processing, Organized by Department of Computer Science & Engineering, TKM College of Engineering, Kollam, on 04 January 2019.
- 'Basic Machine Learning Algorithms', One Week Refresher Programme on Deep Learning, Organized by Department of Computer Science & Engineering, College of Engineering, Muttathara, Thiruvananthapuram, on 12 December 2018.
- 'Machine Learning Algorithms', Two day Workshop on Recent Trends and Research Challenges in Deep Learning, Thiagarajar College of Engineering, Madurai, on 30 August 2018.
- 'Kernel Algorithms', Artificial Intelligence, VSSC, Thiruvananthapuram, on 20 August 2018.
- 'Supervised and Unsupervised Learning', Artificial Intelligence, Organized by VSSC, Thiruvananthapuram, on 16 August 2018.
- 'Regression Algorithms', Artificial Intelligence and Machine Learning, Electronics and Communication Department, Mohandas College of Engineering, Thiruvananthapuram, on 17 July 2018.
- 'Mathematical Foundations of Machine Learning Algorithms', Faculty Development Program on Machine Learning, Department of Computer Science, St. Thomas College of Engineering & Technology, Kozhuvalloor - Chengannur, on 13 July 2018.
- 'Kernel Deep Learning' Short Term Course on Deep Learning and Applications, Center for Interdisciplinary Research, College of Engineering, Trivandrum, on 19 April 2018.

Deepak T G,

- 'Recent trends in Statistical theory and applications', national seminar, Dept. of Statistics, University of Kerala during 28-30 June 2018.
- 'Advances in statistical methods', national conference, Dept. of Statistical Sciences, Kannur university, Kannur, during 8-10 November 2018.
- 'Distribution theory and its applications', international workshop, Dept. of Statistics, University of Kerala, Thiruvananthapuram, during 10-12 December 2018.

Prosenjit Das,

- 'Cardinality of Sigma Algebras', Dept. of Mathematics, CUSAT, 4th Oct 2018

Sarvesh Kumar,

- ** 'On the converegnec of finite volume methods: an overview', University of Oxford, UK, June 06, 2018.
- 'Three and four feild formulations in poroelasticity', 4th International conference on Recent developments in theory, computation and application of differential equations, South asian University Delhi, 21-23 Januray, 2019.
- 'Numerical treatment of initial and boundary value problems', Workshop on computational nonlinear dynamics, University of Kerala, 12-13 December, 2018.

Subrahamanian Moosath K S,

- 'Tangent Bundles', Invited lecture at the national seminar, M G College TVM, 26-7-18
- 'Surfaces', S B college changanassery , 31-7-18
- 'Differential Geometry' Refresher course, University of Calicut, 04-08-18
- 'Analysis and Geometry', St. Therarses Ernakulam, 07-09-18
- 'Topology', Seminar, Govt. College, Mokeri, 1/11/18
- 'Tangent spaces', National seminar, Karpagam Academy of higher education, Coimbatore, 14/12/18
- 'Tangent bundle', National Workshop, Kerala University, 19/12/18
- 'Geometry of our living space', DST Inspire Camp, St. Mary's College Wayanad, 29/12/18
- 'Multivariable Calculus' National Workshop on Glimpses of Differential Geomatry Central University Kasaragod, 30/1/2019
- 'Persistent homology', National seminar on recent trends in Topology, University of Calicut, 9/2/2019
- 'Differential Geometric tools and Applications', 3rd international Conference on Science, Engineering, Technology and Social Sciences (ICSETS - 2019), K E College Mannanam, 12/03/19

K.Sakthivel,

- 'Inverse Problem for the Generalized Korteweg - deVries Equation', International Conference on Numerical Analysis, Computing and Applications, Mohandas College of Engineering and Technology, Trivandrum, Dec. 19, 2018.
- ** 'Dynamic Programming of Stochastic Burgers Equation with Levy Noise', Inter- national Congress of Mathematicians (ICM-2018), Rio de Janerio, Brazil, Aug. 1-9, 2018.
- 'Trajectory Controllability and Stability of Swift-Hohenberg Equation', National Conference on Control and Inverse Problems, Central University of Tamilnadu, Thiruvarur, Mar. 1-2, 2019.

- 'Reconstruction of a Coefficient in the Inverse Problem for the Generalized Korteweg - deVries Equation', National Conference on Recent Developments in Mathematics, Govt Arts College, Coimbatore, Feb. 22, 2019.
- 'Optimal Control of Differential Equations', IIT Mandi, June 13-20, 2018. (Five Lectures)
- 'Applications of Differential Equations to Optimal Control Problems', NCM sponsored Instructional School for Teachers, Indian Institute of Space Science and Technology (IIST), Trivandrum, May 14 -26, 2018. (Three Lectures)

Department of Physics

S Murugesh,

- 'Spin Dynamics: Some Applications', at workshop Recent Trends in Nonlinear Dynamics at IISER-TVM, 13 July 2018.
- 'Relativistic Electrodynamics' at Nathional Seminar on Foundations of Electrodynamics, Maharaja's College, Ernakulam, 06-07, September, 2018. (Two Lectures)
- 'Classical and Quantum Integrability' at workshop on Theoretical Methods in Physics at Mahatma Gandhi University, Kottayam, 21-23, March, 2019. (Two Lectures)

** Talks at International Venues

Library & Information Services

A Abdunnasar,

- 'Plagiarism and Citation Styles', Workshop on Research Methodology - Perspectives and Practices, School of Communication and Information Science, University of Kerala, Thiruvananthapuram, March 20, 2019.
- 'Plagiarism and Reference Management Software', National Workshop on Research Methodology, Mahatma Gandhi College, Thiruvananthapuram, March, 22, 2019.

STUDENTS EXTRA-CURRICULAR ACTIVITIES


410
310
289
307
406
333

9. STUDENTS EXTRA-CURRICULAR ACTIVITIES

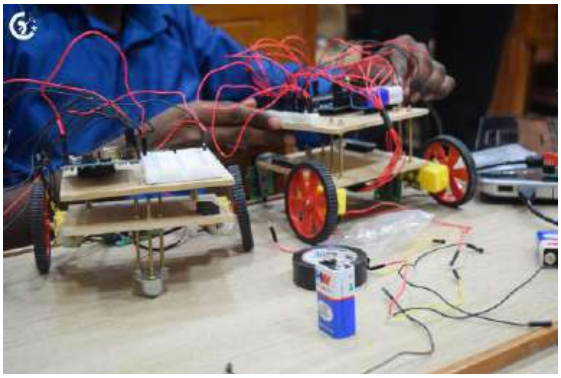
IIST strongly believes that education should not be restricted to the fourwalls of a class room. Academics and extracurricular activities complement each other for the all round development of student. A Student Activity Board (SAB) oversees all activities of students of IIST. Dean (Student Activities and Welfare) heads the Student Activity Board (SAB) which also consists of the Registrar, Head of all departments, Chairman of various institute committees- Sports, Technical, Cultural, Hostel and Canteen committee. Each of these committees has faculty 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 manage the inter-collegiate cultural fest -"Dhanak", the inter-collegiate technology fest- "Conscientia", the sports day of IIST and all other activities of the students. The various students clubs of IIST also comes under SAB. Mentoring system of IIST is also manned by SAB.

9.1 CONSCIENTIA

Inauguration of Conscientia 2019 - Mr. Jesal Kotak, Dr. V. K. Dadhwal, Shri. D K Das (Director, SAC), Dr. YVN Krishna Murthy and Prof. Kuruvilla Joseph

Conscientia 2019 was successfully organized during March 1st to March 4th, 2019. In total, there were about 591 students participated from all over India which is about

25% increase compared to previous editions of ***Conscientia.*** In Conscientia 2019, 40 events were conducted in areas like, Aerospace, Robotics, Mechanical Engineering, Astronomy, Physics, Mathematics, and Programming. Also, special workshops were conducted on topics like Robotics Operating System, Ethical Hacking, Sphere Drone, Swarm Robotics, Big Data Hadoop, Model Rocketry etc. In addition to these events, lecture series were also conducted in which, Shri D K Das, Director, SAC, Ahmedabad, Astrophysicst Dr. Abhas Mitra, Prof Rana Adhikari, Caltech, Senior Scientist Dr. R Aileen Yingst, Dr. Umesh Kadane of IIST, and Mr. Siddhart Ojha, student from University of Petroleum and Energy Studies delivered series of lectures. This year an exhibition by various organizations called as Tech-Expo was organized in the campus as part of Conscientia-19 where, ISRO centers like VSSC, Trivandrum, NRSC, Hyderabad, NARL, Gadanki, I I R S , D e h r a d u n , I P R C , Mahendragiri, and LPSC, Valiamala, put up their exhibits along with Kudankulam Nuclear Poer plant, Centum Electronics, Bangalore, LIGO, India, New Space Resaerch and Technologies, Bangalore, OSA, SPIE student chapter and IIST Ph.D student's startup company. This was a new initiative in this edition of Conscientia. Also, IIST's social outreach wing NIRMAN brought around 160 school students drawn from in and around Trivandrum to visit this Tech-Expo. Apart from these visitors, students, parents, faculty and ISRO employees actively participated in Consceintia-19. External visitors include college students from 72 colleges from 8 States and 2 Union Territori.



9.2 DHANAK

Dhanak 2018, the annual cultural fest of IIST for the 2018-2019 academic year, was conducted from September 28 – October 1, 2018. This was the tenth edition of Dhanak since its inception. This year, the event achieved the highest footfall in its history. Union Bank of India and the institute were the main sponsors of the event. Dhanak was preceded by a variety of online events and competitions. Dhanak 2018 was inaugurated by the eminent film maker Roshni Dinaker. The Union Bank of India Zonal Head and other dignitaries were present at this ceremony. Dean of Student Activities, Dr. Kuruvilla Joseph and Registrar, Dr. A Chandrasekhar spoke on the occasion.

Inauguration of Dhanak 2018 by the noted Malayalam filmmaker Roshini Dinaker

9.3 SPORTS

9.3.1 Annual Sports Day

Dr. V K Dadhwal inaugurating IIST sports ground

The Annual sports meet for the academic year 2018-19 was held on 23rd February (Saturday) 2019 at the Magudagiri ground (IIST Plot-2). This was the first time we were conducting the sports meet on our home ground, which was inaugurated by the Director IIST on 15th February 2019.

Dr. Pradeep Dutta, the First Indian FIFA conditioning instructor and Associate Professor, SAI LNCPE Thiruvananthapuram was the chief guest of the event. Prof. Kuruvilla Joseph (Sr. Professor and Dean (Students Activities) IIST) give welcome and Dr. Y V N Krishna Murthy (Sr. Professor and Registrar, IIST) was felicitated the occasion.

Dr. Y V N Krishna Murthy giving memento to the IIST Sports day Chief Guest Dr. Pradeep Dutta

Flag of IIST was then hosted by the honourable chief guest, followed by lighting of torch by the chief guest and other dignitaries. After March past honourable chief addressed the gathering and declared annual sports meet 2018-19 opened.

9.3.2 Sports Activities

Sports council, IIST organized tournaments in different sports and games in the year 2018-19.The council conducted an orientation programme for B.Tech 2018 batch on 21st July 2018. The first year students were grouped into various houses along with their seniors for house matches. The inter house matches commenced on 27th July2018.

INTER HOUSE TOURNAMENTS

We have been conducting inter-house tournaments in football, cricket, basketball, badminton, chess, table-tennis, caroms and volleyball. We have successfully completed league matches as well as knock out matches with in scheduled time, also distribute the certificates and trophies for winners and runners. Among these competitions we got talented students in respective games to participate in national level tournaments and inter-university tournaments.

9.3.3 Extra Mural

Friendly matches (boys) in Badminton were held against IISER - TVM's badminton team on 2nd October, 2018 in IISER Vithura. Total of 12 matches (including both singles and doubles) were played. Badminton team from IIST won 5 matches (2 doubles and 3 singles), and lost 7 matches (3 doubles and 4 singles).

REVELS CUP – 2019

Students of IIST participated in a national level Revels cup championship on 04th - 09thMarch 2019, which is organized by Manipal Institute of Technology, Manipal. In which we have participated in Football, Cricket, Basketball (Boys & Girls), Chess, Badminton (Boys & Girls).around 51 students were participated in this competition. In chess Competition IIST has secured THIRD position. We got a successful entry to championship and had a great experience to students.

ISRO INTER CENTRE SPORTS MEET

ISRO Inter Centre Sports Meet-2018 for Athletics and Indoor games was held in SDSC SHAR in two phases from 27.08.2018 to 06.09.2018. 15 members from staff and faculty represented IIST in the Sports Meet.

A


B


C

D

A. Dr.Manu KV, Assistant Professor, Dept. of Aerospace Engineering won the Individual Chess Championship adding IIST to the points tally.

B. Award Ceremony in ISRO Sports Meet

C. IIST Participation in athletics in ISRO Sports Meet

D. IIST team in ISRO Sports Meet

IIST bridge team (Shri. Prakash R S, Shri. Girish Kumar K R, Shr. Abhilash S, Shri. Muhammed Rijas) won the Fair Play Award in the tournament.

Swachh Bharat Implementation Committee and Sports Committee organized a campus cleaning programme on October 2nd 2018. The programme started at 8 am. Students, sports coaches and faculty cleaned the Volleyball Court and by around 10 am they moved to Plot II Magudagiri Ground. They enthusiastically participated in the cleaning drive by removing the stones and filling up the pits, and it was over at 2:30 pm.

9.4 MODEL UNITED NATIONS - MUN 2019

Dr. V. K. Dadhwal, Director, IIST inaugurating the IIST Model United Nations 2019

The 9th edition of IIST MUN, IIST MUN 2019 was held during the dates April 6-7 and had simulated the committees – UNCOPUOS (United Nations Council on the Peaceful Uses of OuterSpace) and UNHRC (United Nations Human Rights Council). This edition witnessed large andenthusiastic participation from both outside as well as IIST students.This event challenged the students to broaden their outlook, undertake responsibility, and holistically develop their skills. Special emphasis was given to deliberate upon international relations in the space sector and further the delegates' knowledge and awareness in this field.This event attracted the smartest, most eloquent students across the country who possess the talent to debate and also tackle some of the most pressing global issues from the perspective of a delegate representing a member to the United Nations. Student delegates took on roles of international diplomats and ambassadors in various organizations and agencies of the UN.The event was inaugurated by Director, Dr. V K Dadhwal.With total prize money of INR 20,000 and around 50 participants from various institutes the main event was held in two sessions in two days.

9.5 CLUBS

Guided and supported by faculty members of IIST, the following clubs function in IIST

Mathematics Club

The objective of this club is to provide a platform for having open discussions on any topic in Mathematics and in connection with this; talks/lectures were arranged with a regular interval of time by Department of Mathematics.

FOSS

The FOSS Group, IIST is IIST's FOSS chapter aimed at promoting the use of Free and Open Source Software tools in the fields of core research pertaining to Aerospace, Avionics and the physical sciences. The group, germinating from the basic idea of a shared and thus 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.

Aero club

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.

Last year the club has organized SpaceUp Unconference India with the IIST alumni, which acted as a bridge between IIST and the outside industry. 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, which recently completed its fourth consecutive year. Workshops on topics of interest such as Hovercraft, RC Glider, and Ornithopters organised by AeroClub are usually packed with immense participation from students of all discipline and batches and the projects done by the students in these fields have been quite innovative. Club's outreach has been to various industry experts both inside ISRO and outside of it, where it has invited eminent personalities to discuss topics in its OpenHouse sessions The club also seeks out to merriment and fun occasionally, organising certain GoPublic events such as Kite Flying, Hot Air Balloons where for a short period of 30-40 minutes, the crowd enjoys pleasure of flying or the sight of flight.

Many projects undertaken by members of the club and others under it have been promising in results. These projects are partially funded by the Club and thoroughly reviewed by the faculty of IIST. Few notable are QuadCopter design, 3D Printer, RC Plane and Ornithopter, Two Stage Water Rocket. These works are regularly presented in the sessions organised by the club. All the activities of AeroClub are summed up in its annual magazine, UDAAN. Till date, two editions of UDAAN have been released with third one in the process. Recently, the demonstrations of water rocket and drone flying during the institute foundation day celebrations have been appreciated by visitors. 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.

Computer Club

Avionics Department's students coordinate a Computer Club for discussing computer systems related advancements. They organize training sessions, lectures, and hands-on workshops on computer systems, softwares, programming, networking, cyber security, and embedded systems. Dr. B. S. Manoj is the faculty coordinator for the club. During the last one year, the club organized more than six student-driven events for the benefit of IIST students.

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.

IEEE students chapter

IIST has an active IEEE Student Branch functioning, since 2011. During the last one year, the student branch has organized more than 12 student-driven events for the benefit of IIST students. Two new student branch chapters are added to the student branch during the last one year: IEEE Industrial Applications Society (IAS) student chapter and IEEE Antennas and Wave Propagation Society student chapter. Dr. B. S. Manoj mentors the student branch as its counselor.

Astronomy Club

The Astronomy Club saw ample amount of participation from almost all the academic sections of IIST throughout the period from April 2018 to March 2019.

The 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.

The Astronomy Club also conducted Night-sky sessions, largely with the aid of the Construction and Maintenance Department of IIST and their expertise in creating good low light pollution environments. These night-sky sessions aimed to introduce

to interested students the basic concepts of Astronomy, and also to pique interest in night-sky exploration. One of the main spectacles observed was the Total Lunar Eclipse on July 27, 2018, aided by the 70mm telescope of the Club along with the 8-inch telescope from the department of Astronomy and Astrophysics.

Additionally, the coordinators of Astronomy Club, largely enabled by the association with Conscientia (the Technical & Astronomy Fest of IIST), conducted the Lecture Series of Conscientia, where distinguished speakers and experts in various fields of Space Science and Technology brought to the lay public the wonders of the Final Frontier. Furthermore, in partnership with Nirmaan, IIST, the Astronomy Club conducted an interactive discussion called "Star Trek" for the Girls Higher Secondary School, Nedumangad for furthering their interest in Science and Research.

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). Teams from this club have represented the college in various intercollegiate events and have won several prizes. The club members are also responsible for organising quizzing events during the annual cultural and technical festivals and as part of swatch bharath program. QCFixion, the annual inter-collegiate general quiz competition of Indian Institute of Space Science and Technology, conducted by the Quiz Club of IIST was held on 30th March, 2019 within the IIST campus. The venue was Seminar Hall, D4 (Aerospace Block). The event saw participation from over 9 teams, with 5 teams from outside colleges. Mr. Snehaj Srinivas, Director of Qfactory was the quizmaster. Seven teams made it to the finals which had 5 rounds of quizzing.
The 1st, 2nd and 3rd positions went to the following teams:
1st position: Jameer K B (University College, Trivandrum), Akhil Ghosh (CASC)
2nd position: Sarath V R (TKM College), Jithu Johncy (University College)
3rd position: Aravind M J(University of Kerala), Akshay B Vinayak (University of Kerala. The winners received cash prizes worth Rs. 8000, Rs. 4000 and Rs. 3000 respectively. They were felicitated by the quizmaster and Dr. C.S. Shaijumon, faculty-in-charge of Quiz Club of IIST. QCFixion 2019 was organized by Niharika Rajan(SC16B036) and Bharath Saiguhan(SC16B123), on behalf of Quiz Club of IIST

Photography Club

This club has a moto "Photography is an art of observation. It has little to do with the things you see, and everything to do with the way you see them." – Elliot Erwitt. This club has conducted a session on the technical aspects of camera and post-processing

of images (Digital Image Processing).They also organized a photography exhibition as part of Dhanak 2018.

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 'PhysicsX' Lecture Series, the lectures aim to bring forth the research being actively pursued by professors, to the student community. Furthermore, staying true to our aim, the lectures also include discussions and more importantly, questions; questions that may not be necessarily linked to the topic of the session.

Given below is a list of all the sessions organized by Physics Club from 1st April, 2018 to 31st March,2019:

1. *Chaos And Its Observance In Double Pendulum And Magnetic Pendulum* Sagnik Garai, Indrayudh Ghosh, Solid State Physics, Batch: 2014 2nd August,2018
2. *Playing dice with Molecules*Dr. Umesh Kadhane, Department of Physics 9th August,2018
3. *Devising Semiconduction* Dr. Jinesh K. B., Department of Physics 16th August,2018
4. *Debunking the essential requirements of holography* Dr. Dinesh N. Naik, Department of Physics 13th September, 2018
5. *Internship Experience at Jet Propulsion Laboratory(JPL),* Caltech Jigyasa Nigam, Solid State Physics, Batch:2015 5th October,2018
6. *Physics of Information* Dr. Solomon Ivan, Department of Physics 25th October,2018
7. *Can we signal faster than light?* Souradeep Roy Choudhury, Solid State Physics, Batch: 2015 1st November, 2018
8. *Cue to Qubits* Sagnik Garai, Solid State Physics, Batch:2014 17th January,2019
9. *Internship Experience: JPL, Caltech and LIGO* Jigyasa Nigam, Solid State Physics, Batch: 2015 24th January, 2019

10. *Solitons: An Introduction* Dr. S. Murugesh, Department of Physics 31st January, 2019
11. *Scanning the Microscopic Void* Dr. Sourin Mukhopadhyay, Department of Physics 20th February, 2019
12. *In Search of True Randomness* Anjishnu Adhikari, Engineering Physics, Batch:2017 7th March, 2019
13. *More is Different* Dr. Naveen Surendran, Department of Physics 28th March, 2019

Eco Club

Eco Club @ IIST, deals with activities related to campus environment, maintenance of its ecology, hygiene, and waste disposal. The activities of the club in the year 2018-19 were planting of saplings, Observance of Earth Hour, campus cleaning drives, disposal of non biodegradable waste, organic farming etc. Projects undertaken include Statistical Estimation of resources, Bio Gas Plant, classes for cleaning staff, awareness classes for the students of orphanages, frequent monitoring of garbage dump, waste segregation etc.

Nirmaan

A series of classes were given to the students of Government Girls Higher Secondary School (GHSS), Nedumangad from September – November, 2018. The topics discussed and experimented were

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

NIRMAAN team with school students

Flood Relief

NIRMAAN volunteers collected money for flood relief in Kerala and also got involved in voluntary work in relief collection centres which were functioning all over the city. They were there hectically working throughout Friday and the weekends.
Students Neeraj K, Arnob N.P, Abhishek Accot, Adeeb Hassan, Sharon Jose, Ashwin Khan, Althaf Arshraf and Bastin Baijo, made power banks out of batteries and proved how the simple knowledge of science can make a difference in people's lives during hard times especially. They made 50 power banks in just a few hours and contributed it to the flood affected. Collector Vasuki's team transported these power banks to Wayanad where some places were incommunicado.

Dhwani Fest

IIST students participated in Chess, Badminton, Table Tennis and Futsal in DHWANI-2018 conducted by CET Trivandrum. Badminton team entered in the quarter-final, and the chess team won the Best College in Trivandrum award. The chess team members are

1. Unnikrishnan S (B.Tech 4th year, Aerospace)
2. Abhishek A (B.Tech 2nd year, Engeneering Physics)
3. Shah Fenil Piyush (B.Tech 4th year, Engeneering Physics)
4. Shashwat Gupta(B.Tech Ist year, Aerospace)
5. Dakshin Tillo(B.Tech 2nd year, Engeneering Physics)

Chess Team

9.6 GERMAN CLASS

In IIST, German classes were organized by the Department of Humanities for Ph.D, MTech and BTech students. The classes were taken with a MOU with Goethe Zentrum Trivandrum and an ‘A‘ Level certificate course was provided to the students. On completion of the course, the students wrote the ‘A‘ Level certificate exam and procured the certificate from Goethe Zentrum Institute, Trivandrum.

AUDIT REPORT
2018-2019

SAMSUTHEEN & CO.
Chartered Accountants

Ref: SC/2019-20/37 Date 24.09.2019

INDEPENDENT AUDITOR'S REPORT

We have audited the accompanying financial statements of **INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY, Valiamala P.O., Thiruvananthapuram – 695 547** which comprise the **Balance Sheet** as at **31 March 2019** 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 Accountants 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 opinion 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 judgment, 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.

TC 27/997 (1) & (2), Ground Floor, Vanchiyoor Towers, Vanchiyoor P.O., Thiruvananthapuram-695035
Phone : 0471-2470499, Fax : 0471-2470189, Mob: 94471-31638 E-mail : samsutheenm@gmail.com

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.**

3. During the financial year 2018-19, the Institute made provision for gratuity, pension and leave encashment in the accounts based on Actuarial Valuation done in accordance with Accounting Standard -15 issued by the Institute of Chartered Accountants of India, **but it is not funded yet.**

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 2019.

ii) in the case of the Income and Expenditure statement, of the **deficit** for the year ended on that date.

For SAMSUTHEEN & Co.
Chartered Accountants
Firm Regn No. 013162S dt 1/5/2011

M.Samsutheen M.Com FCA
Proprietor
Membership No. 200384 dt 5/11/1990

Place: Thiruvananthapuram
Date: 24/09/2019.

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

BALANCE SHEET AS AT 31ST MARCH, 2019

(Amount in Rs.)

	Schedule	As at 31.03.2019	As at 31.03.2018
CORPUS/CAPITAL FUND AND LIABILITIES			
Corpus / Capital Fund	1	2,14,13,34,763	2,49,15,03,847
Reserves and Surplus		2	2
Earmarked Funds / Endowment Funds	2	4,91,80,678	4,10,25,264
Long Term Liabilities and Provisions	3	31,34,97,216	9,66,48,727
Current Liabilities and Provisions	4	13,34,59,692	17,76,22,781
TOTAL		**2,63,74,72,351**	**2,80,68,00,622**
ASSETS			
Fixed Assets	5	2,00,12,40,511	2,09,64,02,250
Long Term Assets, Loans, Advances etc	6	13,22,17,815	13,04,06,576
Current Assets, Loans, Advances etc	7	50,40,14,026	57,99,91,796
TOTAL		**2,63,74,72,351**	**2,80,68,00,622**
Significant Accounting Policies & Notes on Accounts	18		

As per our report of even date attached.

For Samsutheen & Co.
Chartered Accountants
FRN : 013162S

C.A. M. Samsutheen
(Proprietor, Mem No. 200384)

Place : Thiruvananthapuram
Date : 24th September, 2019

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Dr. V. K. Dadhwal
Director

R. Hari Prasad
Finance Officer

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2019

(Amount in Rs.)

	Schedule	2018-19	2017-18
INCOME			
Grants / Subsidies	8	70,03,65,000	66,00,00,000
Fees / Subscriptions	9	2,19,60,904	1,10,34,068
Interest Income of IIST	10	78,94,521	96,63,216
Interest Earned on Grant & Retirement Funds	11	2,34,37,971	0
Other Income	12	38,85,326	40,80,190
Gross Surplus/Deficit of Canteen Accounting Committee		31,09,571	38,53,262
TOTAL (A)		**76,06,53,293**	**68,86,30,736**
EXPENDITURE			
Establishment Expenses - Regular	13	30,32,50,162	26,47,12,721
Establishment Expenses - Support Services	14	16,85,85,525	16,64,63,155
Academic & Other Student Expenses	15	12,56,64,801	14,20,47,210
Other Administrative Expenses	16	12,26,29,041	10,76,65,896
Interest Refundable by IIST	17	2,34,37,971	0
Depreciation	5	24,05,67,177	20,06,93,279
TOTAL (B)		**98,41,34,677**	**88,15,82,261**
Excess of Income over Expenditure (A-B)		(22,34,81,384)	(19,29,51,525)
Less : Prior Period Items		**3,57,18,486**	**1,40,94,472**
Balance being Surplus/(Deficit) carried over to Corpus/Capital Fund		**(25,91,99,870)**	**(20,70,45,997)**
Significant Accounting Policies & Notes on Accounts	18		

As per our report of even date attached.

For Samsutheen & Co.
Chartered Accountants
FRN : 013162S

C.A. M. Samsutheen
(Proprietor, Mem No. 200384)

Place : Thiruvananthapuram
Date : 24th September, 2019

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Dr. V. K. Dadhwal
Director

R. Hari Prasad
Finance Officer

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

(Amount in Rs.)

	As at 31.03.2019	As at 31.03.2018
Schedule 1 :: CORPUS / CAPITAL FUND		
Total Grant Received - Capital and Revenue (A)		
Opening Balance of Total Grant Received	7,53,92,24,987	6,56,92,24,987
Add : Grant received during the year	81,20,85,000	97,00,00,000
	8,35,13,09,987	7,53,92,24,987
Total transfer to Revenue Grant (B)		
Opening Balance of amount transferred to Revenue Grant	3,19,46,72,442	2,53,46,72,442
Add : Transfer to Revenue Grant of 2018-19	70,03,65,000	-
Add : Transfer to Revenue Grant of 2017-18	-	66,00,00,000
	3,89,50,37,442	3,19,46,72,442
Surplus / Deficit transferred from Income & Expenditure Account (C)		
Opening Balance of net income / (expenditure)	(1,85,30,48,698)	(1,64,60,02,701)
Deduct: Provision for retirement benefits upto 31.03.18	20,26,89,214	-
Add/Deduct : - Current Year Surplus / (Deficit)	(25,91,99,870)	(20,70,45,997)
	(2,31,49,37,782)	(1,85,30,48,698)
Balance at the year end (A - B + C)	2,14,13,34,763	2,49,15,03,847

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS	1 ISRO-GBP - ABLN & C Project	2 DST Inspire - Dr. Sakthivel	3 DST Inspire - Dr. Mahesh	4 SERB - Dr. Seena V	5 DST Inspire - Dr. Ambili K M	6 DOS-SAC- Dr. Rajesh V J	7 SERB - Dr. Roymon Joseph
a) Opening balance of the funds	7,23,170	3,96,540	27,059	(3,63,566)	6,94,766	3,17,168	4,01,286
b) Additions to the Fund							
i) Donation/Grants	0	0	0	7,50,000	0	0	8,00,000
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	0
iii) Other additions	0	0	0	0	0	0	0
Total (a + b)	7,23,170	3,96,540	27,059	3,86,434	6,94,766	3,17,168	12,01,286
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	1,26,118	0	2,02,232	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	1,26,118	0	2,02,232	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	0	0	1,97,987	0	6,60,000
- Rent/Consumables	0	47,747	0	9,859		0	2,08,814
- Other Administrative Expenses	0	0	0	1,83,324	35,000	78,000	84,000
Sub Total	0	47,747	0	1,93,183	2,32,987	78,000	9,52,814
iii) Fund Returned to the Funding Agency	0	2,22,675	0	0	4,61,779	0	0
Total (c)	0	3,96,540	0	3,95,415	6,94,766	78,000	9,52,814
Net Balance payable as at the year-end (a+b-c)	**7,23,170**	**0**	**27,059**	**0**	**0**	**2,39,168**	**2,48,472**
Net Balance receivable as at the year-end (c-a-b) *Note : Classified under Current Assets under Sch 8*	**0**	**0**	**0**	**8,981**	**0**	**0**	**0**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	8 DST Inspire - Dr. Basudev M	9 NBHM-DAE-PDF- Dr. V.Govindraj	10 SERB - Dr. Jayanthi S	11 LPSC - Dr. Umesh Kadhane	12 DST - Dr. Rama Rao N	13 VSSC - Dr. Natarajan E	14 SERB - Dr. Rakesh Kumar Singh
a) Opening balance of the funds	0	43,200	(71,150)	2,92,830	11,44,360	44,906	(1,16,405)
b) Additions to the Fund							
i) Donation/Grants	7,00,000	0	0	0	0	0	2,66,674
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	0
iii) Other additions (Specify Nature)	0	0	0	0	0	0	0
Total (a + b)	7,00,000	43,200	(71,150)	2,92,830	11,44,360	44,906	1,50,269
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	8,990	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	0	8,990	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	43,200	2,67,634	0	11,15,069	39,290	0
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	0	0	0	0	80,601	0	65,054
Sub Total	0	43,200	2,67,634	0	11,95,670	39,290	65,054
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	0	43,200	2,67,634	0	12,04,660	39,290	65,054
Net Balance payable as at the year-end (a+b-c)	**7,00,000**	**0**	**0**	**2,92,830**	**0**	**5,616**	**85,215**
Net Balance receivable as at the year-end (c-a-b) *Note : Classified under Current Assets under Sch 7*	**0**	**0**	**3,38,784**	**0**	**60,300**	**0**	**0**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	15 SAC - NavIC (IRNSS) Gagan	16 UGC - DAE - Dr. Kuntala B	17 ISRO - MOM - Dr. Rajesh VJ	18 DBT - Dr. Rama Rao N	19 DOS - Dr. Rajesh V J (Spectral)	20 DOS - MOM2 - RPA - Dr. Ambili KM	21 IISU - Dr. Umesh Kadhane - Proj Assistant
a) Opening balance of the funds	1,31,020	1,05,000	6,33,184	17,18,489	1,45,807	45,33,023	1,87,032
b) Additions to the Fund							
i) Donation/Grants	10,39,000	2,88,000	0	54,02,514	2,66,369	0	2,75,000
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	0
iii) Other additions (Specify Nature)	0	0	0	0	0	0	0
Total (a + b)	11,70,020	3,93,000	6,33,184	71,21,003	4,12,176	45,33,023	4,62,032
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	97,545	12,00,743	0	9,97,036	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	97,545	12,00,743	0	9,97,036	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	3,86,741	3,19,393	2,88,333	6,95,477	2,91,667	8,36,134	1,73,240
- Rent/Consumables	1,231	0	0	24,545	0	0	0
- Other Administrative Expenses	963	2,464	36,785	5,37,391	18,910	21,92,384	3,908
Sub Total	3,88,935	3,21,857	3,25,118	12,57,413	3,10,577	30,28,518	1,77,148
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	3,88,935	3,21,857	4,22,663	24,58,156	3,10,577	40,25,554	1,77,148
Net Balance payable as at the year-end (a+b-c)	**7,81,085**	**71,143**	**2,10,521**	**46,62,847**	**1,01,599**	**5,07,469**	**2,84,884**
Net Balance receivable as at the year-end (c-a-b) *Note : Classified under Current Assets under Sch 7*	**0**	**0**	**0**	**0**	**0**	**0**	**0**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	22 IISU - Perf. of Ball Bearings - Dr. Jinesh KB	23 LPSC - Dr. Umesh K - Monte Carlo Model	24 LPSC Dr. Umesh K - Plasma Thruster	25 LPSC - High Thrust EPS - Dr. Umesh K	26 DBT - Dr. Palash - 2017-Liquid Biopsy for Cancer	27 DRDO - ARMREB - Dr. K. Prabhakaran	28 DRDO - SASE - Dr. Govindankutty M
a) Opening balance of the funds	4,76,468	5,10,000	1,16,154	60,00,000	16,05,000	29,55,465	1,10,526
b) Additions to the Fund							
i) Donation/Grants	37,00,000	0	0	70,00,000	4,68,135	0	2,50,000
ii) Income from Investment made on account of Funds	0	0	0	0	6,430	0	0
iii) Other additions (Specify Nature)	0	0	0	0	0	0	0
Total (a + b)	41,76,468	5,10,000	1,16,154	1,30,00,000	20,79,565	29,55,465	3,60,526
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	2,41,605	2,65,556	0	39,75,289	2,950	19,76,802	1,25,101
- Others	0	0	0	0	0	0	26,040
Sub Total	2,41,605	2,65,556	0	39,75,289	2,950	19,76,802	1,51,141
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	4,42,643	2,16,000	90,667	1,47,306	2,22,645	3,34,584	41,828
- Rent/Consumables	92,073	0	0	32,719	2,52,536	2,35,010	0
- Other Administrative Expenses	3,720	28,321	3,908	7,291	1,18,187	6,422	7,067
Sub Total	5,38,436	2,44,321	94,575	1,87,316	5,93,368	5,76,016	48,895
iii) Fund Returned to the Funding Agency	0	0	0	0	0	14,823	0
Total (c)	7,80,041	5,09,877	94,575	41,62,605	5,96,318	25,67,641	2,00,036
Net Balance payable as at the year-end (a+b-c)	**33,96,427**	**123**	**21,579**	**88,37,395**	**14,83,247**	**3,87,824**	**1,60,490**
Net Balance receivable as at the year-end (c-a-b) *Note : Classified under Current Assets under Sch 7*	**0**	**0**	**0**	**0**	**0**	**0**	**0**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	29 Mangrove Cell - Dr. Gnanappazham - 2018	30 Max-Planck - Dr. Jagadheep - 2017	31 MeitY SAMEER - Dr. Priyadarshnam	32 SERB - Dr. Resmi L - 2017 - Gamma Rays	33 SERB - Dr. Seena V - Nanomechanical Sensor	34 IPRC - Dr. Palash - 2018 - Hydrogen Sensor	35 LPSC - Dr.Jinesh K B - Laser Ignition System
a) Opening balance of the funds	51,09,000	19,83,334	42,60,460	9,10,380	45,26,774	0	0
b) Additions to the Fund							
i) Donation/Grants	0	16,09,300	0	3,00,000	10,00,000	20,60,000	29,16,000
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	0
iii) Other additions (Specify Nature)	0	0	0	0	0	0	0
Total (a + b)	51,09,000	35,92,634	42,60,460	12,10,380	55,26,774	20,60,000	29,16,000
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	63,137	2,17,964	5,51,450	3,88,907	18,95,045	5,21,614	0
- Others	0	0	0	0	0	0	0
Sub Total	63,137	2,17,964	5,51,450	3,88,907	18,95,045	5,21,614	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	1,27,071	2,12,903	1,19,081	2,23,076	3,50,000	42,692	0
- Rent/Consumables	7,67,658	0	19,859	18,868	95,234	5,29,783	0
- Other Administrative Expenses	3,28,142	28,030	2,45,511	74,180	1,30,201	0	0
Sub Total	12,22,871	2,40,933	3,84,451	3,16,124	5,75,435	5,72,475	0
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	12,86,008	4,58,897	9,35,901	7,05,031	24,70,480	10,94,089	0
Net Balance payable as at the year-end (a+b-c)	**38,22,992**	**31,33,737**	**33,24,559**	**5,05,349**	**30,56,294**	**9,65,911**	**29,16,000**
Net Balance receivable as at the year-end (c-a-b) *Note : Classified under Current Assets under Sch 7*	**0**	**0**	**0**	**0**	**0**	**0**	**0**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	36 LPSC - Dr. Jinesh K B - SDS	37 SERB - 2018 - Dr. Anand N. - Baryons	38 SERB - 2018 - Dr. Umesh K. - PAH	39 SERB - 2019 - Dr. Vineeth B S - Wireless ReLod	40 AICTE - INAE - Aswathy RV - 2017	41 AICTE - INAE - 2018 Batch	42 SERB - PDF - Dr. Ishwar Kumar C - 2017
a) Opening balance of the funds	0	0	0	0	24,677	0	2,52,987
b) Additions to the Fund							
i) Donation/Grants	20,66,000	6,00,000	32,60,000	8,76,540	1,75,000	5,40,000	0
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	0
iii) Other additions (Specify Nature)	0	0	0	0	0	0	0
Total (a + b)	20,66,000	6,00,000	32,60,000	8,76,540	1,99,677	5,40,000	2,52,987
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	69,000	0	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	69,000	0	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	0	0	1,80,000	4,41,292	0
- Rent/Consumables	0	11,071	0	0	10,000	0	0
- Other Administrative Expenses	0	0	0	0	0	0	0
Sub Total	0	11,071	0	0	1,90,000	4,41,292	0
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	2,52,987
Total (c)	0	80,071	0	0	1,90,000	4,41,292	2,52,987
Net Balance payable as at the year-end (a+b-c)	**20,66,000**	**5,19,929**	**32,60,000**	**8,76,540**	**9,677**	**98,708**	**0**
Net Balance receivable as at the year-end (c-a-b) *Note : Classified under Current Assets under Sch 7*	**0**	**0**	**0**	**0**	**0**	**0**	**0**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	43 SERB - PDF - Dr. Krishnaswamy R - 2017	44 SERB - PDF - Dr. Linsha Vazhayal - 2017	45 SERB - PDF - Dr. Priyanka B - 2017	46 KSCSTE - PDF - Dr. Prescilla - 2018	47 KSCSTE - PhD - Elizabeth George - 2018	48 KSCSTE - PhD - Haritha A - 2018	49 SERB - INTOPMAA-17 - Dr. CS Narayanamurt
a) Opening balance of the funds	2,47,229	1,69,244	2,28,726	0	0	0	(3,924)
b) Additions to the Fund							
i) Donation/Grants	8,79,284	8,50,000	9,00,000	4,72,400	3,10,400	3,10,400	3,924
ii) Income from Investment made on account of Funds	0	0	0	5,248	0	0	0
iii) Other additions (Specify Nature)	0	0	0	0	0	0	0
Total (a + b)	11,26,513	10,19,244	11,28,726	4,77,648	3,10,400	3,10,400	0
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	2,23,674	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	2,23,674	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	6,60,000	6,60,000	6,60,000	4,25,807	1,77,206	1,60,387	0
- Rent/Consumables	0	2,035	18,260	0	0	0	0
- Other Administrative Expenses	1,11,436	1,81,085	1,12,645	48,480	0	2,732	0
Sub Total	7,71,436	8,43,120	7,90,905	4,74,287	1,77,206	1,63,119	0
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	7,71,436	8,43,120	10,14,579	4,74,287	1,77,206	1,63,119	0
Net Balance payable as at the year-end (a+b-c)	**3,55,077**	**1,76,124**	**1,14,147**	**3,361**	**1,33,194**	**1,47,281**	**0**
Net Balance receivable as at the year-end (c-a-b)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Note : Classified under Current Assets under Sch 7							

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	50 DST - NRDMS - Dr. Ramarao N.	51 LPSC - Hindi Technical Seminar	52 IPRC - Hindi Technical Seminar	53 ICMST - Dr.Prabhakaran K	54 NCM - Dr. Moosath	55 SERB - DST - National Conference - Dr. Sakthivel	56 Antrix Corporation - Colloquium Sponsorship
a) Opening balance of the funds	0	0	0	0	0	0	0
b) Additions to the Fund							
i) Donation/Grants	2,00,000	1,08,000	1,00,000	2,00,000	4,48,308	1,50,000	1,50,000
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	0
iii) Other additions (Specify Nature)	0	0	0	0	0	0	0
Total (a + b)	2,00,000	1,08,000	1,00,000	2,00,000	4,48,308	1,50,000	1,50,000
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	0	0	0	0	0
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	0	1,08,000	1,00,000	2,00,000	4,48,308	0	1,45,374
Sub Total	0	1,08,000	1,00,000	2,00,000	4,48,308	0	1,45,374
iii) Fund Returned to the Funding Agency	0	0	0	0	0	0	0
Total (c)	0	1,08,000	1,00,000	2,00,000	4,48,308	0	1,45,374
Net Balance payable as at the year-end (a+b-c)	**2,00,000**	**0**	**0**	**0**	**0**	**1,50,000**	**4,626**
Net Balance receivable as at the year-end (c-a-b) *Note : Classified under Current Assets under Sch 7*	**0**	**0**	**0**	**0**	**0**	**0**	**0**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

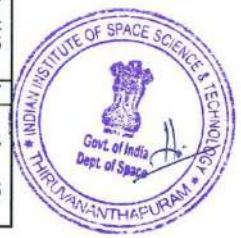
SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	57 DAE - NBHM - CSDEA - Dr. Sakthivel (Travel)	58 SERB - DST - Dr. Deepak TG (Travel)	59 DST - Dr. Deepak Mishra (Travel)	60 SERB - Dr. Praveen Krishna (Travel)	61 DST - PhD - Sathish Kumar (Travel)	62 SERB - PhD - Richu Sebastian (Travel)	63 SERB - Dr. Sudharshan Karthik (Travel)
a) Opening balance of the funds	0	0	0	0	0	0	0
b) Additions to the Fund							
i) Donation/Grants	3,00,000	1,13,009	1,32,561	1,41,181	30,000	1,75,924	1,28,417
ii) Income from Investment made on account of Funds	0	0	0	0	0	0	0
iii) Other additions (Specify Nature)	0	0	0	0	0	0	0
Total (a + b)	3,00,000	1,13,009	1,32,561	1,41,181	30,000	1,75,924	1,28,417
c) Utilisation/Expenditure towards objective of funds							
i) Capital Expenditure							
- Fixed Assets	0	0	0	0	0	0	0
- Others	0	0	0	0	0	0	0
Sub Total	0	0	0	0	0	0	0
ii) Revenue Expenditure							
- Salaries, Wages & Allowance	0	0	0	0	0	0	0
- Rent/Consumables	0	0	0	0	0	0	0
- Other Administrative Expenses	2,61,172	0	1,32,561	1,41,181	30,000	1,75,924	1,28,417
Sub Total	2,61,172	0	1,32,561	1,41,181	30,000	1,75,924	1,28,417
iii) Fund Returned to the Funding Agency	38,828	0	0	0	0	0	0
Total (c)	3,00,000	0	1,32,561	1,41,181	30,000	1,75,924	1,28,417
Net Balance payable as at the year-end (a+b-c)	**0**	**1,13,009**	**0**	**0**	**0**	**0**	**0**
Net Balance receivable as at the year-end (c-a-b) *Note : Classified under Current Assets under Sch 7*	**0**	**0**	**0**	**0**	**0**	**0**	**0**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

Schedule 2 :: EARMARKED/ENDOWMENT FUNDS (contd.)	TOTAL	
	2018-19	2017-18
a) Opening balance of the funds	4,04,70,219	1,96,91,089
b) Additions to the Fund		
i) Donation/Grants	4,27,12,340	4,81,30,588
ii) Income from Investment made on account of Funds	11,678	1,87,969
iii) Other additions (Specify Nature)	0	3,860
Total (a + b)	8,31,94,237	6,80,13,506
c) Utilisation/Expenditure towards objective of funds		
i) Capital Expenditure		
- Fixed Assets	1,31,50,758	1,17,56,156
- Others	26,040	13,31,012
Sub Total	1,31,76,798	1,30,87,168
ii) Revenue Expenditure		
- Salaries, Wages & Allowance	1,12,49,353	95,98,902
- Rent/Consumables	23,77,302	11,76,526
- Other Administrative Expenses	66,27,079	35,19,336
Sub Total	2,02,53,734	1,42,94,764
iii) Fund Returned to the Funding Agency	9,91,092	1,61,355
Total (c)	3,44,21,624	2,75,43,287
Net Balance payable as at the year-end (a+b-c)	**4,91,80,678**	**4,10,25,264**
Net Balance receivable as at the year-end (c-a-b) *Note : Classified under Current Assets under Sch 7*	**4,08,065**	**5,55,045**



INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

(Amount in Rs.)

	As at 31.03.2019	As at 31.03.2018
Schedule 3 :: LONG TERM LIABILITIES AND PROVISIONS		
a) Employee Provident Funds and Retirement Benefits		
- General Provident Fund	3,91,42,748	3,28,84,151
- Contributory Provident Fund	62,25,459	54,24,580
- New Pension Scheme	-	42,176
- Retirement Benefits - Provision	20,66,08,845	-
- Retirement Benefits - Funds Received including Interest	5,32,13,958	5,02,72,614
Sub Total (a)	**30,51,91,010**	**8,86,23,521**
b) Caution Deposit		
- Caution Deposit from Students	83,06,206	80,25,206
Sub Total (b)	**83,06,206**	**80,25,206**
TOTAL	**31,34,97,216**	**9,66,48,727**
Schedule 4 :: CURRENT LIABILITIES AND PROVISIONS		
a) Current Liabilities		
1. Sundry Creditors		
- For Goods		
Capital Goods	3,95,92,338	1,31,83,243
Revenue Expenditure	-	-
- For Services	2,30,54,006	2,51,22,665
2. Statutory Liabilities		
- Overdue	-	-
- Others	23,50,343	27,65,672
3. Other Current Liabilities		
- Interest refundable to DOS (received)	1,61,03,136	3,90,95,993
- Interest refundable to DOS (accrued)	19,91,837	23,43,587
- B.Tech Fees refundable to DOS	3,11,21,088	8,38,14,184
- Others	1,92,46,944	1,12,97,437
Sub Total (a)	**13,34,59,692**	**17,76,22,781**
TOTAL	**13,34,59,692**	**17,76,22,781**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

(Amount in Rs.)

Schedule 5 :: FIXED ASSETS

Particulars	Gross Block (at cost) as at 01.4.2018	Additions		Transfer to Installed from Uninstalled	Deletions	Gross Block (at cost) as at 31.03.2019	Rate of Deprec-iation	Depreciation					Net Block as at 31.3.2019	Net Block as at 31.3.2018
		Installed	Under Installation					As at 01.04.2018	For the year	Prior Period	Deletions	As at 31.3.2019		
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	1,86,40,48,826	84,66,012	0	0	0	1,87,25,14,838	10.00%	66,21,44,448	11,74,27,510	3,60,95,319	0	81,56,67,277	1,05,68,47,561	1,20,19,04,378
Plant & Machinery	92,33,91,551	13,82,32,661	0	0	74,140	1,06,15,50,072	15.00%	49,07,39,464	8,56,30,668	0	60,508	57,63,09,624	48,52,40,448	43,26,52,087
Furniture & Fittings	16,44,80,383	1,34,63,558	0	0	28,150	17,79,15,791	10.00%	8,35,68,307	94,36,068	0	13,190	9,29,91,185	8,49,24,606	8,09,12,076
Ambulance	8,80,644	0	0	0	0	8,80,644	15.00%	5,48,510	49,820	0	0	5,98,330	2,82,314	3,32,134
Motor Cars & Bikes	1,54,06,601	13,39,233	0	0	0	1,67,45,834	15.00%	91,07,699	11,45,720	0	0	1,02,53,419	64,92,415	62,98,902
Motor Buses & Truck	1,07,70,031	0	0	0	0	1,07,70,031	15.00%	53,01,712	8,20,248	0	0	61,21,960	46,48,071	54,68,319
Computers	10,01,51,779	1,55,82,030	0	0	0	11,57,33,809	40.00%	9,11,33,604	98,40,082	0	0	10,09,73,686	1,47,60,123	90,18,175
Software	7,84,71,962	1,06,66,205	0	0	0	8,91,38,167	40.00%	7,05,41,764	80,79,969	0	0	7,86,21,733	1,05,16,434	79,30,198
Library Books	5,72,93,328	35,71,520	0	0	0	6,08,64,848	60.00%	5,45,25,172	38,03,806	0	0	5,83,28,978	25,35,870	27,68,156
Campus networking	4,32,63,382	41,76,964	0	0	0	4,74,40,346	40.00%	3,92,52,387	32,75,184	0	0	4,25,27,571	49,12,775	40,10,995
Canteen Equipments	1,89,19,105	3,66,180	0	0	0	1,92,85,285	15.00%	1,22,31,269	10,58,102	0	0	1,32,89,371	59,95,914	66,87,836
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	5,38,20,536	0	28,10,083	5,31,55,286	0	34,75,333	0.00%	0	0	0	0	0	34,75,333	5,38,20,536
Furniture & Fittings	3,42,837	0	0	3,42,837	0	0	0.00%	0	0	0	0	0	0	3,42,837
TOTAL	**3,36,55,35,990**	**19,58,64,363**	**28,10,083**	**5,34,98,123**	**1,02,290**	**3,51,06,10,023**		**1,52,01,37,359**	**24,05,67,177**	**3,60,95,319**	**73,698**	**1,79,67,26,157**	**1,71,38,83,866**	**1,84,53,98,631**
Previous Year	**2,68,43,33,573**	**68,17,05,542**	**12,25,502**	**17,27,932**	**695**	**3,36,55,35,990**		**1,30,96,91,516**	**20,06,93,279**	**97,52,564**	**0**	**1,52,01,37,359**	**1,84,53,98,631**	**1,37,46,42,057**
Capital Work in progress	**25,10,03,619**	**0**	**5,19,17,945**	**1,55,64,919**	**0**	**28,73,56,645**		**0**	**0**	**0**	**0**	**0**	**28,73,56,645**	**25,10,03,619**
TOTAL													**2,00,12,40,511**	**2,09,64,02,250**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES TO BALANCE SHEET AS AT 31ST MARCH, 2019

(Amount in Rs.)

	As at 31.03.2019	As at 31.03.2018
Schedule 6 :: LONG TERM ASSETS, LOANS, ADVANCES ETC		
a) Loans		
- Staff	28,46,026	12,67,357
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	50,71,789	48,39,219
TOTAL	**13,22,17,815**	**13,04,06,576**
Schedule 7 :: CURRENT ASSETS, LOANS, ADVANCES ETC		
a) Current Assets		
1. Inventories		
- Canteen inventories	7,68,326	7,83,116
2. Sundry Debtors		
- Debtors outstanding for a period exceeding six months		
- Others		
3. Cash Balances in hand (including cheques/drafts and imprest)	55,351	54,361
4. Bank Balances		
a) With Scheduled Banks		
- On Current Accounts	2,22,72,101	7,32,126
- On Deposit Accounts	27,22,99,687	41,05,78,010
- On Earmarked & Retirement Benefits Accounts	15,12,58,047	13,01,48,814
Sub Total (a)	**44,66,53,512**	**54,22,96,428**
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	28,13,935	8,60,405
- Prepayments	3,95,90,381	1,36,97,731
- Others	94,05,569	83,01,695
2. Income Accrued		
- On Bank Deposits	53,89,348	1,46,71,991
- On Other Deposits	1,61,281	1,63,546
Sub Total (b)	**5,73,60,514**	**3,76,95,368**
TOTAL (a+b)	**50,40,14,026**	**57,99,91,796**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2019

(Amount in Rs.)

	2018-19	2017-18
Schedule 8 :: GRANTS / SUBSIDIES		
(irrevocable Grants & Subsidies Recovered)		
1. Central Government	70,03,65,000	66,00,00,000
TOTAL	**70,03,65,000**	**66,00,00,000**
Schedule 9 :: FEES / SUBSCRIPTIONS		
1. Entrance Fees	31,61,000	48,91,125
2. Annual Fees/Subscriptions	1,87,99,904	61,42,943
TOTAL	**2,19,60,904**	**1,10,34,068**
Schedule 10 :: INTEREST INCOME OF IIST		
1. On Term Deposit		
a) With Scheduled Banks	78,25,534	96,47,528
b) Others	0	0
2. On Loans / Advances		
a) Employee/Staff	68,567	15,688
3. Others		
a) Interest on IT Refund	420	0
TOTAL	**78,94,521**	**96,63,216**
Schedule 11 :: INTEREST EARNED ON GRANT & RETIREMENT FUNDS		
1. On Term Deposit		
a) With Scheduled Banks	2,32,22,175	0
b) Others	2,15,796	0
TOTAL	**2,34,37,971**	**0**
Schedule 12 :: OTHER INCOME		
1. Rent Receipts	6,96,387	7,88,642
2. Sale of Tender Forms	11,000	24,781
3. Sale of Scrap / Vehicles / Trees	2,79,358	7,18,328
4. Miscellaneous Income	28,98,581	25,48,439
TOTAL	**38,85,326**	**40,80,190**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2019

(Amount in Rs.)

	2018-19	2017-18
Schedule 13 :: ESTABLISHMENT EXPENSES - REGULAR		
1. Salaries & Allowances	27,50,79,202	24,66,16,595
2. Contribution to NPS	1,45,89,995	1,33,26,830
3. Contribution to CPF	2,68,920	2,62,591
4. Medical Expense- Staff	48,11,222	20,49,555
5. Expense on Employees Retirement & Terminal Benefits	82,89,803	24,38,400
6. Interest on PF Contribution	1,97,280	0
7. Staff Training Expense	13,740	18,750
TOTAL	**30,32,50,162**	**26,47,12,721**
Schedule 14 :: ESTABLISHMENT EXPENSES - SUPPORT SERVICES		
1. Consultancy & Manpower Charges	8,67,85,947	8,45,90,744
2. Remuneration to Contract Employees	64,30,833	1,05,16,460
3. CISF Expenses	7,53,68,745	7,13,55,951
TOTAL	**16,85,85,525**	**16,64,63,155**
Schedule 15 :: ACADEMIC & OTHER STUDENT EXPENSES		
1. Admission Expense	31,93,465	56,53,660
2. Assistanceship to Students	3,43,44,724	3,97,50,459
3. Library Services	2,07,55,656	3,04,31,008
4. Academic Expense	5,01,64,054	5,41,81,848
5. Supplies & Materials	1,56,97,321	1,04,75,305
6. Student Activities Expense	15,09,581	15,54,930
TOTAL	**12,56,64,801**	**14,20,47,210**
Schedule 16 :: OTHER ADMINISTRATIVE EXPENSES		
1. Maintenance & Upkeep		
Repairs & Maintenance - CMD	2,38,35,786	2,03,79,649
Repairs & Maintenance - Labs & Others	1,48,41,991	95,76,513
House Keeping Expense	8,02,827	6,83,340
Sub Total (a)	**3,94,80,604**	**3,06,39,502**
2. Professional Charges		
Audit Fees	2,65,500	1,47,500
Legal Expense	1,94,451	2,75,987
Sub Total (b)	**4,59,951**	**4,23,487**
3. Administrative Expenses - Others		
Vehicle Operating Expense	2,12,16,768	2,00,81,280
Electricity & Water Charges	3,27,99,909	2,56,48,820
Travelling Expense	64,41,026	64,36,808

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT
FOR THE YEAR ENDED 31ST MARCH, 2019

(Amount in Rs.)

	2018-19	2017-18
Research & Development Expense	92,97,863	91,73,628
Printing & Stationery	33,42,330	38,51,996
Advertisement & Publicity	6,34,690	4,46,986
Hospitality Expense	33,37,775	38,96,262
Telephone & Internet Expense	18,74,002	22,84,982
Office Expense	25,24,112	27,02,838
Recruitment & Review Expense	11,29,263	18,63,937
CEP & IPR Expenses	0	2,13,725
Bank Charges	90,747	1,645
Sub Total (c)	**8,26,88,486**	**7,66,02,907**
TOTAL	**12,26,29,041**	**10,76,65,896**

Schedule 17 :: INTEREST REFUNDABLE BY IIST

Interest to CPF Fund [Expense]	2,38,040	0
Interest to DOS [Expense]	1,80,94,973	0
Interest to GPF Fund [Expense]	21,63,614	0
Interest to Retirement Fund [Expense]	29,41,344	0
TOTAL	**2,34,37,971**	**0**

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2019

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 31.03.2019.
   d. Software not having perpetual licenses are written off over the license period.

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

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2019 (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 is still in progress. Buildings, the construction of which are more than 90% complete, certified by the Construction and Maintenance Division and which have been put into use have been transferred from Capital Work-in-Progress to Buildings based on actual payments made.
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 31.03.2019 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 maintained separately in a Current Account and linked Term Deposits.

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2019 (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

2. Revenue
   a. Out of Grant of Rs. 81,20,85,000/-received during 2018-19, Rs. 70,03,65,000/- 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. 1,61,03,136/- (excluding the interest received on the Provident Fund Accounts and Earmarked Funds) has been actually received during 2018-19 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 2018-19, an amount of Rs. 3,11,21,088/- has been shown as refundable to DOS after adjusting related costs.
   d. With respect to BTech students joining the Institute from 2018 onwards the Fees received is recognized as Income of the Institute based on the decision of the Twelfth Finance Committee, IIST.
   e. Canteen Accounting Committee accounts is maintained separately and the gross deficit / surplus, which is exclusive of administrative cost, is recognised in the Income and Expenditure Account.

3. Fixed Assets
   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

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2019 (contd)

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..

a. Capital Work-in-Progress includes a sum of Rs. 4,66,67,277/- 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.
b. An amount of Rs. 34,75,333/- pertaining to assets that have been delivered to IIST before 31.03.2019 but under installation as on 31.03.2019 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 5 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 liability in respect of gratuity, pension and leave encashment has not been made. Permission from DOS for creation &maintenance of a separate pension fund has been received during 2013-14. Provision for Retirement Benefits [Pension, Gratuity & Leave Encashment] has been incorporated based on the actuarial valuation provided by Life Insurance Corporation during 2018-19. In addition, the retirement benefits from the previous employers for the members governed under the GPF have not been received in all cases.

5. Prior Period Item
   Details of prior period items are as given below :-

Details	Prior period expenses
Medical fee reversed – Mtech	3,200.00
HBA Interest refundable	285.00
Depreciation	3,60,95,319.00
Total (A)	**3,60,98,804.00**

Details	Prior period income
Rental Income	23,557.00
Electricity & Water Charges	8,560.00
Telephone charges	2,296.00
Gas Cylinder Storage Shed	3,18,397.00
Laboratory Equipment	1,628.00
CHSS receipts	25,880.00
Total (B)	**3,80,318.00**

Net prior period expense (A-B) = Rs. 3,57,18,486.00

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 17 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2019 (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

   During 2018-19, an amount of Rs. 3,43,44,724/- 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 2019 has not been taken into the books of accounts for 2018-19 as March salary for a particular year for central government employees is released in April of that year only. Expenditure for March 2018 to February 2019 has been shown in 2018-19.

11. Bank balances
    The negative balance in the 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. 63.48 lakhs pertaining to expenditure for Externally Funded projects has been met from IIST bank accounts and is to be transferred from the balance in Earmarked Funds bank accounts to IIST's main bank account.
    b. As on 31.03.2019, assets amounting to Rs. 4.14 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.

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2019 (contd)

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. 12.12 lakhs relates to balances that have been outstanding from 01.04.2018.

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 particular 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. 17.73 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 31.03.2019 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. As per the note provided by the CMD office the project was delayed due to various unforeseen reasons and the extension of the contract was given up to 20.10.2019 without prejudice to the right of the institute to impose the levy of compensation for the delay. As per clause 2 of the agreement the institute can levy penalty on the works which will have an impact on the accounts. The same could not be quantified due to want of details. As on 31.03.2019, advance amount paid to SPCL towards interim advance amounts to Rs. 12.43 crores. The Institute currently holds 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

As per SPCL's confirmation, balance payable to SPCL as on 31.03.2019 is Rs. 92.34 lakhs (subject to reconciliation) and Advances received by SPCL as on 31.03.2019 is Rs. 12.43 crores.

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Schedule 18 :: SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2019 (contd)

19. Tax deducted at Source
Rs. 13.5 lakhs is appearing in Form 26AS of IIST for which amount has not been received and therefore TDS was not taken in IIST books of accounts.

20. 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 Samsutheen & Co.
Chartered Accountants
FRN : 013162S

C.A. M. Samsutheen
(Proprietor, Mem No. 200384)

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Dr. V. K. Dadhwal
Director

R. Hari Prasad
Finance Officer

Place : Thiruvananthapuram
Date : 24th September, 2019

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2019

(Amount in Rs.)

Receipts	2018-19	2017-18	Payments	2018-19	2017-18
I. Opening Balance			**I. Expenses**		
a.Cash and DD's in hand	54,361	19,805	**a.Establishment Expenses - Regular**		
b.Bank Balances			Salaries & Allowances (admin & faculty)	27,49,84,845	24,68,10,146
In current accounts	7,32,126	21,89,28,930	Contribution to NPS	1,45,89,995	1,33,26,830
In deposit accounts	41,05,78,010	20,50,01,352	Contribution to CPF	2,68,920	2,62,591
In earmarked/retirement benefits accounts	13,01,48,814	9,46,74,482	Medical Expense- Staff	49,44,333	20,05,016
			Employees Retirement Benefits	43,70,172	24,38,400
II.Grants Received			Interest on PF Contribution	1,97,280	(19,480)
a.From Government of India	81,20,85,000	97,00,00,000	Staff Training Expenses	13,740	18,750
III. Interest Received			**b.Establishment Expenses - Support Services**		
a.On Bank Deposits	1,66,04,800	14,43,822	Consultancy & Manpower Charges	8,80,69,059	8,25,38,372
b.On Other Deposits	0	0	Remuneration to Contract Employees	64,30,833	1,05,16,460
c.Loans, Advances etc.	68,567	15,688	CISF Expenses	7,43,97,975	7,02,63,267
d. Others	420	0			
IV. Other Income			**c. Academic & Other Student Expenses**		
a.Entrance Fees	31,61,000	48,91,125	Admission Expense	31,94,785	57,08,580
b.Annual Fees/Subscriptions	2,24,35,464	67,89,668	Assistanceship to Students	3,43,06,140	3,98,97,623
c.Other Income	38,39,747	43,18,135	Library Services	2,83,55,335	2,87,57,943
			Academic Expense	4,96,72,233	5,36,06,629
V. Any other receipts			Supplies & Materials	1,53,55,609	1,04,23,542
a. Refund from Branches	0	1,16,070	Student Activities Expense	14,66,337	16,17,533
b.Security Deposits received	19,99,573	10,55,743			
c.Earnest Money Deposits received	56,07,698	46,46,139	**d. Other Administrative Expenses**		
d.Performance Guarantee	43,277	3,58,940	Repairs & Maintenance	1,50,44,997	1,03,51,639
e.Advance for Research & Seminars	4,27,24,018	4,83,22,417	Repairs & Maintenance - CMD	2,32,47,638	2,11,82,457
f. B.Tech Fees refundable to DOS	3,11,21,088	(7,34,58,389)	House Keeping Expense	8,02,827	7,47,315
g.Caution Deposit from Students	2,81,000	0	Audit Fees	2,38,950	1,68,500
h.Bond Amount received [Btech]	20,00,000	0	Legal Expense	1,94,821	2,80,501
i.Stale cheques	96,765	10,03,803	Vehicle Operating Expense	2,06,77,550	2,03,57,980
j.Canteen Accounting Committee	2,12,66,125	2,05,79,745	Electricity & Water Charges	3,27,56,451	2,57,89,479
k. Miscellaneous receipts	112	20,28,000	Travelling Expense	61,28,391	66,69,099

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2019

(Amount in Rs.)

Receipts	2018-19	2017-18	Payments	2018-19	2017-18
l.Interest received and payable to DOS	1,61,03,136	2,18,23,933	Research & Development Expense	99,12,300	91,28,721
m. Net addition to Statutory Liabilities(Staff)	1,01,12,536	1,48,24,819	Printing & Stationery	33,64,908	38,15,042
n. Unexplained credits - Banks	8,16,876	26,880	Advertisement & Publicity	6,34,690	4,46,986
o.Tax Collected at Source	21,000	0	Hospitality Expense	34,10,464	39,16,571
p.Recovery of loans to staff	3,43,731	3,73,024	Telephone & Internet Expense	19,02,980	23,02,813
			Office Expense	25,29,866	26,47,740
			Recruitment & Review Expense	11,29,388	18,53,802
			CEP & IPR Expenses	0	2,13,725
			Bank Charges	90,747	1,645
			II. Payments made against funds for various projects		
			DST Inspire - Dr. Sakthivel	4,06,316	1,60,903
			DST Inspire - Dr. Mahesh	0	8,28,939
			SERB - Dr. Seena V	3,75,794	5,75,070
			DST Inspire - Dr. Ambili K M	6,94,766	12,27,163
			DOS-SAC- Dr. Rajesh V J	78,000	2,38,095
			SERB - Dr. Roymon Joseph	9,53,522	14,29,959
			AICTE - INAE - PhD - R S Mohankumar	0	85,000
			NBHM-DAE-PDF- Dr. V.Govindraj	43,200	5,50,400
			SERB - Dr. Jayanthi S	2,82,619	3,25,879
			DST - Dr. Rama Rao N	12,74,976	88,33,301
			VSSC - Dr. Natarajan E	39,290	1,22,983
			SERB - Dr. Rakesh Kumar Singh	65,054	12,73,525
			SAC - NavIC (IRNSS) Gagan	3,88,935	4,78,980
			UGC - DAE - Dr. Kuntala B	3,21,857	3,00,000
			ISRO - MOM - Dr. Rajesh VJ	4,12,909	3,59,628
			DBT - Dr. Rama Rao N	24,78,163	38,49,952
			DOS - Dr. Rajesh V J (Spectral)	3,19,577	3,64,193
			DOS - MOM2 - RPA - Dr. Ambili KM	45,79,907	15,58,488
			IISU - Dr. Umesh Kadhane - Proj Assistant	1,77,148	87,968
			IISU - Perf. of Ball Bearings - Dr. Jinesh KB	7,80,041	3,532
			LPSC - Dr. Umesh K - Monte Carlo Model	5,09,877	1,40,000

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2019

(Amount in Rs.)

Receipts	2018-19	2017-18	Payments	2018-19	2017-18
			LPSC Dr. Umesh K - Plasma Thruster	94,575	1,43,846
			DRDO - ARMREB - Dr. K. Prabhakaran	23,69,961	3,64,358
			DRDO - SASE - Dr. Govindankutty M	2,16,362	3,65,536
			Max-Planck - Dr. Jagadheep - 2017	4,58,897	51,226
			MeitY SAMEER - Dr. Priyadarshnam	9,35,901	27,540
			SERB - Dr. Resmi L - 2017 - Gamma Rays	6,66,140	41,438
			SERB - Dr. Seena V - 2017	21,32,924	53,226
			AICTE - INAE - Aswathy RV - 2017	1,80,000	1,10,323
			ICSSR - PDF - Dr. Sandhya R. S. - 2017	0	4,18,645
			SERB - PDF - Dr. Ishwar Kumar C - 2017	2,52,987	3,47,013
			SERB - PDF - Dr. Krishnaswamy R - 2017	7,85,186	6,93,510
			SERB - PDF - Dr. Linsha Vazhayal - 2017	8,23,395	7,08,304
			SERB - PDF - Dr. Priyanka B - 2017	10,44,489	6,84,913
			SERB - INTOPMAA-17	20,005	1,83,919
			TIFR - Astronomy Olympiad Nurture Camp	0	1,64,580
			DST - PAMC meeting	0	1,50,528
			SERB - Travel - Dr. Govindan Kutty	0	10,827
			SERB - Travel- Dr. Gomathi	0	1,66,596
			SERB - Travel- Najeeb P K	0	1,63,063
			SERB - Travel- Veena V S	0	67,556
			AICTE - INAE - PhD - 2018 Batch	4,41,292	0
			KSCSTE - PDF - Dr. Prescilla - 2018	4,74,287	0
			KSCSTE - PhD - Elizabeth George - 2018	1,77,206	0
			KSCSTE - PhD - Haritha A - 2018	1,63,119	0
			IPRC - Dr. Palash - 2018 - Hydrogen Sensor	10,45,311	0
			LPSC - High Thrust EPS - Dr. Umesh K	42,01,318	0
			DBT - Dr. Palash - 2017- Liquid Biopsy for Canc	5,96,318	0
			Mangrove Cell - Dr. Gnanappazham - 2018	41,56,748	0
			SERB - 2018 - Dr. Anand N - Baryons	80,071	0
			DAE-NBHM-Dr.Sakthivel-CSDEA 2019	3,00,000	0
			Hindi Technical Seminar- 2018	1,08,000	0
			ICMST - 2018 - Dr. Prabhakaran K	2,00,000	0
			IPRC- 2018- Jayapal	1,00,000	0
			NCM - 2018 - Dr. Moosath	4,48,308	0

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2019

(Amount in Rs.)

Receipts	2018-19	2017-18	Payments	2018-19	2017-18
			Sponsorship - Souvenirs	1,45,374	0
			DST - Dr Deepak Mishra - Travel Grant	1,32,561	0
			DST - Sathish Kumar - Travel Grant (Phd)	30,000	0
			SERB - Praveen Krishna - Travel Grant	1,41,181	0
			SERB - Richu Sebastian 2018	1,75,924	0
			SERB - Sudharshan Karthik Travel Grant	1,28,417	0
			LPSC - Dr. Umesh K	21,337	0
			III. Expenditure on Fixed Assets & Capital Work-in-Progress		
			a.Purchase of Fixed Assets	11,95,31,662	11,93,58,920
			b.Expenditure on Capital Work-in-progress	3,64,91,547	14,94,30,255
			IV. Other Payments		
			Security Deposits (Asset) paid	2,32,570	1,53,870
			Security Deposits repaid to Contractors	11,84,923	27,97,387
			Earnest Money Deposits repaid	47,04,758	51,31,346
			Performance Guarantee	98,543	5,70,474
			Contingency Advance to Staff	1,59,323	41,917
			Loans to staff	19,22,400	50,000
			Canteen Accounting Committee	1,81,41,764	1,71,29,908
			Sundry debtors	11,505	1,497
			Stale Cheques - paid	2,05,553	1,82,008
			Caution Deposit from Students	0	1,67,794
			LPSC - Land	0	1,97,022
			Decrease in TDS, VAT & Labour Cess	4,15,329	52,76,524
			Employee recovery - interest (net)	29,247	3,776
			Tax collected at source [from IIST]	0	21,000
			Tax deducted at source [from IIST]	29,43,593	0
			Btech Fees & Interest refunded to DOS	14,01,82,237	0

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH, 2019

(Amount in Rs.)

Receipts	2018-19	2017-18	Payments	2018-19	2017-18
			V. Closing Balances		
			a.Cash in hand	55,351	54,361
			b.Bank Balances		
			In current accounts	2,22,72,101	7,32,126
			In deposit accounts	27,22,99,687	41,05,78,010
			In earmarked/retirement benefits accounts	15,12,58,047	13,01,48,814
Total	**1,53,22,45,245**	**1,54,77,84,131**	**Total**	**1,53,22,45,245**	**1,54,77,84,131**

Significant Accounting Policies & Notes on Accounts 18

As per our report of even date attached.

For Samsutheen & Co.
Chartered Accountants
FRN : 013162S

C.A. M. Samsutheen
(Proprietor, Mem No. 200384)

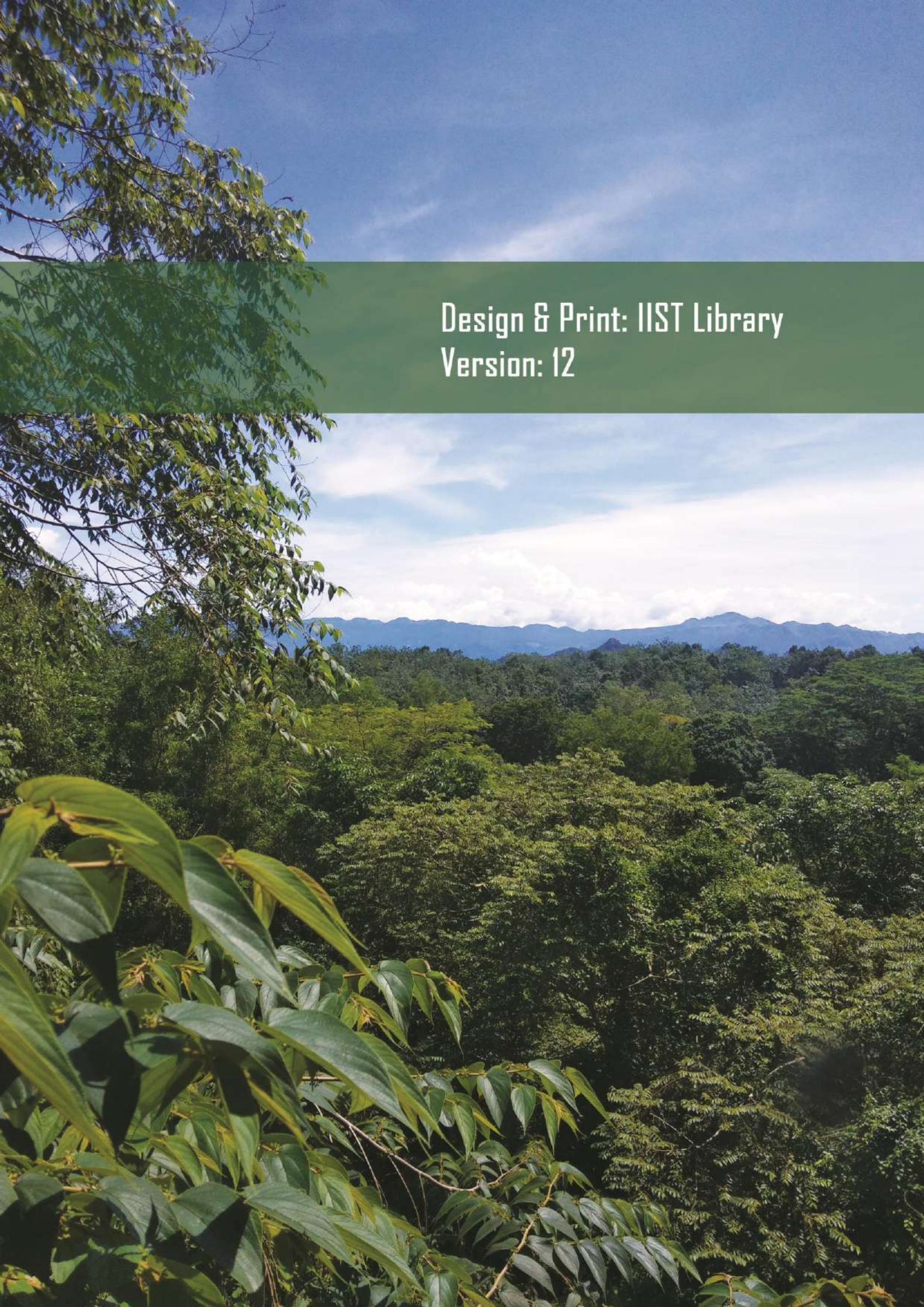
Place : Thiruvananthapuram
Date : 24th September, 2019

For and on behalf of
Indian Institute of Space Science and Technology (IIST)

Dr. V. K. Dadhwal
Director

R. Hari Prasad
Finance Officer

Govt. of India
Dept. of Space



Design & Print: IIST Library
Version: 12

IIST/102/IP/OCT/2019

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, Thiruvananthapuram - 695 547

www.iist.ac.in