



भारतीय अंतरिक्ष विज्ञान एवं प्रौद्योगिकी संस्थान
तिरुवनंतपुरम

तृतीय दीक्षांत समारोह
फ़रवरी 22, 2015

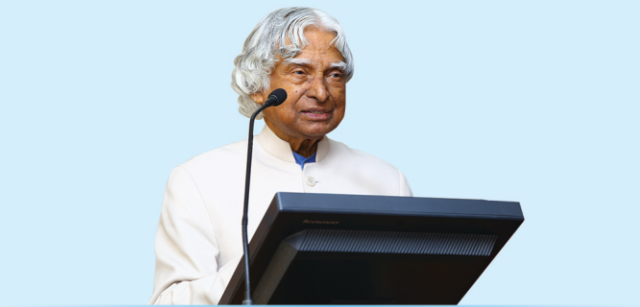
Indian Institute of Space Science and Technology
Thiruvananthapuram

Third Convocation
February 22, 2015

Chancellor's Address

Dr. A. P. J. Abdul Kalam
Chancellor, IIST





“Space Solar Power: Key to a Livable Planet Earth”

Dear friends, I am very happy to participate in the 3rd convocation of the IIST as a Chancellor and share my thoughts with the graduating students, faculty members and the students. First I would like to congratulate all the students who are graduating today and also my best wishes to each one of you for the great and unique future in your professional career. I also greet all the faculty members who have shaped the students who are entering in the new phase of life.

I feel it is appropriate here to make a reference from the message, which I have delivered during my Special Address at the Beijing Forum 2012 on 02 November 2012 on the theme ***“Harmony of Civilizations and Prosperity for All – Challenges and Opportunities: New Thinking in New Reality”*** and also from my address at the 32nd International Space Development Conference (ISDC 2013) at San Diego, California on the topic ***“Space Solar Power: Key to a Livable Planet Earth”***. The thought I put-forth in both international forum was:

“THE NATIONS ARE ONE WAY OR THE OTHER, FOR CENTURIES, SURVIVED BASED ON CONFLICTS, BE IT NATIONAL, REGIONAL AND GLOBAL. THERE IS AN ELEMENT OF FRUSTRATION, AMONG NATIONS NOW ABOUT THESE CONFLICTS THEMSELVES, AND THE PEOPLE WOULD LIKE TO LIVE IN PEACE. IF WE GO INTO DETAILS, I HAVE COME TO THE CONCLUSION; EVERY NATION NEEDS A MISSION BIGGER THAN ITS PEOPLE, BIGGER THAN THE NATION. CAN WE EVOLVE AND PRESENT A GREATER VISION WHERE THE NATION WILL BE BUSY AND COMMITTED, WORK GLOBALLY, REGIONALLY AND NATIONALLY RESULTING IN CONFLICT FREE, PEACEFUL, PROSPEROUS SOCIETIES OF THE WORLD.

What is the one cause which will unite regions, nations and the world and facilitate a happy, harmonious living apart from being prosperous? I would like to present my experience of evolving one such vision which will unify many nations to come together and work for the sustainability of the earth and the humanity. That is planet earth with clean energy from solar power from terrestrial or space. This huge programme of 25 years can be called world knowledge platform to bring multiple nations together and work for sustainable earth with clean energy.

Hence, I feel it is appropriate to share my thoughts to all of you on the topic **“Space Solar Power: Key to a Livable Planet Earth”**.

Dear friends, On 20 July 1969 the Saturn-V booster injected the lunar module of Apollo 11 with two astronauts Armstrong and Buzz Aldrin; and history was made when Armstrong walked on the Moon. For the whole world, Von Braun became a hero of building its biggest booster and fulfilling mankind's age-old vision of Man going to the Moon. At that time, I was a young



fellow, just entered into aeronautical profession, building hovercraft and meteorological rockets. It was a great surprise and fulfillment in my mind to meet my hero at the place of my own work, Vikram Sarabhai Space Centre (VSSC) where Von Braun was visiting at the invitation of Prof Vikram Sarabhai. I became his host. From the time he had landed at VSSC and till he took off, I was with him for the full day. Von Braun gave a very important lecture at VSSC auditorium which was full and overflowing. Von Braun spoke on the subject “outer space provides the greatest challenges to humanity”.

Subsequently, I met Von Braun in the conference hall for discussion on the launch vehicle, particularly on the SLV3 project, for which I was the Project Director. It was a very important discussion for me, because we got into serious discussion on some of the technical aspects on my project, particularly L/D (that is slenderness) ratio of SLV3 with reference of aero-elasticity and sufficient control force requirement. We always cherish the memory of the tall rocket engineers' visit to India. I am happy to receive NSS Von Braun Award which is filled with my memories of Von Braun and his achievements and I had the same wonderful feeling while receiving the award from NSS.

World Space Vision 2050

I was elated about the 32nd International Space Development Conference (ISDC 2013) in San Diego since they have chosen the theme for the conference as "Global Collaboration in 21st Century Space". This is a topic I cherish, one that I have actively promoted for now nearly one quarter of a century, in India and abroad, to a wide variety of audiences. I have been advocating a



World Space Vision 2050 for more than a decade in many national and international aerospace forums, structured to enable mankind formulate and implement:

1. Large Scale Societal missions (including Space Solar Power mission) enabled by low cost access to space.
2. Evolution of a comprehensive space security doctrine, policy and programme.
3. Expansion of Space exploration and current application missions.

Such a World Space Vision 2050 would enhance the quality of human life, inspire the spirit of international collaborative space exploration, expand the horizons of knowledge, and ensure space security for all nations of the world.

There are many initiatives, potential research studies in India, US and other space faring nations which have now brought together India and US to work on the mission of harvesting energy from space with the pioneering effort taken by NSS. I cherish sharing my perspectives with Mark Hopkins, Chairman NSS and his team from ISDC 2010 where I delivered an Address on the topic **“Harvesting Solar Energy from Space”**. I was glad that by mid-2010 we could sign off an understanding to start up an international SSP Feasibility Study with the initiative of **“Kalam-NSS Space based Solar Power initiative”**. We need to set a new direction and pace to accelerate our progress further on this mission, setting significant milestones amidst the many global challenges, socio-economic as well political challenges.

The energy situation and its influence on development, economy and quality of life have touched every nation as evidenced by the statements of the leaders of various nations at different levels.



While it is important to concentrate on every aspect of renewable energy sources including terrestrial solar energy, space community has a great potential to lead to nearly a continuous unlimited energy source. Hence every nation needs a great vision, bigger than its own people, bigger than the nation, to move the world away from a potential energy crisis in the 21st century. So can we the space community now together share our perspectives and evolve such a vision that should be greater than any other vision so far envisioned by humanity? That is clean energy from space solar power for 24x7.

Great Vision & Mission

So far, in all known history, international visions, missions and programmes *have been earth based*: like in areas of food and agriculture, commerce and trade, education and culture, humanitarian aid to mitigate natural and man-made disasters etc. Can we conceive and implement, as a historically first, epoch making happening, a new vision for international collaboration in space? The benefits from such a great vision shall be tangible to each one of the world's population and bring together all human feelings and thoughts, from the most material to the most spiritual, leading on to a *Liveable Planet Earth* through Space Industrialization.

Such a mission in space industrialization could start up with an intensely human international mission in *societal-critical areas of energy, water, environment and security* which would expand over the decades and centuries to all other human needs and activities on planet earth through space exploration and a new order in space through space security. I think there cannot be a greater vision for all nations other than transforming our



terrestrial habitat into a liveable planet earth through international collaboration in space. From my perspective, I believe that the driving force towards a liveable planet is the common threats and opportunities that all nations face. These threats to a livable planet earth are:

1. **Massive shortages, escalating costs of energy and rapidly depleting fossil fuel reserves world over.**
2. **Global environment degradation due to fossil fuels and climate change.**
3. **Depletion of Mineral Resources.**

Livability, Prosperity and Peace

It is clear to us now that our planet has to be livable before it can be prosperous; and it has to be both livable and prosperous before we can dream of peace and freedom from insecurity. The basic and most compelling need now is obviously livability. However, the process of making our now devastated planet livable again even when supporting a population growing from 7 to 11 billion by the turn of the 21st Century is a necessary but not a sufficient condition to obtain prosperity and peace for mankind.

Fundamental parameters for prosperity and peace include *trade and economics, security, health and sustained, ever continuing education of humanity*. These four parameters connect the world with a compounding positive effect, meaning that well-being of one nation on these parameters imply the well-being of every other nation as well.

I had presented in Beijing Forum 2013, my experience of evolving one such vision which will unify many nations to come together and work for the sustainability of the earth and the humanity.



This was the concept of a **World Knowledge Platform for Global Action** that I shall now speak about.

World Space Knowledge Platform: International SSP Mission

With this background, can we initiate a mission to create a **World Space Knowledge Platform**, with these selected 25 experts from the collaborators, as *an International Virtual Laboratory* for conceptual, perspective and strategic planning of technical and management systems and bring reality our cherished dream for a liveable planet earth through a space industrialization mission, starting with space solar power and reusable space transportation systems? This world knowledge platform will become an advisory body for Space Industrialization. *This then is direction and hard core content of what we must accomplish today and in the next few months*, in the spirit and name of our visionaries like von Braun and Peter Glaser whose ideas and hard work have brought humanity to this new level of thinking.

This **World Space Knowledge Platform** which is to be an International Virtual Laboratory will take the form of a **coalition of leading academic institutions in space and energy science & technology, one or two in each of the partner nations**. Guided and coordinated by the World Space knowledge Platform's International Advisory Committee, they would be directed towards bringing out an International Feasibility Study for SSP. It needs to be funded initially as an international cooperative venture with about **\$ US 4 billion over the next five years** with dedicated spending to developing customizable and scalable solutions. *Needless to say, each national stakeholder in this collaboration would be required to*



provide, up front, small seed money to be used for starting-up such an International SSP Feasibility Study Report: so let us see who the first to sign up are!

These academic institutions, one or two in each nation would thus be *sufficiently funded by world governments and industries*. The representatives of government and industries being on the World Space Knowledge Platform's International Advisory Committee and all other operational coordination mechanisms would know exactly what is happening (as the mission moves forward). I trust that answers your question of what would be the source and use of funds. In their turn the academic institutions would fund and coordinate sub-scale technology demonstrations of space solar power and reusable launch vehicle systems on ground, air and in space.

Before I conclude, you would be happy to learn that the world is not standing still in regard to solar power and reusable space transportation systems. Energized by the NSS vision for space solar power, ISRO has a small group of scientists studying space mirror approach that has been highlighted here at ISDC 2013. Japan has announced its long term SSP development programme.

Conclusion

In conclusion, we shall embark on a path-breaking international mission for space solar power within the ambit of a global vision for space industrialization leading on to a new era of peace, prosperity and abundance for all humanity.

We shall build upon the trusting relationships we have established and consolidated these last 4 years between the NSS and India. We shall now strive to expand this relationship in an



organized and well-structured manner creating a World Space Knowledge Platform with a virtual laboratory of 25 specialists and generalists drawn from Government and Industry in the US, India along with other space faring nations. I visualize Indian aerospace institutions such as ISRO, IIST will spearhead in harnessing solar power.

I am confident that with this context, certainly the role of Indian space agencies has acquired new dimension in working for realizing the Space Solar power, which will ultimately create a livable planet earth.

My greetings to all of you.

May God bless you.





Indian Institute of Space Science and Technology

(Declared as Deemed to be University under Sec.3 of UGC Act, 1956)

Valiamala, Thiruvananthapuram



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Third Convocation

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Convocation Address

Prof. Ashutosh Sharma

Secretary, DST





Dr A. P. J. Abdul Kalam, Hon'ble Chancellor of IIST, Dr A. S. Kiran Kumar, Chairman, ISRO, Secretary, DoS, Dr K. S. Dasgupta, Director, IIST, Distinguished Members on the Dias, Members of the Faculty, Members of ISRO Family, Ladies and Gentleman and my beloved and young degree recipients:

Friends, it is a matter of immense delight for me to be here with all of you on this joyous occasion of the third Convocation of Indian Institute of Space Science and Technology (IIST). I am grateful to Dr. A. S. Kiran Kumar for inviting me to this significant and happy occasion. I deem it as a privilege to be in the company of Dr. Abdul Kalam, your beloved Chancellor; a person who has ignited the minds of young Indians with his visions of Modern India. I am sure that DoS/ISRO will aid significantly in the visions, policies and achievements of this modern India in its aspirations of manufacturing, infrastructure, education, sanitation, etc as strongly articulated by our national leadership.

IIST is a relatively young institute which started in September 2007. From what I know, the institute has designed a unique educational model, wherein all the undergraduate students are provided complete financial assistance by Department of Space,

subject to meeting a minimum academic requirement. Furthermore, I am told that those students who successfully complete their undergraduate programme with good grades have a good chance of being absorbed in various ISRO/DoS centers. I am not aware of any other institute which provides such an ideal, unique and effective educational system. An education which is completely free in its truest sense with immense opportunities for the young engineers and scientists to contribute directly to the Indian Space Programme. I am sure that this unique system of educational support must have attracted many talented young students to join this prestigious institute who can contribute significantly in the research and development of National R & D programme in general and space programmes in particular.

I congratulate Department of Space for envisaging and implementing such an educational scheme in our country. ISRO and DoS are reaping the benefits of the quality human resources who emerge from this institute. I am informed that in addition to the three undergraduate programmes, IIST also offers 14 Postgraduate (13 MTech and 1 MS) programmes and PhD programmes in different areas relevant to Space Sciences, Space Technology and other related areas. Such an option is a godsend opportunity to several talented scientists and engineers from ISRO/DoS, for they can update their professional knowledge and improve on their career prospects by enrolling and successfully completing the postgraduate and PhD programmes offered by the institute. In addition, institute has created an excellent research ambience. The institute, in turn gets the benefit of the rich experience of the visionary leaders of the Indian Space programme who are ever willing to train, guide and impart the



knowledge and the skills in a true *guru-shishya parampara*.

Science, education, research and innovation are the four pillars on which any academic institute rests. I am happy that this young institute has a focussed undergraduate programme, as well as a strong PG programme covering various disciplines of Science, Engineering and Technology. IIST has indeed created a niche for itself in terms of the quality of the academic programmes and the academic and research excellence of its faculty. I am convinced that with the continued support and encouragement from Department of Space, the institute will continue to grow and occupy its rightful place in the company of other elite institutions of the country. I imagine that other Central Government Departments may also be thinking of getting their quality human resources from such “niche” institutes. Such a model implemented with several other Central Government Departments would definitely lead to quality scientific and technology manpower generation for our strategic S&T departments.

I am indeed delighted to note that in addition to undergraduates getting their B.Tech degrees, there are students who are also receiving their M.Tech and PhD degrees today. I am pleased to note that in addition to several areas close to Space Technology (Aerospace & Avionics Engineering) and Space Sciences (Earth and Space Sciences), several pure science subjects such as Physics, Chemistry and Mathematics have found space among today's PhD degree recipients. In fact two-thirds of PhD degree recipients are from the pure science subjects which shows the importance the institute accords to the basic science research.



We, as a nation, are proud of the achievements of ISRO scientists and engineers; they have galvanised and steered India's Space Programme to greater heights of excellence and triumph. I am told that four B.Tech. batches have already graduated from IIST and close to 400 + students from IIST have elected to stay with ISRO. The realization that many among the degree recipients today together with those who have graduated earlier will greatly contribute directly to Indian Space Programme is itself an incredibly motivating factor for the young IISTians.

I am indeed happy that the institute has a vibrant research programme with the institute itself funding most of the research projects of its faculty members. Institute is able to synergise UG, PG and research programme which will create an eco-system wherein faculty members and research scholars can act as motivators to PG and UG students. I am particularly pleased to note that the institute has initiated a strong collaborative research programme with several ISRO/DoS centers and I wish the above partnership between the institute and ISRO centers all success. I am pleased to note that the institute provides for a fast-track research funding for the newly inducted faculty members.

The progress of science in the service of our nation hinges critically on synergies and leveraging of research among various S&T departments, institutions, industry and other societal stakeholders. DoS has embarked on an ambitious plan connecting with over 70 ministries/departments of GoI. I am very optimistic that the many natural connects between the Department of Science and Technology with DoS will now also grow rapidly. As you know, Department of Science and Technology has the largest extramural funding among our S&T



departments with a 360 degree connects to scientists, engineers, research institutes and other R&D and educational entities. Presently, DST has International S&T cooperation with 72 countries worldwide to leverage the best on the principles of equity and reciprocity. DST has also introduced many other innovative schemes such as INSPIRE awards, PURSE for the top research universities and a “Fund for Improvement of S&T Infrastructure in Universities and Higher Educational Institutions” (*FIST*) schemes, as well as a plethora of technology translation, transfer and start up activities. Understanding the need to encourage women scientists and engineers, DST has in place a dedicated Scholarship Scheme for Women Scientists and Technologists. While DoS serves as our very able 'eye-in-the-sky', its synergy with DST will produce a seamless connects with the 'foot-soldiers' of science thus bringing together the havens and earth for the greater good of all.

We as a country are justifiably proud of our early post-independence science and technology vision culminating in the founding of several Indian Institutes of Technology that have since fostered our technological progress and have contributed to some of the best brands in our educational and technological eco-systems. We now salute the Department of Space in starting IIST and for conceptualizing and implementing this rather unique educational system for one of our most valued strategic sectors.

I congratulate all the young degree recipients of the third convocation of IIST and wish that they will continue to excel in their chosen professional career and contribute to the glorious future of the Indian Space Programme. The day is not far when



the institute will see its alumni providing the best of leadership to the many S & T activities and institutions in the country including being the Chairman, ISRO and Secretary, DoS. My key advice to the proud graduates today is to further hone their skills and abilities for the synthesis of a myriad of fields and concepts for complex problem solving, rather than be wed to a specific tool-centric approach. Multidisciplinary and interdisciplinary approaches together with nifty teamwork alone will allow us to successfully address the real world S&T challenges of health, water, energy, connectivity, security and environment. And remember, as our lives get busy with the bites, bits and atoms of technology, we mustn't let them deplete the spiritual richness of our inner spaces! Higher than the plentiful data is the distilled information, higher than information is knowledge, but the higher still is the wisdom that alone will help us understand, navigate and holistically engineer the ever increasing complexities of technology and its societal impacts.

Friends, space is indeed the final frontier and I wish each one of you a delightful journey ahead in going where no man has gone before! I offer all of you a Vulcan salute--live long and prosper!

Thank You!





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Director's Report

Dr. K. S. Dasgupta
Director, IIST





DIRECTOR'S REPORT

Most Respected and Our Beloved Chancellor, Dr A. P. J. Abdul Kalam, Honorable Chief Guest, Professor Ashutosh Sharma, Secretary, Department of Science and Technology, Government of India, Chairman, Board of Management, IIST & Secretary, DOS Dr A. S. Kiran Kumar, Guest of Honour, Shri. M. C. Dathan, Director, VSSC, Directors of various ISRO/DOS Centres, former Director of IIST Dr B. N. Suresh, Members of the General Body, Members of Board of Management, Members of IIST Council, Degree recipients, Distinguished Guests, Colleagues, Ladies and Gentlemen

Very Good morning to all of you;

Let me extend a warm welcome to all of you to the 3rd Convocation of our Institute;

Let me at the outset congratulate all the degree recipients.

We are highly honored and pleased to have with us, Professor Ashutosh Sharma, as the Chief Guest on this solemn occasion to address and congratulate all the students who are receiving their degrees today.

Professor Ashutosh Sharma is currently holding the position of Secretary, Department of Science and Technology, Government of India. Professor Ashutosh Sharma has assumed charge of Secretary, DST on 9 January 2015 after moving from IIT Kanpur where he was serving as a Professor of Chemical Engineering. Professor Ashutosh Sharma did his B.Tech in IIT Kanpur (1982) and his MS (1984) and PhD (1988) from Pennsylvania State University and State University of New York at Buffalo, respectively.

Professor Ashutosh Sharma's research contributions span a wide range of inter-disciplinary areas in nanotechnology; carbon based nanocomposites & MEMS/NEMS in energy, health and environment. Professor Sharma has published around 270 peer reviewed papers, and has filed over 10 patents. Professor Sharma is a recipient of numerous honors and awards including the inaugural Infosys Prize in Engineering and Computer Science, TWAS Science Prize of the World Academy of Sciences, Bessel Research Award of the Humboldt Foundation, J. C. Bose Fellowship, Bhatnagar Prize, Homi J. Bhabha Award of UGC, The Syed Husain Zaheer Medal of INSA, Distinguished Alumnus Award of IIT Kanpur and the Life-time Achievement Award of the Indian Science Congress.

It is indeed a great privilege for me to present to all of you a brief report highlighting the activities, aspirations, achievements and future plans of our institute in this Third Convocation of the Indian Institute of Space Science and Technology (IIST).

Before I get started with the important task of presenting our institute's activities; I wish to convey an important message from Swami Vivekananda to the Degree recipients of our Institute.



“Take up one idea; Make that one idea your life; Think of it; Dream of it; Live on that one idea; Let the brain, muscles and nerves of every part of your body be full of that idea; This is the way to SUCCESS. And that is the way great spiritual giants are produced. Others are mere talking machines”.

Every youth like you aims at becoming intellectually competent and technically skilled. But please note knowledge generation without value formation counts for little. Remember that education without values is like a flower without fragrance.

A good education inculcates the virtues of tolerance of divergent views and opinions and makes us spiritually calm. It inspires us to use our learning to indulge in healthy debate rather than enter into conflict within those who disagree with us.

A value based education teaches us to use our learning for the good of humankind than against it. Our Institute's goal is to impart values to all of you to make you sensitive to fellow human beings. I also believe that extensive grooming for four years had made each of you a good human being – who can contribute in a better way to the cause of society at large.

For the benefit of our Chief Guest and other dignitaries, let me give a brief genesis of this institute. The institute was formally inaugurated on 14 September 2007. The institute is the first of its kind in the country, to offer high quality education at the undergraduate, post-graduate, doctoral and post-doctoral programmes on areas with special focus on Space sciences, Space-related technology and its applications. In a little less than a year of its establishment, IIST received the recognition of UGC as a 'Deemed to be University' under Section 3 of UGC Act, 1956. IIST functioned from its Thumba VSSC campus from



14 September 2007 to 14 August 2010 and then moved to its own campus at Valiamala, Thiruvananthapuram from 15th August 2010. The present campus at Valiamala of around 100 acres blends beautifully with scenic hills on the foot hills of Sahyadri mountains.

Admissions to various UG programmes are purely merit based and are based on an All – India entrance examination (IIT-JEE for the first three years 2007-2009), and with the institute's own admission examination (ISAT from 2010-2012) of same standard as IIT-JEE. Since 2013, the admission to the BTech programmes are based on the common engineering entrance examination (JEE Main and JEE Advanced) conducted by CBSE and IIT together with normalized school board marks.

The courses offered by the institute under the various UG programmes in areas such as Aerospace Engineering, Avionics and Physical Sciences are extremely relevant to Space Science & Technology, as well as up-to-date and need based. The present intake of students at the UG level for Aerospace Engineering and Avionics Engineering is 60 each while the UG intake for Physical Sciences is 36.

The academic programmes have been formulated to strengthen the fundamentals, experience the practical realities, and enhance the knowledge and understanding in the areas of interest. The curriculum, courses, practicals, electives and the projects have been developed and are being continuously upgraded. The institute is starting a dual degree programme with B.Tech in Engineering Physics and MS/MTech in Astronomy & Astrophysics, Earth System Science, Solid State Physics and Optical Engineering which will replace current BTech (Physical Science) programme from the academic year 2015 onwards.



Let me take this opportunity to enlighten our Chief Guest and to the other dignitaries on the distinctive educational model which our institute is presently following.

The institute provides assistantship to the tune of Rs.51,400/- per semester per undergraduate student to cover the cost of statutory tuition fees, statutory amenity fee, establishment, hostel and dining as well as student medical cover together with a book grant of Rs.3,000/- per semester. Also, upon successful completion of their B.Tech degree, the students are directly recruited as Scientists/Engineers into one of the many centers of ISRO/DoS, subject to meeting a certain minimum academic standards as per ISRO/DoS recruitment norms. This unique opportunity of employment in the nation's Space Research Organization is an important motivation for students. For students who have joined BTech programme in 2013 and later, the job absorption to ISRO will depend on the vacancy situation prevalent in the various ISRO centers for that particular year.

To encourage our meritorious B.Tech degree students, the institute has constituted various gold medals which will be given away in today's ceremony. These include the (i) the Chairman, Board of Management's Gold Medal to the best outgoing B.Tech student among all the graduating students who has the best academic performance, (ii) the Director's Gold Medal to the best All-Rounder among all the B.Tech students who has excelled in both academics as well as in extra-curricular activities, and (iii) Gold medals to the academic topper of each B.Tech stream – Aerospace, Avionics and Physical Science.

The growing visibility of our Institute has been steadily increasing over the years. The Institute has been actively



involved in collaborative programmes with national and international organizations/universities. The institute has a MOU with Universities Space Research Association (USRA), USA, and with California Institute of Technology (CalTech), USA. The topper of BTech (Aerospace Engineering) programme of our institute will be eligible to undergo a rigorous one year M.S. programme at CalTech. Shri Aditya Chipalkar, topper of BTech (Aerospace Engineering) batch of 2009 batch availed Professor Satish Dhawan Fellowship and successfully completed the MS programme in CalTech last year. Shri. Aditya Chaplakar was selected for the Dr Abdul Kalam Prize by CalTech for his academic excellence. Shri Aditya Chapalkar has since joined VSSC after his return from CalTech. He is also one of the degree recipient of today's Convocation proceedings. Shri Pranav Nath, topper of BTech (Aerospace Engineering) of 2010 batch is presently in CalTech this year availing Professor Satish Dhawan Fellowship. Five students of 2007 B.Tech batch did their project at USRA institutes/universities.

IIST is being recognized for providing excellent education at the undergraduate and postgraduate levels, which can be gauged from the number of aspiring students who apply for admission to both UG and PG programmes. Our institute is also committed to become an established research institute. The primary goal of our institute is to provide equal importance (footing) and opportunity to both engineering and science disciplines and hence does not discriminate one against the other as we acknowledge Engineering and Science are two sides of a coin.

Amongst the degree recipients this year, we have 145 B.Tech students from the three branches of Aerospace Engineering, Avionics, and Physical Sciences, 8 M.Tech students from Soft Computing & Machine Learning, and Chemical Systems and



9 PhD students. Our target of significantly increasing the intake of quality candidates into our Ph.D. programmes so that every faculty member gets to guide at least two to three PhD students is on the right course.

We are grateful and take this opportunity to thank Department of Space, Government of India for their unstinted financial support and funding for excellent research and teaching infrastructure.

An Institute, we believe, is only as good as its people. Our greatest asset is the presence of highly qualified faculty, scientific, academic and other administrative staff including programming and library staff. We have continuously improved on our credentials in research as evidenced by way of publications and the number of Ph.D enrollment of research scholars; 11 students having already received their provisional PhD degrees.

The institute also has a strong post graduate component with 13 MTech and 1 MS programme being offered by the institute currently. These form the backbone of all our activities and excellence.

A matter of extreme satisfaction for the institute is the steady rise in the number of girl students in the institute; they now account for 23 % of the total student population in the campus. The above percentage of girl students is higher than the number usually found in similar such central institutions in the country.

Understanding the importance of attracting talented faculty members, and endeavoring to nurture their research aspirations, the institute provides direct research funding to faculty members based on review by peer-review experts.



The institute in addition, provides funding for fast-track research projects to the tune of Rs. 10 lakhs to encourage newly joined faculty members to initiate their research plans. Several faculty members have been funded under the above fast track project programme. Also, the institute covers all publication journal charges for all accepted manuscripts of faculty members and students.

The institute encourages the faculty members to organize/participate in international and national conferences. The institute, being an autonomous institute under Department of Space, desires close collaborative research with the other DoS/ISRO centers. Towards this end, the institute has funded about 18 ISRO-IIST joint projects with several ISRO/DoS centers. It is hoped that such close collaboration with ISRO centers will provide an opportunity for our faculty members to directly contribute to the Indian Space programme.

Faculty

At the institute, we strongly believe that the quality of an academic institution largely rests on its faculty. We have 94 highly talented faculty members. We believe that our faculty is among the finest in the country and is recognized nationally and sometimes internationally for their quality of research and teaching. Many of our faculty members serve on the editorial Boards of reputed journals, undertake peer-review for journal papers, and are on the Boards of many institutions and organizations. Our lady faculty members account for 22 % of the total faculty strength; a relatively higher percentage than the number that is usually found in similar such central institutions in the country; something which the institute is proud of.



Another feature of the institute is that despite being on the southern tip of the country, there are faculty members from eleven different states; manifestation of a healthy mix of diversity of India.

Academic Activities

We have an outstanding body of 565 UG students, 180 PG students, 86 PhD students, 2 DST Inspire Fellows, and 39 non-academic staff and an excellent infrastructure. Our academic programmes cover a wide range of science and engineering disciplines with special focus on space science, space technology and related areas. Presently the entry to the B.Tech programmes is through the All India Single Engineering Entrance Examination (JEE Main and JEE Advanced) conducted by CBSE and IITs and the normalized school board marks. The admission to the M.S., M.Tech and PhD programmes against open advertisement are available to the public, while options for M.Tech/PhD admission are also possible for Scientists/Engineers from ISRO/DOS. The institute is offering 14 post-graduate courses presently. The institute presently offers a limited number of high-valued ISRO-IIST fellowships amounting to Rs 35,000 per month as well as a large number of regular IIST fellowships (Rs16,000/ Rs 18,000 per month) for PhD students.

Furthermore, all the seven departments of the institute offer PhD programmes. The admission to the M.Tech and PhD programmes are also based on national level (GATE/NET) selection procedures together with a written test and an interview.

In addition to this, The institute offers an attractive fellowship for PDFs amounting to Rs 40,000 per month for a period of one year, extendable to another year on satisfactory research output.



Research

Over the last seven years, the institute has expanded its teaching and research interests in a wide range of areas of national importance and current relevance, related to space science, space technology and other areas. The major research facility creation in areas like Nanoscience & Technology, Virtual Reality and Advanced Propulsion & Laser Diagnostics are ongoing which will provide a thrust to advanced research in these emerging interdisciplinary fields. These major research facilities are to emerge as Centers of Excellence in the near future.

A nanoscience center was initiated in Department of Chemistry to (i) undertake challenging research projects in this area to meet the future requirements of ISRO, (ii) establish comprehensive research facilities under the same umbrella to attract intellectuals across the globe (iii) mould high quality human resources to undertake future challenges (iv) act as a nodal research centre (v) serve as a link between industry and academia in the country.

The first phase of the nanoscience center envisaged R&D activities in the broad areas such as synthesis of nanomaterials for developing nanocomposites for structural and photonic applications, high efficiency photovoltaic cells and batteries and bio-nanomaterials. R&D work initiated in these areas has resulted in 17 international journal publications in reputed international journals and 3 patents filed with Indian Patent Office.

Department of Avionics is establishing the Centre of Excellence in Virtual Reality (VR) for various space and scientific



applications. In the first phase VR lab will have high-end workstations with latest graphic capabilities, 3D monitors, 3D vision-pro glasses and application software's such as Vizard, Blender, Google Sketch, Adobe Master Suit collection, 3ds Max and Maya.

The setting up of Virtual Reality Lab is aimed at developing sophisticated and advanced VR library in open source domain for the benefit of society and scientific community and gearing up this facility for aerospace, atmospheric, astronomical, computer vision and humanities research areas by collaborating with different departments within IIST and outside of IIST.

Following are the major outcomes of the VR Laboratory

- ☞ UG/PG elective course along with lab (using Vizard and Python) on Virtual Reality is being offered for the 7th semester B Tech and M Tech Digital Signal Processing students
- ☞ Research collaboration with NRSC Hyderabad on disaster modelling is currently in progress
- ☞ One journal paper on Virtual reality simulations is published

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.

Following are the major achievements of this laboratory

- ★ Characterization of CE 20 LCSC injector at atmospheric conditions, measured spray cone angle and relative droplet size distribution using Laser diagnostics
- ★ MMH-N₂O₄ Triplet Injector Cold Flow Characterization for PS4 engines
- ★ Characterization of jet behaviour at supercritical conditions using Fluoroketone PLIF
- ★ Characterization of Cavity induced oscillations for scramjet applications
- ★ Proof of concept demonstration of OH-PLIF in LPG-Air Shear Coaxial Flame – to be applied to Hydrogen-Oxygen system
- ★ Proof of concept demonstration of PIV in a jet flow for planar velocity measurements

Medical Assistance

At present the institute's campus has a well equipped FIRST-AID Medical Centre to provide medical aid. M/s. SUT Hospital situated in Thiruvananthapuram city has been recognized by the institute for specialized OPD consultation and it has provision to admit our students as inpatients. The institute provides Comprehensive medical coverage through a special scheme which is free of cost (extent of coverage).



Infrastructure Development

Central Library

The library in the institute boasts of an excellent collection of books and electronic journals. The online catalogue and electronic resources subscribed by the library are available throughout the campus on a 24x7 basis. The institute is an active member of INFLIBNET consortium. Presently 16 electronic databases are being subscribed in the library. The annual cost of e-journal subscription in the library is Rs.2.9 crores.

Computer Services Centre (CSC)

The campus has an high performance computing facility with adequate number of work stations and campus wide Inter/Intranet. Internet and Campus network connectivity extends all its ICT resources to students and faculty through this Campus Network.

Civil Infrastructure

The civil works related to two academic blocks, one Administrative block, Library building, eleven hostels are fully functional. Other civil works are in advanced stage of completion.

Students' Activities

The Dean (Student Activities) of IIST heads the Student Activity Board (SAB), consisting of the Registrar, all Deans and all Heads of the Departments, Chairmen of various institute committees and student representatives from all batches and branches. The students of this institute organize a unique inter-collegiate



cultural festival named “Dhanak” as well as an inter-collegiate technological festival named “Conscientia” every year. These provide a platform for the students to showcase their talents and creativity both in the cultural as well as in the technological domains.

The institute celebrates “Sports Day” wherein students and faculty members of the institute compete in several sporting events and win medals and prizes. The institute has constituted a trophy for the “Best All-Rounder of IIST” and is given every year to the best-all rounder student of the institute who is proficient in academics, sports as well as in cultural activities. The institute also conducts yoga classes regularly for the benefit of staff and students.

The following students' project is being carried out under the guidance of IIST Faculty and the ISRO Scientists, with a view to provide knowledge and hands-on experience to the students to design, develop and build space systems and to work in teams in a project mode.

The IIST students have conceived a 3-axis stabilized nanosatellite of mass around 5 kgs. The conceptual design of the satellite has been completed and the payload and components have been identified, based on the functional requirements and availability. The nano-satellite is proposed to be launched in a polar sun synchronous orbit in the near future.

Students of our Institute has also taken up the design of the VYOM-MK II Sounding rocket after successful launch of the VYOM-MK I on May 11, 2012.

VYOM-MK II aims at doubling the payload capacity to 20Kg and increasing the peak attitude from 14Km to 70 Km. The main



challenge is to do this while maintaining the simplicity and reliability of a single stage rocket.

Acknowledgements

We would like to acknowledge the support received in abundant measure from the Department of Space, Government of India. I personally acknowledge the support and encouragement I have received from our beloved Chancellor, Dr APJ Abdul Kalam, our Chairman, Board of Management Dr A.S. Kiran Kumar, and Members of General Body, Members of our Board of Management, and from all my colleagues, and extend my appreciation to the students for their exemplary behavior and their contributions towards enriching the campus life. I would like to convey my heartiest congratulations and best wishes to each one of the 145 B.Tech graduates, 8 M.Tech and 9 PhD degree recipients, and the student toppers receiving the gold medals for their special achievements at the Third Convocation of the Institute.

I am sure all of you agree with me that strength of any educational Institute is judged by its alumni. By this it implies that you are the ambassadors of this Institute and you have the responsibility to keep the flag of your Institute flying and protect the pride of your Institute. Keep in touch with your alma mater, support it in whatever way you can, and be the ambassadors of IIST. I am sure that you would work for a better world where science and technology are used in socially responsible ways, and in harmony with nature.

I once again thank our esteemed Chief Guest Professor Ashutosh Sharma, our beloved Chancellor Dr APJ Abdul Kalam, our Chairman, Board of Management, Dr A.S. Kirankumar, and all the distinguished guests for being with us today.



IIST attempts not only to teach students, but also to make them wise. Let me conclude my report, by quoting Steve Jobs

“ Your time is limited, so don't waste it living someone else's life. Don't let the noise of others' opinions drown out your own inner voice. And most important. Have the courage to follow your heart and intuition”.

Thank you all!

Jai Hind!





Indian Institute of Space Science and Technology

(Declared as Deemed to be University under Sec.3 of UGC Act, 1956)

Valiamala, Thiruvananthapuram