



# Vijnana Darshan

(For Pre-University College Students of  
Gulbarga & Shimoga Districts)

Date: 19<sup>th</sup> December -21<sup>st</sup> December 2013

**Supported by**

**DEPARTMENT OF SCIENCE & TECHNOLOGY,  
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**Organised by**

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## **Karnataka State Council for Science and Technology**

Indian Institute of Science Campus, Bangalore-560012

### **VIJNANA DARSHAN**

Karnataka State Council for Science and Technology (KSCST) was established in the year 1975. It is one of the first State S&T Councils to be set up in the country. KSCST is an autonomous S&T organization under Department of Science & Technology, Government of Karnataka.

During the last three and half decades of its existence, KSCST has been pro-actively engaging itself to identify locale specific needs / problems in the broad areas of Agriculture, Water, Education, Energy, Ecology and Environment, Habitat, Health, Solid and Electronic waste and Infrastructure. In co-operation with the Indian Institute of Science and several other premier R&D institutions in the state, KSCST executes many projects and programmes, leading to find S&T based solutions such as providing access to energy for cooking and lighting, making available potable and safe drinking water, alternate building technologies, which prevail as the issues of highest priority even to this day thereby improving quality of life of people. Over the years, a number of technologies have been translated, from research and demonstration phase, to the implementation and operational phase. KSCST has also been providing necessary support to the Central and State Governments for the formulation S&T based policies and its wider acceptance by carrying out activities, like scientific survey, project implementation, co-ordination & monitoring, organization of scientific meets and awareness campaigns. The Department of Science and Technology, Government of India advocated KSCST as a model to all the states.

#### **Vision :**

Application of Science & Technology for the management of resources, improvement of environment, quality of life and socio-economic conditions of the people of Karnataka.

**Mission:**

Co-ordinate R & D activities for generation of knowledge for scientifically based interventions, development and popularization of appropriate technologies for adaptation by the civil society to overcome local-specific problems and, inspire and improve human resources of the S&T sectors in the state.

**Vijnana Darshan**

KSCST is very keen to popularize science among rural children. In this regard, the Council has initiated a programme "Vijnana Darshan". This programme aims to take the students on a Science tour to leading science, R & D institutions, Botanical Garden, Zoological Garden in Bangalore to spark the scientific interest in the students. In the current financial year, the Council is arranging visit of 100 Pre-University College Students and 10 faculty members from Gulbarga and Shimoga Districts. This programme is supported by the Department of Science and Technology, Government of India and Government of Karnataka.

The students are visiting Lalbagh, Rain water harvesting Theme Park, Bannerghatta Biological Park, HAL Museum, ISRO Satellite Station, Centre for Nano Science & Engineering, Indian Institute of Science, Visvesvaraya Industrial and Technological Museum, Jawaharlal Nehru Planetarium and Indira Gandhi Musical Fountain.

The dates of visit are 19<sup>th</sup> December 2013 to 21<sup>st</sup> December 2013

## LALBAGH BOTANICAL GARDEN

The Lalbagh Botanical Garden, Bangalore is of royal origin and was started initially as a private garden in an area of 40 acres by Hyder Ali, one of the most famous rulers of old Mysore in 1760. Initially designed in Mughal style, on the model of an extensive garden at Sira in Tumkur near Bangalore, this garden was further developed by Hyder Ali's son Tipu Sultan and subsequently by the British and Indian doyens of horticulture by extension of area and addition of a number of plant species. Of them, Major Waugh, Dr. Wallich, William Munroe, Sir Mark Cubbon, Dr. Cleghorn, William New, A. Blck, John Cameron, Krumbeigal, Rao Bahadur H.C. Javaraya, K. Nanjappa and Dr. M.H. Marigowda, as the Superintendents of the garden, have made noteworthy contributions to the development of Lalbagh.

Lalbagh is currently under the aegis of the Directorate of Horticulture, Government of Karnataka. The Directorate is housed amidst the splendid environs of the botanical garden. Lalbagh was given the status of a Government Botanical Garden in 1856, and since then, it has been an internationally renowned centre for scientific study of plants and botanical artwork and also conservation of plants. Formal and informal styles dominate the garden in perfect harmony, which is a testimony to the beauty of nature. Today, the garden is a lush green paradise with an area of 240 acres in the heart of the city.

### **The Garden**

Lalbagh, for its unique achievement in nurturing the concept of horticulture and aiding the development of horticulture, has earned a pride of place among the gardens of the world and it has come to be regarded as one of the best gardens in the East for its layout, maintenance, scientific treasure and scenic beauty. It is the place of legends and beauty, a place of rarity and wonder, a place of paradise and landmarks. It is an important genetic resource centre for introduction, acclimatization and maintenance of plants; it envisages documentation of the variations available in plants of

KSCST : "Vijnana Darshan" 5

ornamental and economic value. It is an important centre of dissemination of scientific, technical and popular information on plants including offering of regular courses. It aids the development of horticulture in the state. It is a valuable adjunct to botanic study in educational institutions, a vital lung space of Bangalore, a place of beauty that provides healthy recreation to the public and it provides a venue for people to get close to plants and nature.

The garden with well-laid out roads, paths, open spaces, shade and a good collection of many types of plant species attracts a large number of visitors. Lalbagh is well protected with stone walls as enclosures and it has four approach gates. The main gate is at the North facing towards Subbaiah circle, the West gate is towards Basavanagudi, the South gate is towards Jayanagar and the East gate is towards the Double Road.

### **Plant wealth**

The botanical garden is enriched with numerous native and exotic flora of wide ranging diversity, use and interest. This has been achieved by way of introduction; acclimatization and multiplication of plants obtained from various parts of the world since its inception in 1760. Today, nearly 673 genera and 1,854 species of plants are found in Lalbagh. The collection of the plants has made it a veritable treasure house of plants.

Some of the exotic species introduced from different parts of the world include *Agathis* sp., *Amherstia nobilis*, *Araucaria* sp., *Averrhoa bilimbi*, *Bambusa* sp., *Bixa orellana*, *Brownea grandiceps*, *Castanospermum australe*, *Cola acuminata*, *Corypha umbraculifera*, *Couroupita guianensis*, *Cupressus* sp., *Eriobotrya japonica*, *Magnolia* sp., *Swietenia mahagoni* etc. Indigenous species such as *Artocarpus heterophyllus*, *Bombax ceiba*, *Butea monosperma*, *Cassia fistula*, *Dillenia indica*, *Ficus* sp., *Lagerstromia speciosa*, *Michelia champaca*, *Mesua ferrea* etc., can be seen. In addition, a number of ornamental and economic plant species both of exotic and indigenous origin can be found in Lalbagh.

## **Locations of Interest**

Of the many artistic structures in Lalbagh, the Glass House is the most famous. In the necklace of Bangalore's gardens, Lalbagh is a pendant and in the centre of this pendant is the glass house in the form of a diamond. It was built in 1889 during the administration of Sri John Cameron to commemorate the visit of Prince of Wales. Designed on the lines of the Crystal Palace of England, it was intended for acclimatizing the exotic plant specimens. Today, as the jewel of Lalbagh, it is the centre stage for holding the famous biannual flower shows.

The Bandstand, Lecture Hall, Lalbagh House, Pigeon House, Statue of Sri Chamaraja Wodeyar, the Directorate Building, Lalbagh West Gate Guard Room, the Museum and Cottage which now house some of the department offices, main gate of Lalbagh (Cameron gate), Deer Paddock, Aquarium building, Aviary and Kempegowda Tower are other artistic structures that can be seen in Lalbagh. Lalbagh lake is an important location of interest.

## **Education**

Lalbagh is an important centre of dissemination of knowledge of plants having ornamental, environmental and economic value. Regular training courses on fruit and vegetable processing, mushroom cultivation and ornamental gardening and horticulture are offered to the public by the Department of Horticulture. The Dr. M.H. Marigowda National Horticulture Library is a reference library with a good collection of books on horticulture and allied subjects.

## **Location and access**

Lalbagh Botanical Garden is located in the heart of the city, about 4 km from the State Legislature – the Vidhana Soudha. Most parts of the garden is surrounded by different blocks of the beautiful residential layout – Jayanagar. The city buses plying to Jayanagar and localities beyond Jayanagar stop at one or other approach gates of Lalbagh. The garden is accessible through four gates. Vehicles are allowed only through the East

gate towards the Double Road. There is ample parking space on entering through this gate. Vehicular movement inside the garden is restricted. Access to the Directorate of Horticulture and related offices is through the main gate. HOPCOMS, MHS and BNCS offices are easily accessible through the Double Road gate.

### **Opening times**

Lalbagh remains open daily from 6.00 a.m. to 7.00 p.m. throughout the year.

### **Facilities**

All major buildings and important locations in the garden are accessible through well laid out roads and pathways.

### **Training**

Scheduled courses on Horticulture, Post Harvest Technology and Mushroom cultivation are offered to the public by the Department of Horticulture at Lalbagh. Besides these a 10 month Horticulture training programme is organized every year for the rural youth. The Mysore Horticultural Society too organizes courses on Ikebana and Bonsai. All programmes are publicized well in advance in newspapers/respective offices.

### **Events**

Biannual flower shows are organized every year in January and August on the occasion of the Republic Day and Independence Day celebrations respectively. Details can be had from the Directorate of Horticulture or the Mysore Horticultural Society Office. The garden is an institution of botanical and environmental importance, a treasure house of our state and nation, an important lung space of Bangalore –it is the duty of every one of us to protect it from deterioration and to keep it clean. Videography is prohibited.



# SIR M. VISVESVARAYA

## RAINWATER HARVESTING (RWH) THEME PARK

Karnataka State Council for Science and Technology (KSCST) is the first state council in the country to be established to address science and technology issues of the state. Council has established RWH in twenty landmark buildings and four exhibition plots for demonstration of cost effective and sustainable RWH and ground water recharge technologies at Bangalore and Tumkur such as Vidhana Soudha, BBMP head office, BWSSB - BSK field office, Fire station, Beedy workers colony, RTO office, Pollution Control Board, Deputy Commissioner's office etc. Over thirty RWH training programmes for various target groups covering Planners, Architects, Engineers, Contractors, Plumbers, Masons etc., have been conducted. In addition several awareness camps in different wards of Bangalore and Tumkur were also organized. To cover all the districts of Karnataka, Council has established RWH resource and training center for the southern states at Mahatma Gandhi Regional Institute for Rural Energy and Development in Bangalore and District RWH Nodal Centers at all the 27 districts in the state. Individuals and Institutions can contact Rainwater Harvesting Cell at KSCST for technical advice, planning and project implementation.

Sir. M. Visvesvaraya Rainwater Harvesting Theme Park located in 1.1 acre of land for demonstrating all types of RWH models and all information about RWH & water conservative being established by constructing information centre and landscape.

### **Sailent features of Theme Park**

<b>Sl no</b>	<b>Features</b>	<b>Area covered in Sqm</b>
1	Total area of the land	128×38meters=4864 Sqm
2	Total rainwater potential form the plot	4864000 litres. Per year
3	First Floor Roof area	159.99 Sqm

4	Ground Floor Sloped Roof	250 Sqm
5	Main building al round channel	108.45 Sqm
6	Amphi Theatre water body area	122.65 Sqm
7	Total capacity of storage structure	175,379.19 litre
8	Total recharge capacity	25,467.89 litre
9	No. of borewells: Working borewell Silted borewell	140 mtr depth (SE corner) 60 mtr (NW corner)

There is a mandatory requirement for adoption of RWH for every owner or occupier of a building having a sital area of 60'×40' & above, for newly constructing building measuring 30×40 & above dimension.

Sir. M. Visvesvaraya Rain Water Harvesting Theme Park is facilitating the people in adoption of RWH. Entire Park is dedicated to demonstrate the methods of installing rainwater harvesting.

# BANNERGHATTA BIOLOGICAL PARK

Bannerghatta Biological Park is carved out of the Bannerghatta National Park in the year 2002. Bannerghatta National Park was conceived and started in August 1971 for conservation of wildlife and promotion of wildlife tourism with special intension to create recreation facilities to the urban population of the fast growing city Bangalore.

Bannerghatta Biological Park is located about 22 Kms south of Bengaluru city. It is one among the few places in the world where wilderness is preserved so close to a big city. It is having different units such as Zoo, Safari, Butterfly Park and Rescue Center (Conservation of captive animals). All the inhabitants have been provided with an appropriate ambience to live in harmony with nature.

## **Flora**

The type of vegetations in BBP can be broadly classified into two types as described below:

### **1. Scrub Type (Dry Deciduous Scrub Forests):**

Vegetation in this type of forest is characterized by stunted tree growth open canopy of 10% and below. This type of vegetation is the resultant action of repeated hacking by villagers and grazing by cattle in the past from the adjacent villages. Important upper canopy trees are *Anogeissis latifolia*, *Chloroxylon sweitenia*, *Acacia leucophloea*, *Acacia catechu*, *Stereospermum chelonoides*, *Zizyphus* spp, *Diospyros* spp, *Santalum album*, *Shorea talura*, *Azadirachta indica*, *Terminalia* spp, *Dendrocalamus strictus* etc., Whereas *Lantana camara*, *Phoenix acaulis*, *Cassia tora*, *Cassia auriculata*, *Randia floribunda*, *Pterolobium indicum*, *Capparis* spp, *Gloriosa superba* form the undergrowth. *Acacia instia* is the common climber. Grass is generally abundant in this type of forests. Scrub forests afford good foraging habitat for herbivores in rainy season. This type of vegetative is around rocky patches in bear safari and in part of safaris and rescue centre.

## **2. Southern Tropical Dry Deciduous Forests:**

In this type of forest, the canopy opening is 10 – 40% and the trees remain leafless during dry months. Top canopy consists of *Terminalia* spp, *Pterocarpus marsupium*, *Dalbergia latifolia*, *Dalbergia paniculata*, *Gmelina arborea*, *Lagestroemia parviflora*, *Boswellia serrata*, *Dendrocalamus strictus*. Second canopy consists of *Vangueria spinosa*, *Randia dumetorum*, *Wrightia tinctoria*, *Zizyphus jujube*, *Santalum album*, *Kydia calycina*, *Diospyros melanoxylon*, *Shorea talura* and *Casia fistula*.

The undergrowth consists mostly of grasses with lantana breaks here and there. *Eupatorium*, *Phoenix humilis*, *Helicteris isora*, *Desmodium* spp. *Gloriosa superba* form the undergrowth. This type of vegetation is conspicuous in the valley portion all along the streams passing through the BBP.

## **3. Southern Tropical Moist Mixed Forests:**

This type of forests is the mixed deciduous forests with canopy cover up to 35% and above. They are in patches limited to the moist valleys in Ragihalli RF. The species comprising the top canopy of this type are *Tectona grandis*, *Terminalia* spp, *Pterocarpus marsupium*, *Dalbergia latifolia*, *Lagestroemia lanceolata*, *Pterocarpus marsupium*, *Bombax malabaricum*, *Adina cordifolia*, *Ficus infectoria* and other species of *Ficus*. The lower canopy consists of *Embllica officinalis*, *Mallotus philippinensis*, *Kydia calycina*, *Randia dumetorium* etc.

The undergrowth consists of *Solanum ferox*, *Solanum indicum*, *Helicteris isora*, *Hemidesmus indicus*, *Lantana camara*, *Eupatorium* etc. This is the type of vegetation present in the valley –picnic corner, (the old lac reserve).

## **Fauna**

Other than captive animals available in the Zoo, Safaris and Rescue Centres of Bannerghatta, following animal life forms are found in wild in the Bannerghatta National Park; that visit to the non fenced area of Bannerghatta Biological Park and some of them do live in it.

1. Mammals: Elephant, Leopard, Bison, Chital, Sambar, Sloth Bear, Barking Deer, Wild Boar, Wild Dog, Jackal, Mouse Deer, Bonnet Macaque, Striped Hyena, Porcupine etc.
2. Birds: Peafowl, Grey Jungle Fowl, Partridges, Quails, Flycatchers, Wood Peckers, Ibis, Storks, Sunbirds, Flower-Peckers, Thrushes, Eagles, Cuckoos, Parakeets, Orioles, Minivets, Wagtails, Drongos etc., form part of avifauna of the BBP in nature.
3. Reptiles: Land monitor lizard, crocodiles, tortoise, python, rat snake, cobra, krait, viper etc. are the part of animals live in the water holes/ blank area of the BBP.
4. Amphibians: Frogs, toads, salamander etc., in the water bodies of BBP
5. Insects: Varieties of butterflies, bees, ants, etc are seen in the BBP

### **Butterfly Park**

Butterflies have a special place in the insect world. The names such as “Flying Jewels” indicate that butterflies are considered as being beautiful, elusive and fascinating.

The Park was conceptualized as one integrated center that would support education, conservation and research activities with exclusive focus on butterflies as flagship ambassadors of conservation. The Park at Bannerghatta has the following major components:

- A Butterfly garden to sustain local butterfly population
- A butterfly conservatory enclosed under polycarbonate roof
- Research and captive breeding laboratory
- A museum
- A Curio shop

The entire park has been established over area 7.5 acres which has a butterfly trail of about 1 km length. The ‘butterfly trail’ established over a five acre garden leads the visitors to an innovatively designed three dome structure housing the conservatory, museum and the multi-media center. The first of these, with a transparent polycarbonate roof was designed as the

'butterfly conservatory' with a landscaped garden. The huge dome shaped structure with 10,500 sq feet of landscaped garden would provided all possible habitat requirements including host plants and house butterflies throughout the year. The conservatory leads into a museum that will provide information through dioramas with their host plants etc., which leads into audio visual dome here we are projected a documentary movie on butterflies.

A study reported 48 species of butterflies in various seasons at Bannerghatta Biological Park. Thirty species of butterflies belong to five families viz., Papilionidae, Pieridae, Nymphalidae, Lycaenide and Hesperidae were breeding in different seasons under captive conditions and released into the conservatory dome.

# HERITAGE CENTRE & AEROSPACE MUSEUM

The Heritage Centre & Aerospace Museum at Hindustan Aeronautics Limited, Bangalore, is located on Airport Road, 8 km. from M. G .Road and only 1.5 km. from Airport. It is a rare display of sorts, first of its kind and unique in its nature.

A visit to the Heritage centre is a most spectacular feast for the eyes, unseen anywhere in the country. HAL has given Bangalore an unique status City of Aeronautics. Heritage centre, at HAL automatically finds its place in the tourism map of Karnataka.

A trip to Bangalore will be incomplete without a visit to the Heritage Centre. A visit to the Heritage Centre takes you into a new world of Aerospace and speaks volumes about the technological growth of our nation.

One will be taken to dizzy heights by looking at the magnificent aircraft on static display at the Museum. The growth of HAL from Nineteen Forties is shown chronologically by a wonderful photo exhibition. The photographs are of very rare collection and nostalgic.

An audio visual at the lounge shows you HAL's contribution in our country's Aerospace programs. An exciting experience of flying can be had in the modern flight simulators at the centre. A panoramic view of the landing and take off of various aircraft at HAL Bangalore Airport can be had from the ATC Tower mockup located at the roof top.

The view of the runway from the Heritage Centre ATC, has a wide angle effect and shows the entire stretch of runway. (This is better than what one can view from the Bangalore Airport gallery).

This is a place to visit for one and all. A visit once to the Heritage Centre will tempt one to visit again.

# ISRO SATELLITE CENTRE

ISRO Stands for Indian Space Research Organisation. Dr Vikram A Sarabhai is considered as the founding father of space programmes in India. ISRO was formed on August 15, 1969. Department of Space (DOS) and the Space Commission were set up in 1972. ISRO was brought under DOS on June 1, 1972. The prime objective of ISRO is to develop space technology and its application to various national needs. ISRO has established two major space systems, INSAT for communication, television broadcasting and meteorological services, and Indian Remote Sensing Satellites (IRS) system for resources monitoring and management. ISRO has developed two satellite launch vehicles, PSLV and GSLV, to place INSAT and IRS satellites in the required orbits.

Satellites are made at ISRO Satellite Centre (ISAC), Bangalore. Rockets / Launch Vehicles are made at Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram. ISRO's Launch facility is located at SDSC SHAR from where Launch Vehicles and Sounding Rockets are launched. Sounding rockets are also launched from TERLS at Thiruvananthapuram. Indian Space Programme began at Thumba Equatorial Rocket Launching Station (TERLS) located at Thumba near Thiruvananthapuram. The geomagnetic equator of the earth passes over Thumba. A sounding rocket is a rocket, which is intended for assessing the physical parameters of the upper atmosphere. India's first indigenous sounding rocket, RH-75, was launched on November 20, 1967. Space Science and Technology Centre (SSTC) was renamed as Vikram Sarabhai Space Centre (VSSC) in 1972 in honor of Dr Vikram Sarabhai who met with his untimely demise on December 30, 1971. There are six major Centres and several other Units, Agencies, Facilities and Laboratories spread across the country. Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram; ISRO Satellite Centre (ISAC), Bangalore; Satish Dhawan Space Centre (SDSC – SHAR) at Sriharikota; Liquid Propulsion Systems Centre (LPSC) at Thiruvananthapuram, Bangalore and



Mahendragiri, Space Application Centre (SAC), Ahmedabad and National Remote Sensing Centre (NRSC), Hyderabad.

Launch Vehicles are build at VSSC, Thiruvananthapuram; Satellites are designed and developed at ISAC, Bangalore; Integration and launching of satellites and launch vehicles are carried out from SDSC, Shriharikota; Development of liquid stages including cryogenic stage is carried out at LPSC, Sensors for Communication and Remote Sensing satellites and application aspects of the space technology are taken up at SAC, Ahmedabad and Remote Sensing satellite data reception processing and dissemination by NRSC, Hyderabad. Satellite Launch Vehicle-3 (SLV-3) is the first launch vehicle of India. The first successful launch of SLV-3 took place on July 18, 1980 from SDSC SHAR. Apart from SLV-3, India developed Augmented Satellite Launch Vehicle (ASLV), Polar Satellite Launch Vehicle (PSLV) and Geosynchronous Satellite Launch Vehicle (GSLV). A communication satellite usually operates from the Geosynchronous orbit catering to requirements in communication, television broadcasting, meteorology, disaster warning etc. A Remote Sensing satellite is intended for natural resource monitoring and management and operates from a Sun Synchronous Polar Orbit (SSPO).

NNRMS is the acronym for National Natural Resources Management System. NNRMS is an integrated resources management system aimed at optimal utilisation of the natural resources of the country by proper and systematic inventory of resource availability using Remote Sensing data in conjunction with conventional techniques. Aryabhata is the first Indian satellite. It was launched from the former Soviet Union on April 19, 1975. INSAT-4CR weighing 2130 kg and launched by GSLV-F04 on September 2, 2007 is the heaviest satellite launched from India. 40 launch vehicle missions were carried from India so far (till November 2013). 72 + 35 (foreign) satellites were put into orbit so far (till November 2013). PSLV is the first operational launch vehicle of India. It had so far three developmental flights and nineteen operational flights - 21 continuously successful flights.

Chandrayaan-1 is a scientific investigation – by spacecraft – of the Moon. The name Chandrayaan means “Chandra- Moon, Yaan-vehicle”, –in Indian languages (Sanskrit and Hindi) , – the lunar spacecraft. Chandrayaan-1 is the first Indian planetary science and exploration mission. Chandrayaan-1 was launched on October 22, 2008 from Satish Dhawan Space Centre at Sriharikota (SHAR), India. Chandrayaan-1 was operational for 312 days till August 28, 2009. There are eleven scientific instruments onboard Chandrayaan-1 spacecraft. Five of them are Indian and other six are from ESA (3), NASA (2) and Bulgarian Academy of Sciences (1) selected through ISRO Announcement of Opportunity (AO). Two of the ESA instruments have Indian collaboration. The moon undergoes extremes in temperature - the side of the Moon receiving sunlight becomes scorching hot at about 130 °C, and freezing cold at -180 °C during night. The budgetary estimate for realising the proposed Indian lunar mission Chandrayaan-1 stands at Rs. 386.00 crores (about \$76 million). This includes Rs. 53.00 crores (about \$11 million) for Payload development, Rs. 83.00 crores (about \$17 million) for Spacecraft Bus, Rs. 100.00 crores (\$20 million) towards establishment of Deep Space Network, Rs. 100.00 crores (\$20 million) for PSLV launch vehicle and Rs. 50.00 crores (\$10 million) for scientific data centre, external network support and programme management expenses.

ISAC at Bangalore is engaged in developing satellite technology and implementation of satellite systems for scientific, technological and application missions. ISAC is functionally organised into five major areas: mechanical systems area including structures, thermal systems and spacecraft mechanisms; digital and communications area including digital systems and communication systems; integration and power area comprising spacecraft checkout, systems integration and power systems; controls and mission area consisting of control system, mission development and computer and information; and facilities. Reliability and components area and programme planning and evaluation group provide relevant

support to the centre. Project management teams co-ordinate the implementation of INSAT and IRS projects. Space astronomy and instrumentation division is engaged in space science activities. ISRO Satellite Integration and Test Establishment (ISITE) including a Comprehensive Assembly, Test and Thermo-vacuum Chamber (CATVAC) provide necessary support for qualification of sub-systems and systems to meet the requirements of space environment. Achievements include design and development of more than 50 satellites so far of various types like scientific, communication and remote sensing.

For the past four decades, ISRO has launched 70 satellites for various scientific and technological applications like mobile communications, Direct-to-Home services, meteorological observations, telemedicine, tele-education, disaster warning, radio networking, search and rescue operations, remote sensing and scientific studies of the space. ISRO has established two major space systems, the Indian National Satellite System (INSAT) series for communication, television broadcasting and meteorological services which is [Geo-Stationary Satellites](#), and Indian Remote Sensing Satellites (IRS) system for resources monitoring and management which is [Earth Observation Satellites](#). ISRO has launched many [Experimental Satellites](#) which are generally small comparing to INSAT or IRS, [Space Missions](#) to explore the space and [Navigation Satellite](#) to provide accurate position information service to users.

## **THE CENTRE FOR NANO SCIENCE AND ENGINEERING (CeNSE)**

The Centre for Nano Science and Engineering (CeNSE) was established in 2010 to pursue interdisciplinary research across several disciplines with a focus on nano scale systems. Current research topics include, but are not limited to nano electronics, MEMS/NEMS, nano materials and devices, photonics, nano-biotechnology, solar cells and computational nano-engineering. Apart from the regular faculty members at CeNSE, almost 40 faculty members from different departments at IISc are associated in the academic and research activities at the centre. The centre offers PhD programs in a wide range of areas, and has close interactions with the industry. A state-of-the art nanofabrication facility with a clean room spanning 1400 square meters is located at the centre. In addition, there are several characterization labs that cater to material, electronic, mechanical, chemical and optical characterization.

The Centre for Nano Science and Engineering (CeNSE) focuses on interdisciplinary research and education in the broad area of Nano Science and technology covering topics such as nanoelectronics, devices, materials, micro and nanoelectromechanical systems, bio and nanophotonics, bio-electronic interfaces and integrated small-scale systems. In addition to the research programs of the core faculty, the Centre runs an interdisciplinary research and training program involving more than 40 faculty members from various departments of engineering, and basic science at the Indian Institute of Science (IISc). The centre has state of the art nano-fabrication and characterization facilities to enable the development of cutting edge nanoscale technologies for various applications.

Some of the topics currently pursued at CeNSE are Nano-CMOS Transistors, Non Silicon Based Transistors, Novel Memory Architectures such as FeRAM, MRAM and Phase Change Memory, High - K Gate Dielectrics, Spintronics, Photovoltaic devices, Testing and Characterization of Nanoscale Phenomena, NEMS, Magnetic Materials for RF CMOS, Bio-Sensors and Actuators,

Acoustic Sensors, Inertial Sensors, CMOS-MEMS Integration, Energy Harvesting and Power MEMS, Organic Electronic Devices and Sensors, Polymer and nanophotonic devices, Soft Lithography, Self Assembled Monolayers (SAM), Shape Memory Materials and Devices, Ferroelectrics and Phase Shifters, Simulation and Modeling of Nanoscale Phenomena, RF MEMS, Novel System Architecture Paradigms, Optical MEMS, Chemical and Gas Sensors.

### **Nanofabrication Facility**

National Nanofabrication Centre consisting of a comprehensive 14,000 sq. ft. clean-room facility with following capabilities:

#### **Photolithography:**

Laser writer, Coater and Developer Station, Double-sided and Single-sided Mask Aligners, E-beam Lithography

#### **Deposition:**

Oxidation Furnaces, CVD, LPCVD, Plasma CVD, ALCVD, E- beam Evaporation, RF Sputtering, Dual Ion Beam Sputtering, Pulsed Laser Deposition

#### **Etching:**

Computational Nanoengineering (CoNe) laboratory has 24 computers with Windows and Unix operating systems and also houses the mail and web servers. Its computers have modeling and simulation software including finite element analysis and TCAD. The lab is currently engaged in developing a simulation module for microsystems and integrating in a commercial finite element software, NISA. Also pursued in the lab are projects in algorithms for simulation and scientific computing including graphical processor unit (GPU) based computing.

# JAWAHARLAL NEHRU PLANETARIUM

Bangalore Association for Science Education (BASE) is devoted to science popularisation and non formal science education. In addition to administering Jawaharlal Nehru Planetarium, BASE has established a Science Centre in the Planetarium. The Science Centre serves as a nucleus for non-formal science education at all levels. The activities of the Science Centre, along with those of the Planetarium, have made Bangalore Association for Science Education (BASE) a unique institution for dissemination of science with diverse activities ranging from sky-theatre shows, science exhibitions and lectures and workshops for Science Teachers and Students.

## **Sky Theatre - Where the stars twinkle during the day**

Pre-recorded audio visual programs aimed at lay persons and school students are shown in the sky-theatre.

Jawaharlal Nehru Planetarium has been producing its own shows over the last two decades and has a couple of productions from other sources. All shows are available in Kannada and English.

The shows are of two kinds based on the projection system used.

They are:

- Classical Planetarium Shows
- The Fulldome Shows

Our sky-theatre shows are very popular attracting about 200,000 visitors every year. The shows blend science with art, literature and cultural aspects of many countries. Apart from offering clear and informative accounts of science subjects these programmes also bring in historical backgrounds, modern developments and future prospects. Visuals such as cartoons,

paintings, computer animations, video clippings and special effects are liberally used in the programmes.

Recently, sub-titled versions have been introduced on Fridays for the benefit of hearing impaired.

### **Classical shows**

The classical shows utilizes the projector which was installed in 1989. The Planetarium has a hemispherical dome of 15.0 meters diameter with a seating capacity of 210. It is equipped with 'Space master' Opto-mechanical Planetarium projector supplied by M/s. Carl-Zeiss, Jena, Germany. A set of nearly 200 smaller projectors simulate the night sky for a chosen date, time and place. The night sky on the dome as seen with naked eye creates an immersive feeling. The projector can also project constellation pictures, panoramas and some special effects like solar eclipse. The main projector is supported by a number of indigenously made special effects, slide and video projectors. The projector is a very efficient tool for teaching astronomy.

### **Science Watch**

A special 5-minute capsule called "Science Watch" is shown before the commencement of the planetarium show highlighting the recent advances in the field of science and technology and is updated very frequently.

### **Full Dome shows**

Mirror Dome was installed in 2007 and subsequently upgraded in 2012. Fulldome shows are digital video programmes which provide an immersive feeling to the audience with a digital projector. Conventionally, the images or video frames designed for flat surface or screen, appear distorted on the dome. Here a computer software distorts the images and videos so that they appear natural on the dome. Some of the programmes can cater to only half the audience and hence the seating capacity is 120.

The life and works of Jagadish Chandra Bose produced as a full dome planetarium program, received lot of appreciation.

## **Exhibition Hall**

The sky-theatre program is supported by a thematic exhibition covering those details that could not be covered in the programme. The exhibition adds to the educational value and caters to curious minds eager to learn more about the topic. The exhibits include astro-photographs, cartoons, paintings and 3-D models. These colourful posters carrying useful, scientific information is aimed at enabling the visitors with an inclination to learn at more than popular level. Some of the concepts like the reason for annular eclipses, tides and moon, that require involved explanation are presented here through video clips and animations for visitors to go over the content at a leisurely pace.

On several occasions 1-minute capsules are screened to educate lay persons about eclipses, meteor showers and opposition and conjunctions of planets.

The Hall has a ***weighing machine*** that shows the possible weight of a person on various planets and our Moon. A digital display on an artistically produced poster of the solar system displays the weight. A colourful print out of this along with interesting astronomy facts can be obtained on a token fee.

## **Know your Stars**

This is one of the well received science popularisation programmes of BASE and is being conducted since 1999. It is held on the evening of first Sunday of every month in collaboration with Association of Bangalore Amateur Astronomers (ABAA). It introduces the night-sky viewing and also the celestial highlights of the month, and consists of a lecture demonstration inside the sky theatre. Visitors are provided with a sky chart and taught how to read it. The lecture is followed by viewing of the Moon, planets and stars in the open sky through telescopes set up for the purpose.



# THE VISVESVARAYA INDUSTRIAL AND TECHNOLOGICAL MUSEUM (VITM)

The Visvesvaraya Industrial and Technological Museum (VITM) is a museum in Bangalore, India. Its management comes under the National Council of Science Museums (NCSM), Government of India.

## **Establishment**

The museum was instituted as part of the centenary celebrations of the engineer-statesman Sir M. Vishvesvaraya (1861-1962). It was handed over to the Council of Scientific and Industrial Research (CSIR) in 1962. In 1978 when the National Council of Science Museums (NCSM) was formed, Visvesvaraya Industrial and Technological Museum became its southern head quarters. The Council has a chain of 28 centers spread all over India. The objective of the Council is to popularize science through interactive exhibits.

## **Galleries**

Vishveswaraya Museum is not a 'museum' in its classical sense, because it has interactive exhibits unlike stationary models of a museum. It is more of a "Science Centre". Each floor of this museum is dedicated to a scientific discipline.

## **Engine hall**

The 'Engine Hall' exhibits engines of various automobiles, machines used in industry, a jet aircraft engine, and other mechanical devices. The predictability and precision of mechanics is demonstrated by the rolling balls that travel endlessly within metal tracks. It is delighting to watch the balls moving over roller coaster, looping a loop and bouncing high to be caught by a basket. Principle of conservation of energy can be explained convincingly through this exhibit.

## **Electro Technic gallery**

The 'Electro Technic Gallery' contains interactive electrical exhibits which work on the basic principles of electricity, electronics and communication. A

renovated version of Electro Technic gallery is opened to public on 8 April 2010. This gallery exhibits the classical experiments like Oersted's experiment, Barlow's wheel, Faraday's ring, etc. A demonstration on electrostatics, which includes Tesla coil, Van de Graaff generator etc. is on display. This is a must visit for all the students of electricity at basic and advanced level and all those who are attracted by the marvels of electricity.

### **Fun Science gallery**

On the first floor of the Museum we have the 'Fun Science gallery' that displays exhibits on sciences of sound, optics, fluids, math and perception. This is a real fun-filled exhibition and people throng each and every exhibit in large numbers to operate them.

### **Space gallery**

The 'Space Gallery' is about rocket science and the history of space exploration.

Biotechnology hall also on the second floor of Visvesvaraya Museum has exhibits on basics of Biotechnology and its applications. The 'Dinosaur alive' has a moving replica of a Spinosaurus. The 'BEL Hall of Electronics' has interesting exhibits on Electronics.

### **Science for children gallery**

Another gallery named "Science for Children" houses exhibits that engages children in activities that help them to enjoy science. There is a giant piano over which they can dance to play music. A pin-wall helps the children to make the impression of their body parts on it.

### **Other attractions**

There is a virtual game area, where children can play music using virtual instruments. An attractive mural made of colored beads welcome the visitors to this gallery, which is filled with fun and enjoyment. The museum also conducts a mini-planetarium show called 'Taramandal' at regular intervals. This is the only museum in the world other than the Smithsonian Institutions in the US, to have a full scale replica of the 1903 flyer of Wright brothers.

A new 3D theatre using technology from Light Speed, USA is open to the public now. Interesting films on deep sea diving and brain are screened here. The 3d effects are spectacular.

### ***Visitors***

The museum which attracts close to one million visitors a year, is opened on all days (except Dipawali and Ganesha Chaturthi) from 10 am to 6 pm. A serious visitor should be prepared to spend at least 3 hours in the Museum to have a glimpse of this treasure house of knowledge in the heart of Bangalore.

## **Addresses of the Institutions:**

The Director  
Office of the Directorate of Horticulture,  
Lalbagh, Bangalore-560004.  
Ph: 91- 80-26578184

Sir. M. Visvsvaraya  
Rainwater Harvasting Theme Park  
Jayanagar 5<sup>th</sup> Block, 8<sup>th</sup> main 40<sup>th</sup> cross  
Bangalore – 560041  
Ph: 91- 80-26653666

The Executive Director  
Bannerghatta Biological Park  
Bannerghatta, Bangalore -560083  
Ph: 91- 80 – 27828300, 27828540  
Mob : 9164950099

The Manager  
Heritage Centre & Aerospace Museum  
Airport Service Centre  
Hindustan Aeronautics Limited  
Bangalore 560037  
Ph: 91 - 80 - 22320578

The Director:  
ISRO Satellite Centre  
P B No. 1795,  
HAL Airport Road, Vimanapura Post  
Bangalore – 560017  
Ph: 91-80 23415275 or 22172296

The Chairman  
Centre for Nano Science and Engineering (CeNSE)  
Indian Institute of Science  
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The Director  
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The Director  
Visvesvaraya Industrial and Technological Museum  
Kasturba Road, Bangalore- 560001  
Ph: 080 2286 6200

## Vijnana Darshan

(For Pre-University College Students of Gulbarga & Shimoga Districts)

### Details of the Participating Colleges –Shimoga (D)

SI no	Name of the College	Lecturer name (Phone no)	Students name
1	Government Pre-University College B. H. Road, Sagar Shimoga (D)	Mr. Praveen. H. T 9916470266	Mr. Vivek. S Mr. Amith. B Mr. Athrinandan S.Hegde Mr. Akash R Mr. Abhishek S. Karjagi Mr. Harshith Kumar. R Mr. Ajayraj Mr. Ganesh Narayana Naik Mr. Chandan Kumar. J. A Mr. Sanadana B. V Ms. Harshitha . M. G Ms. Meghana R. Sagar Ms. Pooja S. Bhat Ms. Deepa P. Pai Ms. Siri S. Rao <b>(10 boys+5 Girls)</b>
2	Government Pre-University College Amrutha, Hosanagar(T) Shimoga (D) -577432	Mr. Francis G. Benajmin 9448669386	Mr. Abhishek B. A Mr. Sachin H Mr. Vijaykumar I. S Mr. Sunil B. T Mr. Nesar Ms. Deeksha S. K Ms. Megha Y. N Ms. Manasa Y .N Ms. Rakhitha H. B Ms. Vandana E. V <b>(5 boys+5 Girls)</b>
3	Hongirana Independent Pre-University College Amathi Koppa Sagar (T) Shimoga (D)	Mr. Rohith 9686783080	Mr. Koushik P Mr. Thirumalesh K. R Mr. Samartha H. P Mr. Sampath T. G Mr. Vivek Jadhav Mr. Vishnuprasad S. Bhat Ms. Vidya G. R Ms. Pruthvi R. Bhat Ms. Dhanyashree V Ms. Chatanya G <b>(6 boys+4 Girls)</b>

4	MDF Independent Pre-University Science College, Nehru Ground, Sagar	Ms. Anusha M P 9632569289	Mr. Laxmish A. A Mr. Vaibhav Gokhale Mr. Dixit B Ms. Vibha R Ms. Spoorthi S <b>(3 boys+2 Girls)</b>
5	Government Pre-University College Sirivnanthe -577401 Sagar (T) Shimoga (D)	Niranjana Murthy 9449778735	Mr. Bharath. D Mr. Manohare. Y. E Mr. Rakesha H. P Mr. Lokesha. N Mr. Avinash B. R Mr. Udaykumar V Mr. Akshaykumar. N Ms. Swathi. K. S Ms. Meghana S. A Ms. Pooja <b>(7 boys+3 Girls)</b>

**(Total 31 Boys +19 Girls=50 students, 5 Faculty)**

### **Details of the Participating Colleges – Gulbarga (D)**

SI no	Name of the College	Lecturer name (Phone no)	Students name
1	Government Pre-University College Jewargi, Gulbarga (D)- 585310	Mr. Shankarappa M. Hosaddaddi 9902569194	Mr. Purushotham Bheemray Ms. Nagarathna Subhaschandra <b>(1 boy+1 Girl)</b>
2	Government Pre-University College Afzalpur, Gulbarga (D)- 585301	Mr. Prashanth Bindage 9481597050	Mr. Mohammed Atauallah Abdul Raheem Mr. Saifan Sab Nadaf Gulab Sab Mr. Bheemray Goud Ramrao Patil Ms. Basamma Kalyankar Dundappa Kalyankar Ms. Archana Pattar Khurananda Pattar Ms. Shilpa Balganur Sugappa Balganur Ms. Abrar Munera Ahmed Patel Ms. Sujatha Jawali Shankarling Jawali Ms. Geetha Padaki Hanmant Padaki Ms. Priyanka Ashok Desai <b>(3 boys+7 Girls)</b>

3	Matruchaya Pre-University College Sedam, Gulbarga (D) -585222	Mr. Bheemareddy Bejja 9449820166	Mr. Sajeed Shabeermiya Mr. Madhsudhan Reddy Anand Reddy Mr. Akash Bheem Raya Mr. Sridhar Shantappa Mr. Sunil Saibanna Mr. Santosh Basavaraj Mr. Kiran Kumar Nagappa Jamadar Mr. Sunil Yellappa Mr. Mallikarjun Sharanappa Mr. Naveen Rajender Munnur <b>(10 boys)</b>
4	Government Pre-University Science College, Chittapur, Gulbarga (D) -	Mr. Shridhar P Kalekar 9449137570 Mr. Mahesh Kumara M Badiger 9343630111	Mr. Anilkumar Prakash Mr. Rakesh Ramu Mr. Anand Tippanna Ms. Radha Linraj Ms. Supriya Neelkant Ms. Bhagyashree Chitrshekar Ms. Rakhsita Basavaraj Ms. Preethi Annarao Ms. Yasmin Murtuj Sha Ms. Pooja Jalandhar <b>(3 boys+7 Girls)</b>
5	Government Pre-University College Mudhol, Sedam (T), Gulbarga (D) - 585318	Mr. Narasappa T Rangoli 9902550423 Smt. Susma. S- 9449184975	Mr. Shivaprasad G Mr. Adil Patel Mahaboob Patel Ms. Anita Buggappa Ms. Bhavana Bajraj Ms. Navitha Narayana Ms. Mamtaj Begaum Md. Moulana Ms. Savitha Mogalappa Ms. Rukshan Begum Ayyub <b>(2 boys+6 Girls)</b>
6	Government Pre-University College Revaggi, Chittapur (T), Gulbarga (D) - 585322	Mr. Nagaraj B Maliwar 9448651276	Mr. Prakash Hunnusing Rathod Mr. Rajkumar Jaganath Ms. Kavita Rachayya Ms. Farzana Dastgir Ms. Neetha Gurunath Ms. Renuka Rajappa Ms. Renuka Mastan Ms. Pooja Revanasiddappa Ms. Nagaveni Siddanna Ms. Aswini Basavaraj <b>(2 Boys+8 Girls)</b>

(Total 21 Boys+29 Girls=50 Students, 7 Faculty)





**KARNATAKA STATE COUNCIL FOR SCIENCE AND TECHNOLOGY**  
INDIAN INSTITUTE OF SCIENCE CAMPUS, BANGALORE

**Vijnana Darshan-** for Pre-University students of Gulbarga & Shimoga districts

**Programme**

Sir C. V. Raman - Group A - Shimoga

Sir Jagadish Chandra Bose - Group B- Gulbarga

<b>Date</b>	<b>A+B</b> Breakfast	<b>A+B</b> Journey time	<b>A+B</b> Place of Visit	<b>A+B</b> Lunch	<b>A+B</b> Place of Visit	<b>A+B</b> Place of Visit	<b>A+B</b> Dinner
19/12/2013	7.30 AM- 8.30 AM	8.30 AM- 9.30 AM	1) Lalbagh- Botanical Garden (9.30 -11.00 AM)  2) Sir M. Visvesvaraya Rain Water Harvesting Theme Park (11.30-1.00 PM)	1.00 PM- 1.30 PM	Bannerghatta Biological Park (2.30 PM – 5.00 PM)		7.30 PM- 8.00 PM
20/12/2013	7.30 AM- 8.30 AM	8.30 AM- 9.30 AM	1) HAL Heritage Centre & Aerospace Museum (9.30 -11.00 AM)  2) ISRO Satellite Station (11.30-1.00 PM)	1.15 PM- 2.15 PM	Indian Institute of Science a) Centre for Nano Science & Engineering (2.30 - 4.00 PM) b) Interaction with scientists (4.30 -5.30 PM)	Indira Gandhi Musical Fountain (7.00 PM)	7.30 PM 8.00 PM
21/12/2013	7.30 AM- 8.30 AM	8.30 AM- 9.30 AM	1) Jawaharlal Nehru Planetarium (9.30-11.00 AM)  2) Visvesvaraya Industrial & Technological Museum (11.00-1.00 PM)	1.00 PM- 1.30 PM	Cubbon park (2.30 PM-4.00 PM) Water Recycling Plant (4.00-5.00 PM)		

Group A from Shimoga are arriving on 18-12-2013 at 6.00 PM and return journey on 21-12-2013 at 4.00 PM  
Group B from Gulbarga are arriving on 19-12-2013 at 6.00 AM and return journey on 22-12-2013 at 6.00 PM

**Contact details of KSCST officials**

KSCST Office – 080- 23341652, 23348848, 23348849

Dr. S. G. S. Swamy – 9448515976

Shri E. Basavaraju – 9448957666

Shri Visvesvara – 9844358260

Shri Kanakadri – 9886070371

Shri Deepak. K. V – 9740041877

Shri Akshaya – 8867236481

Shri Devendra Jain – 8147509344

**Hostel Adress**

Vishranthi Nilayam  
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Diagonally opposite to Hindu News Paper  
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