

**Ongoing Projects under Space Technology Cells
(As of April 2018)**

IISc Bangalore

Sl. No.	Title of the Project
1.	Sustainable synthesis of Li-Fe-P-O quaternary cathodes for Li-ion batteries with tailored morphology (SuperLion)
2.	Performance evaluation of MEMS based space qualified pressure transducers under extreme environment for inter-planetary mission.
3.	Integrated guidance and control of a lunar module for optimal soft-landing
4.	Solution processability of transition metal dichalcogenides and related applications
5.	Development of a 3-D Riesz Scanner
6.	Development of Low Power Consuming Synthesis Strategy for High-performance Ecofriendly Piezoceramic Sensor/Actuator
7.	Physics of compact objects and underlying Supernovae
8.	Synthesis of Nanoparticles Decorated Carbon Nanotubes for Thermal Control Coating Applications
9.	Fabrication of novel dielectric and ferroelectric ceramic polymer composite fabrics for space applications
10.	Sn-whiskering: Mechanism and Suppression
11.	Inferring ecological feedbacks from spatial patterns and remote sensing data
12.	Novel polymer sheathed ammonia borane based hydrogen storage systems
13.	Design and development of environmentally benign strategies for selective decomposition of hydrazine and its derivatives to hydrogen gas and/or safer products
14.	A-SiC/cSi heterojunction photo detectors with low noise for space applications
15.	Investigation of thermoelectric and mechanical properties of La ₃ Te ₄ system
16.	Exploiting strong thermoelectric effect in 2D transition metal dichalcogenides for IR sensing applications

Sl. No.	Title of the Project
17.	Mechanical Design and Microfabrication of Electro-thermally Actuated Compliant Bistable RF MEMS Switches
18.	Sensor nodes with integrated electronics on flexible substrates for wireless sensor networks
19.	An optical system for characterization of multiaxis dynamics of MEMS devices
20.	Aeroacoustic sound sources in Mach 1.3 merging twin jets
21.	Evaporation from Novel Porous Wick Structures including leaf like ones
22.	Quantum-noise limited displacement detection of nanoelectromechanical systems (NEMS) based on two-dimensional crystals
23.	Investigation of vegetation changes in the rangelands of peninsular India
24.	Arrays of high responsivity III-nitride solar blind UV detectors
25.	Agile Light Sources through Spectral Processing of High Power Super-continuum Lasers
26.	Satellite Image Denoising in Hardware
27.	Petrographic, Geochemical, Isotopic and Remote Sensing study of the Dhala impact crater, India
28.	Auto-ignition of H ₂ jet in a scramjet combustor flow
29.	Ecological ecosystem characterization by analyzing high resolution satellite imagery using contemporary processing methods
30.	Hydrogen gas sensor on plastic substrates
31.	A geometric-mechanics approach for precise control of deployable structures: A case study with tendon-driven elastic arms
32.	Development of fatigue testing machine for cryogenic temperatures
33.	Design and development of an integral cold generation and transportation system
34.	Exploring biofuel prospects in West Coast of India
35.	Optimizing Interconnects for 3-D Packaging of Hybrid Systems
36.	Lithium-Sulfur Batteries with Ionic Liquid Based Polymer Electrolytes and High Capacity Sulfur Cathodes

Sl. No.	Title of the Project
37.	First principles based exploration of atomically thin layered material for next generation Li-ion battery
38.	Non-mechanical beam steering using dielectric meta-surface mirror
39.	Onboard passive micro vibration isolation in spacecraft
40.	Synthetic and spectroscopic studies of novel semiconductor materials for light harvesting and opto-electronics

IIT Bombay

Sl. No.	Title of the Project
1.	Novel route towards fabrication of Borides-Carbon Nanotube (CNT) Bulk Composites with Higher Volume Fraction of Uniformly Distributed/dispersed CNTs
2.	Development of Invisible Watermarks For Vector GIS Data Layers
3.	Heat flux prediction in shock - boundary layer interaction and multi-jet interaction with reversed flow
4.	Evaluation and mapping of flooding along Paradip coast due to storms and tides using Numerical modelling and Geo-Spatial Techniques
5.	Transfer Learning Driven Rapid Change Detection for Disaster Management
6.	A Comprehensive Mapping of Flood Risk in Changing Climate : An Application to Jagatsinghpur District, Orissa
7.	Micromechanics of textile composites
8.	Numerical Simulation of Arc Plasma in Arc-Heated Wind Tunnel
9.	Investigation of the effect of surface roughness on the heat transfer rates of a typical reentry capsule.
10.	Novel Absorber Materials for Multi-junction Solar PV Application using Non-toxic and Earth Abundant Element
11.	A self-consistent predictive quantum transport simulator for quantum dot IR photo detectors
12.	Fractional NPLL and ADC for IRNSS User Receiver
13.	Development of Mild and Efficiency Nitration Reactions: Synthesis of High Energy Materials Relevant to Rocket Propellants

Sl. No.	Title of the Project
14.	Development of Ohmic Contact and Schottky Contact on Gallium Nitride (GaN) HEMT
15.	Visible-NIR Electromagnetic Wave Concentration using Metallic Aperture for Photodetectors
16.	Optimization of Hot Workability and Control of Microstructure in Cu-Cr-Ti-Zr Alloy: An approach through Thermo-Mechanical Simulation
17.	Development of a 3D transient, non-isothermal, multiphase model of a PEM Fuel Cell
18.	Simulation, design and development of a solid state hydrogen storage system
19.	Spacecraft orientation manoeuvres under control and state constraints- Phase 2
20.	Experimental and Numerical Studies on Pulse Detonation Rocket Engines
21.	Growth and Characterization of AlGaIn/GaN Heterostructure by Plasma Assisted Molecular Beam Epitaxy Technique for High Mobility
22.	Polarimetric Synthetic Aperture Radar (SAR) data analysis for Earth Observation applications
23.	Microstructural modeling of aerospace titanium alloys during hot working
24.	Synthesis and Combustion of Novel Energetic Compounds
25.	Simulation of interaction of rocket engine exhaust with lunar dust using DSMC
26.	Development of Pulse Doppler Processing algorithms for MOTR
27.	Experimental Measurements and Theoretical modeling of Deformed Microstructures and Work Hardening Responses in Selected Aluminum Alloys
28.	An integrated Multi-statin Multi-Axis Hybrid Manufacturing System using Arc and Laser Cladding
29.	Sparse Signal Recovery Techniques for Atmospheric Radar

IIT Kanpur

Sl. No.	Title of the Project
1.	Accelerated computational algorithms for accurate simulations of acoustic and electromagnetic scattering from open surfaces
2.	Design of a Smart Inflated Torus and Antenna Membrane
3.	Comprehensive Two & Three Dimensional Modeling of Water Permeation across Proton Exchange Membrane in Fuel Cell integrated with Electro- Osmotic Pump.
4.	Stress Concentration Factors (SCFs) in Curved Plates for Space Applications
5.	Development of Novel Plasmonic Devices for Next Generation Chip-scale Technology based on Nanophotonics
6.	Development of integrated heat pipe based passive thermal Management platforms with vibration isolation capability
7.	Vibration Control of Cryo-coolers for Satellite Applications
8.	Growth and aging of tissues under microgravity environment
9.	Laser Assisted Fabrication of Functionally and Microstructurally Graded Thermal Protection Systems (TPSs) for Reusable Launch Vehicles (RLVs).
10.	Numerical investigations on surface gravity waves and internal tides
11.	Three dimensional transient analysis of side load for current and future booster nozzles during start-up and shut down.
12.	Design & Development of Supercapacitor using heavily Nitrogen Doped Graphene
13.	High throughput surface characterization using coherent optical imaging
14.	Surface grooving of Cu/Ni based alloys using Jet Electrolytic dissolution for enhancement of heat transfer rate.
15.	Fabricating of Porous Copper with Carbon Nanotube Reinforcement for Loop Heat Pipe Application.
16.	Mechanical Behaviour and Processing Maps of Suction Cast High Entropy Alloys.
17.	Synthesizing and Characterizing Sulfur High Energy Cathode Material for Lithium Ion Cells

Sl. No.	Title of the Project
18.	GO2 / GCH4 Combustion Studies in High Pressure Rocket Combustors
19.	Underlay Cognitive Radio based Satellite-Terrestrial Non- Cooperative /Cooperative Communication for Efficient Resource Utilization: Protocol Design and Performance Analysis.
20.	Development of Controlled Expansion (CE) Al-Si alloys by packed rolling.
21.	Interdiffusion and Diffusional Interactions in High Entropy Alloy Systems.
22.	Space-Time Trellis /Turbo coding based robust satellite image processing and communication.
23.	Control of transition in Dual-Bell nozzle using film cooling.
24.	Design and Development of active flexible and Reconfigurable Parabolic Antenna using SMA based smart actuator
25.	Development of Friction Stir Welding and Processing Technology for AA2195 structural application.
26.	Numerical simulations of liquid-sheet breakup in gas-centered swirl coaxial atomizers.
27.	Development of a Gas Sensor to detect leakage of Helium gas from Inflatable Space Structures.
28.	Microstructural and Mechanical Characterization of High- Silicon Stainless Steel.
29.	Gigahertz and Terahertz antenna on photonic crystal substrate
30.	RTE-tomography based cloud and ocean monitoring.
31.	Design and Development of GaN Based Compact DC-DC Converter.
32.	Application-Aware Image Quality Evaluation.
33.	Characterization and Modeling of Radiation hardened CMOS transistors for space applications.
34.	Shape Memory Alloys actuated Mechanically Active Reconfigurable light weight PEEK material based parabolic reflector for active control on RF patterns for High Frequency Micro / Nano Spacecraft Applications.
35.	PDK Development and modeling support for ISRO's GaN HEMT Technology.
36.	Development of novel thermoelectric power generator for waste heat recovery in space.
37.	Impact Melt Cover on Central Peaks of Lunar Impact Craters: Evaluating its Implications for Deriving Sub-Surface

Sl. No.	Title of the Project
	Mineralogy using data from Chandrayaan-1 & other recent lunar missions
38.	Optical characterization of wetlands from Earth Observations.
39.	Integration of spectral and spatial information for hyperspectral image classification.
40.	Parallel Electro-Magnetic Solver for Microwave, Infrared, and Optical applications (MIO-PEMS)
41.	Detectability of Critical Delamination in Composite Space Components: Vibration-based Approach.
42.	Design of polymer nanocomposites based wideband microwave absorbers for stealth and electromagnetic shielding applications.
43.	Modeling and Simulation of LOX- CH4 (semi-cryogenic) Combustion.
44.	Numerical Study of Flow-Thermal Response of a High-Speed Vehicle with Ablative/Non-ablative Thermal Protection System.
45.	Microstructure and Texture Analysis of Hot Forged Ti-6Al-4V Alloy.
46.	Development of High Entropy Metal Diboride for Ultrahigh Temperature Application.
47.	Integrating Lithium Oxychloride Based Solid State Electrolytes with Carbon Encapsulated Si/Ge Anodes and Li-Excess NMC Cathodes for Advanced Lithium Ion Batteries.
48.	Development of ultra-small bimetallic oxide nanoclusters (e.g. NiCo ₂ O ₄ , MnCo ₂ O ₄ , NiMoO ₄ , CoMoO ₄ , and MnMoO ₄) for high performance non-aqueous/aqueous asymmetric electrochemical super capacitor.
49.	Numerical investigation of a kerosene-fuelled scramjet combustor using RANS based flamelet model.
50.	Molecular size and mass sensitive Ultrasensitive Thermal Spectrometer Application.
51.	Stabilization of a 3D Platform for Space Applications Against Rolling and Pitching Excitations
52.	Characterization and Modeling of Membranes for Inflatable Space Structures
53.	Numerical and Experimental Framework for Laser Based Additive Manufacturing of High-Performance Aerospace Parts of Inconel 718 and Ti Alloys.

IIT Kharagpur

Sl. No.	Title of the Project
1.	Design and efficient implementation of advanced encryption and decryption techniques for use in spacecraft communications
2.	Reduction of false acceptance/rejection for non cooperative speakers in automatic speaker recognition system
3.	Implementing a scalable video transcoder based on motion compensated temporal filtering
4.	Thermo hydraulic simulation of LOX booster turbo pump for semi cryogenic rocket engine
5.	Protocol development for interplanetary delay tolerant network
6.	Development of Earth Simulator for time domain GPR Applications
7.	Retrieving temperature and salinity profiles in the Bay of Bengal using satellite observations
8.	Design and development of perforated plate heat exchangers for cooling of gaseous helium by using liquid hydrogen
9.	Droplet-based cooling of Electronic hot spots
10.	Development of Substrate Integrated Waveguide (SIW) based Passive Devices for Satellite Transponder.
11.	Experimental evaluation of forming limit diagram and forming behavior for differently heat treated Inconel -718 material
12.	Damage assessment of composite structures using swarm based optimization technique from changes of vibrational response
13.	Theoretical and Experimental Studies on Cooling of Liquid Nitrogen by Helium Injection
14.	Modeling and Simulation of Shrinkage and Warpage of Autoclave Molded composite components
15.	Microencapsulation of Phase Change Material Using Fluidic Method
16.	Design, Implementation and performance evaluation of Algorithms for compression of Hyper-spectral data products
17.	Design and Implementation a 250 MSPS, 8 BIT ADC in Sub-Micron Technology for Space Application
18.	Geodynamic Modeling and Tectonic Reconstruction of a Fossil Subduction Zone in the Context of Nagaland Ophiolite Complex – Field vis a vis Remote Sensing convergence
19.	Deep Learning for Automated Discovery in Hyper spectral images

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20.	Reliability Assessment of L40 Stage Assembly and Integration Process
21.	Advanced High Strength Conjugated Polymer based Conductive Fibers as a Smart Textile Materials for Space Applications
22.	Assessment and implementation of complex image co-registration and phase unwrapping and Wavelet Based Phase Noise Reduction for interferometric SAR processing
23.	Design of Dual/Tri-Band Circularly-Polarized Antennas with Reduced Ground Plane Size
24.	Design and Development of Closed-Loop MEMS Capacitive Accelerometer
25.	Exploring the MEMS based Flexible Pressure Sensors for Electronic Skin Applications
26.	Exploration of vertical soil moisture profile by assimilating the surface soil moisture data retrieved from remotely sensed SAR data
27.	Indigenous Authenticated Encryption for Satellite Communication
28.	Shoreline change Analysis along Andaman and Nicobar Islands: Implication for Coral Conservation
29.	Development of a high-efficiency, high power-density 5KW modular DC-DC Power supply for space applications
30.	Targeted Evaporative Cooling of Hot Spots using Patterned Surfaces
31.	Polarimetric Analysis of SAR Images for Segmentation, Classification and Recognition of Objects
32.	Development of forest health monitoring model based on Hyperion Data for Geo-Environmental Impact management in the Iron ore Mining Belts of Saranda Forest, Jharkhand
33.	Design of SET Tolerant High-Speed Transceiver for Chip to Chip Backplane interconnect
34.	Hands-free Gesture Control for Immersive Image navigation (Phase-II)

IIT Madras

Sl. No.	Title of the Project
1.	Spatial disaggregation and inverse modeling of quality field level irrigation water distribution and efficiency across a command area using an integrated thermal remote sensing and crop growth modelling approach
2.	Design, Fabrication and testing of programmable high voltage power supply for space applications
3.	Flow characterization studies and performance analysis of an annular aerospike nozzle
4.	Development of the multiscale modelling framework for the fracture studies of textile composites
5.	Mixed mode translaminar fracture of fibre reinforced composites – Experiments and Simulations
6.	Simulation of mixing layer in stratified medium
7.	Identification of mesoscale eddies in the Bay of Bengal using Lagrangian Coherent Structures
8.	16 bit 5MS/S analog to digital converter
9.	Effect of Thermo-mechanical processing on the microstructure, texture and anisotropy evolution in various Ti alloy being used in various launch vehicle programmes of ISRO
10.	Experimental Investigation of Ageing Related issues in composite solid propellants
11.	Condition Monitoring of Aerospace Structural Materials adopting Multi-Fusion Sensor System
12.	CFD Studies on Jet Deflector Duct of Future Launch Pad for Advanced Launch Vehicles of ISRO
13.	Weld repair of XH43 and XH67 superalloys castings
14.	Lattice Boltzmann Simulations of Sloshing Dynamics
15.	Heat and Mass Transfer Across Liquid vapor Interface in a Pressurized Cryogenic Tank with and without sloshing
16.	Design and Development of Five Axis Magnetic Field Assisted Fluid jet Polishing machine for Nano-surface Generation on Optical, Metallic, CFRP Composites & Hybrid Materials (with composite backup structure)
17.	Probing interstellar and atmospheric anions through Velocity Map Mapping
18.	3D Numerical Modeling of Arcjet Thrusters
19.	Assessment of Sea Surface Solar Radiation and Pco2 Fluxes In Coastal and Estuarine Waters Using OCM-2/OCM-2 Data

Sl. No.	Title of the Project
20.	Development of Silicon Bicmos Technology for RF Applications
21.	Development and Characterization of 3D Graphene Foam as a Thermal Insulator for Space Applications
22.	Development of Rotocraft UAV for Operation in Martian Atmosphere

**Savitribai Phule Pune University
(Formerly University of Pune)**

Sl. No.	Title of the Project
1.	Development of Pre qual engineering model of "SEAPS" (300 KHz to 30 MHz) RF Front end electronics and data acquisition system for low frequency space science studies
2.	Studies on biodiversity of poly-extremophilic bacteria for their probable use as test organisms in space research
3.	Fabrication of magnetoelectric energy harvesters by utilizing piezoelectric-macro fiber composite (MFC) and magnetostrictive Nickel/Metglas/Magnetic oxide materials
4.	Design, fabrication and testing of a compact and robust Monochromator
5.	Development of coating/manufacturing technology for friction stir coating/welding tool for welding of 3 mm thick stainless steel sheets
6.	Development of Nuclear Batteries using Radioactive Sources
7.	Drilling techniques/technology for drilling of miniature size holes of diameter less than 10 microns in super alloys for a depth of 1.0 mm
8.	Valve-less linear compressor driven stirling cycle cryocooler for space applications
9.	Converting energy derivable from low energy sources into electrical power for autonomous sensors applications
10.	Development of high current density thermal-field (T-f) cathodes
11.	Studies on glare reduction techniques for indoor illumination systems
12.	Fabrication of a small satellite for monitoring radiations in different orbits of outer atmosphere where orbit maneuvering will

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	be controlled by solar sail
13.	Bioleaching to Electronic Wastes (E-wastes)
14.	Study of cloud parameters observed by Ceilometer with the Satellite retrieved and Mesoscale Model generated, cloud parameters
15.	Astrobiology experiments on Effect of impact and space related stress on micro-organisms isolated from rocks: Implications for origin of life and Lithopanspermia
16.	Wear corrosion and impact toughness of the high nitrogen martensitic stainless steel (XD15NW) (16 Cr, 0.20N, 0.42C, 1.8 Mo, 0.35V, balance Fe (in wt%))
17.	Miniaturized Microstrip Antenna Designs for 3U Cubesat covering UHF, L-and S-band frequency spectrum and their interference study for earth observations
18.	Design and development of work function measurement set up and its use to measure work function of thrusters
19.	Development of solders for use in cryogenic applications
20.	Selective capture and conversion of CO ₂ to methanol from direct air using MOFs supported polyamines
21.	Conducting Polymer supported bimetallic nanostructures for fuel cell and hydrogen storage applications
22.	Investigations of ZnSe:Te quantum dot scintillators for charge particle detection in space radiation environment
23.	Development of aluminium nitride and alumina based ceramics for high temperature electrical insulation
24.	QPSK demodulator based on wideband acquisition technique