



BITS Pilani

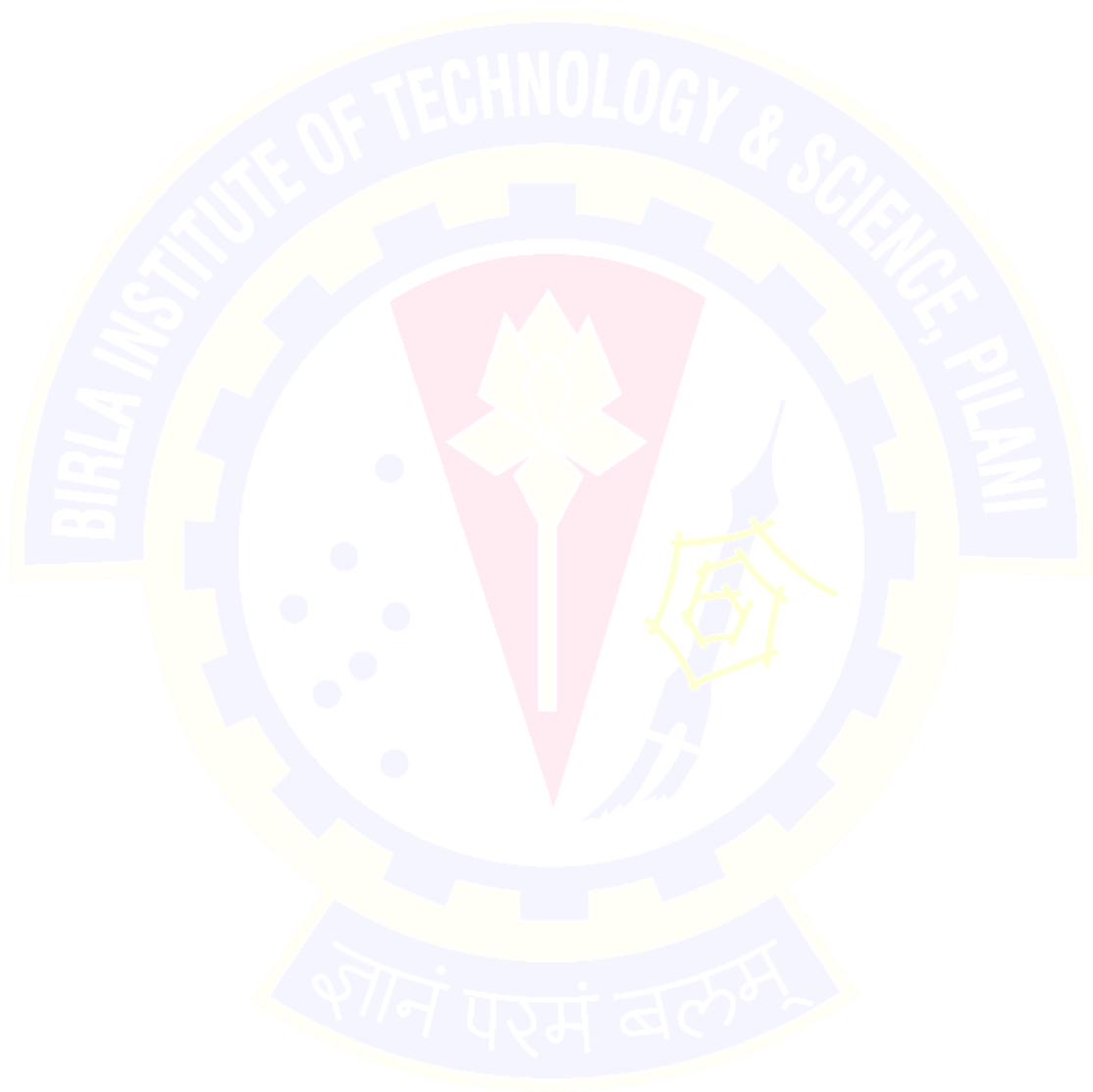
K K Birla Goa Campus

Department of Electrical & Electronics Engineering



Department of Electronics & Electrical Engineering

BITS-Pilani K K Birla Goa Campus



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Message From HoD

Welcome to the Department of Electrical and Electronics Engineering at the BITS, Pilani K.K. Birla Goa Campus. The department envisages becoming a leading center of teaching and training for engineering leaders of tomorrow.

At the onset, I thank all my colleagues for their help in putting together this brochure which hopefully will give the reader an insight into the activities of the department. We are a group of 28 faculties currently with a wide scope in areas of interest spanning from the physics at nanoscale to engineering satellite communication systems. The following pages will give you a brief idea of individual faculty member's area of expertise. Our department prides itself in being a team known for good teaching and for offering courses that are in keeping with industry and research trends.

No department is built in a day, and we are proud to stand on the shoulders of leaders who have set the department on a strong footing. The department has made a conscious effort in sourcing external funding via grants and industry to build up research facilities in the labs. These have also been highlighted in the following pages. This is a continuing process and we expect to bring up two new labs in the department in the next two years.

The department also has been able to draw in the brightest students who have also contributed to the department growth through their involvement in research projects. We have had an excellent placement record for both our FD and HD programs. It is a matter of pride to note that many of our students have graduated to pursue research careers in the leading universities of the world. Our alumni are our ambassadors and we are proud of all of their achievement.

I invite you to peruse the document and come join us as we set on this exciting new growth path of building a world-class Electrical Engineering department. As a student, you will find an environment that will continuously challenge you to better yourself. As a colleagues or a collaborator, we look forward to pursuing cutting edge research and push our boundaries to make the impossible.

Abhijit Pethe
HoD, EEE

About The Department

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The department of Electrical & Electronics Engineering at K. K. Birla, Goa Campus is the largest department on campus both in student and staff strength. The faculty of the department consists of young and experienced highly qualified members with versatile interests in teaching and research. Faculty members are encouraged to engage with industry and research institutions for developing research projects for possible sponsorship from national and international agencies.

The Department provides modern facilities for practicing modern techniques of pedagogy and research. The facilities include tele-presence class rooms, Massive Open Online Courses (MOOC) and Learning Management Systems, etc., to the advantage of students. There are ten different laboratories which are equipped with modern hardware/software design tools for facilitating practical training for first-degree as well as higher degree students. The facilities are also extended to students for developing demonstration projects for exhibition, conferences, publication in journals, etc.

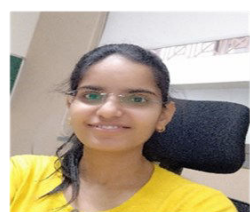
The Department offers: three First Degree Programmes, B.E. Electrical & Electronics (EEE), B.E. Electronics & Instrumentation (EIE) and B.E. Electronics & Communication (ECE); Two Higher Degree Programmes: M.E.Embedded Systems and M.E. Microelectronics; and the PhD Programme (Full Time as well as Part Time). Details of these programs may be found from the BITS, Pilani university webpage.

FD program – website link: <https://www.bits-pilani.ac.in/goa/be>

HD program – website link: <https://www.bits-pilani.ac.in/goa/me>

PhD program – website link: <https://www.bits-pilani.ac.in/university/AcademicResearch/Overview>

Faculty & their Research





Prof. Abhijit Pethe

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Area of Research:

CMOS Scaling, Device Physics, Nanoelectronics, MOS and BJT Technology, Beyond MOS Device: Spintronics, Negative Capacitance, Non-Volatile memories: RRAM, MRAM and its application to neuromorphic engineering, Novel Energy solution: Energy harvesting, on-chip battery, solar cells, Implantable electronics for medical applications, BioSensors using novel materials, Teaching techniques for Science and Engineering.

Research Summary:

Dr. Pethe has worked in various roles in the semiconductor industry over the last 15 years based in the US. His current work involves investigating solar cell designs and exploring use of non-volatile memories for neuromorphic computing.

Selected Publications:

- ◆ A. Fatima and A. Pethe, "NVM Device based Deep Inference Architecture using Self-Gated Activation Functions", Int. Conference on Machine vision and Augmented Intelligence (MAI), 2021.
- ◆ A. Verma and A. Pethe, "Modelling and Analysis of Multi-Junction Photovoltaic Cells," 2020 IEEE 17th India Council International Conference (INDICON), 2020, pp. 1-6, doi: 10.1109/INDICON49873.2020.9342293.

**Prof. Mukund K. Deshmukh**

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Areas of Research:

Sustainable Engineering, Energy Systems Modeling, Distributed Energy Generation, Hybrid Energy Systems, Demand Side Energy Management.

Research Summary:

The principles of sustainable engineering have been guiding research and development in various fields of science and engineering over past several decades. The key to ensure compliance with the principles is to develop of context-sensitive solutions to prevalent problems. Exiting energy supply and demand problems are no exception. In view of future needs of trained and skilled engineering personnel for transforming the energy scenario to be self-sufficient, the educational institutions have a greater role to play. Given the need to pursue future relevant research, the ongoing research on our campus has a focus on increasing use solar and wind energy systems for power generation (in stand-alone as well as grid-interactive modes), and effective distribution and management of electrical energy supplied by state owned utilities.

Selected Publications:

- ◆ Bharatbushan Singh Athokpam, M.K. Deshmukh, Operational Testing of Rooftop SA-SPV System in Coastal Tropical climate”of India”, Energy for Sustainable Development 47 (2018) 17–22.
- ◆ M. K. Deshmukh, Athokpam Bharatbushan Singh, Modeling of Energy Performance of Stand-Alone SPV System Using HOMER Pro, 2018 5th International Conference on Power and Energy Systems Engineering, CPESE 2018, 19–21 September 2018, Nagoya, Japan,Energy Procedia 90 (2019) 90–94

**Prof. Dipankar Pal**

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Areas of Research:

Circuits and systems, ASIC and VLSI.

Research Summary:

Mixed mode circuits; arithmetic and function-circuits; multipliers; data converters; analog & mixed mode ASIC at low voltage, low frequency; current conveyor based function circuits design; low offset, high gain amplifier blocks for biomedical instrumentation and medical electronics; wet electronics.

I have done chip design on both 0.35 and 0.18 μ m technology of AMS and CMP (standard CMOS and biCMOS Double-Metal-Double-Poly-Process). I had fabricated (through foundries in Europe while in UK) a number of analog and mixed signal ASIC's and tested them for various applications.

Selected Publications:

- ◆ A Saha, RK Singh, D Pal (2022) Pair-Wise Urdhava-Tiryagbhyam (UT) Vedic Ternary multiplier, Microelectronics Journal 119, 105318.
- ◆ T Nizam, V Vijay, A Srinivasulu, D Pal, (2021), Novel All-Pass Section for High-Performance Signal Processing Using CMOS DCCII TENCON 2021-2021 IEEE Region 10 Conference (TENCON), 7-10..

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Areas of Research:

Embedded Systems, Deeply Embedded Systems, Wearable Systems, IoT

Research Summary:

Currently I am working on Wearable IoT devices for geriatric health care. This involves building the wearable device itself, working on compressed ensemble ML and DL algorithms that can run wearable devices using Tiny ML (this is a new area of work - only be active for about a couple of years) and ML algorithms for long term health monitoring on the cloud. I am also working on building private cloud lets for industrial IoT.

I have received over 2.4 crores in grants over the last decade. 7 PhD students have completed their PhD with me. Another 3 have submitted their thesis. Another 2 are working in the area of IoT with me.

Selected Publications:

- ◆ Multi-cluster flying ad-hoc network for disaster monitoring applications A Joshi, SC Dhongdi, N Manjarekar, KR Anupama International Journal of Ad Hoc and Ubiquitous Computing 36 (4), 207-221 2021.
- ◆ A Joshi, SC Dhongdi, N Manjarekar, KR Anupama, 2021, Multi-cluster flying ad-hoc network for disaster monitoring applications International Journal of Ad Hoc and Ubiquitous Computing 36 (4), 207-221

**Prof. Ramesha C K**

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Areas of Research:

Fabrication of Ohmic and Schottky contacts to semiconductor materials like GaN, SiC and their characterization using current-voltage and capacitance-voltage techniques. Other areas of interest are: low power VLSI design, device modeling, solar photo voltaic cell, MEMS devices, Reconfigurable Microstrip Antenna Design.

Research Summary:

Fabrication of Schottky diodes and study its electrical characteristics using I-V and C-V techniques. The surface morphology are studied using XRD and AES techniques.

Selected Publication:

- ◆ Shamanth Nagaraju, Lucy J Gudino, Nikhil Tripathi, V Sreejith, CK Ramesha 2021), Mobility assisted localization for mission critical Wireless Sensor Network applications using hybrid area exploration approach ,Journal of King Saud University-Computer and Information Sciences .
- ◆ Vikas V Khairnar, CK Ramesha, Lucy J Gudino (2021), A Parasitic Antenna with Independent Pattern, Beamwidth and Polarization Reconfigurability ,Wireless Personal Communications

**Prof. Anita Agrawal**

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Areas of Research:

System design and simulation, Android /iOS app development using Java, Embedded system prototype designing using FPGAs , Data Acquisition system design using LabVIEW, medical Image processing.

Research Summary:

In a study, an attempt had been made to propose a highly automated method for the determination of instantaneous blood flow rate of the heart. The method used an image processing scheme to compute the diameters of the blood vessels. Code had been written in Verilog Hardware Descriptive Language and was then simulated using Modelsim software. The results computed were compared with the results obtained from the clinical echo laboratories and the similarity index was found to be appreciably high. Similar work had been carried out on the MRI brain scans to detect, diagnose and classify the brain disorders such as Brain tumor, brain hemorrhage and Ischemic Stroke.

Selected Publications:

- ◆ PG Bharathi, A Agrawal, P Sundaram, S Sardesai, 2019, Combination of hand-crafted and unsupervised learned features for ischemic stroke lesion detection from Magnetic Resonance Images, Biocybernetics and Biomedical Engineering 39 (2), 410-425.
- ◆ GB Praveen, A Agrawal, P Sundaram, S Sardesai, 2018, Ischemic stroke lesion segmentation using stacked sparse autoencoder, Computers in biology and medicine 99, 38-52 .

**Prof. Amalin Prince A.**

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Areas of Research:

Reconfigurable Computing, Hardware-Software Codesign, Hardware Accelerated Data Processing.

Research Summary:

Hardware accelerators for multichannel EEG data processing, FMCW radar signal processing for real-time fusion plasma diagnostics, FPGA-based system design, Machine learning techniques for leather species identification.

Selected Publications:

- ◆ Gibin C.G., Buch JJU, Prince A.A.*, and Surya P., (2021) 'SoC Based Automated Diagnostic Instrument for FMCW Reflectometry Applications', IEEE Transactions on Instrumentation and Measurement, vol.70, pp. 1-11.
- ◆ Mittal R., Prince A.A.*, Nalband S., Robert F., and Fredo A.R.J., (2021) 'Modified-MaMeMi filter bank for efficient extraction of brainwaves from electroencephalograms, Biomedical Signal Processing and Control, vol. 69, pp. p.102927.

**Prof. Nitin Sharma**

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Areas of Research:

GNSS Signal Processing, Wireless Communication (MEC, FOG computing, V2V, D2D, IoT)

Research Summary:

My areas of Research include Software Defined Radios and their applications in Communications and GNSS (GPS/GLONASS/NavIC etc.) Signal Processing. Resource allocation for 5G/6G communication including but not limited to D2D Communication, V2V Communication, Cloud-RAN, IoT, Fog Computing MEC, Evolutionary Algorithms, and their use in Engineering Applications (mainly Signal and Image Processing), etc.

Currently, I am working in collaboration with professors in leading universities such as NTU Singapore, The Hong Kong Polytechnic University, Hongkong and Ryerson, University, Canada, Cranfield University, U.K, Ohio University USA.

Selected Publications:

- ◆ S Khanolkar, N Sharma, A Anpalagan, Energy-Efficient Resource Allocation in Underlay D2D Communication using ABC Algorithm, Wireless Personal Communications, 1-26, 2022.
- ◆ A Dey, K Iyer, B Xu, N Sharma, LT Hsu, Carrier-Aided Dual Frequency Vectorized Tracking Architecture for NavIC Signals, IEEE Transactions on Instrumentation and Measurement, 2022.

**Dr. Narayan Manjarekar**

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Area of Research:

Dynamics and Control, Nonlinear control systems, Power system stability and control, Transient stabilization of electrical power systems, Active suspension control of a car, Control Synthesis for Autonomous Underwater Vehicles (AUVs).

Research Summary:

Control Synthesis for AUVs: In this work the dynamics of various AUVs are studied and nonlinear/linearized models of the system are derived. The plant models are analyzed for their dynamic performance and/or stability. Control laws are designed to improve the performance and/or stability of the AUVs in presence of modeling uncertainties, measurement noise and disturbances. Control objectives include control of various subsystems such as steering control, diving control, speed control, trajectory tracking and obstacle avoidance. Different control methods based on linear and nonlinear control theory are employed. Suitable estimations techniques are used to tackle the measurement noise.

Grid connected doubly fed induction generator (DFIG) based wind turbines: In this control system, DFIG based wind turbines are connected to the grid. Dynamics of the system is studied and mathematical models are obtained. Suitable control laws are derived to address control problems such as dynamic and transient stabilization of the grid. Initialization of the system (obtaining the initial conditions) is a challenging task here.

Selected Publications:

- ◆ Abhishek Joshi, Sarang C. Dhongdi, Narayan Manjarekar and K.R. Anupama, 2021 , "Multi-cluster flying ad-hoc network for disaster monitoring applications" International Journal of Ad Hoc and Ubiquitous Computing (IJAHUC), Vol. 36, No. 4. <https://doi.org/10.1504/IJAHUC.2021.114104>.



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Areas of Research:

Modelling and Simulation of micro/nano biosensor devices, Electrochemical biosensors, Electrochemical impedance spectroscopy (EIS), Biosensor with machine learning.

Research Summary:

My research work mainly contributes towards the development of different biosensing platforms based on electrochemical impedance readout with the ultimate goal of performing label-free, real time measurement of various analytes. Current focus is on design and simulation of micro devices for the development of reliable and sensitive biosensor.

Research Example:

In recent years, interdigitated electrodes (IDEs) and transistor based biosensor have gained increased interest in electrochemical biosensor. The performance of the biosensor greatly relies on the design and geometrical parameter of these devices. Therefore, optimization of geometry and structure of these devices are essential towards the development of reliable and cost effective biosensor. Moreover, it is not practical to fabricate and test all possible designs for a specific application. In such situation, simulation study is found to be useful to ensure optimal geometry prior to fabrication for high sensitivity and low cost of the device.

Selected Publications:

- ◆ Deshpande S, Bhand S, Bacher G (2022) Finite element method based modelling and analysis of serpentine electrodes for biochemical sensing. Materials Today: Proceedings.
- ◆ Deshpande S, Bhand S, Bacher G (2021) Investigation of the effect of metallization ratio and side shift on the interdigitated electrodes performance for biochemical sensing. Journal of Applied Electrochemistry 51 (6):893-904



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Area of Research:

UWB Antenna, 3D printed antenna, Monopole Antenna, Metamaterial based antenna, MIMO Antenna, Superstrate antenna, Dielectric resonator antennas, Reconfigurable antenna, EBG structures, Microwave components and circuits

Research Summary:

The growing of wireless communications has been an important additional driving force for the advancement of antenna technology. Antennas are the "eyes" and "ears" of communications systems, radars, satellites and other sensors. They are used in wide range of applications from terminal devices (such as mobile phones), to advanced communication systems on aircrafts, ships, vehicles, medical applications, remote sensing, global navigation satellite systems (GNSS), and so on. Strong demands like small physical size, low weight, low cost, wideband and multiband, reconfigurable capabilities, medical or even aesthetic considerations are increasingly required as essential for modern antenna designs.

Selected Publications:

- ◆ Manohar Golait, Manish Varun Yadav, Balasaheb H. Patil, Sudeep Baudha and Lokesh Kumar Bramhane "A compact ultra-wideband square and circular slot ground plane planar antenna with a modified circular patch," International Journal of Microwave and Wireless Technologies, First View. <https://doi.org/10.1017/S175907872100129X> (2022)
- ◆ M. V. Yadav, S. Baudha and I. Srivastava, "Design of a miniaturized and compact printed antenna for UWB spectrum," Telecommunications and Radio Engineering, 79 (2020), pp. 1529-1538. <https://dx.doi.org/10.1615/TelecomRadEng.v79.i17.40>



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Are-

as of

Research:

Approximate circuit design, analysis and its applications; Emerging nanodevices based circuit design and its applications (VLSI Design).

Research Summary:

Many real time applications in the area of Image Processing, Machine Learning, Communication demand for high speed, low power and less area. Their error resilient nature can be used by designing application specific approximate arithmetic circuits with trade-off in speed, power and area. Also emerging nano devices based memory architectures are tested for in-memory calculations in order to improve speed of processors.

Research Example:

- ◆ High-speed Fast Approximate Recursive Multiplier (FARM) with significantly fewer error characteristics compared to state-of-the-art approximate multipliers.
- ◆ Power- and area-efficient Approximate Wallace Tree Multiplier for error-resilient systems.
- ◆ Logic Design Within Memristive Memories Using Memristor-Aided loGIC (MAGIC), an example of in-memory calculations.

Selected Publications:

- ◆ Pravin Mane, Nishil Talati, Ameya Riswadkar, Ramesh Raghu, C.K. Ramesha, "Stateful-NOR based reconfigurable architecture for logic implementation", Microelectronics Journal, Volume 46, Issue 6, pp. 551-562, 2015, ISSN 0026-2692, <https://doi.org/10.1016/j.mejo.2015.03.021>.
- ◆ N. Talati, S. Gupta, P. Mane and S. Kvatinsky, "Logic Design Within Memristive Memories Using Memristor-Aided loGIC (MAGIC)," in IEEE Transactions on Nanotechnology, vol. 15, no. 4, pp. 635-650, July 2016. doi: 10.1109/TNANO.2016.2570248



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Areas of Research:

Microwave Engineering, Electromagnetics, Waveguides, Antennas, High power microwave, Image Processing

Research Summary:

Our research work involves the design of antennas and waveguides for high power microwave systems. We also work on mode launcher design to excite waveguide and surface wave modes. Simulation is performed in CST studio, HFSS software and experiments are performed in Antenna lab with the help of Vector network analyzer (VNA), Spectrum Analyzer, Anechoic chamber etc.

Selected Publications:

- ◆ Swati V. Yadav, AshishChittora, April, 2021, "Circularly polarized high power antenna with higher-order mode excitation", International Journal of Microwave and Wireless Technologies (Cambridge University press, EuMA).
- ◆ AshishChittora, Swati V. Yadav, July 2020, "Periodic Printed Semi-Annular Substra Loaded TM_{01} to TE_{11} Mode Converter", International Journal of Microwave and Wireless Technologies (Cambridge University press, EuMA), 13 (5), 447-453.

**Dr. Hrishikesh Sonalika**

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Area of Research:

Electromagnetics

Research Summary:

Radomes is a short form of "Radar Dome". It is a protective cover for the antenna. The radiation emitting from the antenna passes through the radome and as a result some of the characteristics of the antenna change.

Absorbers and Rasorbers :It is very important to protect our strategic defense systems against detection by enemy radars. Absorbers are used to absorb the incoming electromagnetic waves so that the radar cross section (RCS) of the system can be reduced and the stealth property of the system can be improved.

Selected Publications:

- ◆ Aparna Parameswaran, Hrishikesh S. Sonalika and Debidas Kundu, "Temperature-Dependent Electromagnetic Design of Inhomogeneous Planar Layer Variable Thickness Radome for Power Transmission Enhancement", IEEE Antennas and Wireless Propagation Letters, Vol. 20, 1572-1576, 2021, IEEE.
- ◆ Aparna Parameswaran, Debidas Kundu and Hrishikesh S. Sonalika, "A Dual-Polarized Wideband Frequency Selective Rasorber with Low In-Band Insertion Loss and High Oblique Incidence Stability", IEEE Transactions On Electromagnetic Compatibility, Vol. 63, Issue 6, 1820-1828, 2021, IEEE.

**Dr. Sarang Dhongdi**

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Areas of Research:

Underwater Acoustic Sensor Networks, Flying Ad-hoc Networks, Underwater communication, Digital Signal Processing

Research Summary:

The main focus of the research work is to explore the three-dimensional underwater or aerial space by using wireless ad-hoc and sensor networks.

Underwater Acoustic Sensor Network (UASN) is a modern tool for ocean observation. In the previous work, an energy efficient cross-layer protocol stack has been developed for the three-dimensional UASN. For testing the protocol stack on hardware testbed, an indoor laboratory based hardware testbed set-up has been developed.

Currently, the research work is about mobile underwater sensor networks, consisting of Autonomous Underwater Vehicles (AUVs). This work is being done by using Unetstack simulation platform, developed by ARL, NUS, Singapore. Link -<https://unetstack.net/>

Selected Publications:

- ◆ Joshi, S. Dhongdi, N. Manjarekar and K.R. Anupama, "Multi-Cluster Flying Ad-Hoc Network for Disaster Monitoring Applications," in International Journal of Ad Hoc and Ubiquitous Computing, vol. 36, 2021 (Inderscience).
- ◆ Ansa Shermin S and S. C. Dhongdi, "Multiple AUVs for Ocean Phenomena Monitoring: A Review," 2022 IEEE 19th Annual Consumer Communications & Networking Conference (CCNC), 2022, pp. 1-7, doi: 10.1109/CCNC49033.2022.9700726.

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Area of Research:

D2D Communications, Intelligent Reflecting Surfaces, UAV to UAV communications, Cooperative Relaying, NOMA, mmWave, Machine learning for Communications System, Resource allocations for 5G and beyond networks.

Research Summary:

Driven by increase in new wireless services and applications, as well as the addition of new wireless users, the demand for radio spectrum has grown day by day. It has led to an acute problem of spectrum scarcity. Recently, D2D communications emerged as one of the core technologies of 5G to improve spectral efficiency by leveraging neighborhood information. In a generic D2D framework, two cellular users living in proximity can form a direct link for data transmission without routing it through the base station. The spectral efficiency of D2D communications can be further improved by incorporating latest technologies such as mm Wave, NOMA, Full duplex radio etc. It can also be seen as a building block for UAV to UAV communications.

Selected Publications:

- ◆ M. Dash, R. Bajpai, N. Gupta, P. Aggarwal, "A Nonlinear MIMO-OFDM based Full-Duplex Cooperative D2D Communications System", in IEEE Access journal, pp 1-12, Nov. 2021 (IF=3.367, JCR 2021)
- ◆ R. Bajpai, N. Gupta, and V. A. Bohara, "An Adaptive Full-duplex/Half-duplex Multiuser Cooperative D2D Communications System with Best User Selection," in IEEE Open Journal of the Communications Society (OJCOMS), vol 2. pp- 1445-1457, June. 2021.



Dr. Rakesh R Warier

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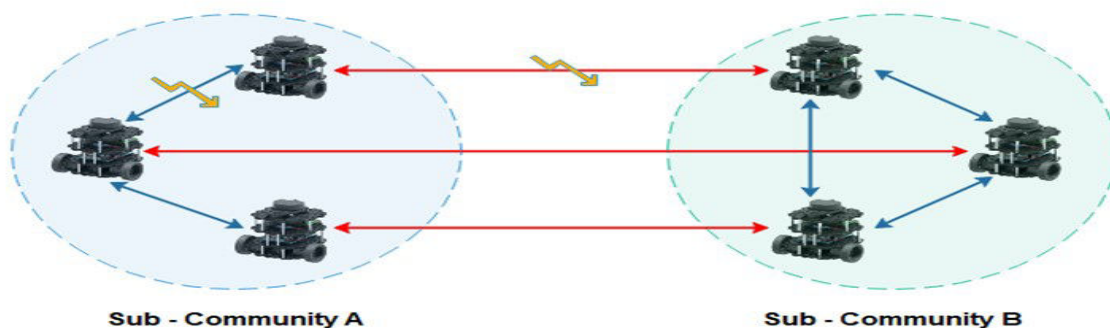
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Areas of Research:

Multi Agent systems, Control and guidance of unmanned aerial systems, Control systems under attack.

Research Summary:

Currently, my research is focused on the control theoretic analysis of the effects of various types of attack on a distributed multi agent systems. One objective is to determine the optimal strategy for an energy constrained adversary, which would be the worst case scenario for the system performance. Additionally, study explores to construct control theoretic methods to mitigate the effects of the attack on the performance of the system.



Selected Publications:

- ◆ Vidya Sumathy, Rakesh Warier, Debasish Ghose (2022), Design, Reachability Analysis, and Constrained Motion Planning for a Quadcopter Manipulator System, AIAA SCITECH 2022 Forum.
- ◆ Rudrashis Majumder, Rakesh R Warier, Debasish Ghose, Game-theoretic model based resource allocation during floods, arXiv preprint arXiv:2112.01439, 2021

**Dr. Ravi Kadlimatti**

Ph.D, The State University of New York, New York, USA

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Areas of Research:

Signal Processing, Communications, Radar, Phased Arrays.

Research Summary:

My work focuses on designing signals and digital signal processing algorithms for improving diversity and multiplexing of signals for MIMO Radar and communications applications. This involves exploring a combination of classical and optimization based approaches to problem solving. I regularly use MATLAB and CST Microwave Studio for design and simulations.

Research Example:

- ◆ Vibrating Antenna Radar: A new phased array technology consisting of an array of vibrating antennas that induce Doppler shift in the transmitted signal, is developed. This in essence maps the spatial resolution to the frequency resolution. Thus, achieving the resolution of a 2D-array using a 1D array of vibrating antennas.
- ◆ Design of Good Code Sets for MIMO Radar and Communications applications such as chirp spread spectrum communications, low-earth-orbit (LEO) satellite communications.
- ◆ Orbital Angular Momentum (OAM) Communications: Spatially orthogonal OAM beams all using the same frequency and time resource could potentially offer high data rates and maximize the channel capacity in line-of-sight wireless communications

Selected Publications:

- ◆ N. Chordas-Ewell, K. Xu, R. Kadlimatti, A. T. Fam and J. H. Choi, "Vibrating Antenna Doppler Radar," 2020 17th European Radar Conference (EuRAD), 2021, pp. 242-245, doi: 10.1109/EuRAD48048.2021.00069.
- ◆ R. Kadlimatti, S. Jha and A. Bhandari, "Polyphase Good Code Sets Based on Symmetrical and Anti-symmetrical Segments of Linear/Piecewise Linear FM Waveforms," 2021 2nd International Conference on Range Technology (ICORT), 2021, pp. 1-6, doi: 10.1109/ICORT52730.2021.9581865.



Dr. Soumyabrata Barik

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Areas of Research:

Electrical Power Systems, Electrical Distribution Networks, Renewable DG Integration, Soft Computing Techniques, Microgrid, Electric Vehicles

Research Summary:

In usual practice, the amount of power exchanged with the main upstream grid is the power requirement by the loads. However, a novel zero bus load flow can be proposed where the predefined power exchange takes place through the PQV δ bus instead of the slack bus. For the PQV δ bus, along with voltage magnitude and angle, the active and reactive powers are also known, unlike the slack bus. The pre-defined active and reactive power can be considered as any pre-defined percentage of the total load or can be decided based on the time of use tariff, where the power exchange varies based on the cost of the electricity. The remaining load demand can be supplied by renewable resources. To carry out the research problem, different objective functions such as loss reduction, voltage profile improvement, profit maximization can be considered with different techno-economical constraints.

Recent Publications:

- ◆ S. Barik, D. Das, “A novel Q-PQV bus pair method of biomass DGs placement in distribution networks to maintain the voltage of remotely located buses”, Energy Elsevier, vol. 194, pp. 116880, (<https://doi.org/10.1016/j.energy.2019.116880>), 2020, Impact Factor-7.147.
- ◆ S. Barik, D. Das, R. C. Bansal “Zero bus load flow method for the integration of renewable DGs by mixed-discrete particle swarm optimisation-based fuzzy max-min approach”, IET Renewable Power Generation, doi-10.1049/iet-rpg.2020.0713, 2021, Impact Factor-3.894.



Dr. Apurba Chakraborty

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Areas of Research:

Compound semiconductor, heterostructure device modelling and characterization, two-dimensional (2D) material devices.

Research Summary:

We work on gallium nitride (GaN) based heterostructure devices. The reliability characteristics of these devices are investigated by experimental and simulation method. Recently, we have also grown research interest in two-dimensional material devices.

Research Example:

AlGaN/InGaN heterostructure shows higher electron confinement compared to AlGaN/GaN heterostructure due to the higher conduction band offset. We carried out the frequency dependent conductance measurement of AlGaN/GaN and AlGaN/InGaN/GaN heterostructure devices. We found that the GaN based heterostructure suffers from more trapping effects compared to the InGaN based heterostructure devices.

Selected Publications:

- ◆ Rinku Rani Das, Santanu maity, Atanu Chowdhury and Apurba Chakraborty “RF/Analog performance of GaAs Multi-Fin FinFET with Stress effect” Microelectronics Journal, Elsevier, 117, 105267, 2021.
- ◆ Apurba Chakraborty, Ankush Bag, Partha Mukhopadhyay Saptarsi Ghosh and Dhrubesh Biswas, “Elimination of V-shaped pits formation in InGaN/GaN/AlN/GaN heterostructure by metal modulation growth technique” Semiconductor Science and Technology, 33, 4, 2018



Dr. Kizheppatt Vipin

Ph.D, Nanyang Technological University, Singapore

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Area of Research:

My research is broadly focused on embedded systems, reconfigurable computing and adaptive systems and their practical engineering applications.

Research Examples:

High-Level Design of Adaptive Systems : This work is mainly concentrated on FPGA reconfiguration and its applications.

Dynamic Partial Reconfiguration: Partial reconfiguration (PR) involves selectively modifying only portions of an FPGA while the remaining portions continue to execute without interruption.

Embedded Systems Development: This involves some real engineering work. The aim is to develop systems which aid in my mainstream research work along with helping to keep up-to-date with industrial trends.

Selected Publications:

- ◆ M. Shafiee, D. Fedorov, B. Grossan, K. Vipin and G. F. Smoot, 2021 "A Readout System for Microwave Kinetic Inductance Detectors Using Software define Radios" to appear in Journal of instrumentation (JINST).
- ◆ K.S Reddy, K. Vipin, 2019, "OpenNoC: An Open-Source NoC infrastructure for FPGA-based Hardware Acceleration", IEEE Embedded system letters.



Dr.Sudarshan Swain

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Area of Research:

EV charging using PV power, Grid Integration of Solar Power, Power Quality, Active Filter, Kalman Filter.

Research Summary:

I am working on EV charging using PV power considering both grid side and PV side problems. Our current focus is to estimate SOC and SOH from efficient charging and discharging of the EV battery. Designing a prototype of a bidirectional EV charger fed from a grid tied PV system.

Research Example:

Electric Vehicle (EV) is a feasible solution in the transport system with the growing price of fossil fuel. Renewable power sources have also increased to provide power in order to match the growing energy demand. Integrating renewable sources to charge the EV, is the current focus, so that the entire system is clean and green. Photovoltaic (PV) system is the best fit to charge the EV. It is therefore necessary to develop a bidirectional EV charger fed from a grid tied PV system and analyze its performance under various abnormal conditions.

Selected Publication:

- ◆ S. Swain and B. Subudhi, "A New grid synchronization scheme for a three-phase PV system using self-tuning filtering approach," in IET Generation, Transmission & Distribution, vol. 11, no. 14, pp. 3557-3567, 9 28 2017.
- ◆ S. Swain and B. Subudhi, "Grid Synchronization of a PV System with Power Quality Disturbances using Unscented Kalman Filtering," IEEE Trans. on Sustainable Energy, vol. 10, no. 3, pp. 1240-1247, 2019.



Dr. Anurag Nishad

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Areas of Research:

Time-frequency analysis of non-stationary signals, physiological signal processing, speech signal processing, Machine learning and Internet of Things (IoT) in Health care.

Research Summary:

Dr.A. Nishad's research interest lies in analyzing and classifying non-stationary signals such as physiological signals and speech signals. This includes the research on signal decomposition methods, wavelet-based filter-banks, time-frequency planes with better resolution, development of automated systems in healthcare to classify physiological signals.

Research Example:

Emotions are the most powerful information source to study the cognition, behaviour, and medical conditions of a person. Accurate identification of emotions helps in the development of affective computing, brain-computer interface, medical diagnosis system, etc. Electroencephalogram (EEG) signals are one such source to capture and study human emotions. In this Letter, a novel time-order representation based on the S-transform and convolutional neural network (CNN) is proposed for the identification of human emotions.

Selected Publications:

- ◆ A. Nishad, A. Upadhyay, G.R.S. Reddy, and V. Bajaj, Classification of epileptic EEG signals using sparse spectrum based empirical wavelet transform, Electronics Letters, vol. 56, pp. 1370-1372, 2020.
- ◆ S.K. Khare, A. Nishad, A. Upadhyay, and V. Bajaj, Classification of emotions from EEG signals using time-order representation based on the S-transform and convolutional neural network, Electronics Letters, vol. 56, pp. 1359-1361, 2020.



Dr. Manish Gupta

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Area of Research:

Modeling and Simulation of Emerging Semiconductor Devices, Memories, Ferroelectric Devices, and Biosensors

Research Summary:

My research work involves designing and optimization of semiconductor devices for low power and high-performance applications. I am also involved in exploring the innovative engineering approach to look into the different material systems such as Si (Silicon) or SiGe (Silicon-Germanium) for memory and in-memory computing applications.

Research Example

The transition from off-to-on state in Metal Oxide Semiconductor Field Effect Transistor (MOSFET) is characterized by Subthreshold swing (S-swing), which is limited by the minimum theoretical value of 60 mV/decade at room temperature in classical MOS transistors. Over the years, the scalability of the classical transistor is limited owing to degradation associated with the enhanced degree of short channel effects. Thus, it is of prime importance to look into the transistor architecture and incorporate new physical mechanisms to extend the scalability of the transistor at lower technology nodes along with application specific design considerations.

Selected Publications:

- ◆ M. Gupta and V. P. H. Hu, "Sensitivity Analysis of Ferroelectric Junctionless Transistors for Non-Volatile Memory Applications," 2022 International Symposium on VLSI Technology, Systems and Applications (VLSI-TSA 2022), Hsinchu, Taiwan.
- ◆ M. Gupta and V. P. H. Hu, "Sensitivity Analysis of Negative Capacitance Junctionless Transistor and Design Aspects for High Performance Applications," IEEE Transactions on Electron Devices, vol. 68, no. 8, pp. 4136-4143, 2021.



Dr. Sri Ram Shankar Rajadurai

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Areas of Research:

Scanning Probe Microscopy, Dynamic modelling, Control systems, Optical motion measurement, Micro-electro mechanical systems (MEMS), Nanometrology, Optical communication.

Research Summary:

I develop indigenous instrumentation systems for the next-generation semiconductor and space industry. I investigate applications of precision motion measurement and control, particularly in the domains of Scanning Probe Microscopy and Free-space Optical Communication.

Research Example:

Scanning probe microscopy (SPM) is a versatile technique to characterize the topography and properties of materials with sub-nanometer resolution. It uses a micro-cantilever probe with an atomically sharp tip to measure the nanomechanical forces from a sample surface in order to characterize it. As the probe scans the sample surface, the forces are measured optically and feedback-regulated through a nano-positioner that adjusts the tip's position. SPM has been widely employed in the in-situ characterization of diverse materials including nanoscale semiconductor devices and active biomolecules such as proteins, DNA.

Selected Publications:

- ◆ R. Sriramshankar and G. R. Jayanth, "An integrated magnetic actuation system for high speed atomic force microscopy," IEEE/ASME Transactions on Mechatronics, vol. 23, pp. 2285-2294, 2018.
- ◆ R. Sriramshankar, R. S. M. Mrinalini, and G. R. Jayanth, "Design and Fabrication of a Flexural Harmonic AFM probe with an Exchangeable tip", J. Micro Bio-robotics, vol. 13, p. 39, 2017.

**Dr. Pramila Jakhar**

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Areas of Research:

Electrochemical Biosensors, Conducting Polymers, Organic and inorganic hybrid devices, Electrochemical growth and Characterization, Hydrothermal growth technique, Metal deposition techniques.

Research Summary:

Research and development of self-powered wearable biosensors for glucose monitoring and various other diseases monitoring like cardiac health and respiration rate.

Research Example:

Wearable sensors are evolving as the next generation point of care testing (POCT) devices in personalized healthcare monitoring. The need of continuous monitoring of vital biomarkers for medical diagnostics has accelerated the research in the area of development of POCT devices. Especially, this requirement is indispensable in case of elderly people.

Selected Publications:

- ◆ Rajagopalan Pandey, PramilaJakhar, PalaniAnandlyamperumal, Vipul Singh, Sang-Jae Kim, “Elucidations on the effect of lanthanum doping in ZnO towards enhanced performance nanogenerators”, International Journal of Precision Engineering and Manufacturing-Green Technology 7, 77–87 (2020).
- ◆ PramilaJakhar, Mayoorika Shukla, and Vipul Singh, “Investigation of Dopant Effect on the Electrochemical Performance of 1-D Polypyrrole Nanofibers Based Glucose Biosensor”, Journal of Material Science: Material in Electronics 30, 3563-3573 (2019).



Dr. Noel Prashant Ratchagar

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Areas of Research:

IC fabrication, Biosensors, Porous membranes.

Research Summary:

Miniaturized silicon biosensors were developed to measure the concentration of triglycerides. Electrolyte-insulator-semiconductor capacitor, whose working principle is similar to the working of a metal-oxide-semiconductor capacitor, was fabricated with silicon nitride as the insulator and silver – silver chloride as the sensing electrode. Standardization of the biosensor was done using various pH solutions and a sensitivity of 56.5 mV/pH was observed. The devices were used to detect the triglyceride concentration within the clinical range of 50 – 150 mg/dL from the blood serum.

Nanoporous membranes, with an average pore size of 8 nm, were fabricated on silicon using solid-phase crystallization techniques. Initially a systematic study was conducted to understand the transportation of biomolecules using zinc oxide nanoparticles as analogues. Selective transportation was achieved by varying the size and charge of the particles. An optical sensor was developed to monitor the dialysis of the biomolecules.

Currently working towards development of wearable biosensors for continuous, real-time monitoring of various diseases.

Selected Publications:

- ◆ Ratchagar N. P., Fidal V. T., Bhadra P., Ghosh A., Chadha A., and Bhattacharya E. "Sensor for continuous and real-time monitoring of biomolecule permeation through ultrathin silicon nanoporous membranes" IEEE Sensors Journal vol. 19, pp. 4419-4427, 2019.
- ◆ Bhadra P., Sengupta S., Ratchagar N. P., Achar B., Chadha A., and Bhattacharya E., "Selective transportation of charged ZnO nanoparticles and microorganism dialysis through silicon nanoporous membranes", Journal of Membrane Science, vol. 503, pp. 16-24, 2016.



Dr. Vivek K. P. Chandran

Working towards Ph.D

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Areas of Research:

Dynamics & Control, Estimation Theory, Flight & Space Dynamics, Attitude Kinematics, Vehicle Hybridization

Research Summary:

Currently pursuing Ph.D. on the topic Gyro-less Attitude and Attitude-Rate Estimation For A Satellite Using Non Linear Models And Star Vector Observations. Attitude Determination and Control System (ADCS) is the resident module which estimates the current pointing attitude of the satellite, compares it with the desired/specified orientation commanded by the ground station and applies the required correction torque to bring it to the referenced attitude. Stellar inertial system of the present day satellite uses a dynamic model based on the moment of inertia, which in turn, varies with the fuel displaced while propagation. The sub half kilogram class of satellites (micro satellites), which is sensitive to moment of inertia changes, would demand for the development of a non-linear dynamic model which is independent of moment of inertia. The non-linear filtering methods for attitude estimation, available in the current literature, is heavily based on application of extended Kalman filter. This approach requires the satisfaction of Gaussian assumption that the probability density function is adequately specified by its mean and covariance.

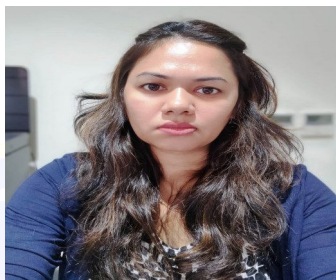
Research Example:

The orbit of the satellite is assumed to be in such a way that • Eccentricity (e) zero, Semi major axis (a) 6992 Km, Inclination (i) 98.76 degrees so that on 10th August 2019, the satellite is above latitude 12:58 degrees and longitude 77:38degrees, which gives Argument of Perigee (w) = 0 degrees, • Argument of Ascending Node(W) = 11:8677 degrees, • True Anomaly (Q) = 167:269 degrees. The error between body frame of reference and satellite frame of reference is assumed to be 1 degrees in all the three directions and the mounting matrix DBS is an identity matrix.

Support Staff



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Mr. Anil Lamani



Mr. Ramesh Bhattu



Mr. Mayur Satarkar

Research Scholars

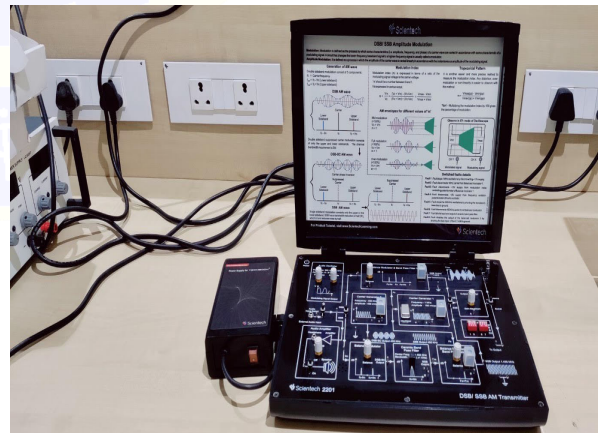
Name of Ph.D Scholar	Thesis Title
Kadam Bhushan Vinayak	Ultra-wideband Microstrip Antenna Beamformer for Wireless Applications.
K. Laxminarsimha Chary	Development of Marine Soundscape for Shallow Underwater Environment
Khanolkar Shailesh Vijay	Development of Resource Allocation Strategies for Device to Device Communication underlying Cellular Networks
N. Balakrishnan	Development of Algorithmic Approaches for Optimization of Flight and Maintenance Planning
Kalyan Ram B	Development of Resource Management Strategies for Machine to Machine Communication Platform
Vivek Chandran K P	Gyro-less Attitude and Attitude-Rate Estimation for A Satellite Using Non Linear Models and Star Vector Observations.
Chembiyan Thambidurai	A General Theory of Cascaded PLLs and its Application to Low noise Frequency synthesis and Wideband Modulation.
Manish Varun Yadav	Design And Investigation Of Ultra-Wideband Compact Planar Antenna For Multiple Applications.
Deshpande Shreyas Suresh Rao	Development of Micro/Nano Interdigitated Electrode Devices for Ultrasensitive and Reliable Biosensors.
Abhijit Dey .	Development of Algorithms for Performance Improvement of GNSS Receiver under Harsh Atmospheric Conditions.
Prateek Singh .	Performance Optimization of GNSS Receiver.
Somesula Sivasagar N N	Resource Allocation in Cloud radio Access Network
D R Karthik	Investigation of High-Depth Penetration of DFIG-Based Wind Power Plants on Rotor Angle Stability of Large Power Systems
Neelam Srikanth	Reconfigurable architecture of neural network for computer vision
Kasi Bandla	Low Power Design of Data Converters Using Pipelining
Ansa Shermin S	Topology Control for Three Dimensional Mobile Underwater Sensor Networks
Joshi Viraj Vilas	Approximate Arithmetic Circuit Design for Error Resilient Applications
Ravishankar Prakash Desai	Nonlinear Modeling and Control Synthesis for a Class of Autonomous Underwater Vehicles

Name of Ph.D Scholar	Thesis Title
Ravishankar Prakash Desai	Nonlinear Modeling and Control Synthesis for a Class of Autonomous Underwater Vehicles
Swati Varun Yadav	Design and investigation of compact high power microwave (HPM) antenna
Afroz Fatima	Design of Neuromorphic Circuits using Emerging Memory Devices
Anjli Varghese	Image Processing and Machine Learning Techniques for Leather Species Identification
Aparna A P	Design and Optimization of Antennas and Radomes
Anita Ramachandran	Design and Development of Intelligent Geriatric Healthcare System
Rahul Bajpai	Outage Analysis for Full-Duplex Cooperative Device-to-Device Communications System
Jerry Anto K	Designing Approximate Circuits for Trigonometric Functions
Surajit Bhattacharjee	Design of Advanced AI Driven Functional Verification Collateral for Low Power Verifiable Digital Interfaces
Suraj S	Power Electronic Converters and Control Strategies for V2G/V2H Systems
Gopika R	Resilient control of distributed systems
Farhana Firdous	Orbital Angular Momentum Communication System
Indu Chandran	Optimal 3D deployment of multi-uav network with minimal latency, maximum coverage and secured communication for disaster management applications
Purab Nandi	Design, Implementation of Model Compression algorithms for ML/DL on SoC based wearable devices for Geriatric Healthcare
Rishikesh Girish Datar	Novel Biosensor Devices for Bio/Chemical Sensing

Facilities and Laboratories

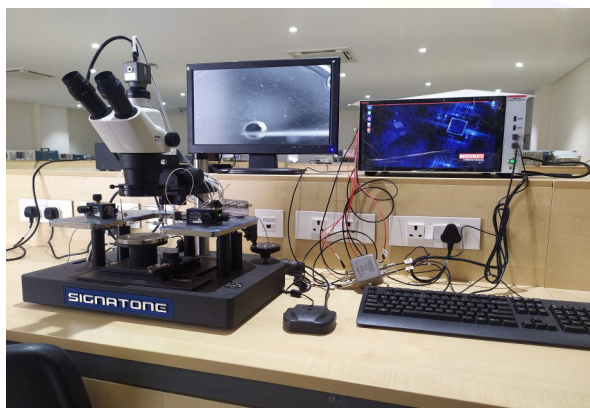
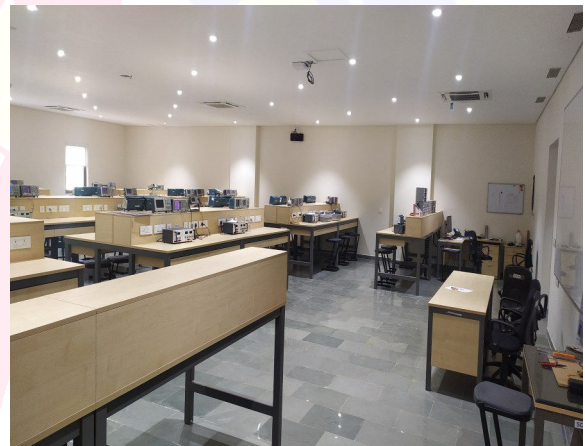
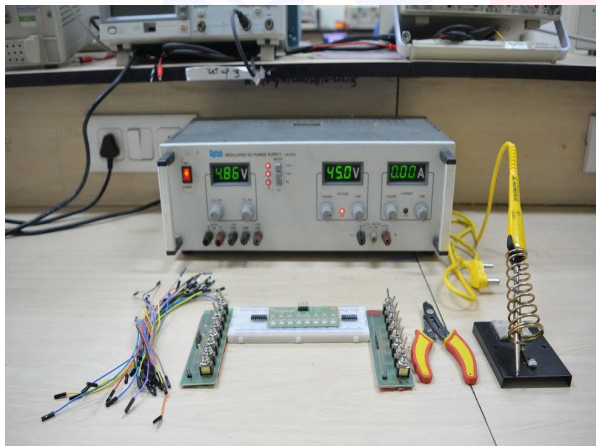
Digital Communication Laboratory

Supports teaching and research in analog and digital communication systems. The research in the lab is carried out in the fields of software defined radio and design of various receivers for space applications. The lab also supports research in smart drone networks and underwater communication networks. Toolkits and board for teaching and research purposes are available here. Antenna trainer systems and a microwave test bench are available for Microwave application. Extensive simulation facilities are available through MATLAB, Simulink, Simulia CST Studio suite for RF/microwave application. Projects in the lab have been funded by various organizations including DST, ISRO, Bill and Melinda Gates foundation and DRDO.



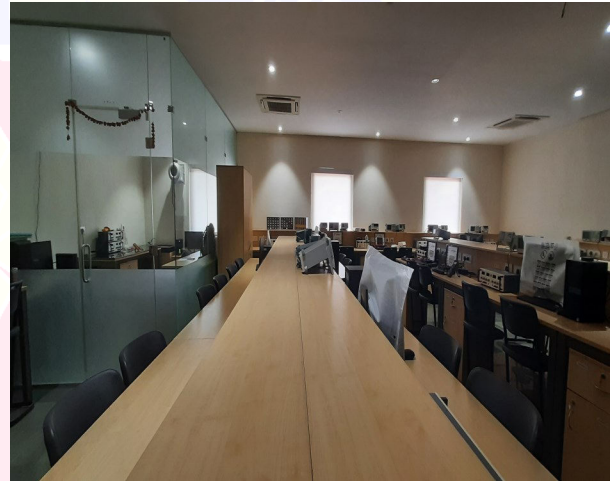
Electronic Design Laboratory

Basic electronic laboratory which provides resources for students to build and debug simple analog and digital electronic circuits. Ability to build complex combinatorial and sequential circuits using standard MSI components. Analog capabilities include opamp circuits, timers, voltage regulators, phase-locked looped, ADCs and DACs. Mostly utilized by the undergraduate and graduate students. We have recently procured a SignatoneH150 Manual analytic probe station along with Keithley 4200A for performing wafer level measurements.



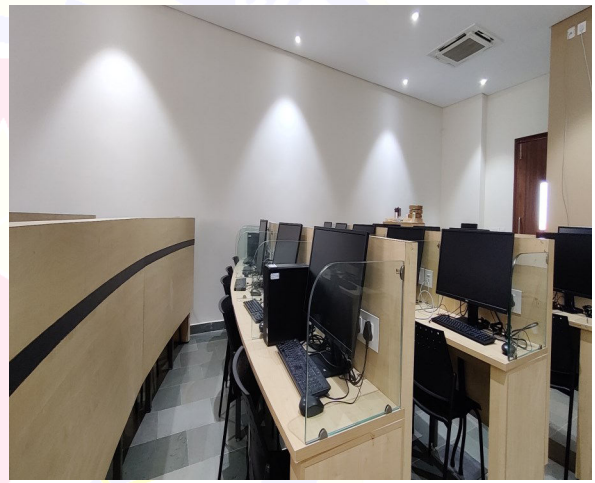
Instrumentation Lab

The lab is dedicated towards research in sensor design and their applications which range from electronics to biotechnology. Interfacing hardware and software is provided by a suite from National Instruments. A PCB prototyping tool is also available in the lab. Additional simulation packages available in the lab include LABVIEW and COMSOL. Projects in the lab have been funded through additional competitive grants from BITS, Pilani.



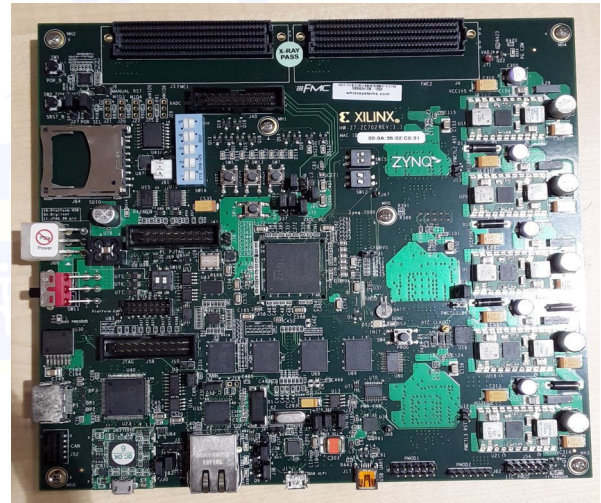
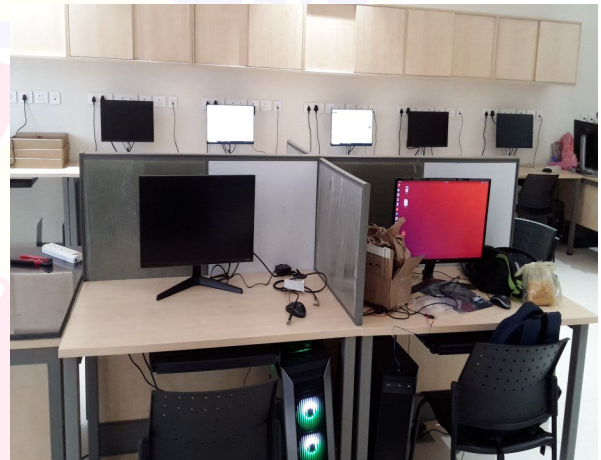
Microelectronics Lab

The lab provides students to the latest device and circuit simulation tools. These include EDA tools from Cadence and Mentor Graphics. Sentaurus suite from Synopsys is available for device simulations. This lab was established through a DST-FIST grant in 2013.



Reconfigurable Computing Lab

The lab supports research in the fields of reconfigurable computing and FPGA based system design. Various boards including Vertex-7, Kintex-7 and Zynq are available. A logic analyzer by Tektronix and an Arbitrary wave generator from Tabor along with oscilloscopes are also available. Projects in the lab have been funded through BRNS and TCS.



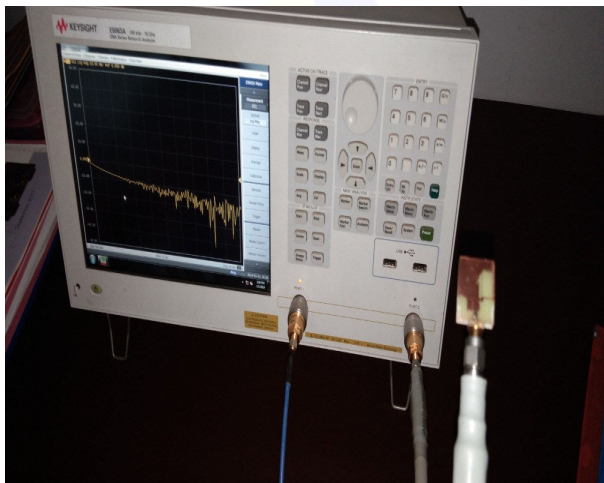
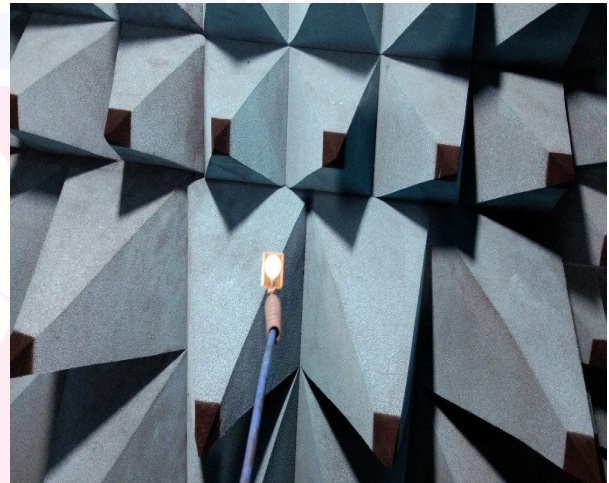
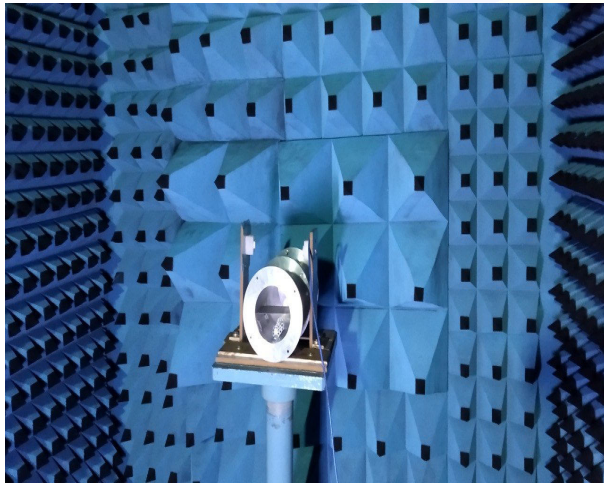
Embedded Systems Lab

The lab supports research in the fields of modular robotics, real time operating systems, wireless sensor networks, IoT networks and wearables. Various ARM and PSoC based development boards are available. Design kits from TI and ATMEL are also available alongwith a wide range of sensors. Projects in this lab have been funded by DST and GAIL.



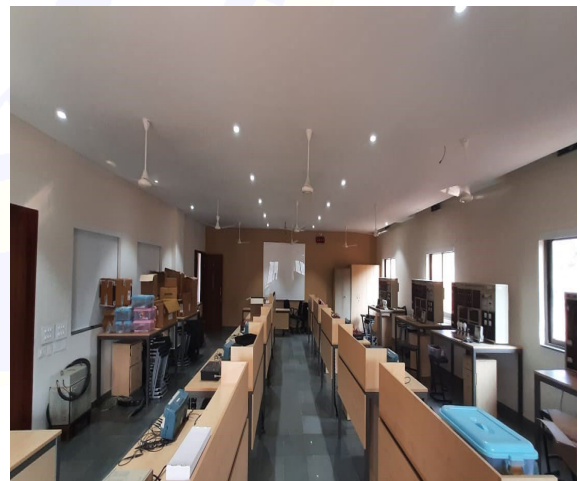
Network Embedded Lab

This lab was setup to support simulation and measurement of RF and Microwave components. The tools in the lab include a Vector Network Analyzer and an Anechoic chamber with a measurement range upto 18GHz. Wireless modules including TelosB, MicaZ, Lotus are also available.



Power Electronics Lab

The lab caters to research in power electronics and EVs. Lab equipment includes Semikrone 3 Phase diode bridge rectifier+ 4 Leg inverter PWM drive, 4-channel DSO, Power analyzers and LCR meters.



Electrical Machines Lab

The lab is a fundamental lab in the department and is primarily a teaching lab. Various equipment include DC shunt motors, DC shunt generators, alternators, induction motors and transformers



Advanced Communication Laboratory

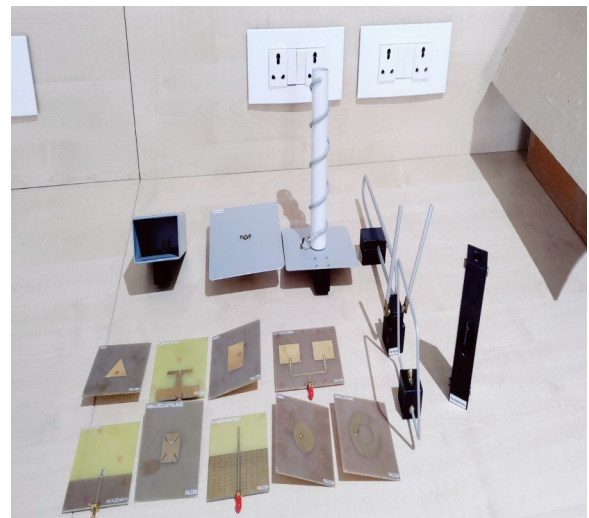
The Advanced Communication Laboratory introduces students to the practice of RF and Microwave Communication. It also involves system design and simulation using CST. This lab is mainly catering the research requirements of students and faculties working in the area of RF and Microwave Communication.

Research

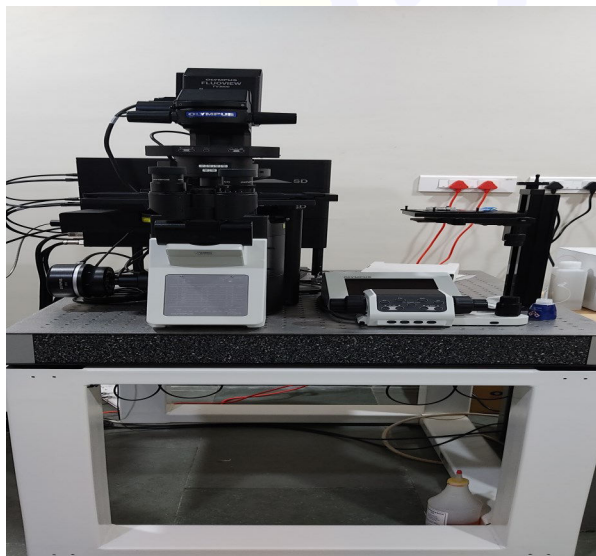
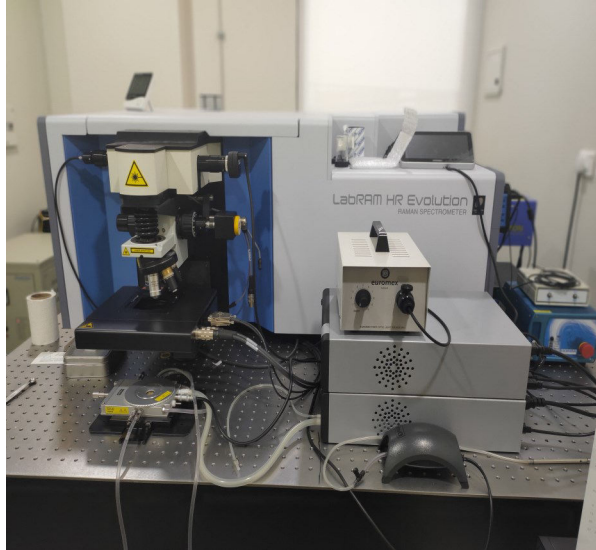
1. RADAR Signal Processing
2. Antenna Design
3. GNSS Signal Processing

Major Equipment

1. Microwave Test Bench
2. Antenna Trainer Kits
3. Optical Communication Trainer Kits
4. Telecommunication Trainer Kits



Central Sophisticated Instrumentation Facility

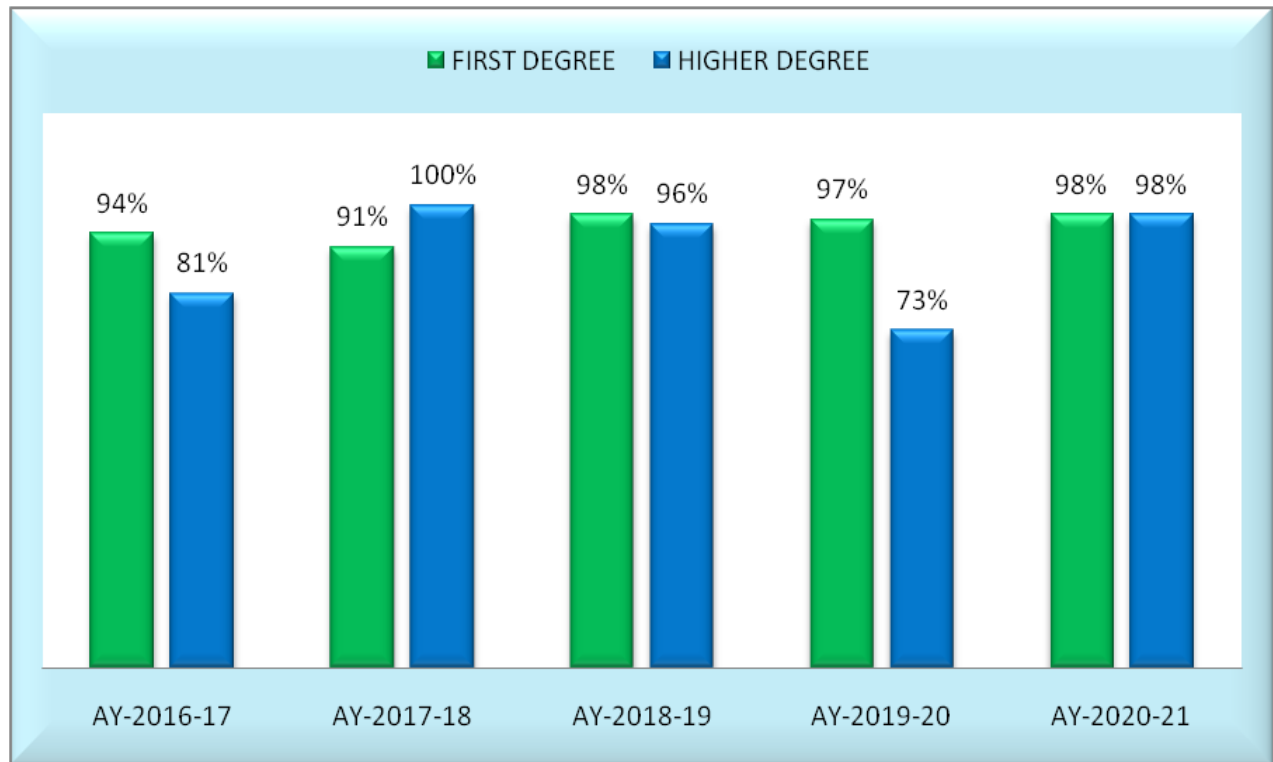


Sponsored Projects

Project Name	PI &(Co-PI)	Funding Agency	Amount	Duration
Investigation of Schottky contacts to Silicon Carbide (SiC) using I-V and C-V techniques	Dr. C. K. Ramesha (PI)	UGC	1,077,800	3 Years
Wireless Sensor Network Design for inaccessible terrains	Dr. K. R. Anupama (PI)	UGC	538,000	3 Years
Hardware implementation of time frequency distribution of Mirnov oscillation in Tokamak using the Hilbert-Huang transform	Dr. Amalin Prince (PI) Dr. K. R. Anupama (Co-PI) Mrs. Femi. R. (Co-PI)	Board of research in fusion science and technology (BRFST)	2,258,000	2 Years
Design and development of condition based monitoring of pipelines using wireless sensor networks	Dr.K. R. Anupama (PI) Dr.Arun Kumar Jalan (Co-PI) Dr.Lucy J Gudino (Co-PI) Dr.K. N. Ponnani (Co-PI) Dr.Sharad Srivastava (Co-PI) Dr.Neena Goveas (Co-PI)	GAIL	7,136,000	2 Years
Design and development of condition based monitoring of pipelines using wireless sensor network	Dr. K. R. Anupama (PI) Dr. Lucy Gudino (Co-PI) Dr. Neena Goveas (Co-PI)	GAIL	9,587,678	
FPGA Based Fuzzy Logic Picomotor Controller for Laser Beam Pointing Stability Correction	Dr. A. Amalin Prince (PI)	Plasma and Fusion Research Committee, under DAE-BRNS, Gujarat.	2,446,000	2 Years

Project Name	PI &(Co-PI)	Funding Agency	Amount	Duration
Development of SDR based GNSS receiver	Dr. Nitin Sharma(PI)	ISRO	3300000	2 Years
Indigenous Development of Automated Correlation System	Dr. Nitin Sharma(PI) Dr. M K Deshmukh(CO-PI)	UMR-DRDO	396750	6 Months
Cloud-Based Analytical Sensor Test Kit for Advanced Process Control	Dr. Nitin Sharma(PI) Prof Srikanth Mutnuri (CO-PI)	Melinda & Gates Foundation	1 crore 25 lakhs	18 Months
Flying Ad Hoc Network for disaster rescue operations	Dr. Sarang C Dhongdi(PI)	SERB-SRG	2156000	2 Years
MPSoC Based Automated Digital Signal Processing System for Tokamak Reflectometry	Dr. A. Amalin Prince(PI)	BRNS	2529350	3 Years
Image Processing and Machine Learning Techniques For Leather Species Identification	Ms. Anjili Varghese(PI) Dr. A. Amalin Prince (Mentor)	TCS-RSP	2534000	4 Years
Surface wave launcher design and simulation	Dr. Ashish Chittora(PI) Dr. M K Deshmukh(CO-PI)	Intel Technology India Pvt. Ltd	1091500	6 months
Vibrating Antenna Radar	Dr. Ravi Kadlimatti	SERB-SRG	2453050	2 Years
Development of low cost vectorised NavIC software receiver for urban environments	Dr. Nitin sharma	SERB	2171400	3 Years
Design of Streamlined Ablatable Radome for Airborne Applications	Dr. Hrishikesh S Sonalekar Debidas Kundu	DRDO	1678600	3 Years

Placement Data



Practice School

Practice School is a hallmark of the BITS Curriculum. Practice School is an educational innovation seeking to link industry experience with university instruction. Especially the capstone PS-II Program creates the required setting for experiential learning, by providing students with an opportunity to work on relevant assignments in an industry of their choice, under the guidance of professional experts and the supervision of faculty.

