NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA

Surathkal, Mangaluru, India 575025

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

About the Institute

National Institute of Technology Karnataka, Surathkal is located in Mangaluru City, Karnataka State, India. The Institute was established as Karnataka Regional Engineering College (KREC) in 1960 and upgraded to the National Institute of Technology Karnataka (NITK) in 2002. The functioning of NITK is governed by NIT Act, 2007 and by the rules laid down by the Government of India from time to time. NITK Board of Governors comprises the Chairperson nominated by the Institute Visitor, the Director, and the nominated members of the Government of India, the Government of Karnataka, the NIT Council, the Institute Senate, and the nearest Indian Institute of Technology. The institute is considered as a premier centre engaged in imparting quality technological education and supporting research and development activities. The institute has a long tradition of research for several decades in both traditional and modern areas of engineering and science. In the recent India Ranking-2022 announced by the National Institutional Ranking Framework (NIRF), NITK secured 10th position in the Engineering Discipline and 27th position in the Overall category. Another academic distinction of the institute is that the National Board of Accreditation (NBA) has granted accreditation to nine undergraduate and 18 postgraduate programmes.

Vision

To facilitate transformation of students into good human beings, responsible citizens & competent professionals, focusing on the assimilation, generation and dissemination of knowledge.

Mission

- Impart quality education to meet the needs of profession and society, and achieve excellence in teaching-learning and research.
- Attract and develop talented and committed human resources, and provide an environment conducive to innovation, creativity, team-spirit and entrepreneurial leadership.
- Facilitate effective interactions among faculty and students, and foster networking with alumni, industries, institutions and other stake-holders.
- Practice and promote high standards of professional ethics, transparency and accountability.

About the Department

The Department of Electronics and Communication Engineering offers an Undergraduate programme in Electronics and Communication Engineering and three Postgraduate programmes in VLSI Design, Communication Engineering & Networks and, Signal Processing & Machine Learning. In addition, it also offers M.Tech (Research) and PhD programmes in these three streams. These PG/ PhD programmes have been designed to provide a platform for bright graduates and postgraduates to conduct research in state-of-the-art technologies. The Department is also a recognized centre under the Quality Improvement Program (QIP) of the Government of India. The B.Tech. in E&C engineering at NITK is one of the most sought-after programmes in the country and attracts top 1% students qualifying in the JEE(Main) exam. The M.Tech. programmes are also equally sought after by the students qualifying in GATE examination. The students of the department have been consistently securing top ranks in national competitive examinations such as Civil Services Examination, Engineering Services Examination, Graduate Aptitude Test in Engineering (GATE) and Common Admission Test for Management Institutes (CAT). Students graduating from the department are regularly recruited by several National and International companies working in core ECE domain, Indian Public Sector companies as well as Multinational companies working in the IT and Financial sectors. In recent years, many leading organizations including Texas Instruments, Intel, ARM, AMD, Qualcomm, Broadcom, Nvidia, Cadence, Synopsys, Microchip, Tejas Networks, Samsung, Central Research Laboratories etc. have recruited graduates as well as post-graduates of the department. Securing close to 100% placement of eligible undergraduate students is a regular annual occurrence. About 10% of the graduates pursue post graduate and doctoral studies in the top-rated Universities in India and abroad. Our students have consistently secured admissions to top rated institutions such as UC Berkeley, Stanford University, Columbia University, Georgia Institute of Technology, University of Michigan at Ann Arbor, ETH Zurich, NUS Singapore (to name a few) in the recent past for graduate studies.

The major goal of the Department is to produce highly knowledgeable, competent and resourceful young engineers who can perform well in a wide variety of job profiles. To achieve this, the curriculum provides a strong foundation in both the analytic and technological aspects of E&C Engineering. It also provides ample opportunities to students to work on mini/major projects, develop communication skills, engage in peer mentoring, explore internship opportunities in industry and world-class universities, engage in entrepreneurships through start-ups, and take part in national and international design contests.

The department has been actively involved in several quality enhancement projects such as Project IMPACT, PI-SSS, EENP, UK-INDIA REC Project, TEQIP and SMD-VLSI Project during the last two decades. In recent years, the department has embarked on R&D projects funded by central agencies such as MHRD, DIT, DST, SERB, ISRO, Govt. of India and private industries. Several funded research projects funded by these agencies

have been executed. In addition, the department is involved in rendering consultancy and advisory services to the Indian Railways, major Public Sector Banks and the Defense Research Development Organization (DRDO) and the police force as well as the district administration of Udupi and Dakshina Kannada districts. The department possesses well trained, competent and highly motivated faculty and staff members who have imbibed and adopted some of the best academic practices being followed in India and abroad. The department has initiated and maintained a continuous dialogue with leading academic institutions, leading industries and R&D organizations. This has resulted in the department being able to develop in step with evolving expectations of students, employers and other stake holders.

Vision

To be a model for academic excellence in the area of Electronics & Communication Engineering.

Mission

M1. Impart quality teaching-learning-experience with state-of-the-art curriculum.
M2. Enhance Research, Consultancy and Outreach activities.
M3. Increase the visibility of academic programmes globally and attract talent at all levels.
M4. Foster sustained interaction with the alumni, industries, R & D organizations, world class universities and other stakeholders to stay relevant in the globalized environment.

Programmes offered

1. B.Tech. in Electronics and Communication Engineering

2. M.Tech and M.Tech (Research) in
   - VLSI Design
   - Communication Engineering and Networks
   - Signal Processing and Machine Learning

3. Ph.D.

BTech in Electronics and Communication Engineering

Admission

In the institute, admission to the four-year B.Tech. Programmes are made in the odd semester of each session at the first-year level. The Joint Seat Allocation Authority (JoSAA) has been set up by the Ministry of Education [erstwhile Ministry of Human Resources Development (MHRD)] to manage and regulate the joint seat allocation for admissions to IITs, NITs, IIEST Shibpur, IIITs and other Centrally Funded Technical Institutes (CFTIs). Admission to all the academic programmes offered by these Institutes is made through a single platform. Admission to NITs is based on the performance in Joint Entrance Examination-Main (JEE-Main) conducted by National Testing Agency. For candidates to qualify for admission in the IITs/NITs/IIITs and such other CFTIs whose admission is based on JEE-Main ranks, they should have secured at least 75% marks in the 12th Class or be in the top 20 percentile in the 12th Class exam conducted by the respective Boards (65% for SC/ST/PwD students). A limited number of admissions is offered to Foreign Nationals and Indians living abroad (DASA & ICCR) by the rules applicable for such admission issued, from time to time, by MoE. Sanctioned intake and admitted student strength for the B.Tech. Electronics and Communication Engineering Programme for the current and the past three academic years are as follows:

Intake/Strength for B.Tech. Electronics and Communication Engineering	2022-23	2021-22	2020-21	2019-20
Sanctioned Intake	**116**	**116**	**123**	**104**
Total number of students admitted in the Programme (including DASA & ICCR)	**133**	**132**	**135**	**120**

Programme Educational Objectives (PEOs)

PEO1: Practice Electronics and Communication engineering in a successful professional career.

PEO2: Pursue higher education and / or research for professional development.

PEO3: Contribute as an individual or a team member with demonstrable attributes in lifelong learning for the welfare of the society.

Programme Outcomes and Programme Specific Outcomes

The Department adopted the Programme Outcomes recommended by the NBA and specified two Programme Specific Outcomes.

Programme Outcomes (POs)

PO1 ***Engineering knowledge:*** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 ***Problem analysis:*** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 ***Design/development of solutions:*** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 ***Conduct investigations of complex problems:*** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 ***Modern tool usage:*** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 ***The engineer and society:*** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 ***Environment and sustainability:*** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 ***Ethics:*** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 ***Individual and teamwork:*** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 ***Communication:*** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 ***Project management and finance:*** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 ***Life-long learning:*** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs)

PSO1 Possess sound theoretical and practical knowledge of Electronics and Communication Engineering.

PSO2 Devise and deliver efficient solutions to challenging problems in Electronics and Communication Engineering.

Programme Curriculum (2021)

The curriculum has been designed in line with the requirements of the stated POs and PSOs. Further, the curriculum has various well-balanced course components under basic sciences, engineering sciences, humanities and social sciences, programme core, programme electives, project, and mandatory learning courses.

The mandatory learning courses include environmental studies, professional ethics and human values, an introduction to design thinking, a liberal arts course, a seminar, practical training, and co-curricular and extracurricular activities. The curriculum allows students to register for certified MOOC courses (NPTEL/SWAYAM etc.) limited to 8 credits for their elective credit requirement. Following is a list of courses offered for the B.Tech. E&C Engineering Programme:

Course Component	Total number of credits
Basic Science Core Courses	16
Engineering Science Core Courses	13
Humanities and Social Science Courses	9
Program Core Courses	62
Programme Specific Electives, Mini Projects (0 - 6 credits), MOOC Courses (0 – 8 credits)	39
Major Project	6
Mandatory Learning Courses	16
Total (Minimum Credits to be earned)	**161**

Basic Science Core (BSC)
CY110 Chemistry
CY111 Chemistry Laboratory
MA110 Engineering Mathematics - I
MA111 Engineering Mathematics - II
PH110 Physics
PH111 Physics Laboratory

Engineering Science Core (ESC)
CS110 C Programming
CS111 C Programming Lab
ME110 Elements of Mechanical Engineering
ME111 Engineering Graphics
WO110 Engineering Mechanics

Humanities and Social Science Core (HSC)
SM110 Professional Communication
SM300 Engineering Economics
SM302 Principles of Management

Mandatory Learning Courses (MLC)
CV110 Environmental Studies
SM111 Professional Ethics and Human Values
EC390 Seminar
EC490 Practical Training
UC100 Introduction to Design Thinking
UC401 Liberal Arts courses/co-curricular/ extracurricular activities

Project (MP)
EC498 Major Project

Programme Core (PC)
EC101 Joy of Electronics and Communication
EC102 Circuits and Systems
EC200 Digital System Design
EC201 Analog Electronics
EC202 Analog and Digital Communication
EC203 Linear Algebra and Probability Theory
EC204 Digital System Design Lab
EC205 Analog Electronics Lab
EC206 Microprocessors
EC207 Electromagnetic Waves and Transmission Lines
EC208 Digital Signal Processing
EC209 Control Systems
EC210 Microprocessors Lab
EC211 Digital Signal Processing Lab
EC300 VLSI Design
EC301 RF Components and Circuits
EC302 VLSI Design Lab
EC303 Communication Lab-I
EC304 Communication Lab-II

Programme Specific Electives (PSE)
To access the complete list of PSE offered, please refer to the curriculum. Scan the QR code or click the below link to access the latest curriculum.
<https://tinyurl.com/2hy65t5x>

Minor

Electronics and Communication Engineering students can take additional specified courses totalling to a minimum of 15 credits for, a) Minor in other disciplines where all the courses are offered by a department other than the Electronics and Communication Engineering department, or b) Interdisciplinary Minor where courses are offered by two or more departments. If the student earns the specified total number of credits required for the minor discipline, then it will find a mention in the student's grade cards and degree certificate.

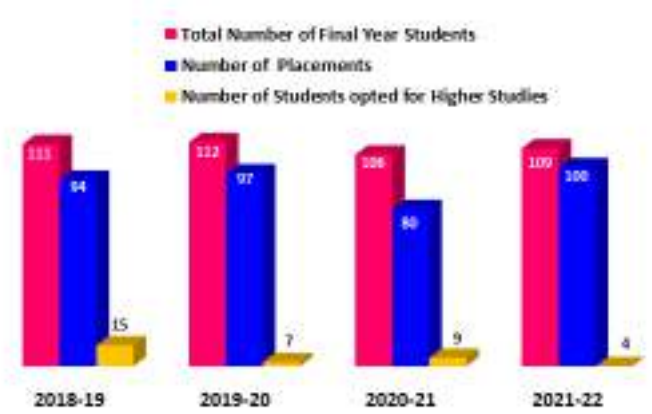
Honors

Electronics and Communication Engineering students seeking Honors degree shall credit a minimum of 16 additional credits from a minimum of four Postgraduate courses offered by the Department of Electronics and Communication Engineering as decided by the Department Undergraduate Committee.

Students' Performance

Students' Academic Performance, Placement and Higher Studies

Students of the Programme have good academic performance, with an average success rate of more than 98%. During the academic years 2018-19 to 2021-22, the combined average placement & higher studies is above 90 per cent in highly reputed companies and universities abroad. The percentage of students who qualified in national/international level tests and opted to pursue higher studies is approximately 10%.



Students' Participation in Professional Activities

The Institute has student chapters of major national and international technical societies such as IEEE Student Branch (CAS, SP, IAS, CS, Photonics, Robotics & Automation, GRSS chapters), CSI Student Chapter, ISTE Student Chapter, IET student chapter, Star Gazing Club, Photography Club etc. Students participate in Workshops/STTPs conducted under TEQIP/ facilitated by various Institute MoUs, Engineer (Technical festival), Incident (Cultural Festival), International Design Competitions such as TI Innovation Challenge, Nebula (supported by Cosmic Circuits) and Intel Lead Program.

The students of the department conduct various activities under the aegis of IEEE, IET, ISTE and other technical clubs. The activities include, IEEE Hardware hackathon- Embedathon, Technical Talks under IEEE Impulse, Insight, Hacktoberfest & Prometheus, student projects under IEEE Envision, Eureka, Hackathons under IEEEXtreme and Praelium, activities under IEEE WiE & SIGHT, to name a few. The students also conduct various technical activities such as Technical Talks, Project Competitions and Project Expo etc as part of the institute annual technical event ***Engineer***.

Students' Publications

Journal Publications

1. Aatresh, Anirudh Ashok, Rohit Prashant Yatgiri, Amit Kumar Chanchal, Aman Kumar, Akansh Ravi, Devikalyan Das, B. S. Raghavendra, Shyam Lal, and Jyoti Kini. "Efficient deep learning architecture with dimension-wise pyramid pooling for nuclei segmentation of histopathology images." Computerized Medical Imaging and Graphics, Elsevier, 93 (2021): 101975.
2. Kanu, Sumit, Rohit Khoja, Shyam Lal, B. S. Raghavendra, and C. S. Asha. "CloudX-net: A robust encoder-decoder architecture for cloud detection from satellite remote sensing images." Remote Sensing Applications: Society and Environment, Elsevier, 20 (2020): 100417.
3. Aatresh, Anirudh Ashok, Kumar Alabhya, Shyam Lal, Jyoti Kini, and PU Prakash Saxena. "LiverNet: efficient and robust deep learning model for automatic diagnosis of sub-types of liver hepatocellular carcinoma cancer from H&E stained liver histopathology images." International journal of computer assisted radiology and surgery, Springer, 16 (2021): 1549-1563.
4. Kalra, Abhi, Aaron Sequeira, Aditya Manjunath, Shyam Lal, and Raghavendra BS. "A new deep learning architecture for dehazing of aerial remote sensing images." Multimedia Tools and Applications, Springer, (2022): 1-17.

Conference Publications

1. Yeshwanth, Y. P., TP Vara Prasad, Vivek Mudadla, and S. Rekha, "Ultra Low Voltage, Low Power Active-RC Filter in 90 nm CMOS Technology", IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), pp. 1-6. IEEE, 2019 - **Won the best paper award**.
2. Nayak, Ashika, Samarth Bonthala, Yashas Uppoor, and M. S. Bhat, "Design of High Gain Operational Transconductance Amplifiers in 180 nm CMOS Technology", IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), pp. 1-4. IEEE, 2019.

3. Bonthala, Samarth, Yashas Uppoor, Ashika Nayak, Sreenivasulu Polineni, and M. S. Bhat, "Design of High-Resolution Delta Sigma Modulator in 180 nm CMOS technology", 9th IEEE International Symposium on Embedded Computing and System Design (ISED), pp. 1-6. IEEE, 2019.
4. Sudhakar, Hitesh, Lamia M. Kalam, Sripathi Muralitharan, S. P. Deepu, and David S. Sumam, "Hardware Implementation of Dual-Tree Wavelet Transform Based Image Reconstruction", IEEE International Symposium on Circuits and Systems (ISCAS), pp. 1-5. IEEE, 2020.
5. Sathwik, G. S., Barun Kumar Acharya, Bilal Ali, Deepu S. P. and Sumam David S., "Real-Time Hardware Implementation of 3D Sound Synthesis", IEEE Asia Pacific Conference on Circuits and Systems (APCCAS), pp. 232-235. IEEE, 2020.
6. Ritwik, Kotra Venkata Sai, Shareef Babu Kalluri, and Deepu Vijayasenan, "COVID-19 Detection from Spectral Features on the DiCOVA Dataset", Proceedings of the Annual Conference of the International Speech Communication Association, INTERSPEECH, 2021, 6, pp. 4266–4270.

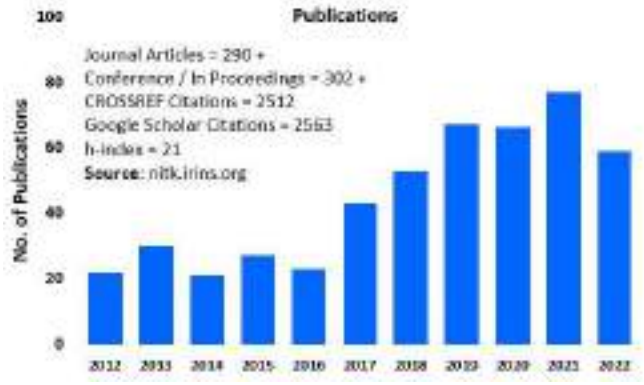
The students actively take part in some of the following technical clubs and societies as part of their co-curricular activities.

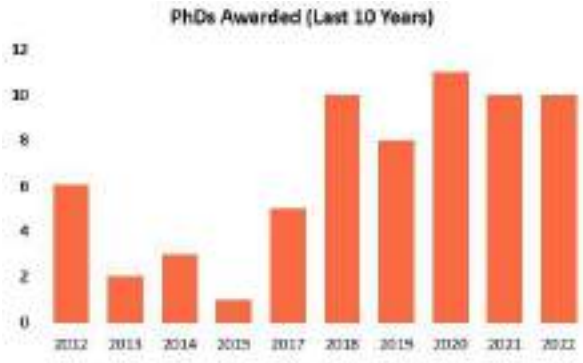
Faculty Information

The department has highly qualified and experienced regular faculty members from various specialisations.

Faculty Name	Highest Degree	Designation	Specialisation
Dr. A. V. Narasimhadhan	PhD (IISc, Bangalore)	Assistant Professor	Medical Imaging, Signal Processing
Dr. Aparna P.	PhD (NITK, Surathkal)	Assistant Professor	Signal Processing, Image & Speech Processing, Multimedia Compression
Dr. Ashvini Chaturvedi	PhD (Multimedia Univ., Malaysia)	Professor and Head	Signal processing application in wireless communication and sensor networks
Mr. B. Nagavel	PhD (Pursuing)	Assistant Professor	Antenna Analysis and Synthesis, Microwave and RF Circuit Design
Dr. Deepu Vijayasenan	PhD (EPFL, Switzerland)	Associate Professor	Speech Signal Processing, Machine Learning
Dr. John D' Souza	PhD (IIT, Kharagpur)	Professor	Communication Engineering, Modulation and Coding, Decoding of Block and Convolutional Codes, Turbo Codes
Dr. Kalpana G. Bhat	PhD (NITK, Surathkal)	Assistant Professor	Analog and Mixed Signal VLSI Design
Dr. Krishnamoorthy K.	PhD (IIT Bombay)	Assistant Professor	RF IC Design, Microwave Circuits & Measurements, Signal Processing
Dr. Laxminidhi T.	PhD (IIT Madras)	Professor	Analog VLSI Design, Mixed Signal Design, Analog Electronics
Dr. Mandeep Singh	PhD (IIT, Roorkee)	Assistant Professor	Silicon Photonics and Optical Sensors
Dr. M. S. Bhat	PhD (IISc, Bangalore)	Professor (HAG)	Analog & Mixed Signal Design, Submicron Devices, RF-MEMS, High-Speed Interconnects, Signal Processing
Dr. Muralidhar Kulkarni	PhD (JMI Central Univ., New Delhi)	Professor (HAG)	Wireless Communications & Networks, Free Space Optics & Optical Communications & Networks
Dr. N. S. V. Shet	PhD (NITK, Surathkal)	Professor	Communications and Networking, Hand off in cellular Mobile Communication
Dr. Nikhil K. S	PhD (IIT Madras)	Assistant Professor	Semiconductor device modeling, Compact Modeling of Devices
Dr. Pathipati Srihari	PhD (Andhra University)	Assistant Professor	Radar Signal Processing, Radar Target tracking and Navigational Systems
Dr. Prabu K.	PhD (NIT, Tiruchirappalli)	Assistant Professor	Wireless Optical Communication, Optical Sensors, Nano-Photonics, 5G Systems and IoT
Dr. Prashantha Kumar H.	PhD (NITK, Surathkal)	Assistant Professor	Error Control Coding, Signal Processing for Communication, RF Receiver Design
Dr. Raghavendra B. S.	PhD (IISc, Bangalore)	Assistant Professor	Signal Processing applications, medical imaging, data mining and patterndiscovery, Computational biology
Dr. Ramesh Kini M.	PhD (NITK, Surathkal)	Associate Professor	Dynamically reconfigurable processor for multimedia applications
Dr. Rathnamala Rao	PhD (IIT Madras)	Assistant Professor	Semiconductor device modeling, VLSI design
Dr. Rekha S.	PhD (NITK, Surathkal)	Assistant Professor	Analog & Digital VLSI Design
Dr. Sandeep Kumar	PhD (IIT Dhanbad)	Assistant Professor	RF Circuit Modeling & Optimization, mm wave Integrated Circuits
Dr. Shyam Lal	PhD (BIT Mesra, Ranchi)	Assistant Professor	Artificial Intelligence, Machine Learning and Deep Learning Algorithms for Satellite and Medical Data Analysis
Dr. Sumam David S.	PhD (IIT Madras)	Professor (HAG)	Signal Processing, Multimedia Signal Processing, VLSI Architecture for Signal Processing
Dr. Sushil Kumar Pandey	PhD (IIT, Indore)	Assistant Professor	Growth and characterization of semiconductor thin films, Semiconductor light emitters and Photovoltaic devices
Dr. U. Shripathi Acharya	PhD (IISc, Bangalore)	Professor	RF and Optical Wireless Communication, Error Control Codes and their applications and Consumer Electronics

Publications and PhDs Awarded





Patents (Granted/Published)

- Omprakash, **M.S. Bhat** and **Dr. U. Shripathi Acharya**, "Alternative means for conductor based short distance signal/ data transfer", Patent No. 301828 granted in October 2018.
- Omprakash N Sringeri and **Sumam David**, "Programmable Switch Network for swapping the connection between two sets of nodes", Patent No. 327002 granted in December 2019.
- Muralidhara, **Rathnamala Rao**, Veeresha R. K, Prasad Prabhu and Gautham S Shetty "Method and System for Measurement of Residual Stress by Drilling Deep Holes in a Weld-Joint" Patent Application No. 201941002849, Published in July 2020.
- Rohit Sharma, **Sandeep Kumar**, S. Ramesh, Kusum Yaday, Utpal Pandey, Vivek Kumar Srivastav and Deepa Gupta, "Methods and Systems for Monitoring a Remotely Located Renewable Energy Power Plant" Patent Application No. 202111025277 published in June 2021.
- Rohit Sharma, Vipin Sharma, **Sandeep Kumar**, Saumya Mishra and Rachit Patel, "Methods and systems for monitoring footwear and well-being of a person wearing the footwear" Patent Application No. 202111028580 published in July 2021.
- Rohit Sharma, **Sandeep Kumar**, S. Ramesh, Kusum Yaday, Utpal Pandey, Vivek Kumar and Srivastav, "Methods and Systems for Monitoring cap and well-being of a person wearing the cap A" Patent Application No. 202111032887A, published in August 2021.
- Rohit Sharma, **Sandeep Kumar**, S. Ramesh, Kusum Yaday, Utpal Pandey, Vivek Kumar and Srivastav, "Internet of Things (IOT) based Smart Stand for Utensils" Patent Application No. 202111035881A, published in September 2021.
- Sanjeev Kumar Raghuwanshi, Yadvendra Singh, Purnendu Shekhar Pandey, **Mandeep Singh**, Santosh Kumar, Azhar Shadab, Ritesh Kumar and Md Tauseef Iqbal Ansari "An IOT Monitoring System for Underground Mines using a Fiber Bragg Grating Chemical Sensor", Patent Application No. 202131051640 A, published in December 2021.
- Vipin Sharma, **Sandeep Kumar**, Krishna Pandey, Rachit Patel and Sapna Katiyar, "Assistance device for Visually and Hearing Impaired Person" Patent Application No. 202211039377 A, published in July 2022.

Books/Book Chapters

- **Muralidhar Kulkarni** and K S Shivaprakasha, "*Information Theory and Coding*", Wiley (India), 2015.
- Couch, Leon W., **Muralidhar Kulkarni,** and **U. Sripati Acharya**, "*Digital and Analog Communication Systems*". 8th Ed. Upper Saddle River: Pearson, 2013.
- **Muralidhar Kulkarni**, *"Microwave & Radar Engineering"*, Fifth Edition, Umesh Publications, New Delhi, 2015.
- R.S. Kaler, **Muralidhar Kulkarni** and Umesh Gupta *"A Text Book on Digital Signal Processing"*, I.K. International Publishing House Pvt. Limited, New Delhi, 2010.
- **Muralidhar Kulkarni** and Farooq Husain, *"Analog & Digital Communication Systems"*, Umesh Publications, New Delhi, 2005.
- **Muralidhar Kulkarni**, *"Digital Communications"*, Umesh Publications, New Delhi, 2005.
- **Rekha S,** Contents contribution for Indian Adaptation of *"Op-amps and Linear Integrated Circuits"* Revised Fourth Edition by Ramakant A. Gayakwad, Pearson Publishers, 2021.
- **Prashantha Kumar H**, Contents contribution for Indian Adaptation of *"Electronic Devices"*, Tenth Edition by Thomas L. Floyd, Pearson India, 2021.
- **Shyam Lal** and Deepak Kumar Panwar, *"Advances in Computer Vision and Information Technology"* (Book Chapter), Publisher: I.K.International Publishing House Pvt. Ltd, New Delhi ; Editors: K.V.Kale, S.C. Mehrotra, R.R. Manza ;ISBN/ ISSN No. : ISBN-978-81-89866-74-7
- **Prabu K** and Santosh A. Janawade, Contents contribution for Indian Adaptation, *"Microwave Engineering Theory and Techniques"*, David M Pozar, Wiley, WILEY India Adaptation.
- **Prashantha Kumar H.** and Prof. Won Y Yang, *"MATLAB/Simulink for Digital Signal Processing"*, Hongrung Publishing Company, Seoul, Korea.

Research and Development Activities

The Department faculty members are actively involved in research and development works. Broad research areas of the faculty members are VLSI Design, Digital Signal Processing and Machine Learning, Communication Systems & Networking, IoT, 5G/6G Technologies, Antenna Design, MEMS Design, Wireless Communication, Error Control for Storage Systems, AI/ML Inspired Chip Design, Biomedical Circuit and Systems, RF Circuit Modeling & Optimization.

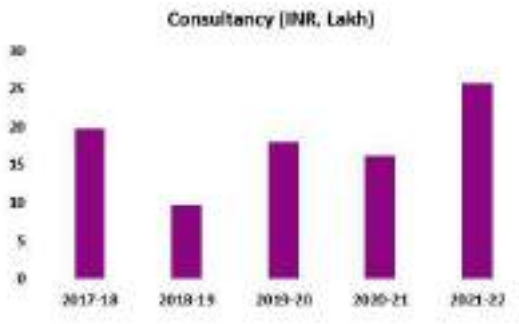
Sl. No.	Project title	Sanctioned Year (FY)	Duration	Funding Agency	Amount (INR) in lakhs	Project Cooridnator(s)/ Principal Investigator(s)
1	An affordable therapeutic solution for rehabilitation of cerebral palsy children with crouch gait	2021-2024	3 Years	SERB - DST, Govt of India	59.75	Dr. Krishnan, Dr. Deepu Vijayasenan, Prof. Sumam David and Dr. Ranjith, jointly with KMC Mangalore
2	Speech technologies in Indian languages	2022-2025	3 Years	MeitY, Govt. of India	90.00 (NITK grant)	Dr. Deepu Vijayasenan. (A Consortium project with IITM, IISc, IIT Goa and other HIEs).
3	Design and Development of Automated Software Tools for Early Forest Fire Detection and Burn Severity Analysis from Multi- sensor Satellite Imagery Data	2022-2025	3 Years	ISRO –DMSP	37.92	Dr.Shyam Lal Dr.Ragavendra B.S. Dr. Aparna P.
4	Nanophotonic porous-silicon based nanostructures for ultra-fast methanol sensing at room temperature	2022-2025	3 Years	SERB-DST, Govt. of India	35.59	Dr. Mandeep Singh
5	Development of low phase noise optoelectronic oscillator with phase compensation approach for radar application	2022-2025	3 Years	DRDO LRDE	30.28	Dr. Mandeep Singh; Co-PI: Prof. M. Kulkarni; Co-PI at IIT (ISM) Dhanbad: Prof. Sanjeev Kumar Raghuwanshi;
6	Design and Development of Nanoscale Integrated System Along with Conformal Antenna as Capsule Prototype for Wireless Capsule Endoscopy	2021-2024	3 Years	BDTD Scheme, Ministry of Science and Technology, DST, Govt of India	74.00	Dr.Sandeep Kumar along with B. K. Kanaujia, JNU and AIIMS New Delhi
7	Design, Development of Harmonically Tuned GaN HEMT Power Amplifier Over Broadband	2022-2024	2 Years	ISRO, Govt of India	14.05	Dr. Sandeep Kumar
8	Programmable photonic microwave signal generation using on-chip spectral shaper for satellite communication	2022-2024	2 Years	SAC-ISRO, Ahmedabad	22.51	Dr. Mandeep Singh
9	Design and Development of Ultra-low power CMOS IC for Wireless Neural Monitoring System	2020-2023	3 Years	International Division, DST, Govt of India	120.20 (India-40.00 South Korea: 80.20)	Dr. Sandeep Kumar Jointly with Prof. Hanjung Song, Centre of Nano-Manufacturing, Inje University, Busan, South Korea
10	Engineering novel label free multi-layer plasmonic nano-biosensor for DNA hybridization	2020-2025	5 Years	DBT, Ministry of Science and Technology, Govt of India	57.00	Dr. Mandeep Singh
11	Development of Highly Conductive Ultrathin VS2 Crystals for High-Performance Flexible Supercapacitors	2020-2022	2 Years	SERB - DST, Govt of India	27.73	Dr. Sushil Kumar Pandey
12	Design and Development of GaN HEMT Based LNA for L5 and S-Band IRNSS Recevier	2020-2023	3 Years	SERB - DST, Govt of India	30.00	Dr. Sandeep Kumar
13	Development of design essentials for Ga2O3 based FinFET for SOC in automotive applications.	2020-2022	2 Years	SERB-DST, Govt. of India.	25.90	Dr. Nikhil K. S.
14	SPARC Project: Exploring Applications of Radiomics in Brain Tumor Assessment and Treatment	2019-2023	3 Years (Extended by one year)	MHRD	38.63	Dr. Sumam David, Dr Deepu Vijayasenan, Dr Girish Menon (KMC Manipal), jointly with Baylor College of Medicine, Houston, Texas PI – Dr Mandava Pitchaiah, Dr Paul Litvak
15	IMPRINT-2 project, Development of cost-effective Radiofrequency ablation system and magnetic hyperthermia equipment for	2019-2022	3 Years	MHRD	48.94	Dr. Ajay Kumar Yadav Dr. PU Saxena, KMC Attavar, Manipal.; Dr. B. Satish Rao, MAHE;

	thermal therapies of cancerous tumours.					Dr. U. Shripathi Acharya Dr. Laxminidhi T.
16	Design and Development of Automated Kidney Cancer Detection System from H&E Stained Kidney Histopathological Images	2019-2022	3 Years	SERB-DST, Govt. of India	27.96	Dr. Shyam Lal
17	Research Grant under Young Faculty Research Fellowship under Visvesvarayya PhD Scheme for Electronics & IT	2019-2021	2 Years	Digital India Corporation, MCIT, Govt. of India	14.80	Dr. Shyam Lal
18	Investigation of photonic generation of microwave arbitrary Waveform for sensing applications	2019-2022	3 Years	MAHE	6.00	Dr.Mandeep Singh
19	Performance Analysis and Enhancement of Radio over Free Space Optical Communication System for 5G Applications for Smart Cities	2019-2022	2 Years	SERB-DST, Govt. of India	28.06	Dr. Prabu K.
20	Development of Automatic Land Cover Change Detection and Analysis System from High-Resolution Remote Sensing Images	2020-2022	2 years	ISRO RESPOND Scheme	19.44	Dr. Shyam Lal
21	Compact multi-band antenna with independently controlled resonant frequency and polarization for mobile wireless applications	2017-2020	3 Years	SERB-DST, Govt. of India	44.22	Dr. Krishnamoorthy K.
22	Design and Development of Wideband Circularly Polarized Antenna using 2D Metamaterial Structures	2018-2020	2 Years	ISRO RESPOND Scheme	25.71	Dr. Krishnamoorthy K.
23	Development and real-time implementation of fully automated liver cancer detection system from H&E stained liver histo-pathological images	2017-2020	3 Years	SERB-DST, Govt. of India	9.94	Dr. Shyam Lal
24	Development and Performance Evaluation of Efficient tracking Algorithms for phased array radars in the presence of electronic counter measures	2016-2019	3 Years	SERB-DST, Govt. of India	13.10	Dr. P. Srihari
25	Automatic Multilingual Speaker Profiling & Forensics	2016-2019	3 Years	SERB-DST, Govt. of India	49.94	Dr. Deepu Vijayasenan
26	FIST Project: Advanced Research Lab in RF Communications and Networks	2016-2020	5 Years	DST, Govt. of India	116.00	Dr. U. Shripathi Acharya Dr. M. S. Bhat Dr. Muralidhar Kulkarni
27	Special Manpower Development Project on VLSI (SMDP-VLSI) phase-III – Chips-to-Systems	2014-2019	5 Years	(DIT) MCIT, Govt. of India	160.00	Dr. Ramesh Kini M. Dr. Laxminidhi T.
28	Intel Embedded Initiative	2011-continuing		Intel Corporation	5.30	Dr. Sumam David S. Dr. Ramesh Kini M.
29	Technical Education Quality Improvement Program	2017-2020	3 Years	TEQIP - Phase III		All Faculty
30	Building capacity in teaching and collaborative research in sensor systems for public utilities–with emphasis on water and electricity distribution system	2016-2018	2 Years	Royal Academy of Engineering, UK	47.50	Dr. M. B. Saidutta, Dr. M. S. Bhat and Dr. K. P. Vittal, jointly with Univ. of Birmingham UK, IBM India, RBEI India.

Testing and Consultancy Services

The Department is actively involved in consultancy services. Revenue generated during the past 5 financial years is more than INR 90 lakhs, with an annual average income of INR 10 lakh. Some of the major consultancy services taken up are,

- Algorithm to Reduce Measurement Errors Due to Sea Surface Multipath and Sea Clutter Funding agency: LRDE, Bangalore, Amount: Rs. 9.44 Lakhs, Year: 2021-2022, Status: Ongoing.
- Study and simulation of track detect before schemes for radar Role, Funding agency: DRDO (RCI), Amount: Rs. 6.49 Lakhs, Year: 2020-22, Status: Ongoing.
- Study of Optimal Pulse Compression Radar waveforms suitable for suppression of Sea and Ground Clutter commissioned by Research Center Imarat (unit of DRDO) (Consultancy fee: Rs. 9.775 Lakhs), Status: Ongoing



- Automatic Bias Estimation Technique for 2D/3D Surveillance radar using Networked Radar Data, Funding Agency: CRL+BEL, Amount: Rs. 8.26 Lakhs, Year: 2019-20, Status: Completed.
- CARS Project: Study of Advanced Radar Signal Processing and Tracking approaches to Detect Low RCS Targets in Heavy Sea Clutter, Funding Agency: RCI DRDO, Amount: Rs. 9.76 Lakhs, Year: 2019-20, Status: Completed.
- Sigma Delta Space Time Adaptive Processing for GMTI for AESA radar, Funding Agency: LRDE, Amount: Rs. 9.63 Lakhs, Year 2018. Status: Completed.
- Study of Various Bias Estimation Techniques for Multi-Sensor Multi-Target Tracking, Funding agency: LRDE, Amount: Rs.9.75 Lakhs, Year 2016-17, Status: Completed.
- Technical Consultancy rendered to Public Sector Banks (Corporation Bank and Syndicate Bank) for procurement of Currency note sorting machines (Consultancy fee: Rs. 10.00 Lakhs/- per annum).

Memorandum of Understanding

- An MoU was signed between Universita Degli Studi di Pavia, Italy and Dept. of ECE, NITK Surathkal with a focus on Student exchange and Collaborative Research in the year 2018.
- An agreement of cooperation (AoC) is signed between Department of Electronics and Communication of National Institute of Technology, Karnataka, India and Department of Nanoscience and Engineering / BK21PLUS Nano Convergence Project Group of INJE University, Gimhae, South Korea with a focus on Exchange of Faculty/Exchange of Research Scholars and Students/Exchange of information and materials in those fields which are of interest to both parties /Activities such as collaborative research, Lectures, and Symposiums etc/ Joint Cultural Programmes in January 2019.
- An agreement of cooperation (AoC) is signed between the Department of Electronics and Communication Engineering of National Institute of Technology Karnataka, Surathkal and Institute of Radio Frequency and Optoelectronics Integrated Circuits plus State Key Lab of Bioelectronics of Southeast University, Nanjing, Republic of China with a focus on Exchange of Faculty/Exchange of Research Scholars and Students/Exchange of information in those fields which are of interest to both parties /Activities such as collaborative research, Lectures, and Symposiums etc/ Joint Cultural Programmes in February 2019.

Major Departmental Events

- 7th IEEE Intl. Conference on "*Recent Advances and Innovations in Engineering*" was held during Dec. 1-3, 2022.
- 3-Day Faculty Development Program on "*SoC Design Methodology using Intel FPGAs"* was held during Dec. 1-3, 2022.
- One month "*NITK-IEEE Photonics Students internship Program 2022*" (online mode) was held during June 1-30, 2022.
- 2nd International Conference (Virtual Mode) on "*Computational Electronics for Wireless Communication"* (ICCWC-2022) was held during June 9-10, 2022.
- Workshop on "*Applications of Radiomics for Healthcare"* was held during April 9-29, 2022.
- Online Practical Training Program on "*Machine Learning and Deep Learning for Remote Sensing Applications*" (MLDLRSA2022) was held during January 17 – February 21, 2022 and April 21 - May 25, 2022.
- Workshop on "*OpenLANE EDA tool for RTL to GDSII flow*" was held during February 21-23, 2022.
- Faculty Development Program on Applications of "*Artificial Intelligence in Digital Histopathology*" was held during Dec. 13-17, 2021
- SERB sponsored Five Day Online Faculty Development Programme on "*Recent Trends in Free Space Optics and its Applications*" (RFA-2021) was held during 04 - 08 October 2021.
- The Department of ECE in collaboration with NITK IEEE Student Branch organized Two Weeks online Summer School on "*Machine and Deep Learning for Remote Sensing Applications*" during 05-16 July 2021.
- The Department of ECE in collaboration with NITK IEEE Photonics Society and IEEE Student branch organized one day webinar on "*Quantum computing*" on 18th June 2021.
- TEQIP III sponsored 5-day workshop (online) on "*Machine learning and Applications*" was held during Feb. 22-26, 2021.
- One-week AICTE ATAL (Online) Faculty Development Program (FDP) on "*Photonics*" was held during Feb. 01-05, 2021.
- One week 2nd- IEEE Workshop on "*Advances in Nanophotonic devices & Sensors - 2021*" was held during Oct. 04-08, 2021 and December 07-11, 2020 as a part of NITK-IEEE Photonics Student Branch Chapter.
- Online Five Day Faculty Development Program on "*Recent Trends in Nanoelectronics and Optoelectronics*" (RNO-2020) was held during Oct. 12-16, 2020.
- One day workshop on "*Recent Trends in Wireless Optical Communications*" was held on 6th March 2020
- Five-Day Short-Term Training Program On "*Speech, Audio and Music Processing*" (SAMP 2020), as a part of NITK Diamond Jubilee Celebrations was held during January 28 – Feb. 1, 2020.
- Winter School on "*Applications of Machine learning techniques for Medical Image Analysis*" in association with Baylor College of Medicine Houston was held on Dec. 2 -13, 2019 as part of SPARC project and NITK Diamond Jubilee events.
- Department level comprehensive external review (Academic review) was held on 28-09-2019. Prof. Rajesh Hegde, IIT Kanpur, Dr. S. V. Sharma, Dy. Director, ISRO and Dr. Narasimha Bhat, Founder CEO, Manipal dot net Pvt. Ltd were the members of the expert committee.
- NBA workshop was conducted during 20-21 May, 2019 to review MTech (VL) programme with Prof. N. S. Murthy (Retd. Professor, NIT Warangal), Prof. Ashok Rao (Former Head, EENP, IISc, Bangalore) and Mr. Nagaraj K (Director, Manipal Dot Net) as resource persons.
- IEEE and ITC/TTTC India sponsored "*VLSI Test Workshop*" was held on 30th March 2019.
- Three-day workshop on "*Mathematics and Everything around Mathematics*" was held during March 8-10, 2019.

Laboratory Resources

Laboratories and Major Equipment

To meet the curricular requirements of academic programmes, the Department has well-equipped laboratories.

Academic Laboratories

1. Analog Electronics Lab.
2. Communication Lab.
3. Digital System Design Lab.
4. Digital Signal Processing Lab.
5. Microprocessor and Embedded Systems (MPES) Lab.
6. Microwave and Optical Communication Lab.
7. Signal Processing and Machine Learning Lab
8. IC Design Lab
9. VLSI Lab.
10. Ultrathin Semiconductor Deposition Lab
11. Wireless Communication and Networks Lab (WCN)
12. Stochastic Modeling, Imaging and LEarning (SMILE) Lab.
13. RF and Antenna Systems Lab
14. Applied Photonics Lab.
15. Computer Vision and Deep Learning Lab.
16. Research Lab.

Facilities in the department

- Digital Storage Oscilloscope
- Function Generator
- DC Regulated Power Supply
- Analog/Digital IC Tester.
- Digital Trainer Kits
- PCB Prototype Machine (LPKF)
- Chemical Free Through Hole Plating System
- Microwave X band benches
- Antenna Trainer
- FSO Link Setup (Lightpoint)
- Wireless Comm Trainer Kits
- LD Driver, LD Module, PD Module, Power Meter
- Fibre Optic Power Source
- Optical Fibre Trainer
- LD Modulator (Transmitter)
- FORX-200m (Receiver)
- Fiber Optics Kits
- Wireless digital comm. training system (Wi-CommT)
- 100MHz Mixed Signal Oscilloscope
- 80MHz Function/Arbitrary Waveform Generator
- Digital Multimeter 6.5 digit
- Electronic Instrumentation Training Kit
- Digital Source meter with Safety universal Test Lead kit
- Microwave experiment kits.
- High end workstations
- Cadence Design suite
- Synopsys EDA Tools
- Xilinx Tools
- TCAD Tools
- FPGA Boards (Xilinx & Altera)
- DSP Boards
- Campus wide MATLAB License.
- XILINX Vivado Design Suite
- ARM based code development tools
- Microcontroller Kits
- Network Simulator/ Emulator
- Systems Vue University License Bundles.
- RF and Optic Design Hardware / Software: ADS, HFSS, SDR tools.
- Vector Network Analyzers, Spectrum Analyzer, Optical Spectrum Analyzer, Digital Logic Analyzer.
- Opti-System Software
- Comsol Multiphysics Pathology Microscopy setup

Department Library

To Department has an exclusive library with about 3500 titles including text books and reference books. Students are allowed to issue two books at a time for a duration of two weeks. The books in the library have been procured with the help of research project grants awarded to the department.






Collaboration with industry and other organizations

The Department has ongoing interaction with many industries and academic institutions for joint R&D projects including Students Internships and Faculty exchange programs. Following are some of the industries/universities/ R&D organizations of interest.

- Bharat Electronics
- Cadence
- Calligo Technologies
- CoreEL Technologies
- Emulex Communications
- Fluxgen Engg. Technology
- Google
- Infineon Technologies
- LEOS, ISRO
- MCIT, Govt. of India
- NIO Goa
- Robert Bosch
- SITAR
- Synopsys
- Texas Instruments
- Xilinx
- IISc, Bangalore
- IITB, IITG, TIFRB
- NIT Durgapur
- ECAM, Lyon, France
- HEIG-VD, Switzerland
- INJE University, Republic of Korea
- Michigan State University, Michigan
- Northeastern University, Boston
- Southeast University, Nanjing, China
- Univ. College Cork, Ireland
- Universita Degli Studi di Pavia, Italy
- Univ. of Southern California
- McMaster University, Canada
- Univ. of Victoria, Canada
- Univ. of Applied Sciences Western Switzerland, HEPIA, Geneva
- East China University, China
- Baylor College of Medicine, Houston

Strengths of the Department

- Motivated and Competent Faculty
- High Quality Students
- Well Designed Curriculum
- Academic Autonomy
- Excellent Teaching-Learning Environment
- Excellent Placement
- Industry and University Collaborations
- Networking with Peer Institutions
- Research Focus

Contact Details

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