

**Tanuj Kumar**  
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## Education

Birla Institute of Technology & Science (BITS), Pilani, India 2015 - 2020  
Integrated Dual Degree program 7.96/10 (3.57/4.0)  
Bachelor of Engineering (Honours) in Electrical and Electronics  
Master of Science (Honours) in Chemistry

## Research objective

I am interested in engineering electronic devices, nanofabrication, optoelectronics, molecular assembly for electronic devices and the exploration of newer electronic materials such as 2D materials for electronic devices.

## Publications

1. **T. Kumar**, R.E. Owyung, S. Sonkusale, “Rapid Cleanroom-Free Fabrication of Thread Based Transistors Using Three-Dimensional Stencil-Based Patterning”, Flexible and Printed Electronics, Submitted. (Undergraduate)
2. S.M. Rajee, A. Goel, S. Sharma, K. Aggarwal, D. Mantri, **T. Kumar**, “Development of On Board Computer for a Nanosatellite”, International Astronautical Congress, Sep 2017 (Undergraduate) [[PDF](#)]

## Talks

1. **T. Kumar**, R. E. Owyung, S. Sonkusale, “High Throughput Cleanroom-Free Fabrication of Thread Based Transistors”, Materials Research Society Fall Meeting, Nov 2020 (Available Nov 21)
2. “Building a Satellite Isn’t Rocket Science”, TEDx BITS Pilani, India, Jan 2019 [[Link](#)]
3. “Role of Open Source in the Development of a Student-Built Nanosat & its Team Members”, Open Source Cubesat Workshop - European Space Agency, Madrid, Sep 2018 [[Link](#)]

## Research Experience

### *Most closely related*

1. Centre for Nano Science & Engineering, Indian Institute of Science Aug 2020 - \*  
*Junior Research Fellow - with Prof. Sushobhan Avasthi*
  - Optimizing fabrication flow and materials for ambient operation broadband quantum dot photodetectors with cleanroom fabrication and deposition techniques for improved responsivity.
  - Researching HTL, ETL materials and engineering bandgaps to reduce dark current.
  - Learning from courses on materials synthesis (NE 241) and fabrication (NE 203) to correlate theory with my experiments and make better material choices.

2. Nanolab, Tufts University Aug 2019 - June 2020  
*Visiting undergraduate student - with Prof. Sameer Sonkusale*
  - Worked on fabrication of flexible, organic, ionogel-gated Thread-Based Transistors (TBT).
  - Developed a high-throughput, cleanroom-free fabrication method to increase TBT production by 100 times thereby solving manufacturing bottleneck.
  - Researched and optimized thread substrate, semiconductor and electrode materials for suitability to fabrication process.
  
3. Team Anant - Satellite team of BITS Pilani Jan 2016 - May 2019  
*Member, On-Board Computer system*
  - Designed and implemented a Linux based On-Board Computer system, its drivers, and sensor interfaces for a nanosatellite to be launched into low-earth orbit.
  - Worked towards overall aim of establishing first-principles research into space systems at BITS Pilani.
  - Built the team's [website](#), learned about space electronics.

### ***Internships***

4. CentraleSupélec May 2019 - July 2019  
*With Prof. Caroline Lelandais-Perrault*
  - Designed an asynchronous Neuromorphic ADC for use in ECG monitoring.
  - Developed a new mathematical model for its figure of merit.
  - Discovered trend of temporally decreasing maximum error in the ADC's conversion.
  
5. Indian Space Research Organization May 2018 - July 2018  
*With Dr. Vinod Kumar, FIE, FIETE*
  - Designed a real-time target prediction system and its mathematical model using an Extended Kalman Filter, accurate to within 500 meters.
  - Developed a software camera model as the testing framework in MATLAB.
  - Classified application of different target detection filters.
  
6. Indira Gandhi Centre for Atomic Research May 2017 - July 2017  
*With Mr. Sanga Ramesh, Scientific Officer*
  - Developed a hybrid 8 channel DMA & Interrupts based nuclear reactor monitoring system
  - Engineered a solution to obtain 8 inputs to system despite DAQ card supporting only 4 interrupt channels
  - Designed a GUI in LabVIEW to simultaneously view 8 channels.

### ***Projects at BITS Pilani***

7. Differential Power Attack Immune Circuits Aug 2018 - May 2019  
*With Prof. Anu Gupta, BITS Pilani*
  - Started the Differential Power Attack project with Prof. Anu Gupta at BITS Pilani. Designed a dynamically scaled, differential pull-down circuit with 0.03% current variation for protection against hardware hackers.
  - Authored group's project proposal to the Department of Science & Technology (DST), Government of India.

8. Electronic properties of materials in radiation environments Jan 2019 - May 2019  
*With Prof. Mrinmoyee Basu*
- Simulated the effects of radiation typically found in the Large Hadron Collider on SiC and GaN MOSFETs to develop radiation hard semiconductors for LHC and space applications.
  - Explored effects of doping and impurities on MOSFET radiation hardness.

### Teaching Assistantships

1. Microelectronic Circuits (EEE F244), Jan 2019 - May 2019
  - Designed and conducted tutorial sessions on SPICE & Cadence simulation techniques.
  - Evaluated students' performances in tests.
  - Group coordinator for all TAs.
2. Computer Programming (CS F111), Aug 2018 - Dec 2018
  - Conducted twice-a-week lab classes on Linux commands and C programming for freshman year students.
  - Developed problem sets and answer keys.
  - Invigilated course quizzes.

### Leadership

1. Founder, Team Lead  
*Publicity, Sponsorship and Design subsystem - Team Anant*
  - Founded the subsystem to increase team's publicity, obtain sponsorships.
  - Increased publicity on social media, newspapers and through talks to increase awareness of nanosatellites and their accessibility.

### Technical proficiency

1. Lab skills: Clean room fabrication, optical lithography, deposition, fume hood work, Raman spectroscopy, AFM, SEM, semiconductor analysis, laser cutting, microscopy
2. CAD & IDE: Cadence tools, LTSpice, LabVIEW, EagleCAD, AutoCAD, Solidworks, Vivado
3. Programming: MATLAB, Verilog, C, C++ (Qualified for GSoC), Assembly, Java, Python, Git, Linux

### Music

1. Drummer, bassist, digital audio artist and mix engineer.
2. Formerly part of the Department of Music at BITS Pilani; played multiple shows.
3. Interested in progressive rock, jazz-rock and melodic metal.