



UGC RECOGNIZED

# PDEU

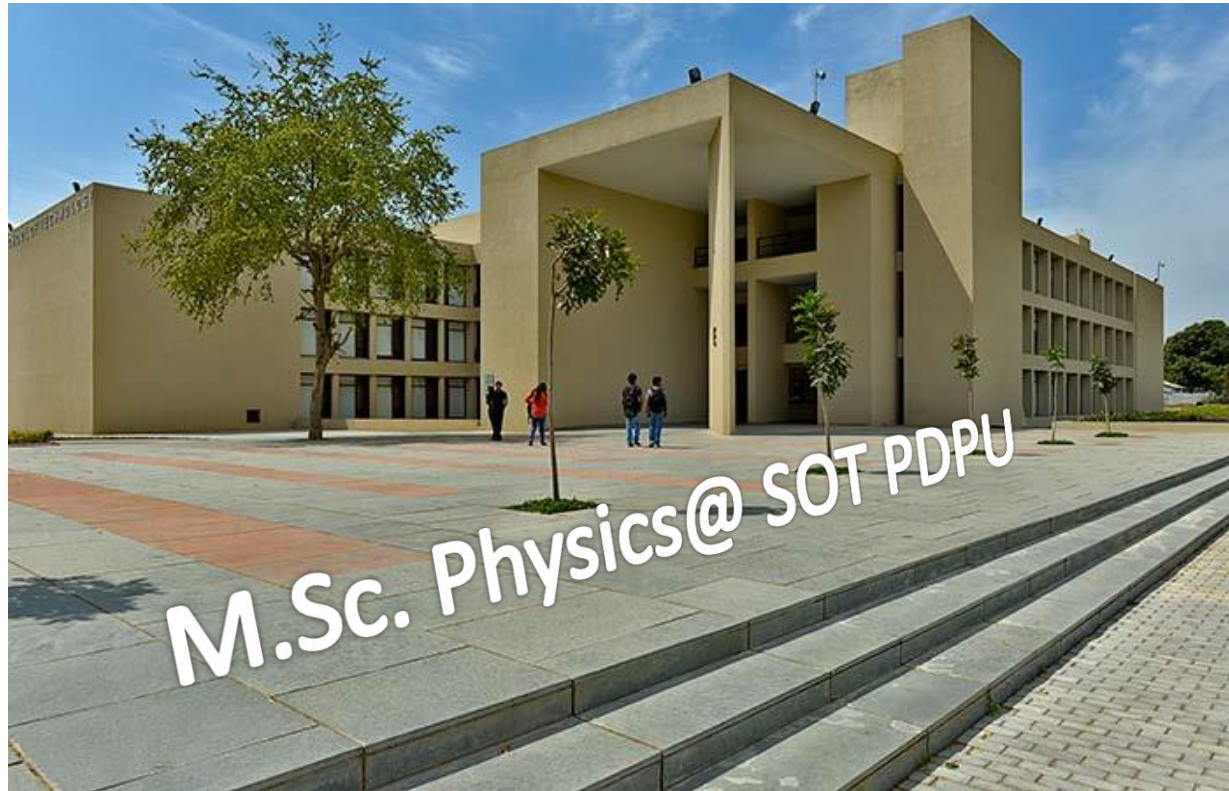
PANDIT  
DEENDAYAL  
ENERGY  
UNIVERSITY

Formerly Pandit Deendayal Petroleum University (PDPU)

**NAAC**

Accreditation  
'A' Grade  
(CGPA 3.39/4.0)

An only University in  
Gujarat  
Granted with  
**GRADED  
AUTONOMY**  
by UGC



**SOT**

SCHOOL OF  
TECHNOLOGY

<https://sot.pdpu.ac.in/physics-dept.html>

# MISSION

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Department of Physics in the School of Technology offers well-designed program curricula to provide in-depth knowledge in the basics of Physics and its applications and inculcates scientific temper in students interested in the Engineering and Technology.

In order to contribute and to provide assistance to PDEU to achieve its mission of academic excellence, the program integrates a judiciously-designed comprehensive curriculum and a research module for a sound academic, professional, and personal development of students.

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# VISION

*“The Department has a vision to graduate admitted students as life-long learners and accomplished researchers in Physics.”*

- To create and maintain the programs of excellence in the areas of research, education and public outreach.
- To promote, inspire and nurture the fundamentals of Physics through M.Sc. courses offered for the basic sciences students.
- To offer research projects with high emphasis on concept-theory-practical training to build up research interest for the transformation of budding Physicists into productive scientists, excellent teachers, entrepreneurs and innovative independent researchers.
- Our specific goal is to become a nationally recognised department of Physical sciences for modern education with a state of art research facility.
- To aspire for excellence in Physical education and research.
- To prepares students for a diverse and challenging world.
- Contribute to a literate society through teaching Physics (with classrooms, labs, and research) and service.
- Strong cross-disciplinary collaborations both within and outside the university.
- The Department of Physics aims to be recognised in (1) student success in the Physical sciences, (2) research contributions and impact, and (3) disciplinary engagement. This will be accomplished by leveraging our strengths, urban location, and student, faculty, and staff capabilities.

# Philosophy of the Program

The Department pursues the following primary objectives:

- Create an academic environment which promotes the intellectual and professional development of students and faculty.
- Develop and maintain a commitment to scholarly activities in research and education which is commensurate with the goals and mission of PDEU.
- Train M.Sc. students in the theoretical and practical skills required for employment or admission to higher education.
- The training of M.Sc. Physics Students in the theory of Physics, the ability to conduct independent research, the clear expression of scientific ideas, and the teaching of Physics.
- Provide programs for all students which meet the educational and technical demands of the sub- disciplines represented in the Department.
- Offer courses in cognate academic disciplines and professional fields which provide the necessary base for the career goals of students and faculty.
- Implicit in these objectives is our responsibility as teachers, which includes but is not limited to, educating students and providing continuing education while promoting and clarifying the role and philosophy of education.
- A strong commitment to research means creating and maintaining a rigorous intellectual environment and achieving our broader commitments to the advancement of knowledge and service to the public.

# Eligibility Criteria

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Undergraduate with Physics (Major) /Physics/Applied Physics as one of the subjects or equivalent degree in offered specialization with minimum 50% marks aggregate of all semester/years or CPI 5.5 on 10 point scale or equivalent score from a recognized university/institute.

# Our Strength

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- Curriculum based on NET, GATE, JEST.
- Project Based Learning
- Student Research Projects funded by University
- Internship in Start-up Projects
- International Exposure Programme
- Highly qualified team of faculty members graduated from IITs, PRL etc. and with postdoctoralexperience abroad (Singapore, JSPS-Japan)

# M.Sc. Physics Course Structure

## SEM 1

1. Classical Mechanics
2. Mathematical Physics
3. Thermodynamics and Statistical Mechanics
4. Solid State Physics
5. Solid State Physics Lab
6. Numerical Methods & Computer Programming
7. Computer Programming Lab
8. Atomic & Molecular Physics

**Total Credits: 20.5**

## SEM 2

1. Quantum Mechanics-II
2. Nuclear and Particle Physics
3. Nuclear and Particle Physics Lab
4. Classical Electrodynamics & Basic Plasma Physics
5. Basic electronics and Instrumentation
6. Basic electronics and Instrumentation Lab
7. Laser Physics and Spectroscopy

**Total Credits: 21.5**

# M.Sc. Physics Course Structure

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## SEM 3

1. Research Methodology
2. Elective-I (specialization)
3. Elective-II (specialization)
4. Elective-III (specialization)
5. Lab (specialization)
6. Project Phase-I

**Total Credits: 21**

## SEM 4

Project Work - II

**Total Credits: 20**



# M.Sc. Physics

Department of Physics, School of Technology

Specializations:

- Renewable Energy Resources
- Advanced Condensed Matter Physics
- Advanced Electronics
- Advanced Fabrication and Experimental Techniques
- Atmospheric Physics and Oceanography

<https://sot.pdpu.ac.in/physics-dept.html>

# M.Sc. Physics Elective Courses

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## **Renewable Energy Resources**

1. Energy Harvesting And Storage Methods
2. Solid State Solar and Thermal Energy Harvesting
3. Wind, Hydro and Bioenergy Harvesting
4. Renewable Energy Resources Laboratory

## **Advanced Fabrication and Experimental techniques**

1. Advanced Experimental and Characterization Techniques-I
2. Advanced Experimental and Characterization Techniques-II
3. Advanced Fabrication Techniques
4. Advanced Fabrication and experimental techniques Laboratory

# M.Sc. Physics Elective Courses

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## **Advanced Condensed matter Physics**

1. Advanced Condensed matter Physics
2. Computational Techniques for Solid State Physicist
3. Characterization Techniques
4. Advanced Condensed matter Physics Laboratory

## **Atmospheric Physics & Oceanography**

1. Fundamentals of Ocean Sciences
2. Instrumentation and modelling of Oceans and Atmosphere
3. Physics and dynamics of the atmosphere
4. Atmospheric Physics & Oceanography Laboratory

# M.Sc. Physics Elective Courses

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## Advanced Electronics

1. Basic Communication Systems
2. Organic Electronics
3. Semiconductor Physics and Devices
4. Advanced Electronics Laboratory

# Research Areas for Sem 4 Projects

- Non-linear optical materials, Bio-Materials
- Transparent Conduction Oxide
- Computational Material Science
- Plasma Physics and applications.
- Perovskite based flexible memristor and solar cell devices
- Thin Films for Opto-electronic Devices
- Global Warming, Climate change and Disaster Management
- Magnetic properties and material
- Laser and Photonics
- Thermoelectric materials, thin Film transistor and Transparent oxide semiconductor
- Experimental Nuclear Physics
- Hybrid electronic materials and devices

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# Faculties and their Research Areas

More Details: <https://sot.pdpu.ac.in/physics-dept.html>

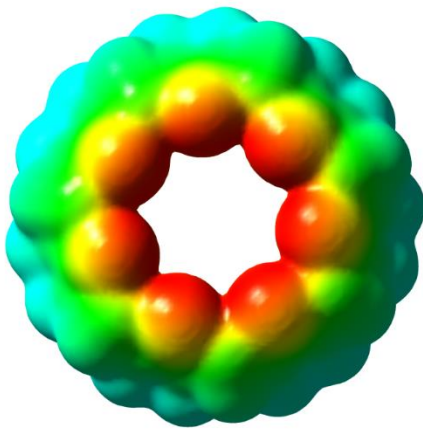
# M.Sc. (Physics)

**Dr. Satyam M Shinde (HOD)**

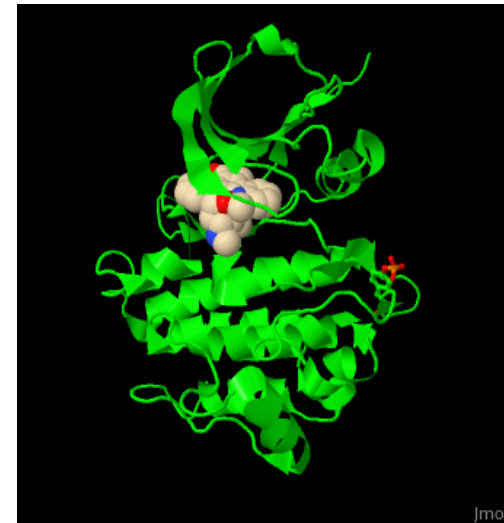
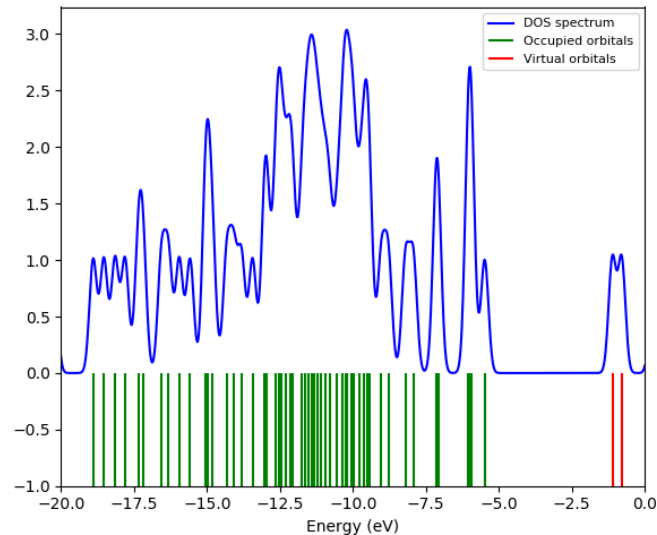
**Associate Professor, Ph.D., M. S. Uni. Of Baroda**

## Research Interests:

- Computational Material Science
- Thermoelectric Materials
- Density Functional theory
- Half/full Heusler compounds
- Organic compounds for drug delivery, bio-sensor applications



**Molecular Electrostatic Surface  
Potential for CB7**

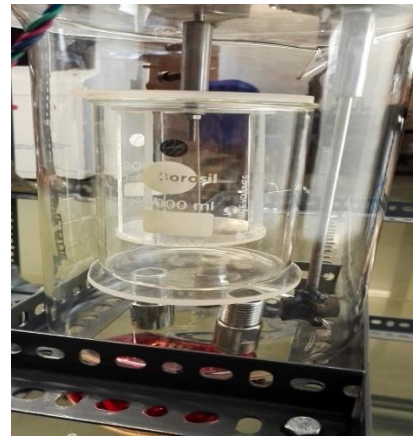
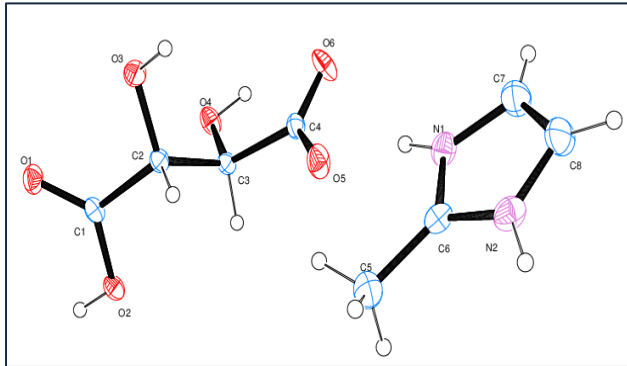


**Tyrosin Kinase enzyme**

**Dr. Bharatkumar B. Parekh**  
**Associate Professor**

## Research Interest:

- (1) Nonlinear Optical Material (Energy conversion materials)
- (2) ZnO Transparent conducting Oxide (TCO) (Solar Cell )



Rapid Crystal growth  
Setup



Grown Crystal and its structure



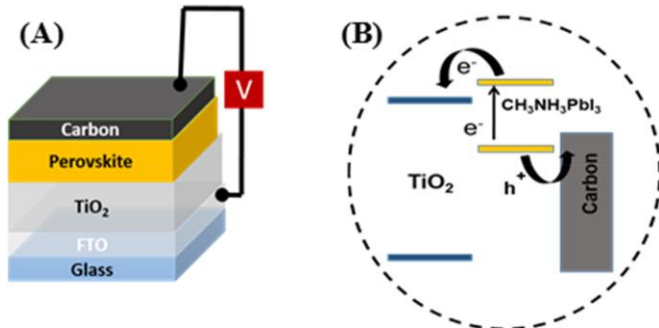
ZnO Use as TCO material



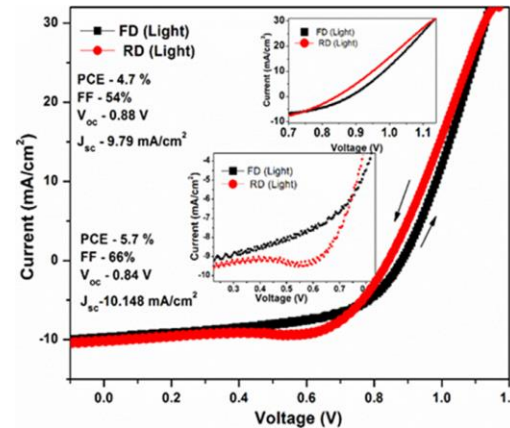
**Dr. Manoj Kumar**  
Associate Professor, Ph.D. IIT Delhi

## Research Interests:

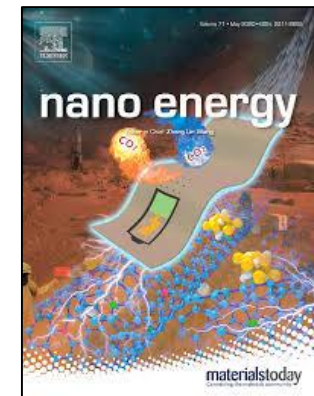
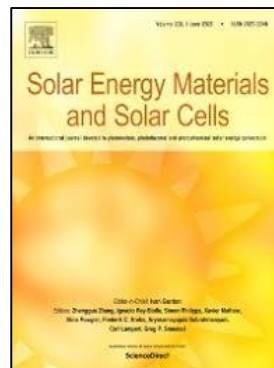
- Thermolectric Materials
- Thin Film Transistor
- Hybrid Electronic Materials and Devices



(A) Solar cell structure in SCAPS-1D and (B) Energy band diagram of the perovskite heterojunction



Observed hysteresis behaviour in the perovskite/carbon heterojunction cell

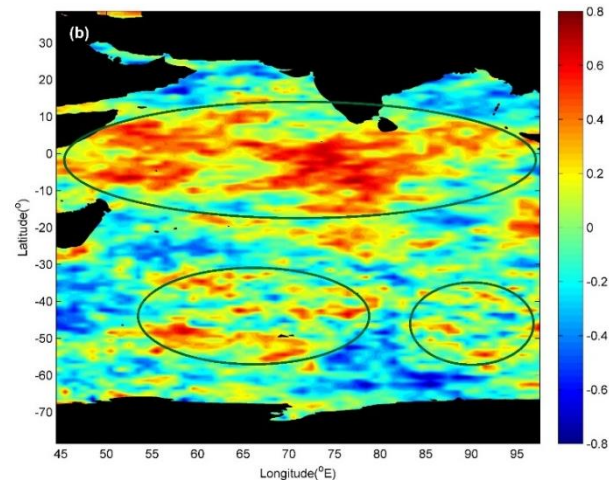
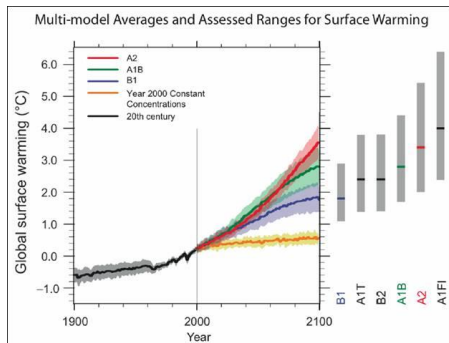


## Dr. Rohit Srivastava Associate Professor



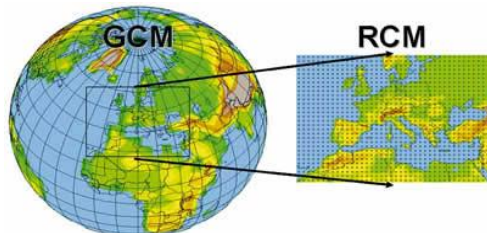
### Research Interest:

- (1) Global warming and climate change
- (2) Cloud microphysics
- (3) Remote sensing and modelling of Ocean and Atmosphere
- (4) Ocean surface water processes



Study of cloud properties over oceanic regions of India (Correlation between Sea Surface Temperature and Cloud Effective Radius)

### IPCC projection of Global warming



Modelling and simulations using High performance computational facility

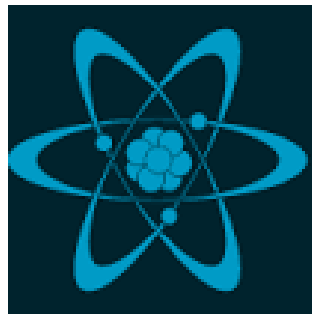
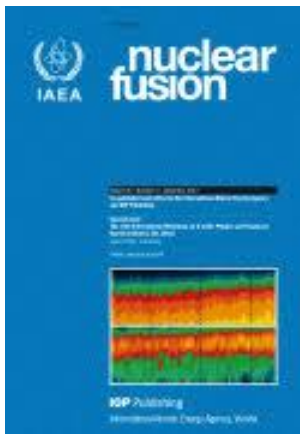
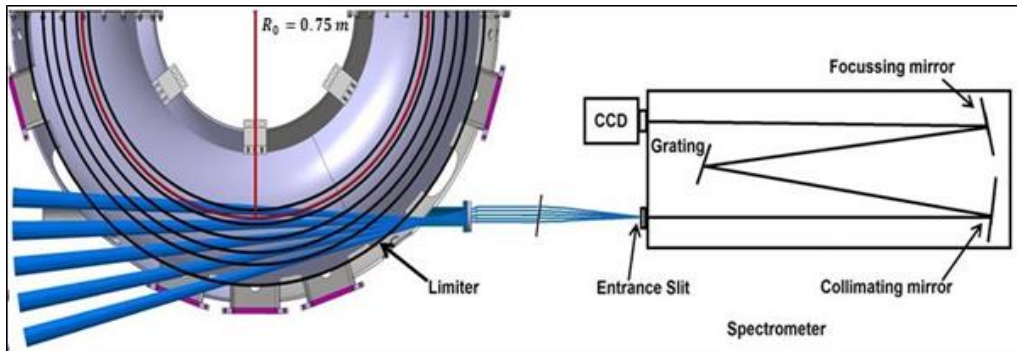


# M.Sc. (Physics)

**Dr. Balamurali Krishna Mayya K.**  
**Assistant Professor**

## Research Interests:

- Modelling and Simulation
- Quantum devices
- Plasma Science and Tokamak



*atoms*

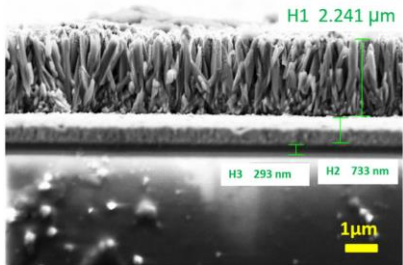
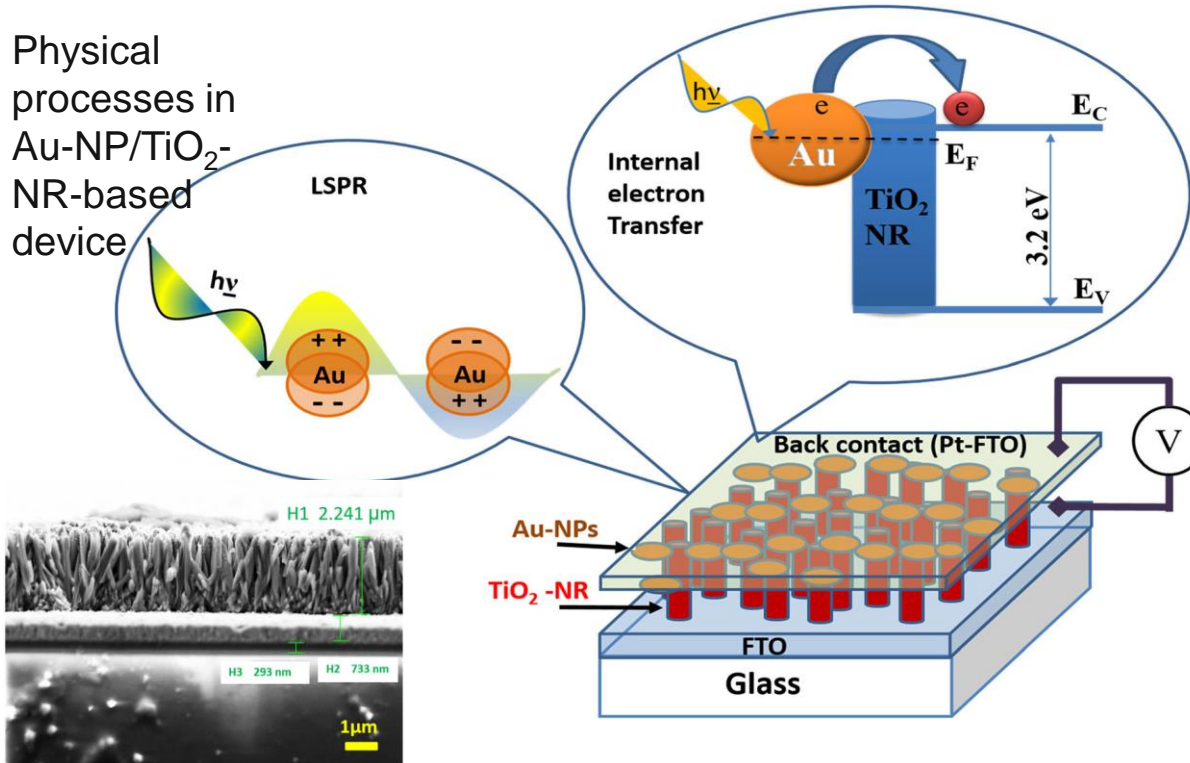


## Dr. Brijesh Tripathi Associate Professor

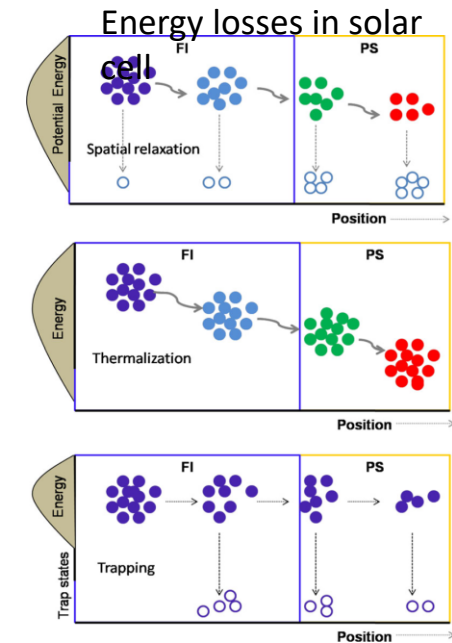
### Research Interests:

- Electronic Device Modelling and Simulation
- Quantum Dot/Well Solar Cells
- Thin Films for Opto-electronic Processes

Physical processes in Au-NP/TiO<sub>2</sub>-NR-based device



Cross-sectional view of the TiO<sub>2</sub>-Nano-rods



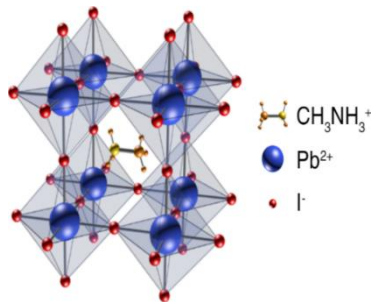
# M.Sc. (Physics)

**Dr. Ankur Solanki**  
Asst./ Prof., M.Tech. IITK,  
Ph.D. NTU Singapore



## Research Interest:

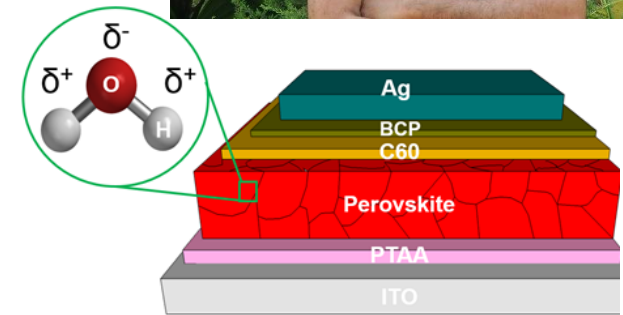
- (1) Hybrid perovskite based flexible memristor, data storage, synapses and solar cell devices
- (2) Materials Engineering and Photo-Physics



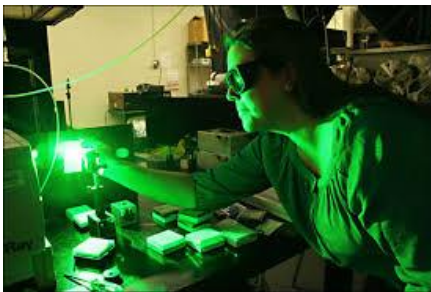
Materials Engineering



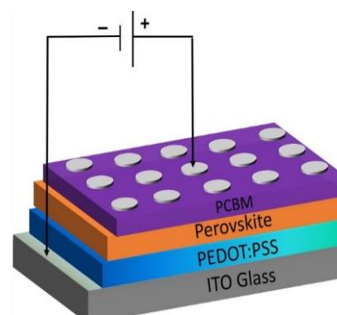
Flexible Devices



Inverted Solar Cell



Ultrafast Spectroscopy



Memory Devices



Glove box for fabrication

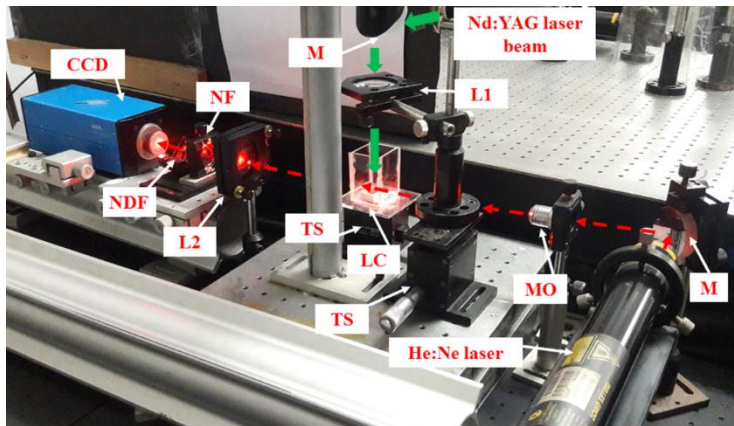
**Dr. Prahlad K. Baruah**  
**Assistant Professor, Ph.D. IIT Guwahati**



## Research Interests:

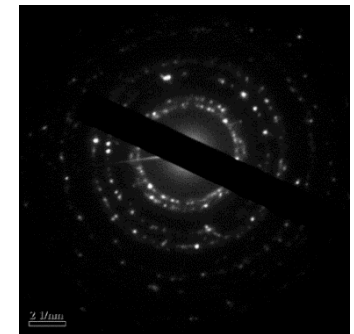
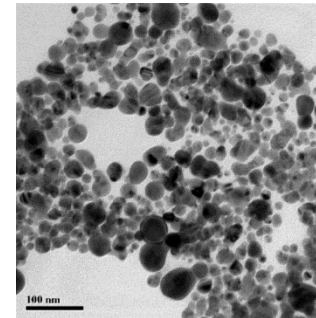
- Laser-matter interaction
- Synthesis of Plasmonic nanoparticles
- Laser-induced cavitation and shockwave dynamics
- Surface enhanced Raman scattering (SERS)
- Antibacterial studies
- Laser micromachining

## Laser shadowgraphy setup

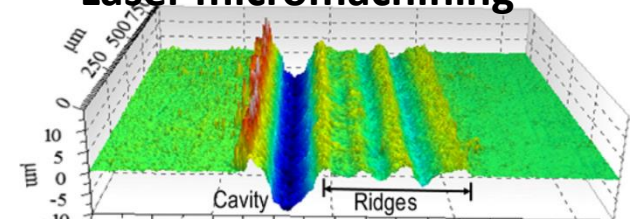


CCD: Charge coupled device, NDF: Neutral density filter, NF: Notch filter, M: mirror, MO: Microscopic objective, L: lens, LC: liquid cell

## Plasmonic Nanoparticles



## Laser micromachining



# M.Sc. (Physics)

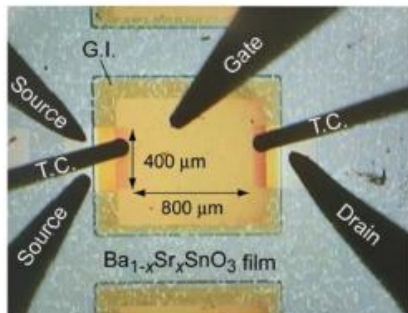
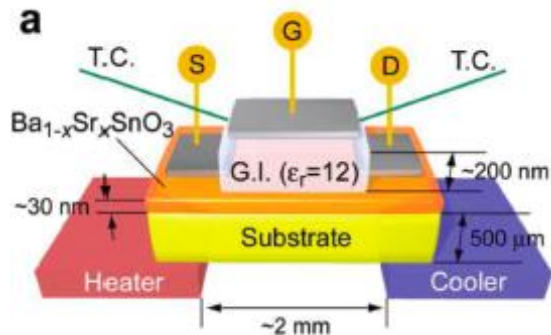
**Dr. Anup V. Sanchela**

Assistant Professor, Ph.D. IIT Bombay  
Postdoc Hokkaido Uni. Japan

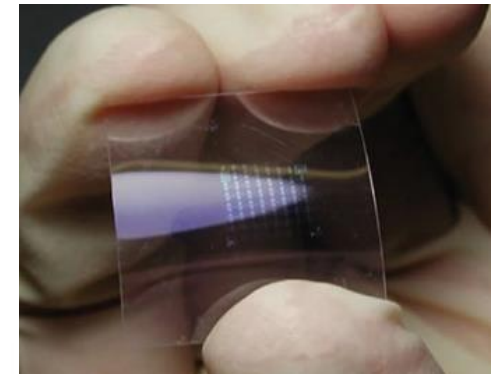
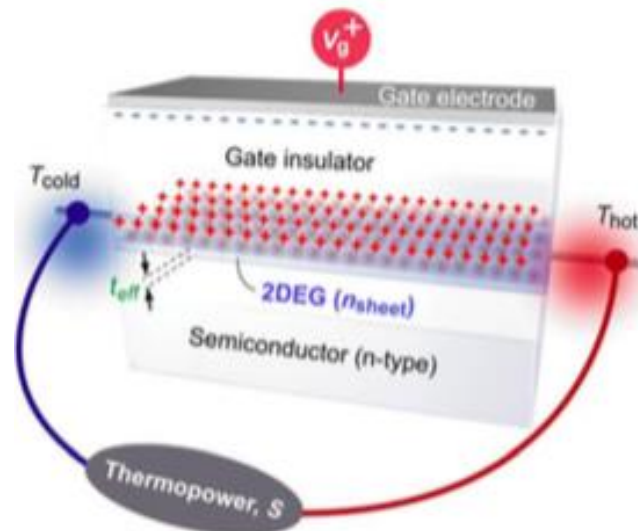


Research Interest: Thermoelectric materials  
Transparent conducting oxide  
Thin film transistor

**TFT**



**Thermopower measurement of TFT**

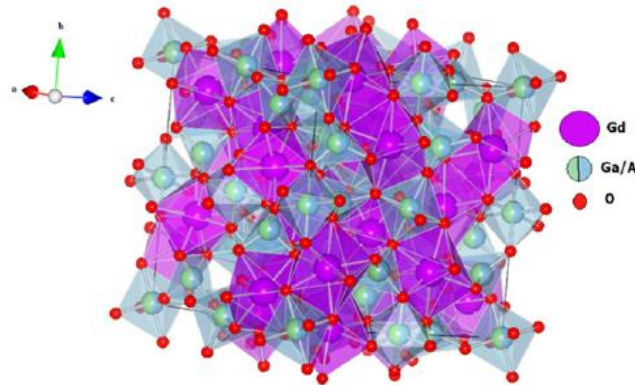


Dr. Sheetal Rawat  
Assistant Professor



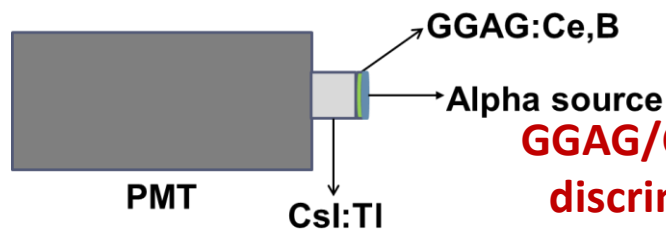
## Research Interest:

- (1) Experimental Nuclear Physics
- (2) Single crystal growth for Radiation detection

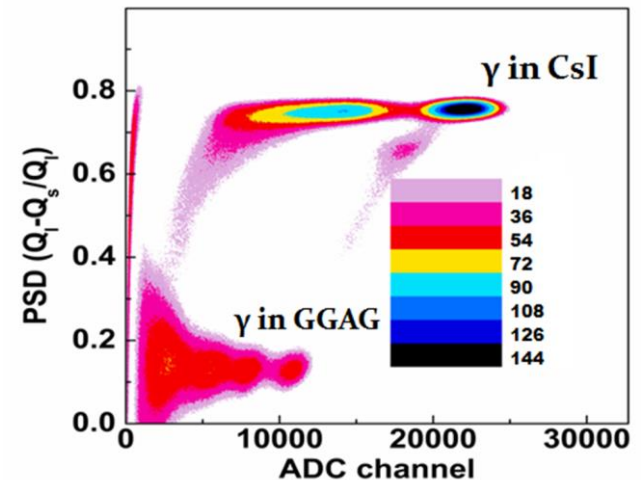


Crystal Structure of  
 $Gd_3Ga_3Al_2O_{12}$  (GGAG)

GGAG:Ce scintillator  
grown in TPD, BARC



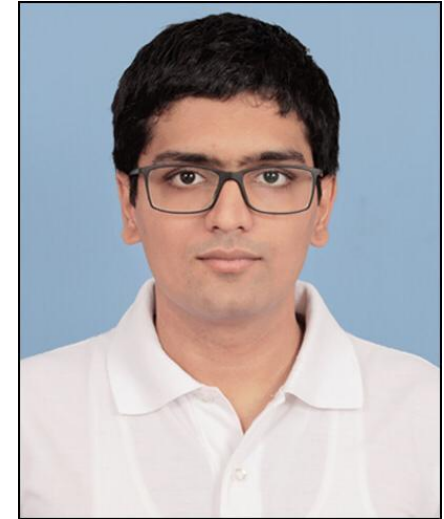
GGAG/CsI Phoswich Pulse shape  
discrimination compact setup



GGAG:Ce useful for DOI medical  
imaging, PET and X-ray camera

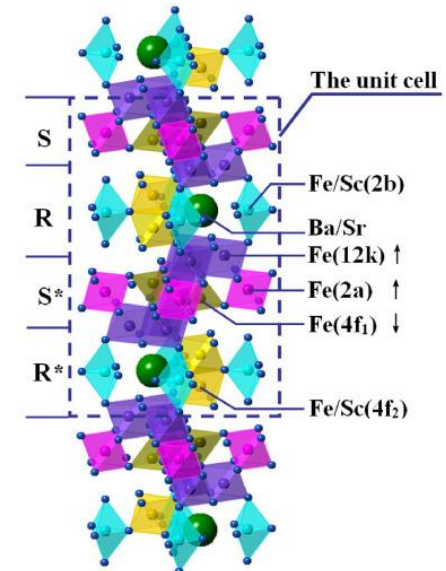


**Abhishek A. Gor**  
**Assistant Professor (on Contract)**



## Research Interests:

- Magnetic properties and materials (Ferrites, Hexaferrites and its thin films)
- Ferroelectrics and Multiferroics, Ferromagnetism.
- Green Synthesis of Hexaferrites.



# Departmental Activities



# CO-CURRICULAR ACTIVITIES /INDUSTRIAL - VISITS/TECH-FEST/EDUCATIONAL TRIPS



**We  
Believe**

in learning by doing  
in training future  
in quality education  
in growing together  
in making a **DIFFERENCE**

