

## Areas of Interest/Research Topic

Name of Faculty Mentor	Areas of Interest/Research Topic	Remarks
<b>Discipline Of Astronomy, Astrophysics And Space Engineering (DAASE)</b>		
<a href="#">Dr. Abhirup Datta</a>	1) Observational Cosmology and Astrophysics - statistics, machine learning, and simulations. 2) Radio and X-ray Astronomy - Observations, Data Analysis and Instrumentation (Square Kilometre Array, GMRT) 3) Statistics and Machine Learning related to Space Applications 4) Space Weather and Ionosphere: NaVIC and GPS applications 5) Space Instrumentation - Payloads and future missions	
<a href="#">Dr. Suman Majumdar</a>	1. Cosmology 2. Early Universe 3. Epoch of Reionization and Cosmic Dawn 4. 21-cm Cosmology 5. Statistical Inference 6. Observations of the Early Universe with Next Generation Telescopes 7. Large Scale Structures 8. Simulations of the Early Universe 9. Cosmological N-body Simulations 10. Square Kilometer Array 11. Machine Learning and Artificial Intelligence 12. Statistics with BIG DATA Cosmology	
<a href="#">Dr. Saurabh Das</a>	1. Space weather/Solar wind prediction and modelling using AI/ML 2. GNSS/GPS navigation and remote sensing 3. Pulsar-based navigation for Human Space Mission 4. Hyperspectral, Multi-spectral and UAV remote Sensing 5. Cyclone and extreme weather prediction using Deep Learning/ AI	

<a href="#">Dr. Amit Shukla</a>	<ol style="list-style-type: none"> <li>1) Active galactic nuclei</li> <li>2) Blazars</li> <li>3) High Energy Astrophysics</li> <li>4) Pulsars</li> <li>5) Multi-wavelength &amp; multi-messenger astrophysics</li> <li>6) Kilonova (electromagnetic counterpart to a gravitational-wave)</li> </ol>	
<a href="#">Dr. Rajkumar Hajra</a>	<ol style="list-style-type: none"> <li>1) Space weather</li> <li>2) Geomagnetic storms and substorms</li> <li>3) Earth's outer radiation belt</li> <li>4) Ionospheric modeling</li> </ol>	
<b>Discipline of Biosciences and Biomedical Engineering (BSBE)</b>		
<a href="#">Dr. Sharad Gupta</a>	<ol style="list-style-type: none"> <li>1) Biophotonics</li> <li>2) NIR imaging</li> </ol>	
<a href="#">Dr. Prashant Kodgire</a>	<ol style="list-style-type: none"> <li>1) Molecular Biology</li> <li>2) Molecular Immunology</li> <li>3) Genetic Engineering</li> <li>4) Recombinant DNA Technology</li> <li>5) Microbiology</li> <li>6) Recombinant Protein Expression and Purification</li> <li>7) Diagnostics</li> </ol>	
<a href="#">Dr. Mirza S. Baig</a>	<ol style="list-style-type: none"> <li>1) Disease Modelling, Target Identification, and Drug Discovery</li> </ol>	
<a href="#">Dr. Hem Chandra Jha</a>	<ol style="list-style-type: none"> <li>1) Project 1- Determination of Epstein Barr Virus and host interaction using bioinformatic tools.</li> <li>2) Project 2- Bioinformatic approach to study plant based products as potential antivirals.</li> </ol>	

	<ul style="list-style-type: none"> <li>3) How to diagnose viral infection!</li> <li>4) How to choose correct diagnostics targets in various infections!</li> <li>5) Genomics &amp; proteomics approaches to understand the host-pathogens interactions!</li> <li>6) Metabolomics &amp; other OMICS studies in modern health sciences!</li> <li>7) Viral infection in brain cells</li> <li>8) Our gut is more important than any other organs!</li> </ul>	
<a href="#">Dr. Parimal Kar</a>	1) Computer Aided Drug Design for Infectious Diseases	
<b>Discipline of Chemistry</b>		
<a href="#">Professor Suman Mukhopadhyay</a>	1) Biological applications of transition metal complexes	
<a href="#">Dr. Apurba K. Das</a>	<ul style="list-style-type: none"> <li>1) Bio-organic chemistry</li> <li>2) Electrocatalysis</li> </ul>	
<a href="#">Dr. Chelvam Venkatesh</a>	<ul style="list-style-type: none"> <li>1) Synthesis of Natural products, Heterocycles and Carbocycles, Construction of C-C and C-X (X =N,O,S,P) bonds</li> <li>2) Diagnostic Applications of New targeting ligands for Cancers and Inflammatory diseases</li> <li>3) Synthesis of Inhibitors for Drug Targets, Drug delivery systems</li> <li>4) Near-infra red fluorescence optical and Nuclear Imaging</li> <li>5) Bio-conjugate Chemistry</li> </ul>	
<b>Discipline of Civil Engineering</b>		
<a href="#">Dr. Neelima Satyam</a>	<ul style="list-style-type: none"> <li>1) Soil structure interaction</li> <li>2) Environmental geotechnics</li> <li>3) Transportation geotechnics</li> </ul>	

	<ul style="list-style-type: none"> <li>4) Soil dynamics</li> <li>5) Rock mechanics and underground structures</li> </ul>	
<a href="#">Professor Sandeep Chaudhary</a>	<ul style="list-style-type: none"> <li>1) Sustainable building materials</li> <li>2) Concrete Technology</li> <li>3) Tall Buildings</li> </ul>	
<a href="#">Dr. Gourab Sil</a>	<ul style="list-style-type: none"> <li>1) Performance Based Geometric Design of Highways</li> <li>2) Safety of Roadway Infrastructure</li> <li>3) Effects of Highway Infrastructure on Driver Behavior</li> <li>4) Traffic Engineering</li> </ul>	
<b>Discipline of Computer Science and Engineering</b>		
<a href="#">Dr. Aruna Tiwari</a>	<ul style="list-style-type: none"> <li>1) Artificial Intelligence</li> <li>2) Machine Learning for Big Data handling</li> <li>3) Soft-computing</li> <li>4) Data Mining</li> </ul>	
<a href="#">Dr. Anirban Sengupta</a>	<ul style="list-style-type: none"> <li>1) Hardware Security</li> <li>2) Digital Forensics</li> <li>3) CAD-VLSI</li> <li>4) Machine Learning Chips</li> <li>5) Computer Architecture and Optimization</li> <li>6) Soft Computing</li> </ul>	
<a href="#">Dr. Surya Prakash</a>	<ul style="list-style-type: none"> <li>1) Machine Learning</li> <li>2) Deep Learning</li> <li>3) Pattern Recognition</li> <li>4) Computer Vision</li> <li>5) Image Processing</li> <li>6) Biometrics</li> </ul>	

<a href="#">Dr. Somnath Dey</a>	<ol style="list-style-type: none"> <li>1) Biometric Security</li> <li>2) Image Processing</li> <li>3) Machine Learning</li> </ol>	
<a href="#">Dr. Gourinath Banda</a>	<ol style="list-style-type: none"> <li>1) Developing Application and Guidance notes for formal analyses of software systems</li> <li>2) Applied Static analyses for systems programs</li> <li>3) Precision positioning system for laboratory scales</li> <li>4) Developing medical cyber physical systems</li> <li>5) Systematic studies into ancient yogic practice affects on human anatomy, physiology and genetics</li> </ol>	
<a href="#">Dr. Neminath Hubballi</a>	<ol style="list-style-type: none"> <li>1) Network Security</li> <li>2) Cyber Security</li> <li>3) Cloud Security</li> <li>4) Fault Detection in Networks</li> </ol>	
<a href="#">Dr. Bodhisatwa Mazumdar</a>	<ol style="list-style-type: none"> <li>1) Secure Lightweight Cryptographic Implementations for IoT Devices.</li> <li>2) Machine Learning Model for Synthesizing Lightweight Cryptographic Primitives.</li> <li>3) Fault Analysis Techniques for Lightweight Cryptography.</li> </ol>	
<a href="#">Dr. Puneet Gupta</a>	<ol style="list-style-type: none"> <li>1) Deep Learning</li> <li>2) Computer Vision</li> <li>3) Image Processing</li> <li>4) Artificial Intelligence</li> </ol>	
<a href="#">Dr. Chandresh Kumar Maurya</a>	<ol style="list-style-type: none"> <li>1) Machine learning</li> <li>2) Deep learning</li> <li>3) Natural language processing</li> <li>4) Text Mining</li> </ol>	

<b>Discipline of Electrical Engineering</b>		
<a href="#">Professor Ram Bilas Pachori</a>	<ol style="list-style-type: none"> <li>1) Signal Processing</li> <li>2) Biomedical Signal Processing</li> <li>3) Speech Signal Processing</li> <li>4) Machine Learning</li> </ol>	
<a href="#">Dr. Shaibal Mukherjee</a>	<ol style="list-style-type: none"> <li>1) Solar cell</li> <li>2) RF transistor</li> <li>3) Artificial neurons/Silicon brain/RRAM for image processing</li> <li>4) 2D materials for RRAMs</li> <li>5) Biochemical sensor</li> </ol>	
<a href="#">Dr. Vivek Kanhangad</a>	<ol style="list-style-type: none"> <li>1) Image analysis</li> <li>2) Computer vision</li> <li>3) Machine learning with a focus on biometric security and biomedical applications.</li> </ol>	
<a href="#">Dr. Mukesh Kumar</a>	<ol style="list-style-type: none"> <li>1) Optoelectronics/Photonics</li> <li>2) Integrated CMOS-Photonics</li> <li>3) On-chip Optical Biosensors</li> <li>4) Device Fabricatoin</li> </ol>	
<a href="#">Dr. Abhinoy Kumar Singh</a>	<ol style="list-style-type: none"> <li>1) Stochastic estimation and filtering</li> <li>2) Target tracking</li> </ol>	
<a href="#">Dr. Saptarshi Ghosh</a>	<ol style="list-style-type: none"> <li>1) Electromagnetics</li> <li>2) Frequency selective surfaces (FSSs)</li> <li>3) Metamaterials</li> <li>4) Microwave absorbers</li> <li>5) Microwave antennas</li> </ol>	

	6) 3-dimensional (3-D) printing	
<a href="#">Dr. Swaminathan R.</a>	<ol style="list-style-type: none"> <li>1) Space-Air-Ground Integrated Networks (SAGIN)</li> <li>2) Hybrid Optical-RF Communication</li> <li>3) Blind Channel Code and Interleaver Reconstruction Techniques</li> <li>4) Index Modulation Techniques for Next-generation Wireless Communication</li> <li>5) Energy Harvesting Schemes for Integrated Optical-RF Networks.</li> <li>6) Non-Orthogonal Multiple Access (NOMA) Techniques</li> <li>7) Intelligent Reflecting Surface-based Wireless Communications</li> <li>8) TeraHertz Wireless Communication</li> <li>9) Machine Learning/Deep Learning for Communication Systems</li> </ol>	
<b>School of Humanities and Social Sciences</b>		
<a href="#">Dr. Nirmala Menon</a>	1) Digital Humanities	
<a href="#">Dr. Ruchi Sharma</a>	<ol style="list-style-type: none"> <li>1) Economics of innovation</li> <li>2) International economics</li> <li>3) Industrial organization</li> <li>4) R&amp;D</li> <li>5) Patenting</li> <li>6) Patent policy</li> <li>7) Technology transfer</li> <li>8) Foreign direct investment and licensing</li> <li>9) Entrepreneurship</li> </ol>	
<a href="#">Dr. Akshaya Kumar</a>	<ol style="list-style-type: none"> <li>1) Indian Cinema</li> <li>2) Comparative Media studies</li> <li>3) Cultural studies</li> <li>4) Sociology of labour migration</li> <li>5) Performance studies</li> </ol>	

<a href="#">Dr. Ananya Ghoshal</a>	<ol style="list-style-type: none"> <li>1) Modernism in Literature and Art ( American and British)</li> <li>2. William Blake-An Introduction</li> <li>3. Epidemics and Literature</li> <li>4. The Cinema of Satyajit Ray</li> <li>5. Fundamentals of Creative Writing</li> </ol>	
<b>Discipline of Mathematics</b>		
<a href="#">Dr. Md. Aquil Khan</a>	<ol style="list-style-type: none"> <li>1) Modal Logic</li> <li>2) Rough Set Theory</li> </ol>	
<a href="#">Dr. Anand Parkash</a>	<ol style="list-style-type: none"> <li>1) Commutative Algebra</li> </ol>	
Dr. M. Tanveer		
<a href="#">Dr. Sanjeev Singh</a>	<ol style="list-style-type: none"> <li>1) Special functions related to Bessel function</li> </ol>	
<a href="#">Dr. Santanu Manna</a>	<ol style="list-style-type: none"> <li>1) Mathematical Modelling of near-surface Love wave fields. (Minimum time required one month)</li> <li>2) Asymptotic analysis of the Rayleigh wave propagation in layered media. (Minimum time required 2 months)</li> <li>3) Dynamic stiffness formulation and Wave motion in a Non-homogeneous structure. (Minimum time required 2 months)</li> <li>4) Apart from the above 3 topics faculty/students can propose any other topic from Applied Mathematics or Wave Theory</li> </ol>	
<b>Discipline of Mechanical Engineering</b>		
<a href="#">Professor Anand Parey</a>	<ol style="list-style-type: none"> <li>1. Condition monitoring</li> <li>2. Noise and vibration</li> <li>3. Mechanical Systems Signal Processing</li> </ol>	



[Dr. Shanmugam Dhinakaran](#)

- 1) **Computational Fluid Dynamics and Heat Transfer:** Mathematical modelling and CFD simulations in all areas.
- 2) **COVID-19:** Modelling of SARS-CoV-2 transmission
- 3) **Analytical solutions:** Advanced fluid flow and heat transfer problems
- 4) **CFD Softwares:** CFD modelling and simulations with OpenFOAM and Ansys Fluent
- 5) **Bluff Body Aerodynamics:** Drag reduction techniques; Flow control; Vortex shedding and heat transfer, etc.
- 6) **Marine Hydrodynamics**
- 7) **Porous Media:** Fluid flow and heat transfer in Porous Media applied to all fields of Science and Engineering
- 8) **Non-Newtonian fluid Mechanics:** Viscoelastic fluid flows; Flow in microchannels; Optimization of microfluidic devices
- 9) **Multi phase flows:** Modelling and simulation of multiphase flows
- 10) **Heat transfer enhancement:** Electronic cooling; Nanofluids; Science and technology of heat pipes; Evaporation, etc.
- 11) **Renewable energy:** Solar air heaters; Solar collectors; Solar stills, etc.
- 12) **Development of numerical schemes:** Finite volume methods: Development of high resolution schemes; Lattice Boltzmann methods, etc.
- 13) **Biofluid Mechanics and Bio-heat transfer:** Respiratory air flow, Blood flow in diseased arteries; Cancer treatment; Drug delivery; Human body heat transfer.
- 14) **Engineering Device development:** Design and development of devices that involves fluid flow, heat and mass transfer.
- 15) **Other areas:** Fuel cells; Thermal Energy Storage; CFD in welding and Metallurgy; CFD in Sports

**Who can apply?** All those who are awarded or pursuing B.Tech/M.Tech/B.Sc/M.Sc/Ph.D in **Engineering** (Aerospace, Agriculture,

	<p>Automobile, Chemical, Civil, Environmental, Mechanical, Textile, Manufacturing, Petroleum, Geotechnical, Nuclear, Marine, Nanotechnology, Mining, Ceramics, Metallurgy, Biomedical, Biotechnology etc) or <b>Science</b> (Applied mathematics, Physics, Biosciences, Biochemistry, Life Sciences, Sports science, etc.)</p> <p><b><u>BSBE Department:</u></b></p> <ol style="list-style-type: none"> <li>1) <b>Computational Fluid Dynamics and heat transfer:</b> CFD applied to all areas of Biochemistry, Biosciences, Bioengineering, Biotechnology and Biomedical Engineering</li> <li>2) <b>COVID-19:</b> Mathematical modelling and simulations of infectious SARS-CoV-2 virus transport</li> <li>3) <b>Biofluid Dynamics:</b> Biofluids &amp; general biological fluid flows; BioMEMS; Biomicrofluidics; Lab-on-a-chip, etc.</li> <li>4) <b>Human body:</b> Respiratory obstructive diseases; Blood flow in diseased arteries (Stenosis &amp; Aneurysm); CFD in cardiovascular disease; Modelling of heat transfer from human body</li> <li>5) <b>Diseases diagnosis and treatment:</b> Drug delivery; Cancer treatment; COPD, etc.</li> <li>6) <b>Tissue Engineering:</b> Heat transfer in biological tissues; Scaffolding; Porous scaffolds; Bio-reactor, etc.</li> <li>7) <b>Bioenergy:</b> Bioenergy systems and modelling; Biomass, Biomass thermochemical conversion; Bioreactors; Microbial fuel cells; Waste water treatment</li> <li>8) <b>Biomedical device development:</b> Respiratory devices; Devices for the disabled and elderly; other medical devices.</li> </ol> <p><b>Who can apply?</b> All those who are awarded or pursuing B.Tech/M.Tech/B.Sc/M.Sc/Ph.D in the following streams: Biosciences, Biochemistry, Biotechnology, Bioengineering, Biomedical Engineering and other relevant science/engineering backgrounds.</p>	
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<a href="#">Dr. Shailesh I. Kundalwal</a>	<ol style="list-style-type: none"> <li>1) Composite Structures</li> <li>2) Experimental Characterization of Composites</li> <li>3) Finite Element Applications</li> <li>4) Flexoelectricity and Piezoelectricity</li> <li>5) Mechanics of Nanostructures</li> <li>6) Nanomechanics &amp; Micromechanics of Composites</li> <li>7) Nanotechnology in Engineering</li> <li>8) Smart Materials and Structures</li> </ol>	
<a href="#">Dr. Indrasen Singh</a>	<ol style="list-style-type: none"> <li>1) Finite Element Methods (Linear as well as Non-linear)</li> <li>2) Finite Element Modeling of Indentation in Elastic-Plastic solids in Abaqus</li> <li>3) Fracture Mechanics</li> <li>4) Continuum Mechanics</li> <li>5) Theory of plasticity</li> <li>6) Mechanical Behaviour of Materials</li> <li>7) Metallic Glasses</li> <li>8) Piezoelectric Materials</li> </ol>	
<a href="#">Dr. Harekrishna Yadav</a>	<ol style="list-style-type: none"> <li>1) Fluid-Structure Interaction</li> <li>2) Shear Flow</li> <li>3) Flow and Turbulence Measurement using Optical Techniques</li> <li>4) Heat Transfer Enhancement</li> <li>5) Supersonic Flow</li> <li>6) Renewable and Sustainable Energy</li> </ol>	
<a href="#">Dr. Satyanarayan Patel</a>	<ol style="list-style-type: none"> <li>1) Thermal energy harvesting using pyroelectric materials</li> <li>2) Heat Transfer analysis for solid-state refrigeration</li> <li>3) Image-based FEM analysis of Composite materials for thermal stress and electric properties</li> <li>4) Energy conversion, storage and harvesting materials</li> </ol>	

	5) Piezoelectric, Pyroelectric and ferroelectric materials	
<a href="#">Dr. Ankur Miglani</a>	<ol style="list-style-type: none"> <li>1) Combustion of next-generation fuels: Gel fuels and nanoparticle laden fuels</li> <li>2) Thermal management of power-dense electronics: Flow boiling in microchannels</li> <li>3) Microfluidics</li> <li>4) Soft-matter: Instabilities in drying colloidal systems</li> <li>5) Machine learning based pattern recognition in energy systems</li> </ol>	
<b>Discipline of Metallurgy Engineering and Materials Science</b>		
<a href="#">Dr. Rupesh Devan</a>	<ol style="list-style-type: none"> <li>1) Nanomaterials for energy applications</li> <li>2) Thin films: synthesis and characterization</li> <li>3) Nanomaterials: synthesis and characterization</li> </ol>	
<a href="#">Dr. Santosh Hosmani</a>	<ol style="list-style-type: none"> <li>1) Surface Engineering and Characterisation</li> <li>2) Tribology</li> <li>3) Physical Metallurgy</li> <li>4) Microstructure-Property correlation</li> </ol>	
<a href="#">Dr. Jayaprakash Murugesan</a>	<ol style="list-style-type: none"> <li>1) Advanced welding techniques</li> <li>2) Fatigue and fracture behavior of advanced materials</li> <li>3) Surface engineering</li> </ol>	
<a href="#">Dr. Hemant Borkar</a>	<ol style="list-style-type: none"> <li>1) Materials Science and Engineering</li> <li>2) Mechanical metallurgy</li> <li>3) Lightweight materials for automotive applications</li> </ol>	
<a href="#">Dr. Ram Sajeevan Maurya</a>	<ol style="list-style-type: none"> <li>1) Bulk Metallic glass (BMG)</li> <li>2) Composite Materials</li> <li>3) Oxide dispersion strengthened (ODS) alloys</li> </ol>	

	<ul style="list-style-type: none"> <li>4) High entropy alloys (HEAs)</li> <li>5) Alloy/composite development by powder technology route: Mechanical alloying</li> <li>6) Spark plasma sintering</li> </ul>	
<a href="#">Dr. Dudekula Althaf Basha</a>	1) Deformation behavior of magnesium alloys	
<b>Discipline of Physics</b>		
<a href="#">Dr. Raghunath Sahoo</a>	<ul style="list-style-type: none"> <li>1) High Energy Nuclear Physics, Quark-Gluon Plasma (Experiment and Phenomenology)</li> <li>2) Application of Statistical Mechanics in High-energy Physics</li> <li>3) Relativistic Kinematics, Statistical Methods in Physical Sciences and Engineering</li> <li>4) Experimental Techniques in Nuclear and High-energy Physics</li> </ul>	
<a href="#">Dr. Rajesh Kumar</a>	<ul style="list-style-type: none"> <li>1) Devices physics</li> <li>2) semiconductor nanomaterials</li> <li>3) Raman spectroscopy</li> </ul>	
<a href="#">Dr. Sudeshna Chattopadhyay</a>	<ul style="list-style-type: none"> <li>1. Electrical Energy Storage: Lithium-ion batteries, and batteries beyond Lithium.</li> <li>2. X-ray scattering (including X-ray diffraction (XRD), X-ray reflectivity (XRR), Grazing incidence small angle X-ray scattering (GISAXS)): Characterization of Nanomaterials, Surface and Interfaces.</li> <li>3. Spectroscopy for interdisciplinary research (for Physicist, Materials scientist and Biologist)</li> <li>4. Nanotechnology in Biomedical applications and Environmental remediation</li> </ul>	

***Note: Outside Faculty members/Students are requested to contact concerned faculty mentor for any query/clarification.***

**Consent form faculty mentor of IIT Indore is a must.**