

INDIAN INSTITUTE OF TECHNOLOGY MADRAS

FACULTY EXPERTISE



Department of Aerospace Engineering

Department of Applied Mechanics

Department of Biotechnology

Department of Chemical Engineering

Department of Chemistry

Department of Civil Engineering

Department of Computer Science & Engineering

Department of Electrical Engineering

Department of Engineering Design

Department of Humanities and Social Science

Department of Management Studies

Department of Mathematics

Department of Mechanical Engineering

Department of Metallurgical and Materials Engineering

Department of Ocean Engineering

Department of Physics



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF AEROSPACE ENGINEERING

LIST OF FACULTY

Amit Kumar

Bharath Govindarajan

Bhaskar K

Devaprakash Muniraj(Yet to update)

Joel George M

Jayachandran T (Yet to Update)

Luoyi Tao

Mahesh S

Manikandan Mathur

Murthy H S N

Muruganandam T M

Nagabhushana Rao Vadlamani

Nagendra Gopal K V

Nandan Kumar Sinha

Rajesh G

Ramakrishna M

Ramakrishna P A

Ranjith M

Ravi Shankar P (Yet to Update)

Sameen A

Santanu Ghosh

Satadal Ghosh

Satya R Chakravarthy

Senthil Murugan M

Shankar Ghosh

Shantanu Shashikant Mulay

Shyam Keralavarma

Sriram P

Sriram Rengarajan

Sujith R I

Sunetra Sarkar

Velmurugan R



Dr. Amit Kumar PhD, Case Western Reserve University, USA Professor, Aerospace Engineering 044-2257-4019; <u>amitk@ae.iitm.ac.in</u> <u>http://www.ae.iitm.ac.in/~amitk</u>

- Combustion: Fire Safety Research on earth and in space (microgravity)
- Propulsion: Rocket and spacecraft propulsion, Electric propulsion





Dr. Bharath Govindarajan PhD, University of Maryland College Park, USA Assistant Professor, Aerospace Engineering 044-2257-4030; <u>bharath@iitm.ac.in</u> <u>https://www.mgbharath.com/</u>



- Numerical modeling of aerodynamics flows: Vortex methods, particle methods
- CFD: Rotorcraft flows, FVM based solvers, moving/deforming (overset) meshes





Dr. K Bhaskar PhD, IIT Madras Professor, Aerospace Engineering 044-2257-4010; <u>kbhas@iitm.ac.in</u> http://www.iitm.ac.in/~kbhas/kbhas.htm



- Beams, Plates and Shells/ Statics, Dynamics and Stability
- Three-dimensional Analysis using Theories of Isotropic / Anisotropic Elasticity
- Theoretical Modelling of Composite Laminates



Plate buckling under nonuniform compression



A zigzag type higherorder laminate model



Dr. Devaprakash Muniraj

PhD, IIT Madras Assistant Professor, Aerospace Engineering 044-2257-4034; <u>deva@iitm.ac.in</u>



Dr. Joel George M

PhD, Indian Institute of Science, Bangalore Assistant Professor, Aerospace Engineering 044-2257-4006; joel@ae.iitm.ac.in



- Navigation, guidance, and control of aerospace vehicles
- Flight dynamics
- Multi-agent systems theory as applied to multiple Unmanned Aerial Vehicle missions

Immediate objectives include setting up a multi-vehicle facility, with quad-rotor platforms, to develop and test various decentralized control and estimation algorithms



Dr. Jayachandran T

Assistant Professor, Aerospace Engineering 044-2257-4035; <u>t_Jayachandran@iitm.ac.in</u>



Dr. Luoyi Tao PhD, University of Pittsburgh, USA Professor, Aerospace Engineering 044-2257-4003; <u>luoyitao@iitm.ac.in</u> http://www.ae.iitm.ac.in/people/faculty/luoyi.html



- Continuum Mechanics: Issues on the foundation of constitutive theory
- Turbulence Modelling: Application of information theory, optimal control and optimization
- Interested in mathematical model construction and analysis of (physical) systems and processes within the constraint of information/data availability.



Dr. S Mahesh PhD, Cornell University Professor, Aerospace Engineering 044-2257-4008; <u>smahesh@iitm.ac.in</u> http://www.ae.iitm.ac.in/~smahesh/



Major Areas of Research

- Solid mechanics analysis of aerospace materials
- Plasticity, fracture, and creep modeling and experimentation



Micromechanical modeling of creep rupture in steels



substructure formation during plastic deformation



Dr. Manikandan Mathur PhD, Massachusetts Institute of Technology, USA Professor, Aerospace Engineering 044-2257-4025; <u>manims@ae.iitm.ac.in</u> https://sites.google.com/site/mathur2m/

- Rotating and Stratified Flows Bistability, Internal Gravity Waves,
- Vortex Stability Non-parallel flows, Compressible flows, Magneto hydrodynamics
- Lagrangian Coherent Structures (LCS) Mixing of passive and diffusive tracers



Internal waves in the lab





Dr. Murthy H S N (PhD - Purdue) Professor, Aerospace Engineering 044-2257-4014; <u>mhsn@ae.iitm.ac.in</u>



Major Areas of Research

Damage mechanisms in metals & composites (fatigue & fracture), contact mechanics & tribology, fretting, constitutive modeling of visco-elastic materials **Currently Working on:**

- 1. Damage evolution around machined holes in composites due to fatigue loads: damage mapping using NDT (*digital image correlation-DIC, infra-red thermography*); modeling continuum & stochastic.
- 2. Fretting fatigue of polycrystalline & single crystal material: experimental studies; analytical modeling to obtain stresses; life estimation using multi-axial fatigue parameters & fracture mechanics.
- 3. Manufacturing of fine grained materials using machining for severe plastic deformation: mechanical characterization
- 4. Three dimensional (3D) effects in contacts
- 5. 2D contact analysis of functionally graded & coated materials



Future Interests: Modeling of biological contacts

6. Constitutive modelling of solid

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Dr. T M Muruganandam PhD, Georgia Institute of Technology, USA Professor, Aerospace Engineering 044-2257-4022; <u>murgi@ae.iitm.ac.in</u> <u>http://www.ae.iitm.ac.in/~murgi/index.html</u>



- Flame stabilisation, Burner Development, Blowout prediction, Precursors to blowout, detection of imminent blowout, unsteady combustion: experimental & analytical
- Optical diagnostics of high speed and reacting flows: Spectroscopic diagnostics, Chemiluminescence, Mie Scattering, LII, PLIF, TDLAS, Schlieren, Tomography (TDLAS, PLIF, Schlieren)
- High speed flows, intakes studies, unsteady movement of shocks, Shock-Boundary Layer Interaction(SBLI), Micro Vortex Generators.





Dr. Nagabhushana Rao Vadlamani

PHD, University of Cambridge, UK Assistant Professor, Aerospace Engineering 044-2257-4037; <u>nrv@ae.iitm.ac.in</u> <u>http://www.ae.iitm.ac.in/~nrv/index.html</u>



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- CFD for Turbomachines: DNS, LES, Hybrid RANS/LES, Low-order modelling
- Transition to turbulence, Coupled interactions, flow control
- High-order solver COMP² development, High performance computing (HPC)



Develop numerical frameworks to predict complex flow physics in turbomachines



Dr. K V Nagendra Gopal PhD, Indian Institute of Science, Bangalore Associate Professor, Aerospace Engineering 044-2257-4015; gopal@iitm.ac.in http://www.ae.iitm.ac.in/~gopal/



- Analytical and computational modeling of the mechanics of multifunctional structures made of advanced materials, multi-scale modelling, dynamics of automotive tyres
- Fracture mechanics Crack growth analysis in metallic and composite structures





Dr. Nandan Kumar Sinha PhD, IIT Bombay, India Professor, Aerospace Engineering 044-2257-4021; <u>nandanks@iitm.ac.in</u> http://www.ae.iitm.ac.in/~nandan/nandan.html



- Nonlinear dynamics, bifurcation & chaos: Modeling nonlinear phenomena in dynamical systems exhibiting bifurcations and chaos under parametric variations
- Advanced six dof simulation: Missile-aircraft engagement simulation with/or without flares, optimization of countermeasure system parameters
- Flight dynamics and control: Inverse design of vehicles, controller development for maneuvers/accident simulation, high angle-of-attack



Design, modelling, simulation, and control of aerospace vehicles



Dr. G Rajesh PhD, Andong National University, South Korea Associate Professor, Aerospace Engineering 044-2257-4032; grajesh@iitm.ac.in http://www.ae.iitm.ac.in/~rajesh



- Wind Tunnel, Shock Tube and Gas Gun Experiments
- Shockwave dynamics

Projectile and sabot design Re-entry aerodynamics Transonic vehicle design Vacuum ejector systems High altitude system design Altitude adaptation nozzles Transdermal drug delivery Needle-less biolistic systems





Dr. Ramakrishna M PhD, University of Texas at Arlington, USA Professor, Aerospace Engineering 044-2257-4005; <u>krishna@ae.iitm.ac.in</u> <u>http://www.ae.iitm.ac.in/~krishna/ramakrishnam.html</u>

- Aerodynamics / Fluid mechanics
- Develop new numerical schemes / algorithms



cylinder

Convergence plot for a new Multi-grid scheme

Stochastic differential eq & Monte-Carlo methods



Dr. Ramakrishna P A

Professor, Aerospace Engineering 044-2257-4005; parama@ae.iitm.ac.in

Major Areas of Research

- Modeling the combustion of solid propellants
- Understanding the mechanism of solid propellant catalyst action
- Understanding the energy separation mechanism in vortex tubes
- Development of high burn rate solid propellants
- Development of fast burning hybrid rocket fuels
- Development of fuel rich propellants for scramjets and ramjets
- Development of high power to weight ratio IC engines



Hybrid rocket motor





Ranjith M PhD, Florida Atlantic University, USA Assistant Professor, Aerospace Engineering 044-2257-4026; <u>ranjith.m@ae.iitm.ac.in</u> http://www.ae.iitm.ac.in/~ranjith.m/index.htm



Major Areas of Research

Aerodynamics and dynamics of:

- > Helicopters
- > MAVs
- Wind turbines





Ravi Shankar P

Professor of Practice, Aerospace Engineering 044-2257-4029;



Dr. A Sameen PhD, Indian Institute of Science, Bangalore Professor, Aerospace Engineering 044-2257-4013; <u>sameen@iitm.ac.in</u> <u>http://www.ae.iitm.ac.in/~sameen</u>

- Vortex and vorticity dynamics, boundary layer flows, flow control
- Computational and experimental fluid dynamics
- Stability, transition and turbulence in classical and quantum fluids
- Thermal convection and mixing

Vortex behaviours Turbulence in wall jet, bluff body wakes, vortex mergers



Flow control: heating, hydrophobic surface, wall suction, magnetic forcing. Separation delay, lift augmentation, transition control.





Dr. Santanu Ghosh

PhD, North Carolina State University, Raleigh, NC, USA

Assistant Professor, Aerospace Engineering 044-2257-4031; <u>sghosh1@iitm.ac.in</u> <u>http://www.iitm.ac.in/~sghosh1/index.htm</u>

Major Areas of Research

- Computations of high-speed turbulent flows
- Shock/boundary layer interaction and its control
- Application of immersed-boundary methods



Top: Schematic of Cartesian Grid surrounding an embedded surface; Bottom: Iso-surface of a control device







Near surface axial velocity contours ; Top: SBL1 at M = 2.5 with no control; Bottom: SBL1 M = 2.5 with flow control using an array of 3 mm high VGs





Dr. Satadal Ghosh

Assistant Professor, Aerospace Engineering

044-2257-4036; satadal@iitm.ac.in



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Major Areas of Research

- Guidance of and Control \succ autonomous aerial vehicles
- Cooperative or adversarial search \geq and capture / contain
- > Autonomous unmanned aircraft systems (UAS) mission test-bed
- Autonomous fleet management
- Guidance for spacecraft \geq applications



Capture Zone of Retro-PN



Target's

Impact/Approach Angle Control





Dr. Satya R Chakravarthy PhD, Georgia Institute of Technology, USA Professor, Aerospace Engineering 044-2257-4011; <u>src@ae.iitm.ac.in</u> <u>http://www.ae.iitm.ac.in/people/faculty/chakravarthy.html</u>



- Combustion instability in gas turbines/ramjets/rockets: experiments & computations, laminar and turbulent flames
- Laser diagnostics of flow, spray, and combustion: PIV, PDPA, LDV, PLIF, tomography
- Nano-aluminium production and combustion, solid propellant combustion, solid rocket combustion instability
- Coordinator, National Centre for Combustion Research and Development (NCCRD)





Dr. M Senthil Murugan Aero-Electro-Mechanics & Systems (AIMS) lab Assistant Professor, Aerospace Engineering 044-2257-4027; <u>drsen@iitm.ac.in</u> <u>https://sites.google.com/view/aimsiitm</u>



Major Areas of Research

- > Nonlinear Dynamics & Control
- > Aero-Servo-Elasticity
- > Metamaterials
- > Morphing Structures
- Morphing Aircraft
- Rotorcraft/Helicopters
- > Spacecraft





(Image courtesy: Nasa, ESA, DLR)



Dr. Shankar Ghosh

PhD, University of Minnesota, USA Assistant Professor, Aerospace Engineering 044-2257-4023; <u>gshankar@ae.iitm.ac.in</u> http://www.iitm.ac.in/~gshankar/gshankar.htm

Major Areas of Research

- Computational fluid dynamics
- Numerical simulations of hypersonic turbulent flows
- > Non-equilibrium effects
- Laser-induced breakdown







Dr. Shantanu Shashikant Mulay

PhD, Nanyang Technological University, Singapore Associate Professor, Aerospace Engineering 044-2257-4016; <u>ssmulay@ae.iitm.ac.in</u> <u>http://www.ae.iitm.ac.in/~ssmulay</u>

Major Areas of Research

- Continuum mechanics, large deformation materials
- Constitutive modelling of composite materials
- Local and nonlocal damage-healing mechanics
- Viscoelastic material modelling
- Development of novel numerical meshless methods
- Multi-physics coupled continuum deformation of soft materials (hydrogels)











Dr. Shyam Keralavarma PhD, Texas A&M University, USA

Assistant Professor, Aerospace Engineering 044-2257-4009; <u>shyam@iitm.ac.in</u> http://www.ae.iitm.ac.in/people/faculty/shyam.html



- Plasticity: discrete dislocation plasticity, crystal plasticity, development of continuum constitutive models using micromechanics.
- Fracture Mechanics: ductile fracture by void growth, low triaxiality fracture, discrete dislocation simulation of crack-tip plasticity.
- Multi-scale Materials Modelling: development of multi-scale models for plasticity, dynamic strain aging, creep and fracture in metals.





Dr. P Sriram PhD, Georgia Institute of Technology, USA Professor, Aerospace Engineering 044-2257-4007; <u>sriram@iitm.ac.in</u> <u>http://ae.iitm.ac.in/~sriram</u>



- Fatigue and Fracture Mechanics
- Composite Materials
- Parallel Computing





Progressive Damage of Layered Composite



Parallel Speed up -Various architectures



Dr. Sriram Rengarajan

Assistant professor, Aerospace Engineering 044-2257-4020; r.sriram@iitm.ac.in, r.sriram@ae.iitm.ac.in https://www.iitm.ac.in/info/fac/r.sriram https://scholar.google.co.in/citations?user=IAIQA6wAAAAJ&hl=en



Major Areas of Research

- Unsteady high-speed flows
- Shockwave boundary layer interaction
- Flow control



Shockwave boundary layer interaction



Dynamic mode decomposition analysis of shock induced unsteady leading edge separation





Dr. R I Sujith PhD, Georgia Institute of Technology, USA Professor, Aerospace Engineering 044-2257-6012; <u>sujith@iitm.ac.in</u> <u>http://www.ae.iitm.ac.in/~sujith</u>

- Research Area: Combustion Instability; Focus Nonlinear dynamics; precursors
- Research Area: Optical flow diagnostics; Focus PIV, PLIF, LDV & PDPA, high speed imaging & image processing





Dr. Sunetra Sarkar PhD, Indian Institute of Science, India Professor, Aerospace Engineering 044-2257-4024; <u>sunetra@iitm.ac.in</u> <u>http://www.ae.iitm.ac.in/~sunetra/sunetra1.htm</u>



- Nonlinear Aero elasticity, Uncertainty Quantification
- Computational Fluid Dynamics, Particle Based Tools





Dr. R Velmurugan PhD, Indian Institute of Technology, Delhi Professor, Aerospace Engineering 044-2257-4017 ramanv@iitm.ac.in http://www.iitm.ac.in/ramanv



- Research Area/Focus 1 : Composite Materials
- Research Area/Focus 2 : Nano Composites
- Research Area/Focus 3 : Impact Mechanics and Structural Crashworthiness



Characterization studies of Composite Materials (polymer, metallic and natural composites)



Characterization and analytical studies of composites materials with nano fillers for improvement of functional properties in structural applications



Studies of different composite materials for impact loading and crashworthiness applications


INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF APPLIED MECHANICS

LIST OF FACULTY

Abhijit Chaudhuri

Anubhab Roy

Anuradha Banerjee

Arockiarajan A

Arul Prakash K

Arun K Thittai

Babji Srinivasan

Baburaj A P

Ganesh Tamadapu

Ilaksh Adalkha

Lakshmana Rao C

Mahesh V Panchagnula

Manivannan M

Pijush Ghosh

Prasad Patnaik B S V

Raghavendra Sai V V

Ramakrishnan S

Ramasubba Reddy M

Ramesh K

Rinku Mukherjee

<u>Sarith P Sathian</u>

<u>Satyanarayanan S</u>

<u>Saumendra K Bajpai</u>

Sayan Gupta

Shaikh Faruque Ali

<u>Sivakumar M Srinivasan</u>

Sujatha N

Vagesh D Narasimhamurthy

Varadhan S K M

Vengadesan S



Dr. Abhijit Chaudhuri PhD, Indian Institute of Science, Bangalore, India Associate Professor, Applied Mechanics 044-2257-4074; <u>abhijit.chaudhuri@iitm.ac.in</u> <u>http://apm.iitm.ac.in/fmlab/abhijit/index.html</u>



- Geothermal system: Coupled processes simulation
- Subsurface hydrology: Conditional and inverse stochastic analysis
- Fluid structure interaction, Water waves





Dr. Anubhab Roy Assistant Professor, Applied Mechanics 044-2257-4080; anubhab@iitm.ac.in https://home.iitm.ac.in/anubhab/

Major Areas of Research

- Living fluids Dynamics of swimming microorganisms
- Hydrodynamic Stability
- Suspension Mechanics





Dr. Anuradha Banerjee

PhD, University of Glasgow, UK Professor, Applied Mechanics 044-2257-4075; <u>anuban@iitm.ac.in</u> <u>http://apm.iitm.ac.in/smlab/anu/Site/Welcome.html</u>



- Fracture and Fatigue of Materials
- Biomaterials/Hard Tissues
- > Composites





Dr. A Arockiarajan PHD, University of Kaiserslautern, Germany Professor, Dept. of Applied Mechanics 044-2257-4070; <u>aarajan@iitm.ac.in</u> <u>http://apm.iitm.ac.in/smlab/rajan/index.html</u>

- Smart/Functional Materials
- Material Modelling
- Experimental characterization





Dr. K Arul Prakash PhD, Indian Institute of Technology Kanpur, India Associate Professor, Applied Mechanics 044-2257-4066; <u>arulk@iitm.ac.in</u> <u>http://apm.iitm.ac.in/fmlab/arul/index.html</u>



Major Areas of Research

- Computational Fluid Dynamics and Heat Transfer Development of Algorithms
- Turbulence Modeling, Large Eddy Simulation and related techniques
- Thermal Hydraulics
- > Aerodynamics, Fluid Structure Interaction

Applications



Dr. Arun K Thittai



Associate Professor, Applied Mechanics (Biomedical Engineering) 044-2257-4053; <u>akthittai@iitm.ac.in</u> <u>https://home.iitm.ac.in/akthittai/</u>

Major Areas of Research

- Biomedical Ultrasound Imaging (Clinical and Pre-clinical)
- Ultrasound Elastography
- Ultrasound guided Treatment monitoring
- Ultrasound Guided Biopsv





Dr. Babji Srinivasan PhD, Texas Tech University University, USA Associate Professor, Applied Mechanics 044-2257-4085; <u>babji.srinivasan@iitm.ac.in</u>

Major Areas of Research

Cognitive Systems Engineering, Human Cyber Physical Systems, Neuroergonomics, Physiological Control Systems







Dr. Ganesh Tamadapu

PhD, IIT Kharagpur Assistant Professor, Applied Mechanics 044-2257-4081; <u>gt@iitm.ac.in</u> <u>https://apm.iitm.ac.in/ganesh.html</u>





Dr. Ilaksh Adlakha

Assistant Professor, Applied Mechanics 044-2257-4082; <u>ilaksh.adlakha@iitm.ac.in</u> https://home.iitm.ac.in/ilaksh.adlakha/

Integrated Research Vision





Dr. C Lakshmana Rao

Doctor of Science, Massachusetts Institute of Technology, USA Professor, Applied Mechanics 044-2257-4059; <u>lakshman@iitm.ac.in</u> <u>http://apm.iitm.ac.in/smlab/clr/index.html</u>

- Ballistic Impact and Blast Mitigation on Structures
- Characterization of Piezopolymers
- Buckling Control of Structures using Smart Materials





Dr. Mahesh V Panchagnula PhD, Purdue University, USA Professor, Applied Mechanics +91-44-2257 4056; <u>mvp@iitm.ac.in</u> <u>http://apm.iitm.ac.in/fmlab/mvp/index.html</u>



- Liquid Atomization and Spray Combustion
- Multiphase Fluid Mechanics
- Wetting and contact angle hysteresis





Dr. Manivannan M PhD, IISc India Professor, Applied Mechanics +91-44-2257 4064; <u>mani@iitm.ac.in</u> http://apm.iitm.ac.in/biomedical/mani



- Haptics/Touch Feedback, Medical Simulation, Advanced Robotics
- Biomechanics: Soft Tissue Multiscale Modeling and Simulation
- Quantitative Physiology: Arterial Pulse Modeling and Simulation

Laparoscopic Simulator Hardware For Haptic Feedback Designed In house



Mannequin Based Simulation For Training on Diagnosing and Treating Heart Attack





Dr. Pijush Ghosh PHD, North Dakota State University, USA Associate Professor, Applied Mechanics 044-2257-4060; pijush@iitm.ac.in http://apm.iitm.ac.in/smlab/pijush/Pijush_index.html



- Self-Healing Materials/Focus 1
- Polymer Thin Films/Focus 2
- Molecular Dynamic Simulation/Focus 3





Dr. Prasad Patnaik BSV Ph.D., IIT Madras, Chennai, INDIA Professor, Applied Mechanics 044-2257-4068; <u>bsvp@iitm.ac.in</u> http://apm.iitm.ac.in/fmlab/bsvp/index.html



- > Control of vortices : through drain tanks, past bodies, through heat exch. etc.
- Flow Structure Interaction (FSI) : vortex induced vibrations, blast mitigation etc.





Dr. V V Raghavendra Sai PhD from IIT Bombay, INDIA Associate Professor, Applied Mechanics 044-2257-4076; <u>vvrsai@iitm.ac.in</u> http://apm.iitm.ac.in/biomedical/sai/index.html

- Localized surface plasmon resonance (LSPR) and surface enhanced Raman scattering (SERS) based Optical Biosensors
- Clinical diagnosis & Environmental monitoring
- Detection of Explosives and Toxins



LSPR based Fiber optic biosensors for model analyte (IgG) V V R Sai, et al 2009. *Biosens. & Bioelectron*, 24, 2804-09;



SERS mapping of AgNP 60nm coated SiO2 Nanosprings



Dr. S Ramakrishnan PhD, Indian Institute of Technology Madras, India Professor, Applied Mechanics MSB207B; 044-2257-4073; <u>sramki@iitm.ac.in</u> <u>http://apm.iitm.ac.in/biomedical/ramki/index.html</u>



- Brain Image Analysis Characterization of Brain micro structure and Tractography in conditions such as Alzheimer's disorders.
- Infrared Thermal Image Analysis Analysis of physiological variables using medical infrared thermograph in Human Breast and Hand.
- > Biomedical Instrumentation Enhancing the diagnostic relevance of medical equipment.
- > Signal analysis EMG signal generation, modeling, diagnosis of myopathy and neuropathy
- Calibration of Medical Devices Design and development of test schemes for calibrating and standardizing medical devices



Brain Image Analysis



Thermal Image Analysis



Instrumentation & Calibration



EMG Signal Analysis



Dr. M Ramasubba Reddy

PhD, IISc, India Professor, Applied Mechanics 044-2257-4057; <u>rsreddy@iitm.ac.in</u>



- Biomedical Instrumentation
- Biomedical Signal and Image Processing
- Computational Biology





Dr. K Ramesh PHD, IIT Madras, India Professor, Dept. of Applied Mechanics 044-2257-4058; <u>kramesh@iitm.ac.in</u> http://apm.iitm.ac.in/smlab/kramesh/index.html



- Experimental Mechanics/Digital Photoelasticity
- Fracture Mechanics/Stress field evaluation
- Educational Technology/Innovative use of Multimedia







Dr. Sarith P Sathian

PhD, IIT Madras, India Professor, Applied Mechanics 044-2257-4062; <u>sarith@iitm.ac.in</u> http://www.apm.iitm.ac.in/; https://sites.google.com/site/sarithshomepage/profile/dr-sarith-p-sathian



- Nanofluidics & Nanoscale heat transfer
- Compressible fluid flows & Molecular Gas Dynamics
- Computational Physics & Soft Matter simulations





Dr. Satyanarayanan S

Assistant Professor, Applied Mechanics 044-2257-4078; <u>satya@iitm.ac.in</u> <u>http://home.iitm.ac.in/satya</u>

Major Areas of Research

- Aerosol Science and Technology Applications
- Emissions measurement and control
- Efficient utilization of energy through recovery, reuse and renewable options







Dr. Saumendra K Bajpai PhD, Johns Hopkins University Asst. Professor, Applied Mechanics +91-44-2257 4072; <u>sbajpai@iitm.ac.in</u> http://home.iitm.ac.in/sbajpai/lab-overview.html/



- Multiple-scale characterization of soft-matter
- Bio-mimetic systems, design, and applications





Dr. Sayan Gupta PhD, Indian Institute of Science, Bangalore Professor, Applied Mechanics 044-2257-4055; <u>sayan@iitm.ac.in</u> <u>http://apm.iitm.ac.in/smlab/sayan/Site/WELCOME.html</u>

- Vibrations, Nonlinear dynamics and Chaos, Stochastic Dynamics
- Stochastic Load Modeling, Structural Reliability, Stochastic Finite Elements
- Damage detection & Life Assessment, Structural Health Monitoring





Dr. Shaikh Faruque Ali PhD, IISC, India Associate Professor, Applied Mechanics 044-2257-4054; <u>sfali@iitm.ac.in</u> <u>http://apm.iitm.ac.in/smlab/sfali/index.html</u>

- Structural vibration and control
- Dynamics and control of nonlinear systems
- Nonlinear and hybrid energy harvesting





Dr. Sivakumar M Srinivasan PhD, Louisiana State University, USA Professor, Applied Mechanics 044-2257-4061; <u>mssiva@iitm.ac.in</u> <u>http://apm.iitm.ac.in/smlab/mss/index.html</u>

- Structural Mechanics / Analysis and design of thermo-mechanical structures
- Inelasticity of materials / modeling mechanics of plasticity, creep and fatigue
- Smart materials & composites / Shape mem alloys, piezos and magnetic
- Research Area/Focus 3





Dr. N Sujatha PHD (NTU Singapore) Professor, Applied Mechanics 044-2257-4067; <u>nsujatha@iitm.ac.in</u> <u>http://apm.iitm.ac.in/biomedical/sujatha/index.html</u>



- Non destructive imaging of tissue using laser speckle techniques
- Optical signal / image processing
- Biomedical optical spectroscopy instrumentation for in vivo diagnostics





Dr. Vagesh D Narasimhamurthy PhD, NTNU, Norway Associate Professor, Applied Mechanics +91-44-2257-4079; vagesh@iitm.ac.in https://home.iitm.ac.in/vagesh/



Major Areas of Research

- CFD, DNS, transition & turbulence, bluff-body flows, wall-bounded flows
- Turbulent premixed combustion, gas-explosion safety
- Gas dispersion, two-phase flows (particulate dispersion)





Dr. Varadhan S K M PhD (The Pennsylvania State University, USA) Asst. Professor, Applied Mechanics +91-44-2257-4071; <u>skm@iitm.ac.in</u> <u>http://apm.iitm.ac.in/biomedical/skm/index.html</u>



Research Areas

Description

Neuromechanics

The neural basis of Biomechanics, understanding the central nervous system control strategies responsible for movement generation

Motor Learning

Understanding the mechanisms that underlie learning motor tasks, from simple, daily movements to special movements in art and sport

Rehabilitation

Development of Assist devices to be used in Rehabilitation of patients with neuro-motor disorders, such as stroke



Dr. S Vengadesan PhD, Kobe University, Japan Professor, Applied Mechanics 044-2257-4063; <u>vengades@iitm.ac.in</u> http://apm.iitm.ac.in/fmlab/sv/index.html



- Insect Aerodynamics/ Aerodynamics of low flying insect under different operating condition
- Bubble transport in a micro channel/Investigation of a PFC bubble transport through a micro channel with bifurcation at different roll angle
- Bluffbody aerodynamics/characterisation of flow regime for elliptic cylinders





INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF BIOTECHNOLOGY



LIST OF FACULTY

Amal Kanti Bera

Athi Narayanan Naganathan

Arumugam Rajavelu (Yet to Update)

Baskar R

Chandra T S

Chandraraj Krishnan

Gopala Krishna Aradhyam

Greeshma Thrivikraman (Yet to Update)

Guhan Jayaraman

Hamsa Priya Mohana Sundaram

Himanshu Sinha

Karthik Raman

Karunagaran D

Kesavan V

Madhulika Dixit

Mahalingam S

Manoj N

Michael Gromiha M

Murugan R (Yet to Update)

Nathiya Muthalagu

<u>Ninitha A J</u>

Nirav Pravinbhai Bhatt

Nitish R Mahapatra

Rajamanickam Murugan

Rama Shanker Verma

Rayala Suresh Kumar

Sanjib Senapati

Santhosh Sethuramanujam (Yet to Update)

Sathyanarayana N Gummadi

Shantanu Pradhan

Smita Srivastava

Srinivasa Chakravarthy V

Subramaniam K

Suraishkumar G K

<u>Vani Janakiraman</u>

Vignesh Muthuvijayan



Dr. Amal Kanti Bera PhD, University of Delhi, India Professor, Biotechnology 044-2257-4121; <u>amal@iitm.ac.in</u> http://www.biotech.iitm.ac.in/faculty/amal



- Structure-function relationship of Ion Channels
- Regulation of Ion Channels
- Ion channels associated with Stroke and Heart attack





Dr. Athi Narayanan Naganathan

PhD, University of Maryland, USA Assistant Professor, Biotechnology 044-2257-4140; <u>athi@iitm.ac.in</u> <u>http://www.biotech.iitm.ac.in/Faculty/ProteinBiophysicsLab/</u>

- Experimental Spectroscopic Characterization of Protein Conformational Behavior and its Relation to Function (Folding-Function Landscape)
- Modeling/Predicting Folding and Fitness Landscapes Using Statistical Methods
- Probing Folding/Dynamics through Coarse-Grained and Molecular Simulations




Dr. Arumugam Rajavelu

Assistant Professor, Biotechnology 044-2257-4150; <u>arumugam.rajavelu@iitm.ac.in</u>



Dr. Arumugam Rajavelu PhD, Jacobs University Bremen, Germany

Assistant Professor, Dept. of Biotechnology 08129966628; arumugam.rajavelu@iitm.ac.in



- Host-Pathogen interactions
- · Drug targets discovery in the malaria parasite
- · Identification of new vaccine candidates from *Plasmodium falciparum*





Dr. R Baskar

PhD, University of Maryland, USA Associate Professor, Biotechnology 044-2257-4110; <u>baskar@iitm.ac.in</u> http://www.biotech.iitm.ac.in/Rbaskar



Major Areas of Research

- Pattern formation in cellular slime molds
- Estimating spontaneous mutation rates and meiotic recombination frequency during different biological events in flowering plants



Arabidopsis as a model to investigate:

- 1. Somatic mutation rates upon parental ageing, hybridization
- 2. Meiotic recombination rates



Dictyostelium as a model to investigate:

- 1. Mechanisms of caffeine action
- 2. Volatile mediated chemotaxis
- 3. Ageing



Dr. Chandra Sainathan (T.S.Chandra)

PHD, Indian Institute of Science, India Emeritus Professor, Biotechnology 044-2257-4103; <u>chandra@iitm.ac.in</u>



- Industrial Biotechnology- salt tolerant enzymes, riboflavin B-vitamins animal feed, antioxidants, neutraceuticals from millet grains, genetic and metabolic engineering in fungi
- Environmental Bioprocesses- biogas, composting, bioconversion of red sea algae carrageenan to alcohol
- Nanobiotechnology-biosynthesis magnetite nanoparticles, electrospun nanomembranes for food packaging, nanoparticle-coated bioelectrodes biofuel cells





Dr. Chandraraj Krishnan PhD, IIT MADRAS, INDIA Professor, Biotechnology 044-2257-4111; <u>kcraj@iitm.ac.in</u> http://www.biotech.iitm.ac.in/faculty/kcr.php



- Biomass conversion/ Cellulosic bioethanol
- Functional Foods/ Oligosaccharides and phenolic acids
- Recombinant Enzymes/Amylases, Cellulases, Xylanases, Proteases





Dr. Gopala Krishna Aradhyam PhD, NCL (CSIR). University of Pune, India Professor, Biotechnology 044-2257-4112; <u>agk@iitm.ac.in</u> http://www.biotech.iitm.ac.in/faculty/agk/home.html



The Signal Transduction Lab

G Protein Coupled Receptors (GPCRs) Ca²⁺-binding proteins

- The general focus of research in our lab is protein structure-function and biochemistry.
- Elucidating novel functions of proteins.

BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH

Signal Transduction by Membrane proteins



<image>

Signal Transduction by Ca2+-binding proteins



Dr. Greeshma Thrivikraman

Assistant Professor, Biotechnology 044-2257-4142; greeshma@iitm.ac.in





Dr. Guhan Jayaraman PhD, Rensselaer Polytechnic Institute, USA Professor, Biotechnology 044-2257-4108; <u>guhanj@iitm.ac.in</u>



- Metabolic Engineering for Biopolymers and Biofuels production
- Bacterial Systems Biology Analysis of Metabolic and Gene Regulatory Networks
- On-line Monitoring of Bioprocesses using Spectroscopic Techniques
- Process Chromatography for Protein Purification





Dr. Hamsa Priya Mohana Sundaram PhD, The Ohio State University, USA Assistant Professor, Biotechnology 044-2257-4132; <u>hamsa@iitm.ac.in</u>



Major Areas of Research

- ComputaNonal biophysics
- Protein aggregaNon
- Protein solubility and stability
- ComputaNonal characterizaNon of materials for therapeuNcs
- Self assembly of nano drug delivery carriers
- Drug-polymer conjugates
- Bio-molecular simulaNons
- MulN-scale modeling





Dr. Himanshu Sinha

PhD, University of Cambridge, Country

Associate Professor, Biotechnology 044-2257-5140; <u>sinha@iitm.ac.in</u> https://biotech.iitm.ac.in/index.php/himanshu-sinha/





Dr. Karthik Raman

PhD, Indian Institute of Science, Bangalore Associate Professor, Biotechnology Bhupat & Jyoti Mehta School of Biosciences +91-44-2257-4139; <u>kraman@iitm.ac.in;</u> <u>https://home.iitm.ac.in/kraman/lab</u>



- Computational Systems Biology/Modelling of Complex Biological Systems
- In silico Modelling for Metabolic Engineering
- High-performance Computing for Biology
- Synthetic Biology/Design of Biological Networks





Dr. Karunagaran D PHD, Sri Krishnadevaraya University, India Professor, Biotechnology 044-2257-4126; <u>karuna@iitm.ac.in</u> http://www.biotech.iitm.ac.in/faculty/dk_new/index.php

- Role of miRNAs
- Aberrations in signaling
- Mechanisms of potential anticancer agents



Target prediction and experimental validation Functional characterization - Effects of miRNAs on signaling pathways



Aberrations in NF-kB, TGF-b, Wnt and apoptosis signaling in cancer cells/tumors



Molecular mechanisms of Apoptosis induced by phytochemicals (curcumin, emodin, plumbagin, allicin etc), marine alkaloid analogs and organic compounds

CANCER BIOLOGY







- Development of acyclic nucleic acid and molecular devices
- Development of organo catalysts from proline
- Exploration of covalent inhibition of cysteine kinases using NCEs





Dr. Madhulika Dixit

PhD, IIT Bombay, India Associate Professor, Biotechnology 044-2257-4131; <u>mdixit@iitm.ac.in</u> <u>http://www.biotech.iitm.ac.in/faculty/mdixit/</u>

- Endothelial Progenitors and Glucose Metabolism
- Endothelial Dysfunction and Shear Stress
- Atherosclerosis
- Research Area/Focus 3





Dr. S Mahalingam

Professor, Biotechnology 044-2257-4130; <u>mahalingam@iitm.ac.in</u> <u>http://www.biotech.iitm.ac.in/Mahalingam</u>



Tumor Biology

- Cross-talk between tumor suppresser genes and oncogenes
- Nucleolar GTPases and ribosome biogenesis
- Functional characterization of Ras effectors

Molecular pathogenesis of HIV

Host-virus interaction, Neutralizing antibodies





Protein Structure and Function

Structural biochemistry of enzymes for biotechnology applications



Molecular Evolution

Comparative genomics of membrane bound proteins





Dr. M Michael Gromiha

Professor, Biotechnology 044-2257-4138; gromiha@iitm.ac.in https://www.iitm.ac.in/bioinfo/Gromiha/

- Protein structure and function: binding affinity and aggregation rate
- Disease causing mutations in transmembrane proteins
- Deep learning and next generation sequence analysis: cancer, Alzheimer and Parkinson diseases

Protein Folding, Stability, Aggregation Interactions



ansmembrane Protein 1. Disease causing mutations in 1. Identify cancer mutations using membrane proteins 1. Mutational effects on binding deep learning affinity of protein complexes. 2. Sequence and structural 2.NGSanalysis: Neurodegenerative parameters for membrane 2. Prediction of aggregation prone disorders proteins regions and aggregation rates 3. Structure based drug design 3. Developing databases and tools Structure-Function Relationship in Proteins and their Complexes: Applications to Drug Design



Dr. Murugan R Assistant Professor, Biotechnology 044-2257-4116; <u>rmurugan@iitm.ac.in</u>







Dr. Ninitha AJ PhD, Michigan State University, USA Assistant Professor, Biotechnology 044-2257-4135; <u>ninitha@iitm.ac.in</u>



Cardio metabolic diseases: novel pathways and drug discovery
Peripheral neuromodulator for device development and therapy
Role of PARPs in hypertension, diabetes, and heart failure





Dr. Nirav Pravinbhai Bhatt

PhD, École polytechnique fédérale de Lausanne (EPFL), Switzerland Assistant Professor, Biotechnology 044-2257-4129; <u>niravbhatt@iitm.ac.in</u>

- Process Analytical Controlled Technology for (Bio-)processes
- Physically Interpretable ML/AI for Biological and Engineering Applications
- Network Control and Learning Theory for Understanding Diseases and Therapeutics





Dr. Nitish R Mahapatra PhD, Indian Institute of Chemical Biology, Kolkata Professor, Biotechnology 044-2257-4128; <u>nmahapatra@iitm.ac.in</u> <u>https://biotech.iitm.ac.in/faculty/nitish-r-mahapatra/</u>

- Functional Genomics and Biomarker Discovery
- Transcriptional and Post-transcriptional Gene Regulation
- Molecular Medicine





Dr. Rajamanickam Murugan PhD, T.I.F.R Mumbai, India Assistant Professor, Biotechnology 044-2257-4116; <u>rmurugan@iitm.ac.in</u> <u>http://www.biotech.iitm.ac.in/Murugan</u>

- Theoretical Biology and Biophysics
- Computational/Systems Biology
- Rate Processes in Biology



Understanding the dynamics of transcription factors helps to further our unravel the design principles connected with the existence of life.



Dr. Rama Shanker Verma PhD, Jawaharlal Nehru University New Delhi Professor, Biotechnology

044-2257-4109; vermars@iitm.ac.in http://www.biotech.iitm.ac.in/faculty/verma/index.html

- Development of Stem Cell based Cardiac Tissue and Liver organ
- Construction of Novel Immunotoxins
- Fanconi Anemia
- Development of Nanotherapeutics

Developing patch and liver organ using biodegradable material and 3D Bio printing using stem cells Targeted anticancer therapy with recombinant immunotoxins Gene expression profiling of Fanconi anemia and Identifying marker genes Drug delivery in cancer stem cell





Dr. Rayala Suresh Kumar

PhD, Cancer Institute, Chennai, INDIA Professor, Biotechnology 044-2257-4137; <u>rayala@iitm.ac.in</u> http://www.biotech.iitm.ac.in/Rayala_research



- Small molecule inhibitors and drug resistance
- Indigenous antibodies for diagnostic applications





Dr. Sanjib Senapati PhD, IIT Kanpur, India Professor, Biotechnology 044-2257-4122; <u>sanjibs@iitm.ac.in</u> <u>http://www.biotech.iitm.ac.in/faculty/Sanjib_lab/index.html</u>



- Protein-ligand and protein-protein docking
- Atomic simulations of Green solvents: Ionic Liquids and supercritical CO₂ (scCO₂)

Structure based drug discovery

lonic liquids for biomolecular preservations scCO₂: a new generation solvent in chemical industries?





Dr. Santhosh Sethuramanujam

Assistant Professor, Biotechnology 044-2257-4143; <u>santhoshs@iitm.ac.in</u>





Dr. Sathyanarayana N Gummadi PhD. IIT Madras, INDIA Professor, Biotechnology 044-2257-4114; gummadi@iitm.ac.in http://www.biotech.iitm.ac.in/faculty/sng/index.html

- Microbial and Enzymatic Process for Caffeine Degradation
- Bioprocess Development for Production of Biopolymers, Xylitol, Enzymes
- Biochemistry of Flippases and Scramblases



Fundamental biosciences to industrial applications



Dr. Shantanu Pradhan PhD, Auburn University, USA

Assistant Professor, Biotechnology +9193303513448; spradhan@iitm.ac.in



- Biomaterials: Natural and synthetic hydrogels for mammalian cell culture and in \geq vitro disease modeling
- Cancer: Mechanisms of tumorigenesis, metastasis and tumor dormancy
- Microfluidics: In vitro models of vascularized tissue microenvironments for drug \succ delivery and cellular crosstalk



Breast cancer cells (left: MDA-MB-231 metastatic and right: MCF7, nonmetastatic) cultured within PEGfibrinogen hydrogels



CANCER TISSUE ENGINEERING

Engineered approaches for modeling cancer & associated pathologies

INSULIN RESISTANCE Systemic Inflammation Metabolic Imbalance Vascular Dysfunction **Tumor Progression**

OBESITY &

CHEMOTHERAPY-INDUCED INJURY Vasculopathy Hepatotoxicity Nephrotoxicity Neuronal Degeneration

Cancer cells encapsulated

in hydrogel

microspheres

Endothelial cells in microfluidic channels



Dr. Smita Srivastava PhD, IIT DELHI, INDIA Associate Professor, Biotechnology 044-2257-4127; <u>smita@iitm.ac.in</u> http://www.biotech.iitm.ac.in/faculty/smita/



- Plant cell technology
- Microbial technology





Dr. V Srinivasa Chakravarthy PhD, University of Texas at Austin, Austin, USA Professor, Biotechnology 044-2257-4115; <u>schakra@iitm.ac.in</u>

http://www.biotech.iitm.ac.in/faculty/CNS_LAB/home.html

Research Area: Computational Neuroscience

Objective 1:

Develop a comprehensive Computational model of Basal Ganglia, a part of the brain affected in <u>Parkinson's Disease</u>

Application:

The model developed has potential Application in Deep Brain Stimulation Surgery for PD.

Objective 2:

Using computational modeling, study the role of vascular dynamics on neural activity.

Application: Leads to the radical notion of vascular computation



Research Area:

Indian Language Technology

Develop a new script called <u>Bharati</u>. The script can represent 9 major Indian scripts. Simple and easy to learn.





K Subramaniam

Professor, Department of Biotechnology 044-2257-4119; <u>subbu@iitm.ac.in</u>



- Control of self-renewal and differentiation decisions in adult stem cells
- Developmental biology of germ cells
- Translational control of germ cell decisions



Forward and reverse genetic approaches using the freeliving nematode *Caenorhabditis elegans* as a model organism





PUF proteins and translational control of gene expression in the germ line







G K Suraishkumar

PhD, Drexel University, Philadelphia, USA Professor, Biotechnology 044-2257-4105; gk@iitm.ac.in



https://biotech.iitm.ac.in/research/faculty/suraishkumar-g-k

- Improved cancer treatment strategy through reactive species (RS) rhythms
- Improved bioprocess strategies (RS-based) e.g. improved algal bio-oil production
- Interesting cell phenomena (RS-based)





Dr. Vani Janakiraman

PhD, UPMC, Paris, France Assistant Professor, Biotechnology 044-2257-4141; vani@iitm.ac.in

https://biotech.iitm.ac.in/research/faculty/vani-janakiraman/



Major areas of research

- Understanding immune evasion and delineating factors that tilt the inflammatory balance
- Understanding the role of novel immune receptors and pleiotropic cytokines in modulating immune responses
- Understanding bacterial communication





Dr. Vignesh Muthuvijayan PhD, Oklahoma State University, USA Associate Professor, Biotechnology 044-2257-4123; <u>vigneshm@iitm.ac.in</u> <u>http://www.biotech.iitm.ac.in/vignesh</u>

- Surface modification of polymeric materials
- Novel biomaterials as tissue engineering scaffolds
- Development of drug delivery systems





INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF CHEMICAL ENGINEERING


LIST OF FACULTY

Abhijit P Deshpande

Aravind Kumar Chandiran

Arun K Tangirala

Basavaraj M Gurappa

Ethayaraja Mani

Himanshu Goyal

Jithin John Varghese

<u>Kannan A</u>

<u>Nagarajan R</u>

Niket Kaisare

Preeti Aghalayam

Pushpavanam S

Raghuram Chetty

Rajagopalan Srinivasan

Rajnish Kumar

Ramanathan S

<u>Ramnarayanan R</u>

<u>Ravi R</u>

Ravikrishna R

Renganathan T

<u>Rengasamy R</u>

Shankar Narasimhan

<u>Sreenivas Jayanti</u>

Sridharakumar Narasimhan

Sumesh P Thampi

Susy Varughese

Swapna Singha Rabha

<u>Tanmay Basak</u>

<u>Tarak K Patra</u>

<u>Upendra Natarajan</u>

<u>Vinu R</u>

name phone



Dr. Abhijit P Deshpande

Professor, Chemical Engineering 044-2257-4169; <u>abhijit@iitm.ac.in</u> <u>http://www.iitm.ac.in/~abhijit</u>



- Polymeric systems: aggregation, gelation, rheology
- Ionic polymers, Polysaccharides
- Wettability and composite processing



Representative publications:

- Majhi A., Pardhi T. K. and Deshpande A. P., International Journal of Multiphase Flow, (2015)
- Kodavaty J. and A. P. Deshpande, Journal of Applied Polymer Science, (2014)
- Jacob A. J., Deshpande A. P., Bouteiller L., Journal of Non-Newtonian Fluid Mechanics, (2014)
- Prathyusha K. R., Deshpande A. P., Laradji M., Kumar P. B. S., Soft Matter (2013)



Aravind Kumar Chandiran

PhD, Gratzel's Group, Swiss Federal Institute of Technology Assistant Professor, Chemical Engineering +91 80563 80100; <u>aravindkumar@iitm.ac.in</u> http://scholar.google.com/citations?user=D18I3fcAAAAJ







Dr. Arun K Tangirala PhD, University of Alberta, Canada Professor, Chemical Engineering 044-2257-4181; <u>arunkt@iitm.ac.in</u> <u>http://www.che.iitm.ac.in/~arunkt</u>



- Process Control, Identification & Monitoring
- Control loop performance assessment
- Data-driven process analysis and control







Dr. Basavaraj M Gurappa PhD, KU Leuven, Belgium Associate Professor, Chemical Engineering 044-2257-4164; <u>basa@iitm.ac.in</u> <u>http://www.che.iitm.ac.in/~basa</u>



Research Area: Colloids and Interface Science

- Self-assembly of colloids and nanoparticles
- Rheology and microstructure of suspensions
- Structure and surface rheology of complex fluid interfaces, Emulsions, Foams
- Surfactant in aqueous, organic and ionic liquids





Dr. Ethayaraja Mani

PhD, IIT Bombay, India Associate Professor, Chemical Engineering 044-2257-4157; ethaya@iitm.ac.in http://www.che.iitm.ac.in/~ethaya/ethaya/Home.html

- Self-assembly of patchy colloids
- Molecular simulation of softmatter
- Stochastic simulation of formation of nanostructures



Soft-colloid Stabilized Emulsions Back to Top



Dr. Himanshu Goyal PHD, Cornell University, USA Assistant Professor, Chemical Engineering 044-2257-4183; goyal@iitm.ac.in https://che.iitm.ac.in/?page_id=3419



- Research Area/Focus 1: Multiscale modeling of reactive multiphase flows
- Research Area/Focus 2: Process intensification using microwaves
- Research Area/Focus 3: Uncertainty quantification in simulation predictions





Dr. Jithin John Varghese

PhD, Nanyang Technological University, Singapore Assistant Professor, Chemical Engineering 044-2257-4182; jithinjv@iitm.ac.in





Dr. Kannan A PhD, McMASTER University, Canada Professor, Chemical Engineering 044-2257-4170; kannan@iitm.ac.in http://www.che.iitm.ac.in/~kannan/



- Intensification of Transport and Reaction Rates in Environmental Pollution Control, Separation Processes and Thermal Food Processing
- Innovative Process Equipments for Environmental Pollution Control
- Modelling and Simulation of Chemical and Environmental Processes \succ







photocatalytic reactor

Reaction pathway in a CFD based fluid flow patterns and convective heat fluxes around a food particle

Ultrasound jet impinging on a spinning disk to enhance mass transfer Back to Top



Dr. R Nagarajan PhD, Yale University, USA Professor, Dept. of Chemical Engineering 044-2257-4158; nag@iitm.ac.in http://www.che.iitm.ac.in/~nag/

- Ultrasonic process intensification
- Particulate phenomena in cleanrooms
- Synthesis of nano-materials & nano-composites







Dr. Niket Kaisare Professor, Chemical Engineering

+91 44 22574176; <u>nkaisare@iitm.ac.in</u> http://www.che.iitm.ac.in/~nkaisare/





Dr. Preeti Aghalayam PhD, Univ. of Massachusetts Amherst, USA Professor, Chemical Engineering 044-2257-4185; preeti@iitm.ac.in http://www.aghalayam.com



- > Catalytic Converters: Detailed chemistry for catalytic reduction of NO
- Reaction Mechanisms: Reduction of detailed reaction mechanisms





Dr. S Pushpavanam PhD, University of Florida, USA Professor, Chemical Engineering 044-2257-4161; <u>spush@iitm.ac.in</u> <u>http://www.che.iitm.ac.in/~spush/</u>



Mathematica

Methods in Chemical

Engineering

- Two phase flows and interfacial transport
- Micro flows: Hydrodynamics and Mass Transport
- Mathematical Modeling and Nonlinear Dynamics





Dr. Raghuram Chetty

PhD, Newcastle University, UK Professor, Chemical Engineering 044-2257-4178; <u>raghuc@iitm.ac.in</u> <u>http://www.che.iitm.ac.in/~raghuc/</u>



Research Interest

- Fuel Cells (Electrocatalyst, Bipolar Plates)
- Redox Flow Batteries (Vanadium Flow Battery)
- Conversion of CO2 into Chemicals
- Electrochemical & Photochemical Wastewater Treatment
 - Electrochemical Reduction of Nitrate
 - Heavy Metal (Chromium) Removal
 - Photocatalytic Degradation (Dyes, Pharmaceuticals)
 - Water Desalination (Anti Fouling RO Membranes)



Different morphologies of Pt catalysts synthesized by electrochemical deposition by varying the potential.



Photodegradation of Rhodamine-B with different crystalline TiO₂ nanotubes (TiNT) phase as compared to commercial P25 nanoparticles.



Dr. Rajagopalan Srinivasan Professor, Chemical Engineering +91 44-2257-4190; raj@iitm.ac.in https://che.iitm.ac.in/?page_id=457



Major Research Areas

- Safety, Sustainability & Resilience of \succ complex systems
- **Cognitive Engineering** \succ
- Supply Chain Management & \succ **Enterprise Optimization**





Dr. Rajnish Kumar Associate Professor, Chemical Engineering Ph: 8805340709; <u>rajnish@iitm.ac.in</u>



- Methane recovery from natural gas hydrate; methane storage and transportation
- Gas separation through molecular selection and enclathration; CO₂ capture
- > Process development and scale up; biomass upgradation through HTL







Dr. Ramnarayanan R

Assistant Professor, Chemical Engineering 044-2257-4174; ramna@iitm.ac.in







Dr. R Ravi PhD, Purdue University, USA Professor, Chemical Engineering 044-2257-4167; <u>rravi@iitm.ac.in</u> http://www.che.iitm.ac.in/~rravi/

- Thermodynamics
- > Transport
- Statistical Mechanics







Dr. R Ravikrishna PhD, Louisiana State University, USA Professor, Chemical Engineering 044-2257-4175; <u>rrk@iitm.ac.in</u> <u>http://www.che.iitm.ac.in/~rrk</u>



- Fate and Transport of Pollutants in the Environment
- Assessment and Remediation of Contaminated Sediments
- Development of Waste Treatment Technologies



Bioaerosol Release from solid waste surfaces



Chemical Release Rates from Sediments



Photocatalytic Degradation of Organic Chemicals



Dr. T Renganathan

PhD, IIT Madras, India Associate Professor, Chemical Engineering 044-2257-4186; renga@iitm.ac.in http://www.che.iitm.ac.in/faculty.php?fid=20

- Multiphase systems Inverse fluidized bed
- Gasification Fluidized bed gasifier





Dr. R Rengaswamy

Professor, Chemical Engineering 044-2257-4159; <u>raghur@iitm.ac.in</u>



- Process Systems Engineering
- Fuel Cell Research
- Computational Droplet-based Microfluidics Research











Dr. Shankar Narasimhan PhD, Northwestern University, USA Professor, Chemical Engineering 044-2257-4165; <u>naras@iitm.ac.in</u> <u>http://www.iitm.ac.in/~naras</u>



- PROCESS DESIGN Sensor networks, Pipeline networks, Heat Exchanger Networks
- DATA ANALYTICS Data reconciliation, Multivariate data analysis, Fault Diagnosis
- PROCESS OPTIMIZATION AND CONTROL Solar powered RO networks





Dr. Sreenivas Jayanti PhD, Imperial College, London, UK Professor, Chemical Engineering 044-22574168; <u>sjayanti@iitm.ac.in</u> <u>http://www.che.iitm.ac.in/~sjayanti/</u>

- Combustion: Oxy-fuel combustion; chemical looping combustion
- Electrochemical devices: Fuel cells; redox flow batteries
- Multiphase flow: computational fluid dynamics, heat transfer







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Cell and stack level studies of fuel cells

System level studies of chemicalExperimental and CFDlooping combustionstudiesofoxycoal

combustion



Sridharakumar Narasimhan

Professor, Chemical Engineering 044-2257-4177; <u>naras@iitm.ac.in</u> <u>http://www.iitm.ac.in/~naras</u>



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Research focus

- Process systems engineering
- Sensor placement and scheduling
- Efficient control relevant model generation
- Optimal operation and design



<u>Approach</u>: Formulate and solve tractable (e.g., convex) optimization problems to guarantee performance

Applications

- Water treatment and distribution
- Pipeline operations
- Systems biology, imaging





Dr. Sumesh P Thampi Assistant Professor, Chemical Engineering 044-2257-4169; <u>sumesh@iitm.ac.in</u> http://www.che.iitm.ac.in/~sumesh



Major Areas of Research

- Hydrodynamics of complex fluids
- Collection motion in active matter
- Interfacial fluid mechanics



Sliding-rolling motion of a drop on an inclined surface streamlines and vorticity contours



Counter rotating colloidal discs to power micro-machines exploiting nematohydrodynamics of active turbulence

Application of fluid mechanics on soft and biological matter



Dr. Susy Varughese Professor, Chemical Engineering

+91 44 2257 4172 ; <u>susy@iitm.ac.in</u> http://www.che.iitm.ac.in/~susy/



Major Areas of Research

- Physics and mechanics of polymeric materials
 - dynamic mechanical behavior of polymers
 - vibration damping and isolation using polymers
 - Filler-polymer interactions

Conducting polymers

- Processing aspects related to inkjet printing & drying of drops
- Wetting and surface energy
- Electromechanical behaviour of conducting polymer films
- Ionically conducting polymers
 - Fuel cell membrane materials
 - Diffusion through membranes
 - Structure and morphology
 - Shape memory behavior

Recycling of polymers and composites



P. Kanakasabai et al., Journal of Power Sources 196 (2011) 946-955



Dr. Swapna Singha Rabha PhD, Indian Institute of Technology Delhi, India

Assistant Professor, Indian Institute of Technology Madras, India : 044-2257-4191; <u>srabha@iitm.ac.in</u>



Research areas

- Micro scopic gas-liquid flows
- Three phase suspension systems e.g. gas-liquid-solid flows
- Process intensifications
- Carbon capture
- Transport in porous media.









Dr. Tanmay Basak PhD, IISc, Bangalore Professor, Chemical Engineering 044-2257-4173; <u>tanmay@iitm.ac.in</u> http://www.che.iitm.ac.in/~tanmay/



Microwave Assisted Material Processing

- Computational Electromagnetics
- Chemical Reacting Systems
- Material Invariant Characteristics
- Closed Form Analysis
- Scattering Effect

Computational Fluid Flow and Heat Transfer

- > Heat Flow visualization and Thermal Management
- > Thermodynamics and Irreversibility: Entropy Generation Minimization
- Finite Element Method and Modeling





Dr. Tarak K Patra

PhD, IIT Kanpur, Post-Doc, Argonne National Laboratory Assistant Professor, Chemical Engineering

- High Throughput Materials Design
- Molecular Simulations and Machine Learning
- High Performance Computing and AI



Computational design of highly stable nanoparticle supercrystals

- Polymeric Ionic Liquids
- Nanoparticle Supercrystals
- Glassy Materials



Engineering polymer architecture for high ion conductivity and mechanical properties



Modeling Structure-property correlations in polymer glasses



Phase transition in 2D materials





Dr. Upendra Natarajan PhD, Institute of Polymer Sci.& Polym. Eng, University of Akron, USA Professor, Chemical Engineering 044-2257-4184; <u>unatarajan@iitm.ac.in</u> <u>http://www.che.iitm.ac.in/~unatarajan/</u>

- Molecular Theory, Simulation and Modeling
- Macromolecular Science and Engineering
- Hybrid Materials and Composites

FMCG - Shampoo, Conditioner, Detergents, Cosmetics, Superabsorbents, structured dispersions

Polymer-based Coatings, liquid dispersions

Advanced structural Materials





Dr. R Vinu

Associate Professor, Chemical Engineering 044-2257-4187; <u>vinu@iitm.ac.in</u> https://sites.google.com/site/vinuresearch/

Current Research Areas

- Catalytic fast pyrolysis of biomass, algae and polymers in micropyrolysis systems with online analysis using GC/MS and FT-IR
- Microwave assisted pyrolysis of renewable feedstocks (biomass, plastic wastes, MSW) for energy and resource recovery and nanomaterials
- Characterization of solid, liquid and gaseous fuels
- Deconstruction and pretreatment of biomasses using non-conventional techniques
- Characterization and degradation of engine oils
- Selective photocatalytic conversion of biomass constituents
- Microkinetic modeling using continuum and stochastic techniques



2D-GC/MS TIC of bio-oil from Prosopis juliflora





INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF CHEMISTRY

LIST OF FACULTY

Amrendra Vijay

Anbarasan P

Archita Patnaik

Arnab Rit

Arti Dua

Ashok Kumar Mishra

Baskaran S

Beeraiah Baire

Bhyrappa P

Chandrakumar N

Debashis Chakraborty

Dhamodharan R

Dillip Kumar Chand

Edamana Prasad

Hema Chandra Kothamarthi

Indrapal Singh Aidhen

Kartik Chandra Mondal

Kothandaraman Ramanujam

Mahiuddin Baidya Md

<u>Madhav Ranganathala Sundar K</u>
<u>Mangala Sundar K</u>
Masilamani Jeganmohan
Muraleedharan K M
Nandita Madhavan (Yet to Update)
<u>Narasimha Murthy N</u>
Pradeep T
Rajakumar Balla
Ramesh Gardas
Ranga Rao G
Sangaranayanan M V
<u>Sanjay Kumar</u>
<u>Sankararaman S</u>
<u>Sekar G</u>
<u>Selvam P</u>
<u>S R K C Sharma Yamijala</u>
Sundargopal Ghosh
Venkatakrishnan P
Vidyasagar K



Dr. Amrendra Vijay PhD, Indian Institute of Science Bangalore, India Professor, Chemistry 044-2257-4234; <u>avijay@iitm.ac.in</u> <u>http://chem.iitm.ac.in/faculty/avijay/</u>

- Optics of Complex Materials
- Quantum Magnetism, Quantum Many-Body/Field Theory, Double-time Greens Functions
- Non-Equilibrium Statistical Mechanics Boltzmann Transport Theory
- Continuous Phase Transitions and Quantum Critical Phenomena
- Topological Fluid Dynamics
- Quantum Dynamics, Semi classical Mechanics and Electrodynamics
- Electronic Structure Theory (Molecular and Condensed Phase systems)
- Ro-Vibrational Spectroscopy, Quantum Scattering Theory and Quantum Rate Theory
- Computational Materials Science, Catalysis and Surface Sciences



Dr. Anbarasan P

PHD, Indian Institute of Science, India Associate Professor, Chemistry 044-2257-4216; <u>anbarasansp@iitm.ac.in</u>

http://chem.iitm.ac.in/professordetails/profanbarasan/profanbu/

- Transition Metal Catalysis Functionalization of Carbenes and Strong Bonds
- Organocatalysis Development of New Brønsted Acid
- Conversion of sugar and carbon dioxide to valuable chemicals




Dr. Archita Patnaik

PHD, Banaras Hindu University, India Professor, Chemistry 044-2257-4217; <u>archita@iitm.ac.in</u> http://chem.iitm.ac.in/professordetails/prof.archita/index.html



- Molecular Nanoscience and Electronics: Molecular junctions: Donor-Bridge Acceptor dyads as molecular rectifiers and configurational switches
- Colloids and Interfaces: Molecular self-assembly and functional materials, Stimuli responsive aggregates with finite curvature
- Colloids and Interfaces: Real-time polarized spectroscopy of interfaces: Biomembranes and catalysis





Dr. Arnab Rit PHD, Banaras Hindu University, India Assistant Professor, Chemistry 044-2257-4205; <u>arnabrit@iitm.ac.in</u> http://www.iitm.ac.in/info/dept/CY



Major Areas of Research

- Synthesis, Structure and Catalytic application of organometallic compounds
- Development of new ligand systems for Poly-nuclear complexes
- Novel Main-group compounds for small molecule activation
- Non-transition metal based hydrogen economy





Dr. Arti Dua

PHD, IISc, Bangalore, India Associate Professor, Chemistry 044-2257-4236; <u>arti@iitm.ac.in</u>

http://chem.iitm.ac.in/professordetails/profartidua/index.htm

- Stochastic Processes in Chemistry and Biology
- Statistical Mechanics of Polymers and Biopolymers
- Biophysical Chemistry



BROAD DESCRIPTION OF THE AREA OF RESEARCH

- Stochastic kinetics of chemical and biochemical reactions for small number of reactants
- Enzyme kinetics at cellular level
- Stochastic gene expression
- Single-enzyme catalysis



- Models of electron transfer reactions in protein matrix
- Non-Markovian models for protein conformational fluctuations
- Counterion condensation in polyelectrolytes





Dr. Ashok Kumar Mishra PhD, IIT Kanpur, India Professor, Chemistry 044-2257-4207; <u>mishra@iitm.ac.in</u> http://chem.iitm.ac.in/professordetails/profmishra/index.html



- Introducing New Paradigms in Analysis of Complex Multifluorophoric Systems
- Developing Miniaturized Fiber Optic Fluorimeters with Novel Design Features





Dr. S Baskaran PHD, IIT Kanpur, India Professor, Chemistry

044-2257-4218; <u>sbhaskar@iitm.ac.in</u>

http://chem.iitm.ac.in/professordetails/profsundarbabubaskaran/index.htm

- Development of new strategies in Organic Synthesis
- Synthesis of Biologically active Natural Products
- Drug Design of Pharmaceutical Importance





Dr. Beeraiah Baire

PhD., IISc Bangalore, India Associate Professor, Chemistry

044-2257-4206; <u>beerut@iitm.ac.in</u> http://chem.iitm.ac.in/professordetails/beeraiahbaire/







Dr. Bhyrappa, P PhD., IISc., Bangalore *Professor, Chemistry* +91 44 2257 4222; <u>byra@iitm.ac.in</u> http://chem.iitm.ac.in/faculty/bhyrappa/



Major Areas of Research

- > Biomimetic Models
- > Porphyrin Synthesis
- > Tunable Macrocycle Properties
- Supramolecular Chemistry
- Materials Chemistry (DSSCs)
- > Catalysis







Dr. N Chandrakumar

PhD, IIT Kanpur, India Emeritus Professor, Chemistry 044-2257 4920; nckumar@iitm.ac.in



- http://chem.iitm.ac.in/professordetails/chandrakumar/index.htm
- Spin Dynamics and High Resolution NMR Methodology development
- Spatially Resolved Magnetic Resonance NMR Microimaging and MRS
- Dynamic Nuclear Polarization Multi-band, multinuclear time domain DNP





Debashis Chakraborty (Dr.rer.nat.)

PhD, University of Göttingen, Germany Professor, Chemistry 044-2257-4223; <u>dchakraborty@iitm.ac.in</u>

- Organometallic Synthesis/Catalysts for Biodegradable Polymers and Copolymers
- Organometallic Synthesis/Catalysts for CO₂ Utilization and Sequestering
- Organic Synthesis/Metal Mediated Catalysis for Organic Reactions
- Organometrallic Catalysts for Olefin Polymereization





Dr. R Dhamodharan PhD, University of Massachusetts, USA Professor, Chemistry 044-2257-4204; <u>damo@iitm.ac.in</u> <u>http://www.iitm.ac.in/http://chem.iitm.ac.in/</u> https://sites.google.com/site/welcometoprofdhamodharangroup/

- Controlled Radical Polymerization Block Copolymers of Complex Architectures
- New Applications Using Biopolymers (Chitin, Cellulose, Rubber, Natural Gums)
- Polymer Light Emitting Diodes (PLED) and Electroluminescent (EL) Materials – Synthesis and Applications in Solar Energy Harvesting





Dr. Dillip Kumar Chand PhD, IIT Kanpur, INDIA Professor, Chemistry 044-2257-4224; <u>dillip@iitm.ac.in</u>



- Supramolecular Chemistry: Self-assembled coordination cages from palladium(II) and organic ligands.
- Homogeneous catalysis: Molybdenum containing catalysts for organic transformation reactions.
- Nanoscience: Synthesis and functional (e.g. catalysis) aspects of metal nanoparticles.









Dr. Edamana Prasad PHD, Kerala University, IN Professor, Chemistry 044-2257-4232; pre@iitm.ac.in http://www.chem.iitm.ac.in



- Self Assembly of Macromolecules
- Photophysics of the Self Assembled Systems





Dr. Hema Chandra Kotamarthi PhD, Tata Institute of Fundamental Research Assistant Professor, Chemistry 044-2257-4213; <u>hemachandra@iitm.ac.in</u> http://chem.iitm.ac.in/faculty/hemachandra/



- Experimental Biophysical Chemistry/ Single-molecule biophysics
- ATP-dependent bio-molecular motors
- Protein folding/unfolding, degradation and disaggregation



Representative data traces





Dr. Indrapal Singh Aidhen

PhD, University of Pune, India Professor, Chemistry 044-22574219; isingh@iitm.ac.in

http://chem.iitm.ac.in/professordetails/profsingh/index.htm

- Synthetic Organic/Carbohydrate Chemistry
- Synthesis of Biologically important Molecules
- Developing Methodologies/Building blocks for Target Driven Synthetic Endeavours

Major research interests have been in three directions. The first direction aims at developing *novel* Synthetic equivalents based on Weinreb amide (WA) functionality and their applications in synthesis of important molecules. The second direction aims at the synthesis of important and challenging targets from the realm of carbohydrate chemistry. The chosen targets belong to the class of *C*-glycosides and *Aza*-analogues. The third direction aims at developing new synthetic strategies and building blocks for biologically/medicinally important molecules.



Dr. Kartik Chandra Mondal PhD, Karlsruhe Institute of Technology Germany Assistant Professor, Chemistry 044-2257-4228; <u>csdkartik@iitm.ac.in</u> http://chem.iitm.ac.in/faculty/kartik/





Dr. Kothandaraman Ramanujam PhD, Karlsruhe Institute of Technology Germany Associate Professor, Chemistry 044-2257-4228; <u>csdkartik@iitm.ac.in</u> http://chem.iitm.ac.in/faculty/kartik/

Areas of Interest:

- Dye Sensitized Solar Cells Perovskite Solar Cells
- Redox Flow Battery (Vanadium and Organic)
- Organic electrode Materials for Li/Na ion Batteries





Dr. MD Mahiuddin Baidya PhD, LMU Munich, Germany Associate Professor, Chemistry 044-2257-4212; <u>mbaidya@iitm.ac.in</u> http://chem.iitm.ac.in/faculty/baidya/



- Transition Metal Catalyzed C-H Bond Activation
- Asymmetric Synthesis with Nitroso Compounds
- Visible Light Photocatalysis for organic synthesis
- Synthesis of Natural Products and Bioactive Compounds





Dr. Nandita Madhavan

Associate Professor, Chemistry 044-2257-4242;





Dr. Mangala Sundar K PhD., McGill University, Montreal, Quebec, Canada Professor, Chemistry 044-2257-4220; <u>mangal@iitm.ac.in</u>

http://chem.iitm.ac.in/faculty/mangal/





Dr. Masilamani Jeganmohan

Associate Professor, Chemistry 044-2257-4211; mjeganmohan@iitm.ac.in http://www.iitm.ac.in/info/dept/CY



Major Areas of Research

- > Transition metal complexes as catalysts in organic synthesis:
 - Metal-catalyzed C-H bond functionalization reactions
 - Metal-catalyzed cyclization and addition reactions
- > Asymmetric synthesis by using chiral metal complexes as catalysts
- Natural products and biologically active molecules synthesis

Catalyst Design > Synthetic Methodologies > Mechanistic Investigation

- Natural Products
- Biologically active molecules
- Chiral Organic Molecules



Dr. Muraleedharan K M

PhD., NIIST Trivandrum (Kerala University), India Professor, Chemistry 044-2257-4233; <u>mkm@iitm.ac.in</u>

http://www.chem.iitm.ac.in/professordetails/profmurali/page/index.html

Research Areas:

- Synthesis of biologically active organic compounds
- Synthetic peptides for therapeutic applications
- Development of soft organic materials through controlled self-assembly





Dr. Nandita Madhavan

PhD.,

, Chemistry 044-2257-4239; <u>nanditam@iitm.ac.in</u>



Dr. N Narasimha Murthy K M

PhD., IISc, Bangalore, Professor, Chemistry 044-2257-4233; <u>murthy@iitm.ac.in</u> <u>http://www.chem.iitm.ac.in/Faculty_murthy.html</u>



- Bioinorganic chemistry of copper and iron
- Activation of O₂, stabilization of M-O₂ adducts, their spectroscopy and catalysis
- Design of binuclear DNA metallohydrolases model for cleavage of P-O bond
- Self-assembly of iron-oxo aggregates
- ¹H NMR and EPR spectroscopy of paramagnetic metal complexes









T. Pradeep

PhD. (Indian Institute of Science, India) Professor, Chemistry

+91-44-2257-4208; <u>pradeep@iitm.ac.in</u> <u>http://www.iitm.ac.in/component/faculty/138/pradeep/</u> <u>Most updated link: http://www.dstuns.iitm.ac.in/t-pradeep.php</u>

- Research Area/Focus 1: Molecular and nanoscale materials
- Research Area/Focus 2: Drinking water purification
- Research Area/Focus 3: Ice chemistry







Dr. Rajakumar Balla

Professor, Chemistry +91-44-2257-4231; rajakumar@iitm.ac.in



- Atmospheric lifetimes of VOCs, CFC/HFC alternatives, biogenically and anthropogenically emitted compounds. Absorption cross-sections and quantum yields of trace and transient species in the Earth's atmosphere; Global Warming Potentials; Ozone depletion and production potentials
- > Cavity Ring Down Spectroscopy; Pulsed Laser Photolysis Laser Induced Fluorescence
- Single Pulse Shock Tube studies on combustion of fuels/bio-fuels Atomic Resonance Absorption Spectroscopic (ARAS) techniques
- Computational studies and kinetic simulations



All the above are fabricated / developed at IITM



Dr. Ramesh Gardas PhD, South Gujarat University, India Associate Professor, Chemistry 044-2257-4248; gardas@iitm.ac.in http://www.iitm.ac.in/component/faculty/138/gardas

- Ionic Liquids
- Solution Thermodynamics
- QSPR and Group Contribution Methods





Dr. G Ranga Rao PhD, Indian Institute of Science, India Professor, Chemistry 044-2257-4226; <u>grrao@iitm.ac.in</u> <u>http://chem.iitm.ac.in/department.html</u>



- Surface and nanomolecular catalysis: rare earth oxides, transition metal oxides and polyoxometalate compounds
- Solid state electrochemistry : electrocatalysis and supercapacitors
- > Materials chemistry : porous materials, hybrid and functional materials





M V Sangaranarayanan

PhD, IISc Bangalore Professor, Chemistry 044-22574209; <u>sangara@iitm.ac.in</u>

- Modelling of Electrochemical Interfaces
- Biosensors and Super capacitors
- Electron transfer at liquid/liquid interfaces





Dr. Sanjay Kumar

Professor, Chemistry 044-2257-4227; <u>sanjay@iitm.ac.in</u> http://www.iitm.ac.in/info/fac/sanjay



Major Areas of Research

- > Theoretical Chemistry, Quantum Molecular Reaction Dynamics
- High level ab initio bound-state quantum calculations and quantum dynamics of fundamental elementary chemical reactions
- Ion-molecule and low-energy resonant electron-molecule collisions, nonadiabatic (beyond the Born-Oppenheimer approximation) dynamics
- Computational modeling of chemical (organic) reactions & their mechanistic pathways





Dr. S Sankararaman PhD, University of Victoria, BC, Canada Professor, Chemistry 044-2257-4210; <u>sanka@iitm.ac.in</u>



http://chem.iitm.ac.in/professordetails/profsankaraman/index.htm

- Synthetic and mechanistic organic chemistry acetylene and olefin chemistry
- Synthetic Organometallic chemistry and catalysis NHC-metal chemistry
- Catalytic carbonylative annulation reactions using carbon monoxide gas





Dr. G Sekar PhD. (IIT Kanpur, India) Professor, Chemistry 044-2257-4229; <u>gsekar@iitm.ac.in</u> http://chem.iitm.ac.in/faculty/sekar/



- Asymmetric synthesis
- Metal nanocatalysts
- Halogen bonding catalysts





Halogen bonding catalysts Domino oxidations of benzylic secondary alcohols Selective activation of benzaldehyde with CBr₄ with high selectivity and control HBH(I) intermediate FG = functional groups X = CI, Br, I ewis ba FG halogen-bond ewis ha onor catal DMSO Or CH₃COOH 55 mol% I rt, neat

Selective oxidation of heterobenzylic C(sp3)-H bond

He

Iodination of electron deficient aromatics

HBH(I) intermediate



- ➢ GREEN CHEMISTRY AND CATALYSIS, BIOMASS CONVERSION, FUEL CELLS
- > H₂ Energy, CO₂ Photoreduction, NO_X Reduction and VOC Abatement
- > Ordered Porous Materials (Zeolite-type) for Organic Transformation





Dr. S R K C Sharma, Yamijala PhD, Jawaharlal Nehru Centre for Advanced Scientific Research Assistant Professor, Chemistry 044-2257-4xxx; <u>chaitanya@iitm.ac.in</u> http://chem.iitm.ac.in/faculty/chaitanya/



- Development, implementation, and application of nonadiabatic molecular dynamics methods
- Understanding the microscopic mechanism of batteries, and water-pollutants degradation
- External-energy assisted catalysis





Dr. Sundargopal Ghosh

Professor, Chemistry 044-2257-4230; <u>sghosh@iitm.ac.in</u> http://chem.iitm.ac.in/professordetails/profghosh

Major Areas of Research

- > Synthetic main group cluster chemistry, mainly polyhedral borane.
- Rare-earth metallaborane clusters; Metal-borides from metallaboranes.
- > Metallaboranes in catalysis: Functionalization of hydrocarbons; catalytic cyclotrimerization of alkynes.
- Molecular recognition: Design and synthesis of new ferrocene derivatives containing boron centered functionalities.



Boron Neutron Capture Therapy



Supraicosahedral Clusters



MgB₂ the Superconductor Multichannel Probefor Metal Ions



Dr. Venkatakrishnan P PhD, IIT Kanpur India Assistant Professor, Chemistry 044-2257-4230; <u>pvenkat@iitm.ac.in</u>

http://chem.iitm.ac.in/professordetails/Venkatakrishnan.pdf

- Organic Electronics Organic Materials for Solar Cells and Transistors
- Organic Sensors Developing Organic Materials for Solid-State Sensing
- Organic Photonics Brilliant Organic Emitter Dyes for Bio-Imaging







Dr. K Vidyasagar PhD, Indian Institute of Science, India Professor, Chemistry 044-2257-4221; <u>kvsagar@iitm.ac.in</u> http://chem.iitm.ac.in/professordetails/profvidyasagar/index.htm



- Oxides, Chalocogenides and Organo-phosphonates
- > Potential applications: SHG activity, luminescence, ion-exchange etc.




INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF CIVIL ENGINEERING

Back to Top

LIST OF FACULTY

Alagappan Ponnalagu

Alagusundaramoorthy P

Amlan K Sengupta

Arul Jayachandran

Arun Menon

Ashwin Mahalingam

Atul Narayan S P

Balaji Narasimhan

Benny Raphael

Bhargava Rama Chilukuri

Boominathan A

Chandan Sarangi

<u>Chandrasekhar Annavarapu Srinivas</u> (Profile yet to be uploaded) Dali Naidu Arnepalli

Devdas Menon

Dodagoudar G R

Gangolu Appa Rao (yet to be uploaded)

Gitakrishnan Ramadurai

Indumathi M Nambi

Karthik K Srinivasan

Koshy Varghese

Lakshmi Priya Subramanian

Lelitha Devi Vanajakshi

<u>Ligy Philip</u>

<u>Maji V B</u>

Manu Santhanam

<u>Mathava Kumar S</u>

Meher Prasad A

Mohan S

Murali Krishnan J

Murty B S

Murty C V R

Nageswara Rao B

Nikhil Bugalia (Yet to Update)

Phanisri Pradeep Pratapa

Piyush Chaunsali

Radhakrishna G Pillai

Raghukanth S T G

Rajagopal K

Ramamurthy K

Ramesh Kannan Kandasami

Ravindra Gettu

Robinson R G

Rupen Goswami

Sachin S Gunthe

Saravanan U

Satish Kumar S R

Satyanarayana K N

Shiva Nagendra S M

Sivakumar Palaniappan

Sivanandan R

Soumendra Nath Kuiry

Srinivasan K (Profile yet to be uploaded)

Subhadeep Banerjee

Sudheer K P

Surender Singh

Tarun Naskar

Thyagaraj T

Veeraragavan A

Venkataraman Srinivasan

Venu Chandra



Dr. Alagappan Ponnalagu

Assistant Professor, Civil Engineering 044-2257-4320; <u>alagappan@iitm.ac.in</u>

Major Areas of Research

- Modelling of ballistic and blast resistant structures
- Impact studies of fast moving projectile on nuclear domes
- Damage modelling
- Aortic dissection and Aneurysm





Dr. P Alagusundaramoorthy PhD., IIT Madras, India Professor, Civil Engineering 044-2257-4276; aspara0@iitm.ac.in http://www.civil.iitm.ac.in/faculty#st



- Advanced Composite Structures
- FRP Composites in Retrofitting and Rehabilitation of Structures
- Heat Straightening Process of Steel Structures



Offshore Oil Platforms and Aircraft Structures



Static and Seismic Strengthening of Concrete, Steel and Masonry Structures with GFRP and CFRP Composites



Heat Straightening Process for Damage in Strong Axis, Weak Axis, Twisting and Bulging of Steel Structural Members



Amlan K Sengupta, PE PhD, Missouri University of Science & Technology Rolla, USA Professor, Civil Engineering 044-2257-4277; <u>amlan@iitm.ac.in</u> <u>http://www.iitm.ac.in/component/faculty/70/amlan/</u>



- Earthquake engineering as applicable to building design
- Assessment of concrete bridge decks for deterioration





Dr. Arul Jayachandran PhD, IIT Madras, India Professor, Civil Engineering 044-2257-4292; <u>aruls@iitm.ac.in</u>



- Stability design of structural steelwork
- Cold-formed/ Light Gauge Steel structures
- Glass structural engineering





Dr. Arun Menon PhD, University of Pavia, Italy Associate Professor, Civil Engineering 044-2257-4299; <u>arunmenon@iitm.ac.in</u> http://www.civil.iitm.ac.in/new/?q=arun_edu

- Structural Safety of Historical Monuments
- Seismic Behaviour, Assessment and Retrofit of Masonry Structures
- Seismic Risk Assessment of Structures at Urban Scale
- Historical Seismicity and Seismic Hazard Analysis





Dr. Ashwin Mahalingam PhD, Stanford University, USA Associate Professor, Civil Engineering 044-2257-4318; <u>mash@iitm.ac.in</u> http://www.civil.iitm.ac.in/new/?q=ash_edu



- Infrastructure Policy and Public Private Partnerships
- Virtual Planning, Design and Construction
- Sustainability and Globalization in the Architecture, Engineering and Construction (AEC) Industry



Infrastructure Policy: When should PPPs be selected? How can they best be structured? What challenges arise as these projects are operational ?



Virtual Planning, Design and Construction: Can Stakeholder Input be brought into planning using IT tools? How can project planning be optimized using visualization? How can technology adoption be enhanced?



Sustainability and Globalization: How can Virtual Teams in the AEC industry work together effectively? How can they design and create a sustainable built environment?



Dr. Atul Narayan SP PhD, Texas A&M University Assistant Professor, Civil Engineering 044-2257-4300; <u>atulnryn@iitm.ac.in</u> <u>http://www.civil.iitm.ac.in/atulnryn</u>



- > Bitumen
- Bituminous concrete
- Granular materials
- Cement paste and fresh concrete





Dr. Balaji Narasimhan

PhD, Texas A&M University, USA Associate Professor, Civil Engineering 044-2257-4293; <u>nbalaji@iitm.ac.in</u> http://www.iitm.ac.in/component/faculty/70/nbalaji/



- Remote Sensing and GIS
- Hydrological Modeling
- Irrigation water management



Crop Evapotranspiration, Inter-basin water transfer, Irrigation efficiency



Impact of climate and landuse changes on the water resources



Floods & droughts extent, magnitude, duration and frequency



Dr. Benny Raphael

Professor, Civil Engineering 044-2257-4310; <u>benny@iitm.ac.in</u> http://www.civil.iitm.ac.in/benny_edu

Major Areas of Research

- Building Automation and Control
- Computer Aided Engineering: Modeling, Optimization, Data mining
- Energy efficient buildings: Sustainable and smart building







Dr. Bhargava Rama Chilukuri

Assistant Professor, Civil Engineering 044-2257-4270; <u>bhargava@iitm.ac.in</u>

Major Areas of Research

- Traffic Flow Theory of Homogenous and Heterogeneous Traffic
- Numerical Simulation of Traffic Flow Models
- Optimal Control of Traffic Systems





Dr. A Boominathan PhD, MGSU, RUSSIA Professor, Civil Engineering 044-2257-4275; <u>boomi@iitm.ac.in</u> http://www.iitm.ac.in/component/faculty/70/boomi/

- Soil Dynamics and Liquefaction
- Earthquake Geotechnical Engineering
- Foundations subjected to Cyclic and Dynamic loads





Dr. Chandan Sarangi PhD, IIT Kanpur, India

Assistant Professor, Civil Engineering chandansarangi@iitm.ac.in



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Major Areas of Research

- Impact of aerosols (particulate air pollution) on hydrometeorological processes (clouds, rainfall, fog, transpiration)
- Impact of dust deposition on Himalayan hydrology
- Modelling fate and transport of aerosols at regional and global scale
- Relative role of aerosols on temperature and extreme rainfall over Megacities



Aerosols and Hydro-Meteorology (ahm) Lab



Dr. Chandrasekhar Annavarapu Srinivas PhD, Duke University, US Assistant Professor, Civil Engineering 044-2257-4325; <u>annavarapuc@iitm.ac.in</u>





Dr. Dali Naidu Arnepalli

PhD, IIT Bombay, India Associate Professor, Civil Engineering 044-2257-4297; <u>arnepalli@iitm.ac.in</u> http://www.iitm.ac.in/component/faculty/70/arnepalli/

- Geosequestration of Carbon for Mitigation of Green House Gases
- Design of Barrier Systems and Their Long Term Performance
- Geoenvironmental Engineering
- Unsaturated Behaviour of Geomaterials and Geosynthetic Clay Liners





Devdas Menon Professor, Civil Engineering 2257 4253 ; 9884078303; <u>dmenon@iitm.ac.in</u>

www.devdasmenon.com



Major Areas of Interest

- Structural Concrete Design
- Structural Analysis & Reliability
- Bridge Engineering

- Affordable Rapid Mass Housing
- Wind & Earthquake Engineering
- Self Awareness





G R Dodagoudar Professor, Civil Engineering

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Dr. Gangolu Appa Rao

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Dr. Gitakrishnan Ramadurai PhD, Rensselaer Polytechnic Institute, USA Associate Professor, Civil Engineering 044-2257-4298; <u>gitakrishnan@iitm.ac.in</u> http://www.civil.iitm.ac.in/new/?q=gita_edu



- > Dynamic Traffic Assignment
- Transportation Network Modelling
- Econometric and Optimization Models in Transportation





Dr. Indumathi M Nambi PhD, Clarkson University, USA Professor, Civil Engineering 044-2257-4289; indunambi@iitm.ac.in http://www.iitm.ac.in/indu_edu



- Ground Water Contamination including NAPL /Transport and Remediation
- Industrial Wastewater Treatment/Physical and Chemical Processes
- Water and Waste Water /Tertiary treatment for reuse





Dr. Karthik K Srinivasan PhD, The University of Texas at Austin, USA Professor, Civil Engineering 044-2257-4282; <u>karthikks@iitm.ac.in</u> <u>http://www.civil.iitm.ac.in/new/?q=ks_edu</u>

- Travel Demand Modeling
- Transportation Network Optimization and Reliability
- Intelligent Transportation System





Dr. Koshy Varghese PhD, The University of Texas at Austin, USA Professor, Civil Engineering 044-2257-4257; <u>koshy@iitm.ac.in</u> http://www.civil.iitm.ac.in/people/faculty/koshy/

- Automation in Construction
- Design Information Management
- Computer Integrated Project Delivery





Dr. Lakshmi Priya Subramanian PhD, Georgia Institute of Technology, USA Assistant Professor, Civil Engineering 044-2257-4319; <u>lakshmipriya@iitm.ac.in</u>



Major Areas of Research

- Stability of steel structures
- Numerical and computational analysis of stability models
- Structural Fire engineering





Dr. Lelitha Devi Vanajakshi

PhD, Texas A&M University, USA Professor, Civil Engineering 044-2257-4291; <u>lelitha@iitm.ac.in</u> <u>http://www.iitm.ac.in/component/faculty/70/lelitha/</u>



Major Areas of Research

- Traffic Flow Modeling
- Traffic Operations
- Intelligent Transportation Systems





Dr. Ligy Philip PHD, IIT Kanpur, India Professor, Civil Engineering 044-2257-4274; <u>ligy@iitm.ac.in</u> http://www.civil.iitm.ac.in/new/?q=ligy_edu



- Water Treatment and Rural Water Supply
- Domestic and Industrial Wastewater Treatment, Recycle and Reuse





Dr. V B Maji PhD, IISc Bangalore, India Associate Professor, Civil Engineering 044-2257-4294; <u>vbmaji@iitm.ac.in</u> <u>http://www.civil.iitm.ac.in/new/?q=maji_edu</u>



- Behaviour of jointed rocks
- Underground excavation and slope stability



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Dr. Manu Santhanam PhD, Purdue University, USA

Professor, Civil Engineering 044-2257-4283; <u>manus@iitm.ac.in</u> http://www.civil.iitm.ac.in/new/?q=manu_rp



- Durability and long term performance of concrete
- Microstructural characterization and non-destructive evaluation of concrete



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Dr. S Mathava Kumar Associate Professor, Civil Engineering 044-2257-4267; <u>mathav@iitm.ac.in</u> <u>http://www.civil.iitm.ac.in/mathav_edu</u>



Major Areas of Research

- Water and Wastewater Treatment
- Emerging Contaminants/Micro-Pollutants Removal
- Bioremediation of Contaminated Systems and Biogenic Metal Removal





A MEHER PRASAD Professor, Civil Engineering T: 044 2257 4260; M: 9444017194; prasadam@iitm.ac.in



Major Areas of Interest

- Structural Dynamics
- Structural Analysis & Reliability
- Structural Health Monitoring



- Affordable Mass Housing
- Wind & Earthquake Engineering
- Computational Mechanics



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Dr. S MOHAN

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Areas of Expertise

- Environmental Systems Modeling
- Water and Wastewater Treatment
- Sustainability Engineering
- Environmental Impact Assessment
- Water Resources Systems Modeling
- Hydraulic Modeling of Rivers, and Lakes
- Ground Water Assessment and Modelling

Current Research Works

- Modeling of Ground Level Ozone using Data Mining
- Assessment and Remediation of the Pollution in Wetlands
- Real time Groundwater Control for Mining Operations
- Treatment of Leachate from Municipal Solid Waste Open Dumpsite using Combined Bioreactor - Composite Block Technique
- Optimization of Water Use and Waste Generation in Pharmaceutical Industries through Green Engineering Principles
- Assessment and modelling the fate of Persistent and Bio accumulative (P&B) Emerging Contaminants (ECs) in wastewater
- Advanced Oxidation Process for Open Dumpsite Leachate Treatment
- Modeling of Microbial Contaminant Transport in Water Distribution Systems
- Municipal Solid Waste Treatment using Bioreactor Landfill Technology
- Effluent Management in Textile Industry
- Development of Integrated Operation of Multi-Reservoir System with Meta Heuristics Modelling
- > Treatment of beach sands contaminated during oil-spill
- > Plasma Reactor Technology for Hazardous waste Management





Dr. J Murali Krishnan

PhD, IIT Madras, India Professor, Civil Engineering 044-2257-4284; jmk@iitm.ac.in



- Asphalt Rheology
- Viscoelasticity
- Pavement Engineering





Dr. B S Murty PhD, Washington State Univ., Pullman, USA Professor, Civil Engineering 044-2257-4262; <u>bsm@iitm.ac.in</u> <u>http://www.civil.iitm.ac.in/new/?q=murty_edu</u>



- Open-Channel Flow Modeling
- Closed Conduit Flows
- Groundwater Resources Management







Nonlinear Seismic Behavior of Structures

Geometric and

Material Nonlinearity

- Earthquake-Resistant Design of Buildings and Bridges
- Seismic Design Codes; Books in Earthquake Engineering





Displacement-Based Seismic Design

Earthquake Engineering

Ductility



Dr. B Nageswara Rao PhD, University of Iowa, USA Professor, Dept. of Civil Engg. 044-2257-4285; <u>bnrao@iitm.ac.in</u> <u>http://www.civil.iitm.ac.in/?g=rao_rp</u>



- Computational solid mechanics, finite element analysis, meshless analysis
- Fracture mechanics, micromechanics and homogenization methods
- Structural reliability & optimization, fuzzy structural analysis, dimension reduction methods



Data Analysis–Statistics, Distribution



FEM/Meshless-Stress/Displ./ Damage/Fatigue/Creep/ Fracture/Corrosion



Probabilistic Methods, Reliability, Sensitivity, Design Optimization, NDE Scheduling


Dr. Phanisri Pradeep Pratapa

Assistant Professor, Civil Engineering +91-9346032783; ppratapa@iitm.ac.in

Major Areas of Research

- Origami-based engineering for novel structures and materials
- Meta-materials for civil engineering applications
- Structural dynamics of lattice systems





Dr. Piyush Chaunsali

PhD (University of Illinois at Urbana-Champaign) Assistant Professor, Civil Engineering 044-2257-4312; <u>pchaunsali@iitm.ac.in</u>

Major Areas of Research

- Cement chemistry and concrete durability
- Processing-microstructure-performance relationships of low CO₂ cements
- Characterization of industrial by-products for their beneficial reuse





Dr. Radhakrishna G Pillai PhD, Texas A&M University, USA Associate Professor, Civil Engineering 044-2257-4303; pillai@iitm.ac.in http://www.civil.iitm.ac.in/pillai



- Understanding corrosion and its effects on concrete structures
- Testing/modelling the corrosion & durability parameters of concrete structures
- Durability of repairs & cathodic protection in concrete structures





- Natural Hazards
- Risk Assessment
- Wave Propagation
- Structural Dynamics
- > Earthquake Engineering

Longitude (⁰)

PSHA Map of India



Dr. Raghukanth S T G

PhD, IISc, Bangalore

Professor, Civil Engineering

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Dr. K Rajagopal PhD, University of Florida, Gainesville, USA Professor, Civil Engineering 044-2257-4263, gopalkr@iitm.ac.in http://www.iitm.ac.in/

- Geosynthetics and Reinforced Soil Structures
- Ground Improvement
- Finite Elements applied to geomechanics



Geosynthetics for Sustainable Shoreline Protection



Construction of Expedient Road Bases



Construction of Very High Retaining Walls using Geosynthetics



K RAMAMURTHY Professor, Civil Engineering T: 044 2257 4265; E: <u>vivek@iitm.ac.in</u>



Major Areas of Research

- Lightweight ash based aggregates
 - Aggregate manufacturing procedures
 - Quality assessment of fly ash aggregates
- Aerated & foam concrete blocks/bricks
 - Manufacturing procedures
 - Effect of admixtures on engg. properties
- Interlocking brick masonry
 - Increasing the construction speed
 - Strength of masonry units/systems





Sintered & cold-bonded fly ash aggregates



Aeratead concrete system



An Interlocking Block Masonry System Back to Top



Ramesh Kannan Kandasami, PhD, Assistant Professor, Civil Engineering

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Areas of research:

- 1. Constitutive behavior of transitional geo-materials
- 2. Hydraulic fracturing
- 3. Wellbore strengthening
- 4. Bio-inspired geotechnics





Failure locus for cohesive-frictional geomaterials

Fracture propagation in an anisotropic granular system Rupture device to determine the strength of filter cake across different fracture width Strength and stability of termite mounds

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Dr. Ravindra Gettu

PhD, Northwestern University, USA Chair Professor, Civil Engineering 044-2257-4266; gettu@iitm.ac.in

- High Performance concrete, Self Compacting Concrete
- Fibre and Textile reinforced Concrete
- Sustainability assessment of concrete systems











Flexural creep testing





Dr. R G Robinson PhD, IISc, Bangalore, India Professor, Civil Enginerring 044-2257-4286; <u>robinson@iitm.ac.in</u> <u>http://www.civil.iitm.ac.in/new/?q=rob_rp</u>



- Soft Clay Engineering
- Ground Improvement
- Physical modelling





Rupen Goswami PhD, IIT Kanpur, India Associate Professor, Civil Engineering +91 44 2257 4301; rg@iitm.ac.in http://www.civil.iitm.ac.in/new/?q=rupen_edu



- Nonlinear Behaviour of Structures
- Steel Structures







Dr. Sachin S Gunthe

PhD, Indian Institute of Tropical Meteorology, India Associate Professor, Civil Engineering 044-2257-4308; s.gunthe@iitm.ac.in

- Properties and interaction of atmospheric aerosols including bioaerosols
- Role of atmospheric aerosols in Earth system science
- Aerosol cloud precipitation interaction Indian monsoon







Dr. U Saravanan PHD, Texas A&M University, USA Professor, Civil Engineering 044-22574314 Email: <u>saran@iitm.ac.in</u> http://www.civil.iitm.ac.in/new/?q=sar_edu



- Constitutive modeling
- Nonlinear analysis
- Structural health monitoring





Dr. Satish Kumar S R

D.Eng, Nagoya University, Japan Professor, Civil Engineering 044-2257-4287; <u>kim@iitm.ac.in</u> <u>http://www.civil.iitm.ac.in/new/?q=satish_edu</u>

- Structural Engineering / Design of Steel Structures
- Structural Engineering / Earthquake Resistant Design & Seismic Testing





Dr. K N Satyanarayana PhD, Clemson University, USA Professor, Civil Engineering 044-2257-4268; <u>satyakn@iitm.ac.in</u> <u>http://www.civil.iitm.ac.in/new/?q=satya_edu</u>



Major Areas of Research

- Infrastructure & Construction Project Management
- Public Private Partnerships Risk Management, Capacity Building
- Construction Procurement & Contracts
- Construction Mechanisation





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RESEARCH INTERESTS

URBAN AIR QUALITY MANAGEMENT	Emission inventory, air quality monitoring, modelling, source- receptor modelling and control strategies
VEHICULAR POLLUTION MODELLING	Deterministic, statistical and artificial neural network approaches
INDOOR AIR QUALITY	Monitoring, modelling and control strategies
INDUSTRIAL AIR POLLUTION CONTROL	Design of air pollution control equipments and environmental impact assessment
ENVIRONMENTAL DATA ANALYSIS	Multivariate data analysis and environmental auditing



Urban Air Quality Management

Indoor Air Quality Management

Industrial Pollution Control
Back to Top



Dr. Sivakumar Palaniappan PhD, Arizona State University, USA Assistant Professor, Civil Engineering 044-2257-4258; <u>sp@iitm.ac.in</u> <u>http://www.civil.iitm.ac.in/new/?q=sp_edu</u>



- Construction Project Planning and Control, Information Technology Applications in Project Management
- Sustainable Construction: Life cycle energy use in buildings, carbon footprint of construction processes
- Modelling and Simulation of Construction Processes using discrete event simulation





Dr. R Sivanandan PhD, Virginia Tech, USA Professor, Civil Engineering 044-2257-4275; <u>rsiva@iitm.ac.in</u> http://www.iitm.ac.in/component/faculty/70/rsiva/



- Congestion Management
- Traffic Simulation and Analysis
- Intelligent Transportation Systems (ITS)





Dr. Somendra Nath Kuiry PhD, IIT Kharagpur **Assistant Professor, Civil Engineering** 044 -2257 4309; snkuiry@iitm.ac.in http://www.civil.iitm.ac.in/new/?g=kuiry_edu

- Computational hydraulics river, coastal and dam-break flow \triangleright
- Modelling of hurricane and tsunami wave propagation
- Modelling of sediment transport in rivers and coasts
- Experimental study on dam-break and river flow



Ξ



Dr. Srinivasan K PhD., Indian Institute of Technology Madras Professor, Civil Engineering 044-2257-4212; <u>ksrini@iitm.ac.in</u> <u>https://civil.iitm.ac.in/?page_id=669#</u>





Dr. Subhadeep Banerjee PhD, National University of Singapore Associate Professor, Civil Engineering 044-2257-4304; <u>subhadeepn@iitm.ac.in</u> www.civil.iitm.ac.in/new/?q=subh_edu

- Soil Dynamics and Earthquake Engineering
- Constitutive Relationship of Soil
- Finite Element Modelling
- Physical modelling and laboratory testing





Dr. K P Sudheer PHD, IIT Delhi, India Professor, Civil Engineering 044-2257-4288; <u>sudheer@iitm.ac.in</u> <u>http://www.iitm.ac.in/component/faculty/70/sudheer</u>



- > Hydrologic Modeling
- Predictions in Ungauged Basins (PUB)
- Uncertainty and Sensitivity Analysis





Dr. Surender Singh PHD, IIT Roorkee, India Assistant Professor, Dept. of Civil Engineering 044-2257-4313; surender@iitm.ac.in https://civil.iitm.ac.in/faculty/surender/



Major Areas of Research

- Valorization of C&D Waste & other Industrial/Agricultural Waste
- Design, Monitoring and Rehabilitation of Concrete Pavements
- Special Cement Concrete Pavements



Developing Economical Techniques for Beneficiation of Recycled Aggregates for Sustainable Pavement Applications



Evaluation & Monitoring of Rigid Pavements



Special Concrete Pavements

Valorization of Different Wastes for Sustainable Rigid Pavement Applications



Dr. Tarun Naskar PHD, IISc Bangalore

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- > NDT
- Inverse Analysis
- Surface Wave Propagation





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- Unsaturated soil behaviour
- Ground improvement
- Geoenvironmental engineering





Dr. A Veeraragavan PhD, Bangalore University, India Professor, Civil Engineering 044-2257-4272; <u>av@iitm.ac.in</u> http://www.civil.iitm.ac.in/new/?q=veer_edu



- Pavement Engineering / Pavement Management System
- Sustainable Road Infrastructure / Recycling of Pavement Materials
- Traffic Engineering and Management / Road Safety



Pavement Maintenance and Asset Management of Road Infrastructure



Recycling of Pavement Materials for Sustainable Road Infrastructure



Engineering Measures to Enhance Road Safety Under Mixed Traffic



Dr. Venkatraman Srinivasan PhD, University of Illinois Urbana Champaign, USA Assistant Professor, Civil Engineering 044-2257-4321; <u>venkatraman@iitm.ac.in</u>

Major Areas of Research

- Process based eco-hydrological models of vegetated land surfaces
- Climate change impact on food and water security
- Experimental manipulation of crop micro climate environment





Dr. Venu Chandra PhD, IIT Kanpur, India Assistant Professor, Civil Engineering 044-2257-4281; <u>vc@iitm.ac.in</u> http://www.civil.iitm.ac.in/vc_edu



- Experimental Hydraulics
- Sediment Transport
- Cohesive Sediment Dynamics
- River Training and Scour Protection Works





INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING



Dr. Akanksha Agrawal Ph.D., University of Bergen, Norway Assistant Professor (Grade II), Dept. of Computer Science & Engg. 044-2257-4391; akanksha@iitm.ac.in



Parameterized Complexity

A paradigm to deal with hard problems. Each instance has an integer called the parameter.

Typical Goals:

Fixed parameter tractability: Limit the exponential factor in the runtime of the algorithm to the parameter alone.

Kernelization: Polynomial time preprocessing algorithm to reduce the instance size to a function of the parameter.

Parameterized Computational Geometry

Computational Geometry

Some problems from the field, to be studied in the realm of Parameterized Complexity:

Fundamental Visibility Problems: Art Gallery and Terrain Guarding, and their variants.

Graph Modification to Geometric Graphs: Make at most k modification to the given graph, to obtain geometric graphs like Delaunay graphs, geometric intersection graphs, etc.

Classical Graph Problem on Geometric Graphs: Obtain (more) efficient algorithms for classical graph problems when restricted to geometric graphs like unit disc graphs, unit square graphs, etc.



Dr. Anurag Mittal PhD, Univ. of Maryland College Park, USA Professor, Dept. of CSE 044-2257-4372; amittal@iitm.ac.in

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Computer Vision

- Multi-Camera Security and Surveillance
- Contour-based Object Detection & Recognition
- Feature Detection and Description







Dr. Arun Rajkumar

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Primary areas of Research

- Algorithmic Machine Learning
- Learning to Rank
- Multi Armed Bandits

Application Domains of Interest

- Education
- Healthcare
- Transportation







Dr. C Chandra Sekhar PhD., IIT Madras, India Professor, Computer Science and Engineering 044-2257-4363; <u>chandra@cse.iitm.ac.in</u> <u>http://www.cse.iitm.ac.in/chandra</u>

- Machine Learning for Speech Technology
- Kernel Methods for Pattern Analysis
- Content based Information Retrieval



Support Vector Machines based Approaches to Acoustic Modeling for Speech Recognition



Design of Dynamic Kernels for Speech and Image Data



Scene Image Retrieval using Kernel Methods





Dr. Chester Rebeiro

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- Hardware Security
 - Side Channel Analysis
 - Hardware Trojans
 - PUFs
- Cryptography
 - Implementations in Hardware and Software
- Operating Systems
 - Secure Operating Systems Design





Dr. Deepak Khemani PHD, IIT Bombay, India Professor, Computer Science and Engineering 044-2257-4365; <u>khemani@iitm.ac.in</u> <u>http://www.cse.iitm.ac.in/khemani</u>



- Artificial Intelligence/Knowledge Representation and Reasoning
- Artificial Intelligence/Automated Planning
- Artificial Intelligence/Memory Based Reasoning







Dr. Dharanipragada Janakiram

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Major Areas of Research

- Distributed Systems, Grid Computing and Cloud Computing
- Service Oriented Architectures for Operating Systems
- Big Data Analytics and Database Systems
- Internet of Things (IoT)
- Sensor Device Integration into Cloud Systems
- Andriod Security



Research Challenges in Building Large Scale Software Systems








Dr. Harish Guruprasad Ramaswamy

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Major Areas of Research

- Machine learning with Noisy/Weak Labels
- Theoretical Foundations of Deep Learning
- Optimising Complex Performance Measures in Machine Learning



Geometry and Optimisation based approaches for Machine Learning Back to Top





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- Speech and Music Signal Processing
- Network Traffic Analysis
- Machine learning for Speech, Music, Network Traffic Data



Music Analysis

- Tonic identification
- Motif disconvery
- Transcription of Mridangam
 strokes

IBM Faculty Award 2006

Rais Ahmed Moerial Lecture Award 2012





Network tranffic analysis

User profiling Anomaly detection Topic Analysis

TTS: GE Research Innovation Award 2013



Speech Processing

Segmentation of speech Speaker Verification Keyword spotting

Screen Reader: Manthan Award Finalist 2012



Dr. Jayalal Sarma

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Areas of Research:

- Theoretical Computer Science, Computational Complexity Theory
- Structural, Arithmetic & Boolean Circuit Complexity
- Algebra and Computation, Pseudo-randomness, De-randomization





Dr. John Augustine PhD., Univ. of California, Irvine, USA Associate Professor, Computer Sci. and Engg. 044-2257-4383; <u>augustine@cse.iitm.ac.in</u> <u>http://www.cse.iitm.ac.in/~augustine/</u>



Algorithms at large including:

- Distributed Algorithms
- Computational Geometry

> Online Algorithms





V. Kamakoti specializes in the areas of VLSI Design and Computer Architecture. His specific interests include power-aware design and testing of digital circuits, secure compute and network architectures, wireless sensor networks and thermal imaging based embedded systems for medical diagnosis.

He is one of the co-founders of the Reconfigurable Intelligent Systems Engineering (RISE) group. The RISE Lab is involved in development of indigenous secure computing and networking platforms.



- Automated Formal Verification
- Program Analysis
- Programming Languages





Dr. Krishna Moorthy Sivalingam PhD., State Univ. of New York, Buffalo, USA Professor, Computer Science & Engg. 044-2257-4378; <u>skrishnam@iitm.ac.in</u> http://www.cse.iitm.ac.in/~skrishnam



Computer Networks: Wireless Networks, Optical Networks



Hybrid Optical-Packet DCN Switch

EPC Controller OF Gateway Switch OF Switch OF Switch OF Switch UTE UTE UTE

SDN Based LTE EPC

Network Protocols and Algorithms: Design, Analysis and Implementation



V Krishna Nandivada PHD, UCLA, USA Associate Professor, Computer Sci. and Engg. 044-2257-4380; <u>nvk@iitm.ac.in</u> <u>http://www.cse.iitm.ac.in/~krishna</u>

- Compiler Optimizations Optimizations for multicore systems
- Compiler Optimizations Semantics preserving optimizations.
- Language design for performance and programmability.
- Software security Security for mobile applications





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- Multi-core Architectures
- Network-on-Chip
- Emerging Memory Technologies





Dr. Manikandan Narayanan

Associate Professor, Computer Science & Engg. (CSE) Core Faculty, Initiative for Biological Systems Engg. (IBSE) Robert Bosch Centre for Data Science and AI (RBC-DSAI)

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Major Areas of Research

Computational methods (multilayer graphical models, ensemble graph algorithms) that've crucial applications in biology and beyond!

- Bioinformatics and Computational Biology; Systems Biology/Genomics of Health and Disease
- Complex (Multilayer)
 Network Models and Graph
 Algorithms; Integrative
 Data science





Dr. Meghana Nasre Assistant Professor, Computer Sci.& Engg. 044-2257-4373; <u>meghana@iitm.ac.in</u> <u>http://www.cse.iitm.ac.in/~meghana</u>



Major Areas of Research

- Graph Theory, Algorithms
- Matchings in graphs under preferences





Dr. Mitesh M Khapra PHD, IIT Bombay, India Assistant Professor, Computer Sci. & Engg. 044-2257-4371; <u>miteshk@cse.iitm.ac.in</u> <u>http://www.cse.iitm.ac.in/~miteshk</u>



- Developing robust evaluation metrics for Natural Language Generation
- Developing NLP tools and technologies for Indian languages
- Evaluating robustness of NLP systems to adversarial attacks





N S Narayanaswamy Indian Institute of Technology Madras, India Professor, Computer Science and Engg 044-22574369; <u>swamy@iitm.ac.in</u> <u>https://www.cse.iitm.ac.in/~swamy</u>



- Software Systems for Resource allocation, Scheduling
- Software Systems for Knowledge Representation and automated planning
- System design for Electronic Voting

Algorithms Analysis for running time and solution optimality Studies on Special classes of inputs

Domain Classification using Ontologies and Automated Planning Techniques Design of systems using knowledge representation, automated planning, optimization algorithms

Domain Knowledge, Efficient Optimization Algorithms



Nishad Kothari PhD, University of Waterloo, Canada Assistant Professor, Computer Sci. and Engg. 044-2257-4360; <u>nishad@iitm.ac.in</u>



Research Areas: Matching Theory, Structural Graph Theory

- One of the main objectives is to find NP and co-NP characterizations of graph classes; for example:
 - Classes motivated by Combinatorial Optimization: *PM-compact* graphs, *Birkhoff-von Neumann* graphs
 - > Classes defined by excluding certain matching minors: K4-free graphs, prism-free graphs
 - > Classes motivated by theoretical physics and enumerative combinatorics: *Pfaffian* graphs
- Developing induction tools (i.e., generation theorems) that are useful in characterizing graph classes
- Discovering graphs that play a special role in certain areas of Graph Theory.









Sequential decision making under uncertainty



Dr. Pratyush Kumar PHD, ETH Zurich, Switzerland Assistant Professor, Computer Sci. & Engg. 044-2257-4388; pratyush@iitm.ac.in http://www.cse.iitm.ac.in/~pratyush/



- Combining systems thinking with deep learning to design systems considering non-functional properties of time, energy, security, and variable effort inference
- Correct-by-construction design of cyber-physical systems meeting hard end-to-end timing constraints with application in safety-critical systems





Dr. Raghavendra Rao B V

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Major Areas of Research

- Computational Complexity Theory
- Algebraic Complexity Theory
- Combinatorial Commutative Algebra
- Analysis of Algorithms
- Computational problems on algebraic and combinatorial structures



Dr. Ravindran B

Professor, Computer Sci. & Engg 044-2257-4370; ravi@cse.iitm.ac.in

https://www.cse.iitm.ac.in/profile.php?arg=MjE=





Rupesh Nasre

Assistant Professo, Professor, Computer Sci. & Engg 044-2257-4374; <u>rupesh@iitm.ac.in</u> <u>http://www.cse.iitm.ac.in/~rupesh</u>



Major Areas of Research

- Parallelization
- > Compilers
- Domain Specific Languages





Dr Shweta Agarwal PhD, University of Texes at Austin

Assistant Professor, Computer Sci. & Engg 044-2257-4384; <u>shweta@iitm.ac.in</u> <u>http://www.cse.iitm.ac.in/~rupesh</u>



- Cryptography, particularly post-quantum cryptography from hard lattice problems
- Applications of Blockchain technology to socially relevant problems
- Computing on encrypted data to enable machine learning on encrypted data
- Resolving conflict between utility and privacy in age of big data







Secure Cloud computing

Patient private medicine Back to Top



Dr. C Siva Ram Murthy PhD, Indian Institute of Science Professor, Computer Sci. & Engg 044-2257-4361; <u>murthy@iitm.ac.in</u>







Dr. Sivaramakrishnan K C

PhD, Purdue University, U.S.A. Assistant Professor, Computer Sci.& Engg. 044-2257-4350; <u>kcsrk@cse.iitm.ac.in</u> <u>https://kcsrk.info/</u>





Dr. Sreenivasa Kumar P

PhD, IISc. Bangalore Professor, Computer Sci & Engg 044-2257-4366; <u>psk@cse.iitm.ac.in</u>; <u>psk@iitm.ac.in</u> <u>https://www.cse.iitm.ac.in/~psk/</u>





Dr. Sukhendu Das

Professor, Computer Science and Engineering

+91-44-2257-4367; sdas@iitm.ac.in http://www.cse.iitm.ac.in/~sdas,/~vplab



Major Areas of Research

<u>CBVR using DMST-CSS and Hyper-strings</u> <u>Recognition</u>

Unconstrained Face





(Proposed VIDCAR)

MTH

SLAR for "Smart CBIR"

(ICPR-10)

SLAR

- EDT
- ESS





Domain Adaptation, Saliency (FRBP),								
Soft object and biped dynamics								
Image IT	FT	CA GB	IS	RC	HFT	SF	FRBP	GT
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← Unifying Visual Perception and Visualization for cognitive intelligence algorithms → Back to Top



Dr. Sutanu Chakraborti PhD, The Robert Gordon University, UK

Associate Professor, Computer Science 044-2257-4376; <u>sutanuc@iitm.ac.in</u> http://www.cse.iitm.ac.in/~sutanuc/



- Text and Web Analytics
- Machine Learning for Knowledge Acquisition
- Cognitive Aspects of Language and Memory





Dr. Yadu Vasudev Assistant Professor, Computer Sci. & Engg 044-2257-4386; <u>yadu@iitm.ac.in</u> <u>http://www.cse.iitm.ac.in/~yadu</u>



- Sublinear Algorithms
 - Property testing algorithms for large sparse graphs
 - Distributed algorithms on sparse networks
- Computational Complexity Theory
 - Complexity of isomorphism problems
 - Randomness in computation



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF ELECTRICAL ENGINEERING

LIST OF FACULTY

Abhishek Sinha

Amitava Dasgupta

Ananth Krishnan

Anbarasu Manivannan

Andrew Thangaraj

Anil Prabhakar

Aniruddhan S

Anjan Chakravorty

Aravind R (Profile yet to be uploaded)

Arun Karuppaswamy B

Arun D Mahindrakar

Arun Pachai Kannu

Avhishek Chatterjee

Balaji Srinivasan

Bharath Bhikkaji

Bhaskar Ramamurthi (Profile yet to be uploaded)

Bhaswar Chakrabarti

Bijoy Krishna Das

Boby George

Debdutta Ray

Deepa Venkitesh

Deleep R Nair

Devendra Jalihal

Enakshi Bhattacharya

Gaurav Raina

<u>Giridhar K</u>

Harishankar Ramachandran

<u>Jagadeesh Kumar V</u>

Janakiraman Viraraghavan

Jayaraj Joseph

Kalyan Kumar B

Kamalesh Hatua (Profile yet to be uploaded)

Kaushik Mitra	Ramalingam C S (Profile yet to be uploaded)				
Krishna S	Ramkrishna Pasumarthy				
Krishna Jagannathan	Ravinder David Koilpillai (Yet to be uploaded)				
Krishna Vasudevan	<u>Sarathi R</u>				
Lakshminarasamma	Saurabh Saxena (Profile yet to be uploaded)				
Mabosh Kumar	- <u>Shanthi Pavan</u>				
Manivasakan R	Sheetal Kalyani				
<u>Mathiazhagan C</u>	<u>Shivananju B N</u>				
Mohanshankar Sivaprakasam	Shreepad Karmalkar				
Nagendra Krishnapura	Soumya Dutta				
Nandita Dasgupta	Sridharan K				
Nitin Chandrachoodan	<u>Srikrishna Bhashyam</u>				
Pradeep Kiran Sarvepalli	Srirama Srinivas				
Puduru Viswanadha Reddy	<u>Swarup K S</u>				
Oedeer Abreed Kher	Uday Khankhoje				
	Umesh S (Profile yet to be uploaded)				
Rachael Kalaimani	Venkatesh T G (Profile yet to be uploaded)				
<u>Radha Krishna Ganti</u>	Venkatesh Ramaiyan				
Rajagopalan A N	Vinita Vasudevan				



Dr. Abhishek Sinha

PhD, MIT, USA Assistant Professor, Electrical Engg. 044-2257-4410; <u>abhishek.sinha@iitm.ac.in</u>



- Research interest: Theoretical Machine Learning, Network Control, and Information Theory
- Please visit <u>https://home.iitm.ac.in/abhishek.sinha/</u> for details on my research





Dr. Amitava DasGupta PhD, IIT Kharagpur, India Professor, Electrical Engineering 044-2257-4416; adg@ee.iitm.ac.in http://www.ee.iitm.ac.in/~adg/



- Research Area/Focus 1: Device Modelling (Mu`GFETs, LDMOS, HEMTs, QM effects)
- Research Area/Focus 2 : MEMS: Design, Fabrication & Characterization
- Research Area/Focus 3 : Silicon and Compound Semiconductor Technology





Ananth Krishnan PhD. from Texas Tech University

Associate Professor, Electrical Engineering 044-2257-4451; <u>ananthk@iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/~ananthk</u>



Major Areas of Research

- Design, Fabrication and Characterization of Plasmonic devices
- > Design, Fabrication and Characterization of Optical Metamaterials
- Wafer scale photonic devices



Dr. Anbarasu Manivannan PhD, IISc Bangalore Associate Professor, Electrical Engineering 044-2257 4412; <u>anbarasu@iitm.ac.in</u> <u>https://anbuchalcogen.wixsite.com/anbarasu</u>



Research Specialization

- Phase Change Memory (PCM) for high speed Non-volatile RAM & universal memory
- Novel two-terminal Selector Devices & 3D cross-point memory architectures
- > Phase change materials for neuromorphic computing and Photonic applications



Research Thrusts

- Design of novel materials for high-speed NVRAM
- Development of prototype PCM with SRAM-speed
- Novel phase change photonic memory device
- Multi-bit data storage technology
- Phase change photonic memory & Optoelectronic devices
- Phase change synaptic devices and neuromorphic computing

K.D. Shukla, N.Saxena, D. Suresh and M. Anbarasu, Scientific Rep. 6, 37868 (2016)



Dr. Andrew Thangaraj PhD, Georgia Tech, Atlanta, USA Professor, Electrical Engineering 044-2257-4424; <u>andrew@ee.iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/~andrew</u>



- Theory and implementation of modern error control codes
- Coding for multi-terminal communication problems
- Wireless and wireline network coding





Dr. Anil Prabhakar Professor, Electrical Engineering 044-2257-4425; <u>anilpr@iitm.ac.in</u> http://www.ee.iitm.ac.in/~anilpr/



Major Areas of Research

- Photonic & Quantum Technologies & Applications (quantum.iitm.ac.in)
- Quantum Networks, Quantum Computing, Quantum Machine Learning
- Assistive technologies and Rehabilitation Engineering (create.iitm.ac.in)





Dr. S Aniruddhan PhD, University of Washington, Seattle, USA Associate Professor, Electrical Engineering 044-2257-4468; <u>ani@ee.iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/~ani/</u>



- CMOS RFIC design
- Phase-locked loops and frequency synthesizers
- IC design for Biomedical Applications




Dr. Anjan Chakravorty PHD, IIT Kharagpur, India Professor, Electrical Engineering 044-2257-4460; <u>anjan@iitm.ac.in</u> http://www.ee.iitm.ac.in/~anjan/index.html



- SiGe Heterojunction Bipolar Transistors/ Modeling of Non-Quasi-Static Effects
- Laterally Diffused MOSFETs/ Modeling of Self-Heating & Snapback Effects
- Nano FETs/ Modeling of Charges and Non-Reciprocal Capacitances





Dr. Aravind R PhD., University of California, USA Professor, Electrical Engineering 044-2257-4417 ; <u>aravind@ee.iitm.ac.in</u> http://www.ee.iitm.ac.in/user/aravind/





Dr. Arun Karuppaswamy B PhD, Indian Institute of Science, Bangalore Assistant Professor, Electrical Engineering 044-2257-4449; <u>akp@ee.iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/akp</u>



Major Areas of Research

- > AC micro-grids
- Grid-connected inverters
- Switched Mode Power Supplies
- Power Electronics

Hardware Development

- Inverter Design
- ✤ DSP Board Design
- Converter Design
- Filter Design

Control, Comm. and UI

- Digital Control (DSP)
- CAN Communication
- Python Based UI

Some Project Areas

- ✤ Inv. Ct Mode Control
- ✤ Volt Mode Control
- Anti-Islanding
- ✤ EMI Filter Design
- ✤ Ultra-Cap Storage



Dr. Arun D Mahindrakar PHD, IIT Bombay, India Associate Professor, Electrical Engineering 044-2257-4445; <u>arun_dm@iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/~arun_dm</u>



- Experimental work /Mobile robots
- Formation control of multiple robots/Aerial vehicles





Dr. Arun Pachai Kannu Associate Professor, Electrical Engineering 044-2257-4463; <u>arunpachai@ee.iitm.ac.in</u>

http://www.ee.iitm.ac.in/~arunpachai

Major Areas of Research

- Signal Processing in Millimeter Wave Beam-forming Systems
- Massive Random Access and Media Based Modulation Techniques
- Theory and Applications of Sparse Signal Recovery



Detection and Estimation Problems in Wireless Communications



Dr. Avhishek Chatterjee PhD, University of Texas at Austin, USA Assistant Professor, Electrical Engineering 044-2257-4452; <u>avhishek@iitm.ac.in</u> <u>https://www.iitm.ac.in/info/fac/avhishek</u>



- Stochastic networks: communication and social networks; crowdsourcing; fault tolerant computing; quantum information systems
- Network inference: inferring network phenomena; learning on networks; neural networks





Dr. Balaji Srinivasan PhD, University of New Mexico, USA Professor, Electrical Engineering 044-2257-4426; <u>balajis@ee.iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/facs_balajis</u>

- High Power & Ultrashort Pulse Fiber Lasers
- Fiber Bragg Gratings
- Distributed Fiber Sensors





Dr. Bharath Bhikkaji PhD, Uppsala University, Sweden Associate Professor, Electrical Engineering 044-2257-4455; <u>Bharath.Bhikkaji@iitm.ac.in</u> <u>http://ee.iitm.ac.in/~Bharath</u>



- Modeling and Control of Flexible Structures
- Vibration control of Smart Structures
- Portfolio Analysis and Selection





Dr. Bhaskar Ramamurthi

PhD., University of California, USA Director, IIT Madras Professor, Electrical Engineering 044-2257-4403; <u>bhaskar@ee.iitm.ac.in</u> http://www.ee.iitm.ac.in/user/bhaskar/





Dr. Bhaswar Chakrabarti

PhD, UTDallas, USA Assistant Professor, Electrical Engineering 044-2257-4413; bchakrabarti@iitm.ac.in



- Ultimate scalability of resistive memories with 2-dimensional heterostructures
- Design and development of 2-d RRAMs; performance evaluation; device model
- Develop neuromorphic circuit applications



10 W power consumption Fault tolerant. Messively parallel

309(2019)



conductance of certain



materials can be used to emulate synaptic Q. Xia and J. J. Yang, Nat. Mat., vol. 18, connectivity in neural networks

2d RRAM Graphene

Low variability, switching power

Graphen

Targets (3 year)

Conventional RRAM



Higher variation, switching power

Process development for all-2d resistive memory fabrication

- 2d-resistive memory prototype fabrication
- Electrical and physical characterization of developed device
- Development of device models



Dr. Bijoy Krishna Das PhD, University of Paderborn, Germany Professor, Electrical Engineering 044-2257-4459; <u>bkdas@iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/~bkdas</u>

- Silicon Photonics & Optical Interconnect for Communications
- Integrated Optoelectronics for Sensor Devices
- Nonlinear Integrated Optics



Low-loss Trimmed Waveguide Structure in SOI (0.06 dB/mm)



Waveguide PIN Phase-Shifter in SOI (Modeling & Fabrication)



Fiber Pigtailed & Packaged DWDM Channel Interleaver (100 GHz)



Dr. Boby George PHD- IITM, Post-doc.-TU Graz, Austria Associate Professor, Electrical Engineering 044-2257-4465; boby@ee.iitm.ac.in http://www.ee.iitm.ac.in/facs_boby

- Sensors and Instrumentation for
 - Automotive and Transportation Applications
 - Biomedical Applications/Healthcare Technologies
 - Industrial Applications







Dr. Debdutta Ray PHD, TIFR, Mumbai, India Assistant Professor, Electrical Engineering 044-2257-4479; <u>dray@ee.iitm.ac.in</u>

Major Areas of Research

- Organic Solar Cells (OSOL)
- Novel organic devices
- Study of material for roll-to-roll processing
- Large area devices
- Organic field effect transistors (OFET)
- Organic doping
- Engineering thin film morphology



Organic solar cells







Engineering morphology

SD





Dr. Deepa Venkitesh PhD, IIT Bombay, India Associate Professor, Electrical Engineering 044-2257-4466; <u>deepav@iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/facs_deepa</u>



- Development of fiber lasers for specific applications in different wavelength ranges
- Distributed temperature and strain sensors using nonlinear optics





Deleep R Nair

Associate Professor, Electrical Engineering 044-2257-4471; <u>deleep@iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/user/deleep/</u>



- Semiconductor devices: Device Design, Fabrication, Characterization and Numerical modeling
- ➢ RF MEMS
- Circuit Device interactions



Devendra Jalihal

Professor, Electrical Engineering Coordinator, RuTAG-IITM & Indian Language SMS taskforce 044-2257-4471; <u>deleep@iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/user/deleep/</u>

Research Areas

- Wireless Communication
- DSP for Communications
- MIMO Receiver Techniques

Research projects

- Indo-UK Cross Layer Energy Efficiency
- > DISANET Emergency Communications
- > Tata Power Battalion Communication System
- Project Guidance: M.Tech (30+), DD (10) B.Tech (30+)

Awards & Publications

- Journals (15), Conferences (60)
- Sponsored Research projects as PI (total value ~ 680 Lakhs)

Research Scholars (over last 5 years)		
	Ph.D.	MS
Completed	1	5
In Progress	2	1
Project Staff	8	





Enakshi Bhattacharya

PhD, TIFR Mumbai, India Professor, Electrical Engineering 044-2257-4419; <u>enakshi@ee.iitm.ac.in</u> http//www.ee.iitm.ac.in/~enakshi/



- MEMS and NEMS
- Biosensors and BioMEMS
- Semiconductor materials and devices





Dr. Gaurav Raina PhD, University of Cambridge Associate Professor, Electrical Engineering Tel: 044-2257-4453; gaurav@ee.iitm.ac.in http://www.ee.iitm.ac.in/facs_gaurav



Research Areas

- Control and Nonlinear Systems
- Performance Modelling of Communication & Transport Networks
- > Mobile Payments, Security, Commerce



Dr. K Giridhar PhD (Univ. of California, Santa Barbara, 1993) Professor, Electrical Engineering +91 44 2257 4420; giri@ee.iitm.ac.in http://www.iitm.ac.in/ee/~giri

- Adaptive Signal Processing for Broadband Wireless Communications
- Interference Aware Estimation, Detection, Scheduling, and Rate Adaptation
- Wireless Standards, Future Het-Nets, Strategic Comm., and Performance Analysis





Dr. Harishankar Ramachandran PhD, UC Berkeley, USA Professor, Electrical Engineering +91 44 2257 4421; <u>hsr@iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/~hsr</u>



- Physical Layer Optical Links
- Quantum descriptions of Optical Links
- Edge Plasma Physics
- Computational Electro Magnetics

I work on problems where stochastic effects are present, and where quantum corrections need to be computed. Many of my students work on computational problems in Electromagnetics, both in optics and in plasma physics.



Dr. Jagadeesh Kumar V

Professor, Electrical Engineering 044-2257-6406; <u>vjk@iitm.ac.in</u> http://www.ee.iitm.ac.in/facs_vjkumar



- Electrical, Electronic and Biomedical Instrumentation
- Sensors and signal conditioning
- Measurements on properties of ferromagnetic materials



Variable Reluctance Type Pressure Transducer



Calibration free pulse oximeter



Brake wear sensor for heavy vehicles

Applying analog and digital electronics for Sensing and Measurements



Dr. Janakiraman Viraraghavan PhD, IISc Bangalore, India Assistant Professor, Electrical Engineering 044-2257-4485; janakiraman@iitm.ac.in http://www.ee.iitm.ac.in/janakiraman



- Low Power Circuit Design Techniques for Machine Learning Hardware
- In Memory Computing
- Statistical Analysis in VLSI





Dr. Jayaraj Joseph

PhD, IIT Madras, India Assistant Professor, Electrical Engineering 044-2257-5439; jayaraj@iitm.ac.in

https://scholar.google.com/citations?user=jkACmbEAAAAJ&hl=en

- Medical Devices and Healthcare Technology
 - Image free ultrasound for vascular health diagnosis & early screening
 - Point of care diagnostics
 - Unobtrusive physiological monitoring
- Sensors and Instrumentation





Vascular Ageing

ARTSENS[®] : Image-free ultrasound tech. for early vascular diagnosis

Cuff-less Central Blood Pressure Modelling, Sensors and Devices Clinically reliable cuff less BP

Point of care diagnostics Quantitative fluorescent imaging Rapid immunoassay kits





Dr. B Kalyan Kumar PhD, IIT Kanpur, India Associate Professor, Electrical Engineering, 044-2257-4446; <u>bkalyan@iitm.ac.in</u> http://www.iitm.ac.in/component/faculty/72/bkalyan/



- Power System Stability
- Flexible AC Transmission Systems (FACTS)
- Power Quality
- Power System Optimization



Dr. Kamalesh Hatua

PhD, Indian Institute of Science, Bangalore Professor, Electrical Engineering 044-2257-4475; <u>kamalesh@ee.iitm.ac.in</u> http://www.ee.iitm.ac.in/user/kamalesh/



Dr. Kaushik Mitra PhD, University of Maryland, College Park, USA Assistant Professor, Electrical Engineering 044-2257-4411; <u>kmitra@iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/kmitra/</u>

- Research Area/Focus 1: Computational Imaging (CI)
- Research Area/Focus 2: Image Processing and Computer Vision
- Research Area/Focus 3: Machine/Deep learning for CI



Image reconstruction and inference for Lensless Cameras



Solving inverse problems in CI and processing





Dr. S Krishna PhD, Indian Institute of Science, India Assistant Professor, Electrical Engineering 044-2257-4448; <u>krishnas@iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/~krishnas</u>



Power System Stability Analysis and Control

Problems I have worked on:

- Under frequency load shedding scheme
- Detection of voltage collapse and corrective action
- Strategy for transient stability improvement using braking resistor and excitation system
- > On-line dynamic security assessment: computational aspects



Dr. Krishna Jagannathan PhD., Massachusetts Institute of Technology Associate Professor, Electrical Engineering 044-2257-4469; <u>krishnaj@ee.iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/~krishnaj/</u>



- Wireless Networks: Resource Allocation, Cross Layer Control
- Distributed Control and Optimization of Complex Networks
- Stochastic Modelling and Performance Analysis





Dr. Krishna Vasudevan

PhD, IIT Madras, India Professor, Electrical Engineering 044-2257-4428; <u>krishna.vasudevan@iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/facs_krishna</u>



- > PMSM/BLDC Motor drives
- Power Electronics for Renewables
- Grid Integration of Renewables

Motor control, Electric vehicles, Electromagnetic Actuators

Power Converters for solar, battery applications Power Converters and control for grid integration



Dr. Lakshminarasamma

PhD, IIsc Bangalore, India Associate professor, Electrical Engineering 044-2257-4462; <u>lakshmin@iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/facs_lakshmin</u>

- DC DC Power Converters, Modeling, Analysis and Design
- High Frequency Converters and Inverters for Renewable Energy Applications



33 W 500 kHz DC DC Converter Designed and Implemented for space craft Applications.



2 kW Interleaved Boost DC DC Converter High Power Applications, Operated in Interleaved and Paralleling



A 500 W 100 kHz 48 - 400 V Soft switching DC DC Bridge converter

Finds Applications for Aircraft, solar/Fuel cell fed power supplies



Dr. Mahesh Kumar PhD, IIT Kanpur, India Professor, Electrical Engineering 044-2257-4429; <u>maheshk@iitm.ac.in</u> http://www.ee.iitm.ac.in/facs_mahesh



- Power Quality Monitoring, Analysis and Interpretation
- Application of Power Electronics in Power Systems: Custom Power Devices
- Renewable Energy Grid Interactive and Grid OFF Systems



Based on monitored data of industrial plants, their detailed performance evaluations are carried out. Also, based on the study of analyzed data, interpretation can be made to avoid serious consequences of power quality problems.



Custom Power Devices are used to eliminate power quality related problems such as unbalance, reactive power, harmonics etc., in power distribution systems. Control, Design and development of these devices are the core issues which are being addressed.



Custom power devices are basically power electronic based controllers and find numerous applications in renewable energy systems. Efficient grid interactive inverters, their design and control for optimal power sharing with the local grid and loads are important aspects which are explored and investigated.



Dr. R Manivasakan PhD, IIT Bombay

Assistant Professor, Electrical Engineering 044-2257-4330; rmani@ee.iitm.ac.in http://www.ee.iitm.ac.in/~rmani/



Major Areas of Research

- Optical Networks: PHY and Layer 2
- Queueing Theory and its Applications to Communication networks \succ
- TDM over PSI



Performance Analysis of Communication Networks (Optical and Wireless)



Dr. C Mathiazhagan Asst. professor, Electrical Engineering 044-2257-4431; <u>mathi@ee.iitm.ac.in</u>



Major Areas of Research

Analog and digital circuits, Instrumentation





Dr. Mohanasankar Sivaprakasam

PhD - University of California Santa Cruz, USA

Associate Professor, Electrical Engg +91-9884511692; <u>mohan@ee.iitm.ac.in</u>

- Healthcare technologies
- Biomedical devices and instrumentation
- Medical signal/image processing





Dr. Nagendra Krishnapura PhD, Columbia University, USA Associate Professor, Electrical Engineering 044-2257-4444; <u>nagendra@iitm.ac.in</u> <u>http://www.iitm.ac.in/~nagendra</u>



- Analog integrated circuit design
- RF integrated circuit design
- Circuits and systems education



Increase speed and precision, and reduce power and area of ICs Back to Top



Dr. Nandita DasGupta PhD, IIT Madras, India Professor, Electrical Engineering 044-2257-4422; <u>nand@ee.iitm.ac.in</u>

http://www.ee.iitm.ac.in/~nand/



- Research Area/Focus 1: Thin oxides and High-k Dielectrics
- Research Area/Focus 2 : III-V Semiconductor Devices
- Research Area/Focus 3 : Micromachining for MEMs & photonic devices



Pigtailed InGaAs/InP p-i-n Photodetector with micromachining for fibre coupling



Improvement in the reliability of thin oxides with ac anodization



GaAs MESFET-based Transimpedance preamplifier


Dr. Nitin Chandrachoodan PhD, Univ. of Maryland, College Park, USA Associate Professor, Electrical Engg. 044-2257-4432; <u>nitin@iitm.ac.in</u> http://www.ee.iitm.ac.in/~nitin/







Dr. Pradeep Kiran Sarvepalli PhD, Texas A&M University, USA Assistant Professor, Electrical Engineering 044-2257-4473; sarvepalli@iitm.ac.in http://www.ee.iitm.ac.in/~pradeep



- Classical and quantum error correction
- Quantum algorithms
- Quantum cryptography



Quantum information processing



Dr. Puduru Viswanadha Reddy

Associate Professor, Electrical Engg. 044-2257-4486; <u>vishwa@iitm.ac.in</u>

Major Areas of Research

- Control systems
- Game theory
- Optimal control
- Operations research



Multi-agent control systems







Dr. Oadeer Ahmad Khan PhD, Oregon State University, USA Assistant Professor, Electrical Engineering 044-2257-4484; <u>gkhan@ee.iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/gkhan</u>



- Analog and Mixed Signal Circuits: Voltage/Current reference, low power circuits, PVT detection and compensation, voltage and current sensors
- Power Management Integrated Circuits: Voltage regulators, DC-DC Converters, LED drivers, battery chargers, energy harvesting





Dr. Rachel Kalaimani

Assistant Professor, Electrical Engineering 044-2257-4487; <u>rachel@ee.iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/rachel</u>



- Optimization and control of complex dynamical systems
- Networked control systems
- Learning based control



Stabilizing NCS subject to SNR constraints on channel along with scheduling











Dr. Radha Krishna Ganti PHD, University of NotreDame Associate Professor, Electrical Engineering 044-2257-4467; rganti@ee.iitm.ac.in http://www.ee.iitm.ac.in/~rganti/



- Wireless Networks
- Stochastic Geometry
- Information Theory





Dr. A N Rajagopalan PhD, IIT Bombay, India Professor, Electrical Engineering 044-2257-4433; <u>raju@ee.iitm.ac.in</u> <u>http://www.iitm.ac.in/~raju</u>



Shape from Motion Blur



Digital Heritage Reconstruction



Non-Uniform Deblurring n HDR



Super-resolution Matting



Face Recognition in Occlusion and Blur



Underwater Imaging





Dr. Ramalingam C S

PhD., University of Rhode Island, USA Associate Professor, Electrical Engineering 044-2257-4475; <u>csr@ee.iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/~csr/</u>







Dr. Ramkrishna Pasumarthy PHD, University of Twente, The Netherlands Associate Professor, Electrical Engineering 044-2257-4470; ramkrishna@iitm.ac.in http://www.ee.iitm.ac.in/~ramkrishna

- Mathematical Modeling
- Control of physical systems
- Simulations of Large scale infrastrctures





Dr. Ravinder David Koilpillai

PhD., California Institute of Technology, USA Professor, Electrical Engineering 044-2257-4405; <u>davidk@iitm.ac.in</u>







Dr. R Sarathi PhD, IISc, Bangalore, India Professor, Electrical Engineering 044-2257-4436; <u>rsarathi@iitm.ac.in</u> <u>http://www.iitm.ac.in/info/fac/rsarathi</u>



- Condition monitoring of power apparatus adopting Multi sensor fusion Technique
- Pulsed power technique for nano particle production and sterilisation of liquid foods
- > Development of high performance nanocomposites for electrical insulation



Theoretical and experimental studies to identify the location of discharges in power apparatus especially in transformers by measuring UHF signals generated by discharges and by triangulation process



Facility for generation of nano particles by wire explosion process and for use of nano aluminium for Rocket propellant.

Pulsed power technique for sterilisation of liquid foods.



Optimisation of nano fillers in nano composites for obtaining good electrical, thermal and mechanical properties for various electrical insulation applications.



Dr. Saurabh Saxena

PhD., University of Illinois Assistant Professor, Electrical Engineering 044-2257-4457; <u>saurabh.saxena@ee.iitm.ac.in</u>





Dr. Shanthi Pavan PhD, Columbia University New York, USA Professor, Electrical Engineering 044-22574437; <u>shanthi@ee.iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/~shanthi/faculty.html</u>

- Analog Mixed Signal Design : A/D and D/A conversion, filters
- Microwave IC Design : Broadband equalization and beamforming
- Sensor Interfaces : Bio and inertial sensor read electronics





Dr. Shanti Bhattacharya

Professor, Electrical Engineering 044-2257-4438; <u>shantib@iitm.ac.in</u> <u>https://sites.google.com/site/appliedopticsgroup/</u>

Major Areas of Research

- Design and fabrication of diffractive optical elements
- Design and fabrication of Optical MEMS
- Fibre and free space-based Optical Metrology systems (eg OCT, spectroscopy)





Dr. Sheetal Kalyani PHD, IIT Madras, INDIA

Associate Professor, Electrical Engineering 044-2257-4474; <u>skalyani@iitm.ac.in</u>

- Robust statistics based estimation/detection approaches and outlier detection.
- Applications of extreme value theory to problems in wireless networks/systems.
- Statistical learning theory and its applications.





Dr. Shivananju B N PhD, Indian Institute of Science, India Assistant Professor, Electrical Engineering 044-2257-5408; shivananju@iitm.ac.in http://www.ee.iitm.ac.in/user/shivananju/



- Two-dimensional Materials Based Photonics and Optoelectronics Applications
- Biochemical Photon Fingerprints for Healthcare Applications
- Polaritons and Excitons Technologies for Industrial Applications





Dr. Shreepad Karmalkar PHD, IIT Madras, India Professor, Electrical Engineering 044-2257-4409<u>; karml@ee.iitm.ac.in</u> http://www.ee.iitm.ac.in/~karmal/



- Semiconductor Device Modeling and Fabrication
- Nanotechnology
- Education



Nanowire devices Electroless processing





Superjunction), GaN HEMT





Dr. Soumya Dutta PHD, JNCASR, Bangalore, India Assistant Professor, Electrical Engineering 044-2257-4472; <u>s.dutta@ee.iitm.ac.in</u> http://www.ee.iitm.ac.in/user/s.dutta/

Major Areas of Research

- Organic Solar Cell (OSC) /Perovskite Solar Cells
- Organic Thin Film Transistors (OTFTs) and Circuits
- Reduced Graphene Oxide (rGO) based NEMS and Microelectronic Devices
- Ferroelectric Polymer based Surface Acoustic Wave (SAW) Devices
- Organic LED and AMOLED Display













Dr. K Sridharan Ph.D, RPI, New York Professor, Electrical Engineering 044-2257-4423; <u>sridhara@iitm.ac.in</u> http://www.ee.iitm.ac.in/~sridhara



Major Areas of Research

- VLSI Architectures for autonomous systems and DSP; FPGA-based design and implementation
- Sensor-based planning and control for mobile robots, cooperative robot navigation and rendezvous
- Video stabilization and stitching Algorithms and VLSI architectures
- > Design of digital circuits in emerging device technologies, reliability studies



FPGA-based Robotics



Cooperative Robotics



Digital Nano-circuits



Dr. Srikrishna Bhashyam PhD, Rice University, USA Professor, Electrical Engineering 044-2257-4439; <u>skrishna@iitm.ac.in</u> http://www.ee.iitm.ac.in/~skrishna/



- Multi-hop multi-flow wireless communication: Capacity, protocols and codes
- Network resource allocation: Centralized and distributed optimization
- Statistical signal processing methods





Dr. Srirama Srinivas

PHD, NIT Warangal, India Associate Professor, Electrical Engineering 044-2257-4447; srsrini12@iitm.ac.in

- Multilevel Inverters, PWM control & diagnostics
- Integration of distributed energy systems with utility grid
- Control algorithms for DC-DC and DC-AC Converters





Dr. K S Swarup PhD, IISc Bangalore, India Professor, Electrical Engineering, IITM 044-2257-4440; <u>ksswarup@iitm.ac.in</u> http://www.ee.iitm.ac.in/facs_swarup



- Power Systems, Operation, Optimization, Planning, Deregulation and Control
- Energy Management Systems / SCADA, Smart Grid, Automation and Protection
- Soft Computing, Intelligent Systems, Evolutionary Computational Intelligence





- Numerical ElectroMagnetics and Optics Lab (NEMO)
- Inverse problems in electromagnetics
- Microwave remote sensing of the Earth and Moon

Breast cancer detection using	Soil moisture detection on Earth	Physics based WiFi propagation and source placement
machine learning	Ice detection on Moon& analysisofChandrayaan data	studies

 $\Leftarrow \mathsf{EXAMPLES} \text{ OF RESEARCH APPLICATIONS} \Rightarrow$



Dr. Umesh S PhD., University of Rhode Island, USA Professor, Electrical Engineering 044-2257-4461; <u>umeshs@ee.iitm.ac.in</u> http://www.ee.iitm.ac.in/~umeshs/





Dr. Venkatesh T G PhD., Indian Institute of Science, Bangalore Associate Professor, Electrical Engineering 044-2257-5448; <u>tgvenky@ee.iitm.ac.in</u> <u>http://www.ee.iitm.ac.in/tgvenky/</u>





Dr. Venkatesh Ramaiyan PhD, Indian Institute of Science, Bengaluru Assistant Professor, Electrical Engineering 044-2257-4464; <u>rvenkat@iitm.ac.in</u> <u>http://www.iitm.ac.in/~rvenkat</u>



- Distributed Medium Access in Ad hoc Wireless Networks
- Cross-layer Resource Allocation and QoS Provisioning in Cellular Networks
- High Rate Communication Networks for Control Applications





Dr. Vinita Vasudevan PhD, IIT Bombay, India Professor, Electrical Engineering 044-22574442; <u>vinita@iitm.ac.in</u> http://www.ee.iitm.ac.in/~vinita

- Circuit Noise, Timing, Power, leakage analysis
- Reduced order modelling
- System simulation and optimization

Some problems I have worked on:

- > Fast and accurate statistical timing analysis of digital circuits
- > Analysis of clock jitter in sigma-delta converters
- > Optimum scheduling of data parallel tasks in partially reconfigurable systems



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF ENGINEERING DESIGN



LIST OF FACULTY

Asokan Thondiyath

Balkrishna C Rao

Ganapathy Krishnamurthi

Jayaganthan R

Kavitha Arunachalam

<u>Krishna Kumar R</u>

Nilesh J Vasa

Niravkumar Patel

Palaniappan Ramu

Ramanathan M

Sandipan Bandyopadhyay

<u>Saravana Kumar G</u>

Shankar Ram C S

Srikanth Vedantam

Srikanthan Sridharan

Tuhin Subhra Santra

Venkatesh Balasubramanian



Dr. Asokan Thondiyath

Professor, Engineering Design 044-2257-4707; <u>asok@iitm.ac.in</u> <u>http://ed.iitm.ac.in/~balkrish/</u>



- Robotics
- Mechatronics
- Automation
- Medical Devices

Design

- Autonomous underwater robots
- > Surgical robots
- Variable buoyancy systems
- Medical / rehabilitation devices
- Aerial robots
- Multimodal robots
- New Product
 Development

Dynamics

Nose

Metallic

Bellow

- Mathematical modelling and Simulation
- Analysis of 6dof motion dynamics
- Dynamic path planning and obstacle avoidance
- Localisation and Mapping

Control

anding Gears

Top Frame

- Guidance, Navigation and Control for Autonomous operation
- Control algorithms for improved performance
- Hybrid Control architectures for robot control



Dr. Balkrishna C Rao

Associate Professor, Engineering Design 044-2257-4660; <u>balkrish@iitm.ac.in</u> <u>http://ed.iitm.ac.in/~balkrish/</u>



Major Areas of Research

- Severe Plastic Deformation (SPD) for creating nanocrystalline metals and alloys
- Sustainable manufacturing and additive manufacturing of metals
- Innovations for a sustainable future









Dr. Ganapathy Krishnamurthi PHD, Purdue University, USA Associate Professor, Engineering Design 044-2257-4745; gankrish@iitm.ac.in https://ed.iitm.ac.in/~gankrish/

- Developing multi-modal pre-clinical imaging systems
- Developing software for medical image analysis
- 1. In close collaboration with Radiologists, we develop methods for automated analysis of medical images towards obtaining useful diagnostic and prognostic information.
- 2. We validate these methods on publicly available databases as well as using data from our radiologist collaborators.
- 3. We also develop low-cost pre-clinical imaging systems for enabling in-vivo imaging of rodent disease models.
- 4. Our focus is on developing low cost in-vivo fluorescence imaging systems as well as x-ray micro-CT systems







Dr. R Jayaganthan PhD, Indian Institute of Technology Madras, India Professor, Engineering Design 044-2257-4735; <u>edjay@iitm.ac.in</u> <u>https://ed.iitm.ac.in/team.html</u>

- Additive Manufacturing of Automotive, Aerospace, and Biomedical Structural Materials
- Fatigue, Fracture & Impact Mechanics
- Finite Element Modeling & Simulation of Deformable Solids
- Machine Learning for Life Time Prediction of Structural Materials





Dr. Kavitha Arunachalam Indian Institute of Technology Madras, India Associate Professor, Engineering Design http://ed.iitm.ac.in/~akavitha/index.html

- Antennas, Filters, Microwave Circuits
- > EM Medical Devices Thermal therapy, Diagnostic
- EM Nondestructive Evaluation (NDE) Microwave, Eddy Current Inspection



EM Medical Devices









Tire Mechanics

Dr. R Krishna Kumar PhD, IIT Madras Professor, Engineering Design 044-2257-4661; <u>rkkumar@iitm.ac.in</u> <u>http://www.iitm.ac.in/ED</u>



- Non-linear Finite Element / Tire mechanics and Biomechanics
- Biomedical Signal Processing/Cardiovascular
- Biomedical Image Processing/Diabetic Retinopathy, Cardiac imaging, image guided surgery



Optic Disc Detection

Five lead wireless ECG



Nilesh J Vasa

Dr. Eng., Kyushu University, Japan Professor, Engineering Design +91-44-2257-4706; <u>njvasa@iitm.ac.in</u> <u>http://ed.iitm.ac.in/~vasa/</u>



- Laser assisted micro-manufacturing, annealing, texturing of thin films
- Optical coherent tomography technique for biomedical applications




studies

Dr. Niravkumar Patel PhD, Worcester Polytechnic Institute, USA Assistant Professor, Engineering Design 044-2257-4737; <u>niravpatel@iitm.ac.in</u> <u>nirav.robotics@gmail.com</u>

- Image guided, robot assisted minimally invasive interventions
- Autonomy in robot assisted minimally invasive surgeries







Dr. Palaniappan Ramu PhD, University of Florida, Gainesville, USA Associate Professor, Engineering Design 044-2257-4738; palramu@iitm.ac.in http://www.ed.iitm.ac.in/~palramu/

- Treatment of uncertainties in engineering design
- Design space exploration and surrogate enabled optimization
- Engineering analytics and decision sciences







Dr. M Ramanathan

PhD, Indian Institute of Science, India Associate Professor, Engineering Design 044-2257-4734; <u>mraman@iitm.ac.in</u> <u>http://ed.iitm.ac.in/~raman</u>



- Geometric and solid modeling /Analysis of Mesh Models and Point-sets
- Image processing (including biomedical)/Primitvie extraction from images
- Computational geometry in curved world/Shortest path, Voronoi diagram



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Dr. Sandipan Bandyopadhyay PhD, Indian Institute of Science, Bangalore Associate Professor, Engineering Design 044-2257-4733; <u>sandipan@iitm.ac.in</u> <u>http://www.ed.iitm.ac.in/~sandipan</u>

- Computational kinematics
- Mechanics, control, and design of parallel robots
- Design of mechanisms and products





Dr. G Saravana Kumar

PhD, IIT Kanpur, India Associate Professor, Engineering Design 044-2257-4736; <u>gsaravana@iitm.ac.in</u> <u>http://ed.iitm.ac.in/~gsaravana</u>



Development of representational and computational tools for virtual and physical prototyping applied to arrive at solutions to design problems.

CAD/CAE/CAM



 Image: state of the state



Engineering Optimization

Nature Inspired Computing

Optimal Design Back to Top



Dr. C S Shankar Ram PhD, Texas A&M University, USA Professor, Engineering Design +91-44-22574705; <u>shankarram@iitm.ac.in</u> <u>http://ed.iitm.ac.in/~shankarram</u>



Major Areas of Research

- Mathematical Modelling of Dynamic Systems, Control, Fault Diagnosis, Automotive Systems, Vehicle Dynamics, Transportation Systems
- Brakes Model based analysis, control and diagnosis of electro-pneumatic brakes for heavy commercial vehicles, antilock braking system, vehicle stability control, regenerative braking
- Suspension Active suspension for heavy commercial vehicles, rollover detection and prevention









Dr. Srikanth Vedantam SCD, Massachusetts Inst. of Technology, USA Professor, Engineering Design 044-2257-4739; <u>srikanth@iitm.ac.in</u> <u>http://ed.iitm.ac.in/~srikanth</u>

- Mechanics of Smart Materials and Functionally Graded materials
- Hydrodynamics of flow in microchannels
- Discrete computational mechanics





Dr. Srikanthan Sridharan PhD, Univ. of Illinois at Urbana-Champaign, USA Assistant Professor, Engineering Design +91-44-22574748, srikanthan@iitm.ac.in https://home.iitm.ac.in/srikanthan/



- Modeling and control of e-drive systems for electrified vehicles (EV)
- Component-level design /sizing of e-drive system
- EV battery modeling and characterization



Vehicle speed profile in an example drive cycle

E-drive loss comparison among different control methods



Design of passive components of e-drive system





Capacitors

Inductors

Source: Presentation at SAE World Congress Experience 2017



Dr. Tuhin Subhra Santra Ph.D, National Tsing Hua University, Taiwan Assistant Professor, Engineering Design 044-2257-4747; <u>tuhin@iitm.ac.in</u> <u>https://ed.iitm.ac.in/~tuhin/</u>



- Bio-Micro/Nano Electro Mechanical Systems (Bio-MEMS/NEMS)
- Biomedical Micro/Nano Devices
- Biofabrication
- Cell Chip/Lab on a Chip
- Nanomedicine
- Bionanomaterials

"We are developing micro/nano fabricated chips for massively parallel high throughput single cell therapy and diagnostics using different physical mechanisms such as electrotherapy, laser therapy, mechanotherapy etc."











Dr. Venkatesh Balasubramanian PhD, Louisiana Tech University, USA Professor, Engineering Design 044-2257-4117; <u>chanakya@iitm.ac.in</u> <u>http://www.ed.iitm.ac.in/~vb/</u>

- Medical Devices and Implants
- Human Factors and Ergonomics
- Innovation and Manufacturing Strategy





 Driver Fatigue
Occupant Safety
Occupational Biomechanics duct & Process Design



 RBG Risk Scaling
RBG Innovation Ladder
Sustainable Manufacturing
Manufacturing Strategies



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCE

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LIST OF FACULTY

Aditya Kolachana Anindita Sahoo Anup Kumar Bhandari Avishek Parui Aysha Iqbal Viswamohan **Binitha V Thampi Dhanavel S P** Divya A Hemachandra Karah (Profile yet to be uploaded) Joe Thomas Karackattu John Bosco Lourdusamy Jyothirmaya Tripathy Kalpana K Krishna Malakar Mathangi Krishnamurthy Merin Simi Raj Millind Brahme Muraleedharan V R Prema Rajagopalan

Rajesh Kumar Roland Wittje Sabuj Kumar Mandal Santhosh R Santhosh Abraham Santhosh Kumar Sahu Satya Sundar Sethy Solomon Benjamin Sonika Gupta Sreekumar Nellickappilly Srilata K Subash S Sudarsan Padmanabhan Sudhir Chella Rajan Suresh Babu M Swarnalatha Rangarajan. Tabraz S S **Umakant Dash** Vipin P Veetil



Dr. Aditya Kolachana PhD, IIT Bombay Assistant Professor, Humanities & Social Sciences 044-2257-4544; <u>aditya@iitm.ac.in</u> <u>https://hss.iitm.ac.in/team-members/aditya-k/</u>



Major Areas of Research - History of Science and Technology in India

Focus:

- > Development of mathematics and astronomy in India Manuscriptology
- Scientific literature in Sanskrit

Outcomes:

- Authentic accounts of the development of science in India
- Publication of important scientific texts written in Sanskrit, with translation and notes using modern scientific notation Development of alternative pedagogical techniques

Below: A manuscript of the mathematical commentary Nisrstārthadūtī depicting algebraic notation in Sanskrit

सं.परसंध। संकलिनोनं (सं.परसं क्रमपपन्तनेव मेवसंकलितस्वरूप पनविधिनासंकतिनेकास्वरूपं पिद्य भव हु पर् ।तथा शातंपदानां चनेक्वं बंगेकिवेन त्रिगु शान



Anindita Sahoo

Associate Professor, Humanities and Social Sciences 044-2257-4534, <u>anindita@iitm.ac.in/sahoo.anindita@gmail.com</u> <u>https://hss.iitm.ac.in/team-members/anindita-sahoo/</u>







Dr. Anup Kumar Bhandari

PhD (in Quantitative Economics), Indian Statistical Institute Associate Professor, Humanities and Social Sciences 044-2257-4531, <u>anup@iitm.ac.in</u> <u>http://www.hss.iitm.ac.in/anup/index.html</u>

Major Areas of Research

- Production Economics, with special emphasis on Productivity and Efficiency Analysis
- Applied Industrial Economics
- Issues related to Indian Banking and Indian Financial Markets



Dr. Avishek Parui PhD, Durham University, UK Assistant Professor, Humanities & Social Sciences 044-2257-4535; <u>avishekparui@iitm.ac.in</u> <u>https://hss.iitm.ac.in/team-members/avishek-parui/</u>



- Memory Studies
- Masculinity Studies
- Medical Humanities





Dr. Aysha Iqbal Viswamohan

Professor, Humanities & Social Sciences 044-2257-4521; <u>draysha@iitm.ac.in</u> <u>http://www.hss.iitm.ac.in/aysha/index.html</u>



Major Areas of Research

- Film Studies
- Drama and Contemporary Fiction
- Popular Culture





Dr. Binitha V Thampi

PhD, Institute for Social and Economic Change, Bangalore, India Associate Professor, Humanities and Social Sciences 044-2257-4528;binithathampi@iitm.ac.in

- Gender and Development
- Decentralised Planning and Governance
- ICTs for Development

Gender critique of public policies and engendering of development Analysis of governance reform initiatives and decentralized planning

Digital divide and the inclusion

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Dr. Dhanavel S P

Professor, Humanities and Social Sciences 044-2257 4522; <u>dhanavelsp@iitm.ac.in</u> <u>http://www.hss.iitm.ac.in/dhanavel</u>

Major Areas of Research

- Indian English Drama
- > American Poetry
- English Language Teaching, Communication and Soft Skills

Recent Books

- English Language Teaching in India: The Shifting Paradigms (New Delhi: Tata McGraw-Hill, 2012)
- English and Soft Skills (Hyderabad: Orient BlackSwan, 2010)
- English and Communication Skills for Students of Science and Engineering (Chennai: Orient BlackSwan, 2009)











Dr. Divya A Assistant Professor DoHSS, IITM 044-2257 4542 ; <u>divya@iitm.ac.in</u>

Lecture 3D: Realism, Gender in Tagore's Kabuliwala

Tagore on Realism

- "I am surprised when you say that my short stories are lyric in appeal...I'd like to emphasise that there was never any want of realism in them. I've written what I have seen, deeply felt and directly experienced."
- "If you think it over you'll see that the real picture of Bengali families had its artistic and authentic representations in my short stories" (See *Prabasi*, May 1941)



Dr. Hemachandran Karah

PhD, University of Cambridge, UK Assistant Professor, Humanities and Social Sciences 044-2257-4529; <u>hkarah@iitm.ac.in</u>





Dr. Joe Thomas Karackattu

Assistant Professor, Humanities and Social Sciences 044-2257 4511 ; joe@iitm.ac.in http://www.hss.iitm.ac.in/joethomas/index.html

Major Areas of Research

- Economic interdependence and conflict
- India-China relations
- Cross-Strait relations

Economic interdependence

Cross-Strait relations India-China relations China's foreign and economic policy

How conflict stands to be deterred, informed, or transformed by the value of economic linkages at the inter-state level Back to Top



D.Phil [University of Oxford, UK] Assistant Professor, Humanities and Social Sciences 044-2257 4511; 94440 18510; jbl@iitm.ac.in; jbl.hss@gmail.com Fax: 044-2257 4502 https://hss.iitm.ac.in/team-members/john-bosco-lourdusamy/



Areas of expertise: History of Science, Technology and Medicine in colonial India.

Current specific areas of focus:

- Global circulation of crops
- Flows of botanical knowledges
- Rise of plantations



Dr. Jyotirmaya Tripathy PhD, IIT Kharagpur, India Professor, Humanities and Social Sciences 044-2257 6581; jyotirmaya@iitm.ac.in https://hss.iitm.ac.in/team-members/jyotirmaya-tripathy/



- Cultural Studies
- Culture and Development
- Contemporary India

Questions around culture and identity; cultural criticism; postcolonial cultures How culture mediates development thought and practice; development as a process; development narratives Indian cultural expressions; Indian thought on nation and nationalism; Indian development Cultures

BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH



Dr. K Kalpana PHD, Madras Institute of Development Studies nai Assistant Professor, Humanities and Social Sciences 044-2257-4520; <u>kkalpana@iitm.ac.in</u> <u>http://www.iitm.ac.in/component/faculty/75/kkalpana/</u>



Shifting Paradigms of State-Civil Society Relationships

Understanding how the socio-political dynamics of gender, class and caste mediate and shape Indian women's experience of development in post-Independence India

Critical analysis of the shifting relationships between the Indian state and civil society actors in the delivery of public and social services



Dr. Krishna Malakar PhD, IIT Bombay, India

Assistant Professor (Climate Policy), Humanities and Social Sciences

- 044-2257-4510; krishnamalakar@iitm.ac.in
- Vulnerability, risk and adaptation of communities to environmental/climate change
- > Resilience, response and recovery of communities from extreme weather events
- Social barriers to adoption of technology by communities
- Livelihood and environmental sustainability



https://scholar.google.com/citations?user=Yc-tKKgAAAAJ&hl=en&oi=ao



Dr. Mathangi Krishnamurthy Assistant Professor, Humanities and Social Sciences 044-2257-4530; <u>mathangi@iitm.ac.in</u> <u>http://www.hss.iitm.ac.in/mathangi/index.html</u>

Major Areas of Research

- The anthropology of globalization
- Labor, body, and gender
- The politics of the Indian middle-class

The relationship between globalization, the new middle-classes, forms of labor, and production of body, kin, and identity

1-800 Worlds:

ongoing An book project, this investigates the formation of call both centers as and precursors symptoms of the new Indian middle-classes

politics The of medical outsourcing: This project investigates new forms of labor as practised in the gestational surrogacy industry and will solicit funding from the Wellcome Trust, UK.



Dr. Merin Simi Raj

Assistant Professor, Humanities and Social Sciences merinsimiraj@gmail.com

Major Areas of Research

- Indian English fiction historicizing texts and textualizing history; nation-writing; secularism and Indianness debate; visibility from marginalized locations - gender, caste and region
- Literary Historiography Studies the writing of literary histories in India; questioning the foundations and frameworks; Nationalism and the politics of inclusion/exclusion
- Caste studies and Dalit writing caste and secular nationalist imaginings; discourse of denial and castelessness; construction of new knowledge subjects





Dr. Milind Brahme PhD (JNU, India) Associate Professor, Humanities and Social Sciences 044-2257-4508; <u>brahme@iitm.ac.in</u> <u>http://www.hss.iitm.ac.in/milind/index.html</u>



- Research Area Modern German and Comparative Literature
- Research Area Education School and Higher Education in India
- Teaching Area Literary Theory, Literary Criticism, German Language and Literature

Areas of Application of Research

German Language and Literature:

My research in this area does not have any direct application. Indirectly it informs my teaching as well as research guidance in English and German Literary Studies.

Education:

- Research Guidance
- Research based Consultancy in the form of Monitoring the Sarva Shiksha Abhiyan in Tamil Nadu for the MHRD since 2008
- Evaluation of Pedagogical Interventions and Innovations in School Education for the Tamil Nadu Government as well as private non-profit institutions



Dr. VR Muraleedharan PhD (IIT Madras) Professor, Humanities and Social Sciences 044-22574506, <u>vrm@iitm.ac.in</u>

http://www.hss.iitm.ac.in/muraleedharan/index.html



- Healthcare Economics (Focus on Financing mechanisms and HR policies); Dr. UmakantDash is my research partner. Collaborative research project with 10 Institutions from 7 countries, supported by DFID, UK; <u>http://resyst.lshtm.ac.uk</u>
- History of Healthcare in South India (Focus on Institutional history, role of technology in health care and Patient Autonomy); Dr John Lourdusamy and Dr N Sreekumar are coresearchers.
- Healthcare Technology Assessment (Focus on methodologies for economic evaluation of healthcare technologies.) In collaboration with NHSRC, Delhi.

As a part of an International Consortium of 10 Research Institutions, our focus of research is on the design and implementation of innovative financing mechanisms and human resources policies that will help build resilience and responsiveness of health system to promote health and health equity. This study is funded by DFID UK up to 2016.

This project is funded by the Wellcome Trust UK for three years up to 2015, coordinated by Dr John Lourdusamy and Dr Sreekumar. I focus on how introduction of various technologies changed the public perception of medical profession in early 20th century. Dr John and Dr Sreekumar are looking at the history of medical institutions in Madras city, and concept of patient autonomy as practiced by indigenous medical practitioners, respectively.

During the next five years, I intend to work on methodologies for undertaking economic evaluation of medical technologies in poor resource settings, such as in India, where access to quality care remains the most critical issue.





Dr. Prema Rajagopalan

PhD, Indian Institute of Technology, Kanpur Associate Professor, Humanities and Social Sciences

044-2257-4513; prema@iitm.ac.in



RESEARCH INTERESTS:

- Sociology of Science
- Sociology of Work
- Built Environment and Society





Rajesh Kumar

PhD, University of Illinois at Urbana-Champaign, USA Professor, Department of Humanities and Social Sciences Phone: 044-2257-4537; Email: rajesh@iitm.ac.in https://hss.iitm.ac.in/team-members/rajesh-kumar/

- Language in Education/Teaching of English
- Language and Mind (Cognition)
- Structure of South Asian Languages (Linguistic Theory)
- Sociolinguistics



Organization of language at the levels of sounds, words, and sentences with reference to human mind.



Linguistic competence and performance, relationship between language and society, and relationship between language and human mind.





Applications of the fundamental ideas of language learning/acquisition and teaching in general and teaching of English language in particular.

Understanding nature and structure of natural language and its applications





Roland Wittje

PhD, University of Illinois at Urbana-Champaign, USA Associate Professor, Humanities and Social Sciences 044-2257-4540; <u>roland@iitm.ac.in</u> http://www.hss.iitm.ac.in/index.php/faculty/institute-faculty?id=60

Research Interests:

- History of the physical sciences and engineering of the late 19th and 20th century
- Global history of science and technology
- History of scientific collections, research technology and scientific practice
- History of science education and technical training
- History of acoustics



Dr. Sabuj Kumar Mandal

Assistant Professor, Humanities and Social Sciences 044-2257-4532; <u>sabuj@iitm.ac.in</u> <u>http://www.hss.iitm.ac.in/sabuj/index.html</u>

Major Areas of Research

- Energy and Environmental Economics
- Efficiency and Productivity Analysis(frontier approach)
- Industrial Economics & Applied Econometrics
- Behavioral Economics



Industrial Energy Efficiency









Dr. R Santhosh PhD, ISEC Bangalore, India Associate Professor, Humanities and Social Sciences 044-2257-4517; <u>rsantho@iitm.ac.in</u> www.hss.iitm.ac.in/santhosh/index.html

- Research Area: Sociology of Religion, Islam
- Research Area: Development Studies and globalization
- Research Area: Social Movements and state

Changing articulation of religion in the contemporary world. Role of Islamic activism and charity in the fields of social welfare and public health in Kerala.

New Social movements and identity question





Dr. Santhosh Abraham

Assistant Professor, Humanities and Social Sciences 044-2257-4536; abraham@iitm.ac.in http://www.hss.iitm.ac.in/abraham/index.html

Major Areas of Research

- Colonial Courts, Legal Pluralism, Customary Laws, Conflicts
- Mental Asylums and Legal Norms in Colonial South India
- Territorial Logics of Malabar and South Canara: History and Land in the Social Construction of Law






Dr. Santosh Kumar Sahu

PhD, IIT Bombay, India Assistant Professor, Humanities and Social Sciences 044-2257-4512 | <u>santosh@iitm.ac.in</u> <u>https://hss.iitm.ac.in/team-members/santosh-kumar-sahu/</u>



- Industrial Ecology and Policy
- Applied Industrial Economics



https://sites.google.com/view/sksahuiitm/home

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Dr. Satya Sundar Sethy PhD, Central University of Hyderabad, India Associate Professor, Humanities & Social Sciences 044-2257-4509; <u>satyasundar@iitm.ac.in</u> <u>http://www.hss.iitm.ac.in/satya/index.html</u>



- Research Area: Philosophy of Language, Analytical Philosophy
- Research Area: Contemporary Western Philosophy
- Research Area: Information and Communication Technologies (ICTs) in Education



Semantic and Mental Representations



Meaning, Truth, Belief System, and Knowledge



Assessment and Evaluation, Quality Assurance, Pedagogy and Andragogy of Learning, Instructional Design

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Dr. Solomon Benjamin

Ph.D. Massachusetts Institute of Technology Associate Professor, Humanities and Social Sciences 044-2257-4538; <u>solly.benj@iitm.ac.in</u>



Major Research Areas

- Trans-National Urbans: Indian and Chinese Urbanism as a 'South' Theory: Coproducing Indian and Chinese Urbanisms: With researchers at the Hong Kong Baptist University, Chinese University of HK, CRIT Mumbai, this networks works on the idea of 'Co-produced Urbanism to re-think the urban not as bounded but inter-connected ideas and practices. Preliminary funding from the Indian Council of Social Science Research.
- Logics of Non-Metro Urbanization: SUBURBIN (Subaltern Urbanisation in India) funded by the 'ANR' French National Research Agency <u>http://suburbin.hypotheses.org/701</u> With more than 30 collaborators in India and France, coordinated with the CHS Delhi, CPR Delhi, IFP Pondicherry, the project analyses the logics of small town large village urban agglomerations.
- Spatialzing Peri-Urban Claims: Land, Politics, and Economy: Research network focusing on metro-peripheries as part of *Global Suburbanisms: Governance, Land, and Infrastructure in 21st Century*: With fifteen 'co-applicants' more than 40 collaborators in a long term international research collaborative funded under the Major Collaborative Research Initiatives (MCRI), Social Science and Humanities Research Council (SSHRC), Canada) http://www.yorku.ca/city/?page_id=222





Repair' or 'Reconstitution' in Indian China Bazaars: An issue of conceptual and empirical significance





Chieftain' House in South Canara and it's Chinese Vase: Mediations via 'customary' claims underpin non-metro urbanisation, with trans-national trade links to T



Dr. Sonika Gupta Mphil & PhD: JNU, India

Associate Professor, Humanities and Social Sciences 044-2257-4523: <u>sonika@iitm.ac.in</u>

- International Relations & Chinese Politics
- Tibet Studies & Himalayan Borderlands
- Chinese Foreign Policy





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Dr. Sreekumar Nellickapilly PhD, Hyderabad Central University Professor, Humanities and Social Sciences 044-22574514, <u>srkumar@iitm.ac.in</u> http://www.hss.iitm.ac.in/sreekumar/index.html



- Bioethics and the History of Healthcare in South India (Focus on Patient Autonomy, Institutional history and the role of technology in health care); Dr John Lourdusamy and Prof. V.r.Muraleedharan are co-researchers.
- Traditional/Indegenous Medicine (Focus on Scientific and Ethicsal aspects) supported by INSA, New Delhi.
- Philosophical, phenomenological, scientific and hermeneutical dimensions of human reality and human wellbeing.
- Research Area/Focus 2
- Research Area/Focus 3

Philosophical, Phenomenological and Scientific Conceptions of Human Wellbeing

This project is funded by the Wellcome Trust UK for three years upto 2015, coordinated by Dr John Lourdusamy and Prof. V.R.Muraleedharan. I focus on the problem of Patient Autonomy and Wellbeing with This project is funded by the Indian National Science Academy, New Delhi and it tries to understand the history, ethical outlook and cultural aspects related to the traditional Ayurveda practitioners of Kerala who are known as Parambarya Vaidyas. The phenomenological and philosophical conceptions of human being. This is a broad area of my research where I take insights from both the western and Indian philosophical traditions.





Dr. K Srilata PhD, Hyderabad Central University Professor, Humanities and Social Sciences 044-22574515; <u>sree@iitm.ac.in</u> <u>http://www.hss.iitm.ac.in/srilata/</u>



- Theories of Creativity and Creative Writing Research
- Indian Literatures in Translation
- Children's Literature; Women's Writing





Major Areas of Research

- Foreign Direct Investment
- Economics of Innovation and Technological Change
- International Trade





Dr. Sudarsan Padmanabhan PhD (Pondicherry Univ & Univ of South Florida) Associate Professor, Humanities and Social Sciences 044-22574526, <u>sudarsanp@iitm.ac.in</u> http://www.hss.iitm.ac.in/sudarsan/index.html



- Social and Political Philosophy (Focus on Social, Political and Cultural Theories and Institutions): Dr. JyotirmayaTripathy is my research partner. India EU Study Centre Project (IESCP) - 2010-2011 - <u>www.iescp.net</u> -Result of India - EU Joint Action Plan - Strong emphasis on EU studies, teaching, research and student exchange
- Erasmus Mundus Consortium (IBIES) with Aarhus University, Denmark Collaborative teaching, student exchange and research partnerships with 19 national and international universities funded by the European Union. (www.erasmus.iescp.net) - 2013-2016
- Erasmus Mundus Asia Lot MAE Erasmus Mundus Consortium with Aarhus University (<u>http://www.mae-erasmus.iescp.net/</u>) Proposal stage

My area of current research is the construction of Indian social imaginary. I am interested in the pre-colonial, colonial and post-colonial social, political and economic institutions that influenced the formation of Indian nation and state. An attempt to create an Indian social imaginary is simultaneously an endeavour to create a moral order. The Constitution of India best exemplifies an attempt to institutionalize India's post-colonial, non-hierarchical, and democratic moral order.

The India EU Study Centre Programme funded by the EU was envisioned by the EU-India Joint Declaration to increase mutual cooperation in Higher Education. The research group at IIT Madras was called the Centre for Comparative EU Studies (CCEUS). The broad areas covered by the Centre were philosophy, political sciences, literature, culture studies, and international relations. More specifically, social and political theory, postcolonial, poststructural and postmodern cultural debates, contemporary debates in international relations. especially, problematizing nation-state and cosmopolitanism.

The EU Study Centre has conducted several international workshops, seminars and conferences with its European and Indian partners. The outcome of this partnership is two edited volumes published by Routledge, India. *The Democratic Predicament: Cultural Diversity in Europe and India* (2013) is edited by Dr. Jyotirmaya Tripathy and Dr. Sudarsan Padmanabhan and the second volume titled politics in the *Global Age: Critical Reflections on Sovereignty, Citizenship, Territory and Nationalism* edited by Dr. Sonika Gupta and Dr. Sudarsan Padmanabhan by Routledge Publishers is forthcoming.



Dr. Sudhir Chella Rajan Denv, University of California, Los Angeles Professor, Dept. of Humanities and Social Sciences 044-2257-4525; scrajan@iitm.ac.in https://hss.iitm.ac.in/team-members/sudhir-chella-rajan



- Political theory and the environment: automobility; climate change; resource curse; transport and urban policy
- Periurban initiative: armatures and enclaves; bypasses and youth; community gardening; repair cultures
- Corruption studies: big histories; grand corruption; social theories of elite networks and emergence





Dr. M Suresh Babu PhD (JNU, New Delhi) Professor, Humanities and Social Sciences 044-2257-4527; <u>sureshbabum@iitm.ac.in</u> http://www.hss.iitm.ac.in/sureshbabu/index.html



Major Areas of Research

- Industrial Economics
- Trade and Development
- Education and Human Capital



My research has been on Competition, Entry Barriers and Productivity Growth in Indian Manufacturing Industries



I am currently interested in the issues related to unorganized manufacturing sector in India, especially innovations and growth



I have been associated with the monitoring of Sarva Sikha Abhayan in Tamil Nadu and the implementation of ICT in schools

Industrial Performance/Applied Macroeconomics/Innovations and Human Capital

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Dr. Swarnalatha Rangarajan PHD, University of Madras, India Professor, Humanities and Social Sciences 044-2257-4519, <u>swarna@iitm.ac.in</u> <u>http://www.hss.iitm.ac.in/swarnalatha/index.html</u>



- Ecocriticism
- American Literature
- Early Modern English Literature



Representation of environmental debates in cultural spacesecofeminism, econarratives from the Global South, bioregionalism, ecophilosophy

place studies



The diverse genres of 18th, 19th and 20th American Literaturewith a special focus on the writings of Thomas Wolfe



Shakespearean drama – the greening of Shakespeare studies



Dr. S S Tabraz

Assistant Professor, Humanities and Social Sciences 044-2257-4533; <u>tabraz@iitm.ac.in</u>

Major Research Areas

- Politics of West and South Asia
- Theories of International Relations
- US mediation in conflicts in West Asia especially Israeli-Palestinian Conflict







Dr. Umakant Dash PhD (IIT Kanpur) Professor, Humanities and Social Sciences 044-22574516, <u>dash@iitm.ac.in</u> <u>http://www.hss.iitm.ac.in/umakant/index.html</u>



- Healthcare Economics (Equity, Efficiency and Governance)
- Efficiency Analaysis (Data Envelopment Analysis)
- Financial Economics (Fixed Income Securities, Derivatives Market)





Dr. Vipin P Veetil

PhD, George Mason University, USA Assistant Professor, Humanities and Social Sciences 044-2257-4543; <u>vipin@iitm.ac.in</u>



- Monetary Economics
- Macroeconomics







INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF MANAGEMENT STUDIES

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LIST OF FACULTY

<u>Amit R K</u>

Arshinder Kaur

Arun Kumar G (Profile yet to be uploaded)

Kamalanabhan T J

Krishna Prasanna

Lata Dyaram

Madhumathi Rajendran

Nandan Sudarsanam

Nargis Pervin

Prakash Sai L

Rahul R. Marathe

Rajendran C

Richa Agrawal

Rupashree Baral

Saji K Mathew (Profile yet to be uploaded)

Srinivasan G

Sundarraj R P

Thenmozhi M

<u>Thillai Rajan A</u>

<u>Usha Mohan</u>

Vaibhav Chawla

Varisha Rehman

Vijayalakshmi V



Dr. R K Amit PhD, IISc Bangalore, India

Associate Professor, Management Studies 044-2257-4575; <u>rkamit@iitm.ac.in</u> <u>http://www.doms.iitm.ac.in/amit.htm</u>



- Game Theory
- Decision Theory
- Operations Research





Dr. Arshinder Kaur PhD, IIT Delhi, INDIA

Associate Professor, Management Studies 044-2257-4553; <u>arshinder@iitm.ac.in</u> <u>http://www.iitm.ac.in/arshinder</u>

- Supply Chain (SC) Management/ SC Coordination, SC contracts, Closed-loop SC
- Inventory Management/ Newsboy model and Operations Research Applications
- Strategic Sourcing/Evaluation and selection of suppliers





Dr. Arun Kumar G

PhD, IISc. Bangalore, India Assistant Professor, Mechanical Engineering 044-2257-4563; <u>garun@iitm.ac.in</u> <u>https://doms.iitm.ac.in/index.php/arun-kumar-g</u>





Dr. TJ Kamalanabhan PhD, University of Madras, India Professor, Management Studies 044-2257-4556; tjk@iitm.ac.in



Specialization: Human Resource Management and Organizational Behavior

Courses: Talent Management, Performance Management, Training & Development and Compensation Management

Current research: Stress and Burnout, Employee Turnover, Performance Dimensions in Hospitals, Corporate Communication





Dr. Krishna Prasanna PhD, University of Madras, India Professor, Management Studies 044-2257-4571; <u>pkp@iitm.ac.in</u> <u>http://www.doms.iitm.ac.in/pkp.html</u>



- Fixed Income Markets
- Financial Risk Management
- Corporate Governance





Lata Dyaram Ph.D (Indian Institute of Technology Madras) Associate Professor, Management Studies 044-2257-4567; <u>lata.dyaram@iitm.ac.in</u>



Major Areas of Research

- Organizational Behavior, Leadership and Organization Development (L&OD), Human Resource Management
- Cognition, spontaneous mental states and goal directed behavior across contexts
- Behaviorism combining elements of philosophy, methodology, and psychological theory





Dr. Madhumathi Rajendran

PhD, Madras University, India Professor, Management Studies 044-2257-4565; <u>rmm@iitm.ac.in</u>



- Capital Markets
- Corporate Governance
- International Finance





Dr. Nandan Sudarsanam PhD, Massachusetts Institute of Technology, USA Assistant Professor, Management Studies 044-2257-4580; nandan@iitm.ac.in



Advancement of Algorithmic techniques for solving problems and achieving objectives

Research Approach Deployed

Core Methodologies Advanced

- Experimentation
- Data Mining/ Machine Learning
- Decision-making under uncertainty
- Applied Statistics

Simulation of Meta Models $y(x_{1}, x_{2}, ..., x_{n}) = \beta_{0} + \sum_{i=1} \beta_{i} x_{i} + \sum_{j \neq i} \beta_{ij} x_{i} x_{j} + \varepsilon$ $x_{i} \sim NID(0, \sigma_{x}^{2}) \quad i \in 1...m$ $x_{i} \in \{+1, -1\} \quad i \in m+1...n$ $\varepsilon \sim NID(0, \sigma_{c}^{2})$ $Pr(\delta_{i} = 1) = p$ $Pr(\delta_{ij} = 1 | \delta_{i}, \delta_{j}) = \begin{cases} p_{00} & \text{if } \delta_{i} + \delta_{j} = 0 \\ p_{01} & \text{if } \delta_{i} + \delta_{j} = 1 \\ p_{11} & \text{if } \delta_{i} + \delta_{i} = 2 \end{cases}$ $f(\beta_{i} | \delta_{i}) = \begin{cases} N(0, 1) & \text{if } \delta_{i} = 0 \\ N(0, c^{2}) & \text{if } \delta_{i} = 1 \end{cases}$ $f(\beta_{ij} | \delta_{ij}) = \frac{1}{s_{1}} \begin{cases} N(0, 1) & \text{if } \delta_{ij} = 0 \\ N(0, c^{2}) & \text{if } \delta_{ij} = 1 \end{cases}$ Domains of Application

- Engineering Systems
- Demographic and Census Data
- Financial Data
- Manufacturing and Product Design



Dr. Nargis Pervin

PhD, National University of Singapore, Singapore Assistant Professor, Management Studies 044-2257-4574; <u>nargisp@iitm.ac.in</u> http://www.doms.iitm.ac.in/domsnew/index.php/nargis-pervin

- Social Network Mining
- Recommender System
- Mobile App Analytics
- Big Data Analytics





Dr. L Prakash Sai PhD, IIT Madras, INDIA Professor, Management Studies +91-44-2257-4568; <u>lps@iitm.ac.in</u>

- Strategy and Policy Studies
- Technology Foresight and Innovation
- Competitiveness and Business Excellence





Dr. Rahul R Marathe PHD, Iowa State University, USA Associate Professor, Management Studies 044-2257-4579; <u>rrmarathe@iitm.ac.in</u> <u>http://www.doms.iitm.ac.in/rahul.htm</u>

- Mathematical and statistical modeling
- Stochastic processes
- Optimization





- Production and Operations Management
- Logistics and Distribution Management
- Inventory & Supply Chain Management, and Analytics
- Optimization Algorithms, Heuristics, Evolutionary & Swarm Intelligence Algorithms





Dr. Richa Agrawal Ph D, IIT Bombay, India Associate Professor of Marketing, Dept. of Management Studies 044-2257-4564; <u>richa@iitm.ac.in</u> <u>http://www.doms.iitm.ac.in/richaagrawal</u>



- Scale Development
- Contemporary Marketing Areas: Green marketing, Luxury marketing, etc.





Dr. Rupashree Baral PhD, IIT Bombay, India

Associate Professor, Management Studies 044-2257-4561; <u>rupashree@iitm.ac.in</u> <u>http://www.iitm.ac.in/component/faculty/76/rupashree/</u>

- Research Area 1: Work-Family Dynamics
- Research Area 2: Diversity/Generational Differences at the Workplace
- Research Area 3: Technology and Human Interface: Problems and Prospects





Saji K Mathew PhD, IIT and Management Gwalior Professor, Management Studies 044-2257-4573; <u>saji@iitm.ac.in</u> <u>http://doms.iitm.ac.in/index.php/skm</u>



- Web Personalization, Information Privacy
- Business Analytics, Business Value
- Digital Platforms, Business Strategy





G Srinivasan PHD, IIT Madras Professor, Management Science 044-2257-4560; <u>gsrini@iitm.ac.in</u> http://www.doms.iitm.ac.in

- Cellular Manufacturing
- Supply Chain Modeling
- Sequencing and Scheduling.





Dr. R P Sundarraj PhD, University of Tennessee at Knoxville Professor, Management Studies 044-2257-4558; <u>rpsundarraj@iitm.ac.in</u> <u>http://www.doms.iitm.ac.in/domsnew/index.php/sundarraj-rp</u>



Major Areas of Research

- Electronic negotiation and applications
- Analytics
- Innovation management
- Supply chain management

Prior experience

- > Qatar University, Doha
- University of Waterloo, Canada
- Clark University, USA





Dr. Thenmozhi M

PhD, University of Madras, India

Professor, Management Studies

044-2257-4562; <u>mtm@iitm.ac.in</u>

http://www.doms.iitm.ac.in/thenmozhi.htm, http://ssrn.com/author=567794

Specialization: Corporate Finance and Strategy, Corporate Valuation, Financial Markets, Computational Finance, Forecasting and Time Series Modeling, Stock and Commodity Derivatives.

Courses: Financial accounting, Cost Management, Financial Management, Financial Institutions and Markets, Computational Finance, Fixed Income Securities :Trading and Strategy, Investment Management, Empirical Research in Finance, Options and Futures.

Current research: Cash holdings and Governance, CBHI scheme Performance, Intraday Price discovery and Volatility Spillover, India VIX and Risk Management, Liquidity in Currency Options, Crude Oil Pricing.





Dr. Thillai Rajan A

Fellow (PhD), Indian Institute of Management Bangalore, India Professor, Management Studies +91-044-2257-4569; <u>thillair@iitm.ac.in</u> http://www.iitm.ac.in/thillai.htm



Private Equity and Venture Capital

- Annual India venture capital and private equity report series
- Value addition by venture investors
- Non-financial risk management by private equity investors



Infrastructure Finance

- Private equity in infrastructure
- Project finance in high risk environments
- Impact of PPP on costs and overruns
- Impact on PPP on project outcomes viz., access, cost, price, quality, and efficiency



Corporate Finance

- Real options
- Corporate social responsibility
- Sources of SME funding and impact of performance



Dr. Usha Mohan PHD, Indian Statistical Institute, INDIA Associate Professor, Management Science 044-2257-4576; <u>ushamohan@iitm.ac.in</u> http://www.doms.iitm.ac.in/usha.html



- Quantitative Models in Supply Chain Management
- Socially Relevant Applications of Operations Research
- Combinatorial Optimization

Order Management in MTO environments and Design of Sales force Incentives Design of Food Supply Chains to improve Food security and Scheduling patients in Health Care Delivery Systems

Pick up and Delivery Vehicle Routing Problems


Dr. Vaibhav Chawla FPM (PhD), IIM Kozhikode,India Assistant Professor, Management Studies 044-2257-4585; <u>vaibhavchawla@iitm.ac.in</u>



- > Exploring mechanisms to address customer complaints over social media
- Understanding customer psychology during product return in e-commerce context





Dr. Varisha Rehman

PhD, IIIT - Allahabad, India

Assistant Professor, Dept. of Management Studies 044-2257-4572; varisha@iitm.ac.in

http://www.doms.iitm.ac.in/domsnew/index.php/varisha-rehman

- Advertising (traditional and new media advertising)
- Consumer Behavior
- Entertainment Marketing







Dr. V Vijayalakshmi PhD, Indian Institute of Technology Madras, India Assistant Professor, Management Studies 044-2257-4566; <u>viji@iitm.ac.in</u> <u>https://doms.iitm.ac.in/index.php/vijayalakshmi-v</u>



- Positive Organizational Behavior: Generating Positivity in the Workplace, Happiness and Work, Workplace Emotions, Finding Meaning in Work, Strength-Based Approach to Work, Discovering Calling, Integral Leadership Development, Unlearning
- Cross-Cultural Management: Cultural Competence and Global Dexterity
- Teaching, Learning and Education: Holistic Education, Contemporary Teaching and Learning Beliefs and Practices, Creativity in Teaching-Learning





INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF MATHEMATICS

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LIST OF FACULTY

Anoop T V (Profile yet to be uploaded)	<u>Santanu Sarkar</u>
Aprameyan P	<u>Sanyasiraju YVSS</u>
Arijit Dey	Sarang S Sane
Arindama Singh	<u>Satyajit Roy</u>
Balaji R (Profile yet to be uploaded)	<u>Shaiju A J</u>
Chand A K B (Profile yet to be uploaded)	<u>Shruti Dubey</u>
Chidella Srinivasa Rao	Sivakumar K C (yet to be uploaded)
Dipromit Majumdar	Sivaram Ambikarasan
	Soumen Sarkar
Jayanthan A V	Sounaka Mishra
Kalpana Mahalingam	Srinivasa Rao Manam
Kunal Krishna Mukhopadhyay	Sriram B
Narayanan N	Suhas Jaykumar Pandit (yet to be uploaded)
Neelesh S Upadhye	Sumesh K
Ponnusamy S	Sundar S (Profile yet to be uploaded)
Priyanka Shukla	Thamban Nair M
Radha R	Uma V (Profile yet to be uploaded)
Rama R	<u>Venkata Balaji T E</u>
Ramesh Kasilingam	Vetrivel V



Dr. Anoop T V

PhD, The Institute of Mathematical Sciences, India Assistant Professor, Mathematics 044-2257 4634; anoop@iitm.ac.in https://home.iitm.ac.in/anoop/





My interests lie, broadly, in analysis on spaces admitting large groups of symmetries (Lie group actions). Currently, this includes

- Analysis (harmonic analysis, microlocal analysis, spectral analysis) on Riemannian symmetric spaces and their compactifications
- Representations of real Lie groups, including a study of its relation to complex geometry
- Geometric quantization in relation to representations of Lie groups, especially real degenerations of Kähler polarizations

The unifying feature, both thematically and in the methods which are used, is the presence of, typically, a non-compact Lie group acting as symmetries. The interaction between the algebraic, analytic and geometric aspects of such groups is what enables us to obtain refined results, often with explicit formulae



Arijit Dey B.Sc: Presidency University, Kolkata, <u>M.Sc/Ph.D: IMSc,</u> <u>Post. Doctoral stay: CMI, TIFR (Mumbai), MPI (Bonn)</u> Associate Professor, Mathematics 044-2257-4635; <u>arijit@iitm.ac.in</u>



My broad subject of research is algebraic geometry in particular I am interested in following topics:

- Vector Bundles and Decorated sheaves over algebraic varieties, Principal Bundles over algebraic varieties.
- Toric Geometry (Bundle theoretic questions)





Dr. Arindama Singh PhD, IIT Kanpur, India Professor, Mathematics 044-2257-4613; <u>asingh@iitm.ac.in</u> <u>http://mat.iitm.ac.in/home/asingh/public_html/index.html</u>



- Numerical Analysis
- Knowledge Compilation
- Image Processing

APPLICATION 1

APPLICATION 2

APPLICATION 3

Numerical solution of singularly perturbed twopoint boundary-value problems and of elliptic PDEs, use of regularization methods A propositional knowledge base is converted to a set of its prime implicants or prime implicates so that conclusions can be drawn from the knowledge base comparatively easily PDEs are used to deblur and denoise images using regularization methods. Improvisation on the Perrona-Mallick type of PDE-based image processing is the main trick used here



Dr. Balaji R Associate Professor, Mathematics 044-2257 4631; <u>balaji5@iitm.ac.in</u>







Dr. Chand A K B PhD, Indian Institute of Technology, Kanpur Professor, Mathematics 044-2257 4629; <u>chand@iitm.ac.in</u>







Dr. Chidella Srinivasa Rao PhD, IISc Bangalore, India Professor, Mathematics 044-2257-4623; <u>chsrao@iitm.ac.in</u> http://mat.iitm.ac.in/home/chsrao/public_html

- Nonlinear Ordinary Differential Equations
- Nonlinear Partial Differential Equations
- Generalized Burgers Equations





Dr. Dipramit Manjumdar Assistant Professor, Mathematics 044-2257 4644; <u>dipramit@iitm.ac.in</u>

Major Areas of Research

- p-adic families of modular forms and automorphic forms
- Selmer group and Iwasawa theory for modular forms
- Supply chain management

Other Areas of Interest

- Application of elliptic curves in cryptology
- Analytic number theory, specifically application of Galois representation in analytic number theory





Dr. A V Jayanthan PhD, IIT Bombay, India Associate Professor, Mathematics 044-2257-4625; jayanav@iitm.ac.in http://mat.iitm.ac.in/home/jayan/public_html/index.html



- Hilbert coefficients and homological properties of Blowup algebras
- Betti numbers of affine and projective monomial curves
- Buchsbaum-Rim function, polynomial and their coefficients

Blow-up algebras arise from the process of blowing up of an algebraic variety. This is an important process in the resolution of sigularities. I study homological properties, such as Cohen-Macaulayness, Gorensteinness using a certain numerical function known as Hilbert function and its coefficients.

Buchsbaum-Rim function is a generalization of Hilbert function. Though the Hilbert function and its coefficients are very well studied, the Buchsbaum-Rim function and its coefficients are not very well studied. I study these coefficients and its relation with homological properties of a given module.

Betti number of a module indicates its computational complexity. It is an important invariant in many applied areas. I study certain classes of affine and projective curves and their Betti numbers.



Dr. Kalpana Mahalingam

Associate Professor, Mathematics 044-2257-4630; <u>kmahalingam@iitm.ac.in</u> <u>http://mat.iitm.ac.in/home/kalpana/public_html/</u>

Major Areas of Research

- Theory of Codes
- Theory of Biomolecular Computing
- Combinatorics of words





Study of structures and operations on biomolecules using formal language theory

Study of words using matrices





Kunal Krishna Mukhopadhyay

Associate Professor, Mathematics 044-2257-4640; <u>kunal@iitm.ac.in</u>

Major Areas of Research

- C* and von Neumann Algebras
- Ergodic Theory, Free Probability
- Quantum Groups, Quantum Information
- Recently interested in Radom Matrices





Dr. Narayanan N PhD, The Institute of Mathematical Sciences Asstistant Professor, Mathematics 044-2257-4605; <u>naru@iitm.ac.in</u> <u>https://math.iitm.ac.in/naru</u>

- Structural Graph Theory
- Combinatorial Algebra
- Combinatorics





Dr. Neelesh S Upadhye PhD, IIT Bombay Associate Professor, Mathematics 044-2257-4625; <u>neelesh@iitm.ac.in</u> <u>http://mat.iitm.ac.in/neelesh</u>



- Probabilistic Approximations, Estimation Methods
- Financial Time Series Modelling
- Data Science: R programming, Statistical Learning
- Subordinated Stochastic Processes, Modelling and Simulation



Dr. S Ponnusamy PhD, IIT Kanpur, India Professor, Mathematics 044-2257 4615; <u>samy@iitm.ac.in</u> https://sites.google.com/site/samy8560/



- Quasiconformal and Harmonic Mappings
- Special Functions and Function Spaces

Main themes which I deal with include:

Bohr Phenomenon on various function spaces, Integral transforms acting on function spaces, Quasiconformal and elliptic mappings, Univalent harmonic mappings in plane and in higher dimensions, Landau and Bloch type Theorems for p-harmonic mappings in several complex variables, Inequalities concerning special functions and John disks, Characterization of domains in terms of metric inequalities.



Dr. Priyanka Shukla PhD, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore Assistant Professor, Mathematics 044 2257 4609; priyanka@iitm.ac.in https://home.iitm.ac.in/priyanka/



- Granular flows \succ
- Hydrodynamic stability
- Mode interactions in fluid flows
- Kinetic theory



Chemically driven fingering instability: theory and simulations

Granular convection, shearbanding, etc. Landau equation, mode interactions and resonance



e = 0.0907

x 10



Higher order moment theories for rarified and granular gases

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Dr. R Radha PhD, Institute of Mathematical Sciences, Chennai Professor, Mathematics 044-2257-4620; <u>radharam@iitm.ac.in</u> <u>https://math.iitm.ac.in/naru</u>



Major Areas of Research

- Harmonic Analysis on Euclidean spaces, LCA groups, Compact groups and Heisenberg group
- Frame theory, Wavelet Analysis and Invertibility of Operations
- Theory of Multipliers, Segal algebras and Bergman-Fock spaces





Dr. Rama R Professor, Mathematics 044-2257-4616; <u>ramar@iitm.ac.in</u> http://mat.iitm.ac.in/home/ramar/public_html/index.html

Major Areas of Research

- Formal Languages and Automata Theory
- Molecular Computing
- Image Cryptography







Dr. Ramesh Kasilingam PhD, IIT Madras, India Professor, Mathematics 044-2257-4647; <u>rameshk@iitm.ac.in</u> <u>https://math.iitm.ac.in/rameshk</u>

- Differential topology and Algebraic topology
- Surgery classification of manifolds
- Topological Data Analysis





Dr. Santanu Sarkar PhD, Indian Statistical Institute Associate Professor, Mathematics <u>santanu@iitm.ac.in</u> <u>https://sites.google.com/site/santanusarkarwb/</u>



- Cryptology
- Computational Number Theory
- Coding Theory







Dr. Y V S S Sanyasiraju PHD, IIT Madras, India

Professor, Mathematics 044-2257-4621; sryedida@iitm.ac.in

http://www.iitm.ac.in/home/sryedida/public_html/index.html

- Development of RBF based grid free schemes
- Higher order compact schemes
- Finite difference and finite volume schemes for incompressible flows





Sarang S Sane Assistant Professor, Mathematics 044-2257-4604; <u>sarang@iitm.ac.in</u> https://home.iitm.ac.in/sarang/



Broad Research Interests

My current research interests are broadly centred around commutative algebra, K-theory, geometry and topology. But I like to study anything that I find beautiful.

Some more details

One of the themes I work on is doing obstruction theory in algebra with intuition from topology.

The main question I study in this regard is to analyze the structure of various obstruction theories (e.g. Euler class groups, Chow groups, Chow-Witt groups, etc.) with the aim of studying the splitting properties of projective modules/vector bundles.

Another theme which I am currently pursuing is the study of triangulated categories. More specifically, studying special derived subcategories of the derived category of modules/sheaves for a ring/scheme.

Invariants associated to these, such as Ktheory or Witt theory are also of considerable interest to me and are part of both mentioned themes.



Dr. Satyajit Roy PhD, IISc. Bangalore, India Professor, Mathematics 044-2257-4617; <u>sjroy@iitm.ac.in</u> <u>http://www.iitm.ac.in/sjroy.html</u>



- Boundary Layer Theory
- Convective Heat and Mass Transfer
- Computational Fluid Dynamics





Dr. A J Shaiju PHD, Indian Institute of Science, India Associate Professor, Mathematics 044-22574638; <u>ajshaiju@iitm.ac.in</u>



- Research Area/Focus 1 SYSTEMS AND CONTROL THEORY
- Research Area/Focus 2 GAME THEORY

Study of various classes of Non-linear control systems that admit solutions in closed form.

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Dr. Shruti Dubey PhD, Indian Institute of Technology Kanpur Associate Professor, Mathematics 044-2257-4639; <u>sdubey@iitm.ac.in</u> http://www.mat.iitm.ac.in/home/sdubey/public.html/index.html

Major Areas of Research

- Nonlinear Analysis of Fractional Functional Differential Equations
- Mathematical Study of Ferromagnetic Systems





Dr. Sivakumar K C

Professor, Mathematics 044-2257-4622; <u>kcskumar@iitm.ac.in</u>







Sivaram Ambikasaran

Professor, Mathematics

044-2257-4622; <u>sivaambi@alumni.stanford.edu</u> <u>http://sivaramambikasaran.com/</u>



Theoritical & Computational Aspects of

- Numerical linear Algebra
- Approximation Theory
- Fast Stable Algorithms
- PDE's & Integral Equations





Applications include

- Acoustic & Electromagnetic scattering
- Finite Element & integral equation solvers
- Data driven physical modelling
- High dimensional statistics



Dr. Soumen Sarkar PhD, Indian Statistical Institute Kolkata Assistant Professor, Mathematics 044-2257-4643; <u>soumen@iitm.ac.in</u> https://home.iitm.ac.in/soumen/



RESEARCH INTERESTS

- 1. Topology:
- 2. Geometry:
- 3. Analysis:
- 4. Computing Research:
- 5. Algebra:

Algebraic Topology, Differential Topology, Toric Topology Toric Geometry, Convex Geometry, Differential Geometry Analysis on Manifolds, Functional Analysis

Topological Complexity of Motion Planning Algorithms, Topological Data Analysis, Persistent Homology Homological Algebra, Equivariant Cobordism and K-theory



The geometric interpretation of a retraction sequence



Dr. Sounaka Mishra PhD, Indian Statistical Institute Kolkata Associate Professor, Mathematics 044-2257-4627; <u>sounak@iitm.ac.in</u>

- Combinatorial Optimization
- Design of Approximation Algorithms for Hard Optimization Problems
- Graph Theory

Complexity of Minimum Dominating Set and its variations Approximation algorithms for node/edge deletion problems





Dr. Srinivasa Rao Manam

Associate Professor, Mathematics 044-2257-4637; <u>manam@iitm.ac.in</u> http://www.iitm.ac.in/info/fac/manam



Major Areas of Research

- Integral Equation Methods in water wave Scattering
- Wave-Bottom and Wave-Structure Interactions



Dr. B Sriram PhD, University of Florida, USA Assistant Professor, Mathematics 044-2257-4641; <u>bsriram@iitm.ac.in</u> https://math.iitm.ac.in/bsriram

- Functional Analysis
- Operator Theory

Positive maps

Non-Commutative Sets / Functions

Interpolation

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Dr. Suhas Jaykumar Pandit

Assistant Professor, Mathematics 044-2257-4608; <u>suhas@iitm.ac.in</u>






Research Interests

- Operator algebras
- > Operator spaces
- Quantum information
- Quantum probability

My research interests are mainly in the theory of operator algebras, specially focusing on the theory of completely positive maps, completely bounded maps, quantum dynamical semi-groups, E_0-semigroups, product systems, dilations, representations of C*-algebras and Hilbert C*-modules. I also have research interests in the theory of quantum probability and the mathematical aspects of quantum information theory.



Dr. Sundar S PhD., IIT Madras, India Professor, Mathematics 044-2257-4618; <u>slnt@iitm.ac.in</u> <u>https://math.iitm.ac.in/public_html/slnt/index.htm</u>





Dr. M Thamban Nair PhD – IIT Bombay, India Professor, Mathematics 044-2257-4610; <u>mtnair@iitm.ac.in</u> <u>http://mat.iitm.ac.in/home/mtnair/public_html/index.html</u>



- Applicable Functional Analysis
- Operator Equations
- Inverse and III-Posed Problems

Problems in Applications take the form of operator equations. So, in the abstract frame work ,one has to investigate approximate solutions of operator equations.

Such investigations are useful in obtaining numerical approximations for the solution of differential and integral equations. Most of the inverse problems in applications are ill-posed. For stable approximate solutions for such problems, they have to be regularized using appropriate tools from Functional Analysis and Operator Theory.



Dr. Uma V

Associate Professor, Mathematics

044-2257-4626; <u>vuma@iitm.ac.in</u> <u>https://math.iitm.ac.in/public_html/uma/index.html</u>





Dr. Venkata Balaji T E

PhD, CMI, Siruseri, Chennai, India Assistant Professor, Mathematics 044-2257-4628; <u>tevbal@iitm.ac.in</u> http://www.iitm.ac.in/component/faculty/77/tevbal/



- Algebraic Geometry and Commutative Algebra
- Moduli and Classification of Vector Bundles, Quadratic Modules, Clifford Algebras
- Arbitrary Base Scheme Constructions and Specialisation Problems
- Orthogonal and Spin Groups





Dr. V Vetrivel PHD, IIT Madras Professor, Mathematics 044-2257-4619; <u>vetri@iitm.ac.in</u>



- Non-linear Analysis Solving inclusions involving set valued functions without convexity
- Non-smooth Analysis Specifically, the sufficiency of optimality criteria for non-smooth optimization problems is focused to study how far the convexity can be relaxed. This helps extend the existing algorithms to solve non-smooth optimization problems.
- Variational Inequalities Algorithmic approach to solve variatinal inequality problems and their variants has been developed which paves the way for looking at interesting applications.
- We study robustness concepts for set-valued optimization problems using set approach. This helps deal with uncertainty in data.



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF MECHANICAL ENGINEERING

LIST OF FACULTY

Abhijit Sarkar	Krishna Kannan
Amitava Ghosh	Krishnan Balasubramaniam
Anand T N C	Krithika Narayanaswamy
Anand K	Mallikarjuna J M
Anil Kumar Meena	Mani A
Arunachalam N	Manivannan PV
Arunn Narasimhan	Manoj Pandey
Arvind Pattamatta	Mayank Mittal
Ashis Kumar Sen	Narasimhan Swaminathan
Babu V	Pallab Sinha Mahapatra
Balaji C	Parag Ravindran
Balaji Srinivasan	Piyush Shakya
Chandramouli P	Prabhu Rajagopal
Dhiman Chatterjee	Prakash Maiya M
Gnanamoorthy R	Prasad B V S S S
Hariharan K	Raghavan V
Kameswararao Anupindi	Raghu Prakash V

Raju Sethuraman

Ramesh A (Profile yet to be uploaded)

Ramesh Babu N

Ramkumar Penchaliah

Ratna Kumar Annabattula

Samuel G L

Sarit Kumar Das (Profile yet to be uploaded)

Sateesh Gedupudi

Sathyan Subbiah

Seshadri Sekhar A

Shaligram Tiwari (Profile yet to be uploaded)

Shamit Bakshi

Shankar Krishnapillai

Shyama Prasad Das

Sivasrinivasu Devadula (Profile yet to be uploaded)

Somashekhar S Hiremath

Soundarapandian S

Sourav Rakshit

Srikrishna Sahu

Srinivas Reddy K

<u>Srinivasan K</u>

Sujatha Chandramohan

Sujatha Srinivasan

Sundararajan T (Profile yet to be uploaded)

Sundararajan Natarajan

Sushanta Kumar Panigrahi

Varunkumar S

Venkatarathnam G

Vishal V R Nandigana

Viswanath K (Profile yet to be uploaded)



Dr. Abhijit Sarkar

PhD, IISc Bangalore, India Associate Professor, Mechanical Engineering 044-2257-4723; asarkar@iitm.ac.in http://www.iitm.ac.in/component/faculty/78/asarkar/

Vibration of Shells

- Acoustics \succ
- Vibration
- Wave Propagation

Dispersion characteristics of structural acoustic waveguides



Application areas: Noise Control in Application areas: Dynamics Ducts and Mufflers

of sheet metal components

Applications of Mathematics to Problems in Mechanics

- Asymptotic Methods
- Computational methods
- **Continuum Mechanics** ⊳
- Fluid-Structure ⊳ Interaction
- Signal Processing algorithims for condition monitoring, music, etc.



Dr. Amitava Ghosh

PhD, IIT Kharagpur, India

Associate Professor, Mechanical Engineering 044-2257-4724; <u>amitava_g@iitm.ac.in</u>

Current research activities:

- High speed machining / Focus: nano-MQL and Cryogenic application
- Cutting tools with soft and hard tribo-coating / Focus: machining of Al-alloys
- Development of single layer (SL) abrasive tool / Focus: SL diamond dressing tool





- Laser-based diagnostics for spray characterization and combustion
- Fuelling systems for engines
- > CFD for I.C. Engines





Dr. K Anand PhD, IIT Madras, India Assistant Professor, Mechanical Engineering 044-2257-4720; <u>anand_k@iitm.ac.in</u>



Major Areas of Research

- Experimental and Numerical Investigations on Low Temperature Combustion
- Automotive Fuel Surrogate Modelling
- Developing High Efficiency, Clean Combustion Engines through Fuel Modifications

Diesel Fuel Surrogate Model Representation







Dr. Anil Kumar Meena

PhD, Arts et Métiers ParisTech, Paris, France Assistant Professor, Mechanical Engineering 044-2257-4726; <u>anilm@iitm.ac.in</u>

Research interests:

- Casting, Heat Treatment, Microstructure and properties of ADI
- Dry and near dry machining
- High speed machining
- Sustainable manufacturing
- Light-weight alloys for automotive applications





Microstructure & Material properties machining

Process route optimization

Dry and MQL





Dr. N Arunachalam

Assistant Professor, Mechanical Engineering 044-2257-4722; <u>chalam@iitm.ac.in</u>

Major Areas of Research:

- Prognostics and health management of industrial systems
- Grinding Process modeling and control for advanced materials
- Machine vision and its applications







Dr. Arunn Narasimhan PhD, Southern Methodist University, USA Professor, Mechanical Engineering 044-2257-4696; <u>arunn@iitm.ac.in</u> http://www.iitm.ac.in/component/faculty/78/arunn/



- Heat and Fluid Flow in Biological Systems (Bio-heat and Bio-fluids)
- Phase Change and Convection Heat Transfer (passive cooling / thermal storage)



Retinal Laser Surgery / Retinal Drug Delivery (Bio-heat-flow Models)



Electronics Cooling as Bidisperse Porous Media / Porous Medium Combustion / Heat Transfer Enhancement



Brain Stroke Cooling / Cryosurgery (Bio-heat-porous – medium Models)



Dr. Arvind Pattamatta

Associate Professor, Mechanical Engineering 044-2257-4654; <u>arvindp@iitm.ac.in</u> <u>http://mech.iitm.ac.in/Faculty/ap/home.php</u>



Major Areas of Research

- Micro and Nano scale Heat transfer with applications in micro electronic cooling
- Two Phase flows during flow boiling in microchannels
- Computational Fluid Dynamics and Mesoscopic Numerical Methods.





Dr. Ashis Kumar Sen

Associate Professor, Mechanical Engineering 044-2257-4716; <u>ashis@iitm.ac.in</u> <u>http://www.ashislab.in/</u>



Major Areas of Research

- Microfluidics Technology
- Healthcare and Lab on Chip diagnostics
- Interfacial phenomena in microfluidics





Dr. V BABU PhD, The Ohio State University, USA Professor, Mechanical Engineering 044-2257-4688; <u>vbabu@iitm.ac.in</u> <u>http://www.iitm.ac.in/</u>

- High Speed Propulsion/Supersonic intakes; Supersonic combustion
- Computational Aero-acoustics/Prediction and mitigation
- Lattice Boltzmann method/Simulations of flow and heat transfer; HPC





Dr. C Balaji PhD, IIT Madras Professor, Mechanical Engineering 044-2257-4689; <u>balaji@iitm.ac.in</u> http://mech.iitm.ac.in/Faculty/CB/home.php



- Optimization in heat transfer
- Inverse heat transfer
- Satellite meteorology, numerical weather prediction and data assimilation





Dr. Balaji Srinivasan PhD, Stanford University, India Associate Professor, Mechanical Engineering 044-2257-6657; <u>sbalaji@iitm.ac.in</u>

- Robust Numerical Methods for Compressible and Rarefied Flows
- Analysis and computation of Turbulent Flows
- Applied Machine Learning





Dr. Chandramouli P PhD, The Ohio State University, USA Professor, Department of Mechanical Engineering +91 44 22574690; mouli@iitm.ac.in https://sites.google.com/site/iitmmouli/



- Nonlinear Dynamics
- Noise and Vibration Control
- Fluid-Structure-Acoustic Interactions



Efficient computation of large order nonlinear dynamical systems Windmilling in aeroengines



Hybrid techniques for noise control Double porous linings & embedded resonators



Breathing waves in submerged fluid filled tubes

Flow acoustics of fluid filled shells

COMPUTATIONAL AND EXPERIMENTAL METHODS FOR NVH





Dr. Dhiman Chatterjee PhD., Indian Institute of Science, India Professor, Mechanical Engineering Ph: +91 44-2257 4697; Email: <u>dhiman@iitm.ac.in</u> <u>http://mech.iitm.ac.in/Faculty/dc/home.php</u>



- Cavitation and two-phase flow
- Microscale flow and flow devices
- Turbomachinery





R Gnanamoorthy, Dr Eng (Japan) Professor, Mechanical Engineering Ph: +91 44-27476302; gmoorthy@iitm.ac.in http://www.iiitdm.ac.in/faculty.php?pid=RGM

➢ Focus

- 'Engineering' Surfaces for Improved Performance
- Damage Tolerant Design and Tribo Design
- Advanced Materials & Product Design
- High Performance Test Machines and Product Development





'Engineering' Surfaces for Nanostructure



Duplex

Gear







Dr. K.Hariharan PhD, IIT Madras , India Asstistant Professor, Mechanical Engineering 044-2257-4679; <u>hariharan@iitm.ac.in</u> <u>http://www.iitm.ac.in/hariharan</u>

- Stress relaxation/ Servo press formability
- Electro plasticity
- Robo forming
- Severe plastic deformation





Dr. Kameswararao Anupindi PhD, Purdue University, USA Assistant Professor, Mechanical Engineering 044-2257-4695; <u>kanupindi@iitm.ac.in</u> <u>https://home.iitm.ac.in/kanupindi/</u>



- Eddy-resolving simulations of turbulent flow and heat transfer
- Lattice Boltzmann methods
- Bio-fluid dynamics



 $\begin{array}{cccccc} ({\tt R} - {\tt Ro}) \, / \, ({\tt Ro} - {\tt Ri}) & ({\tt R} - {\tt Ro}) \, / \, ({\tt Ro} - {\tt Ri}) & ({\tt R} - {\tt Ro}) \, / \, ({\tt Ro} - {\tt Ri}) & ({\tt R} - {\tt Ro}) \, / \, ({\tt Ro} - {\tt Ri}) \\ ({\tt a}) \, Re_i = - Re_o = 500 & ({\tt b}) \, Re_i = - Re_o = & ({\tt c}) \, Re_i = - Re_o = & ({\tt d}) \, Re_i = - Re_o = \\ 4000 & 8000 & 16000 \\ \end{array}$

Turbulent flow in a counterrotating Taylor-Couette flow



Evolution of vorticity in abdominal aortic aneurysm



Dr. Krishna Kannan PhD, Texas A&M University, USA Professor, Mechanical Engineering

044-2257-4708; <u>krishnakannan@iitm.ac.in</u> http://www.iitm.ac.in/component/faculty/78/kkrishna



- Broad area of research: Continuum mechanics
- Research focus: Development of constitutive equations using rigorous and systematic thermodynamically frameworks describing many phenomena such as crystallization of polymeric melts, and viscoelasticity and chemical aging of polymeric materials
- Some applications:



Constitutive equations for fiber spinning of crystallizing polymeric melts



Constitutive equations for vulcanization of rubber and thermo-mechanical behavior of (viscoelastic) filled networked rubbers



Constitutive equations for chemical aging of composites



Dr. Krishnan Balasubramaniam

Professor, Mechanical Engineering 044-2257-4662; <u>balas@iitm.ac.in</u> <u>http://www.cnde-iitm.net/balas/index.html</u>



Major Areas of Research

- > Non-destructive Imaging & Evaluation of Materials, Structures, Products
- Structural Health Monitoring using in-situ Sensor Systems
- Measurements of Material Properties and In-Process Parameters





Dr. Krithika Narayanaswamy Assistant Professor, Mechanical Engineering 044-2257-4650; <u>krithika@iitm.ac.in</u>

https://mech.iitm.ac.in/meiitm/personnal/dr-krithika-narayanaswamy/

Major Areas of Research

- Chemical kinetic modeling of transportation fuel surrogates
- Development of compact kinetic schemes and reduction methods
- Reactive flow simulations with accurate finite rate chemistry





Dr. J M Mallikarjuna

PhD, IIT Madras, India Professor, Mechanical Engineering 044-2257-4698; jmmallik@iitm.ac.in http://www.iitm.ac.in/component/faculty/78/jmmallik/



- Alternate fuels Vegetable oils, Biodiesel, Hydrogen, Ethanol, Methanol, LPG, Biogas, CNG
- In-cylinder flows, liquid and air interaction analysis using PIV and CFD in 4 and 2 Stroke engines
- HCCI Engines Liquid and gaseous fuels, GDI engines



Performance and Emission characteristics of alternate fuels. Engine modifications for liquid and gaseous fuels. Combustion characteristics.



In-cylinder flows and air-fuel interaction in 4S and 2 stroke engines is done through PIV and CFD analysis



HCCI – usage of liquid and gaseous fuels for HCCI operation, engine modifications, performance, emission and combustion characteristics is done. Diesel, LPG, biogas have been tried





Dr. P V Manivannan PhD, IIT Madras, India Associate Professor, Mechanical Engineering Ph:044-22574710; Cell: 9444952257 Email: <u>pvm@iitm.ac.in</u> <u>http://www.iitm.ac.in/component/faculty/78/pvm/</u>



Major Areas of Research

- Automotive Control systems: Engine Management Systems (SI, CI, Hydrogen Fueled Engines), Electric Power Steering, Active Suspension system (MR damper), etc.
- Robotics and Sensor Network: Robotics / Unmanned Vehicle Guidance and Control, Sensors and Sensor Network (wired / wireless), Automated Highway System (AHS) & Intelligent Vehicles
- Industrial automation: Embedded Controller and Real Time Operating System (RTOS) for Mechatronic System





Dr. Manoj Pandey PhD, Cornell University, USA Asst. Professor, Mechanical Engineering 044-2257-4658; <u>mpandey@iitm.ac.in</u>

- Reduced Order Modeling and Nonlinear Dynamics of Resonant MEMS
- Finite Element based Multi scale Modelling of Elastic Plastic Applications
- Multi Physics analysis of MEMS





Dr. Mayank Mittal Assistant Professor, Mechanical Engineering +91-44-2257-4680; <u>mmittal@iitm.ac.in</u> https://www.iitm.ac.in/info/fac/mmittal



Major Areas of Research

- Experimental diagnostics and modeling of advanced internal combustion engine; alternate fuels; aftertreatment system
- Laser-based diagnostics for flow and combustion
- Signal and image processing; computer vision



In-cylinder fuel spray and combustion visualization



Laser grid inside the engine cylinder

 4444111
And the second

Undelayed and delayed images of molecular tagging velocimetry



Dr. Narasimhan Swaminathan PhD, Georgia Institute of Technology, USA Associate Professor, Mechanical Engineering 044-2257-4743; <u>n.swaminathan@iitm.ac.in</u> <u>http://www.iitm.ac.in/component/faculty/78/n.swaminathan/</u>



- Material property determination using atomistic methods
- Finite element modeling of multiphysics phenomena







Dr. Pallab Sinha Mahapatra

PhD, Jadavpur University, India

Assistant Professor, Mechanical Engineering 044-2257-4692; pallab@iitm.ac.in http://www.iitm.ac.in/pallab



- Multiphase heat transfer: condensation and boiling, multiphase modelling
- Self-propelled systems: collective dynamics, crowd modelling




Dr. Parag Ravindran PhD, Texas A&M University, USA Associate Professor, Mechanical Engineering 044-2257-4714; paragr@iitm.ac.in http://www.iitm.ac.in/component/faculty/78/paragr/



- Constitutive modeling of viscoelastic materials
- Modeling of creep response in metals
- Modeling of fatigue loading in fibre reinforced composites
- Linear and non-linear constitutive models for viscoelastic materials within a thermodynamic framework.
- > Development of continuum models for creep in copper.
- Thermo-mechanical response of glass-epoxy composites: coupling between the thermal and mechanical response in composites.
- Development of continuum models for composites and polymers and comparison to experiments involving cyclic loading.



Dr. Piyush Shakya PhD, Texas A&M University, USA Associate Professor, Mechanical Engineering



- Condition monitoring
- Fault Diagnosis and Prognosis
- Innovative signal processing
- Bearings, Gears



Failed bearings samples after dismantling



Dr. Prabhu Rajagopal PhD, Imperial College London, UK Associate Professor, Mechanical Engineering 044-2257-4741; prajagopal@iitm.ac.in https://sites.google.com/site/iitmprabhu



Ultrasonic techniques for inspection, monitoring and control

- Nondestructive Evaluation & Structural Health Monitoring
- Manufacturing Process Control



Inspection of pipe networks (e.g., Oil and Gas Industry, Heat Exchanger Tubes)



Monitor structural health (e.g., aircraft wings, ship hull, wind turbines)



Measurement of liquid <u>level</u> (*e.g.*, Underground/ pressurized fluid reservoir)

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Dr. M Prakash Maiya PhD, IIT Bombay, India Professor, Mechanical Engineering 044-2257-4650; <u>mpmaiya@iitm.ac.in</u> <u>http://mech.iitm.ac.in/Faculty/mpm/home.php</u>



- Sorption Technology
- Solid State Hydrogen Storage
- Air-conditioning and Ventilation

Sorption Technology

- 1. Adsorption coolers
- 2. Absorption systems
- 3. Cogeneration
- 4. Desalination

Solid State H₂ Storage

- 1. Material characterization
- 2. HMT and Reactor design
- 3. Cooling and Heat storage systems
- 4. H₂ compressors

Air-conditioning and Ventilation

- 1. Hybrid AC systems
- 2. Wall / Concrete and Passive cooling
- 3. Desiccant and
 - Evaporative cooling
- 4. Industrial ventilation



Dr. B V S S S Prasad

PhD, Indian Institute of Technology Kharagpur Professor, Mechanical Engineering 044-2257-4671; prasad@iitm.ac.in



- Turbomachines/ Gas Turbine Blade Cooling Technology
- Energy/Fluidization Technology
- ComputI. and ExptI. Heat Transfer /AUSM Schemes, Heat Flux measurements





- Liquid Fuel Droplet Evaporation and Combustion alcohols and biofuels
- Laminar Flames Hydrogen and oxygen enhanced flames, flame stability studies
- Heterogeneous Combustion pool flames, coal and biomass gasification



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Dr. V Raghu Prakash, PhD. (IISc)

Professor, Mechanical Engineering 044-2257-4694; <u>raghuprakash@iitm.ac.in</u> http://www.mech.iitm.ac.in/Faculty/vrp/home.php

- Fatigue, Fracture and Failure Analysis
- Materials Characterization
- Crash Performance
- Product Design



Life Prediction and Residual Life Extension



Development of crash compliant structures



New Product Development

Back to Top



Dr. Raju Sethuraman

Professor, Mechanical Engineering 044-2257-4673; <u>sethu@iitm.ac.in</u>

Research Area/Focus : Computational Solid Mechanics

Modeling and simulation of structural materials undergoing inelastic finite deformation







Dr. Ramesh A PhD, IIT Madras, India Professor, Mechanical Engineering 044-2257-4676; <u>aramesh@iitm.ac.in</u>





Dr. N Ramesh Babu

Professor, Mechanical Engineering +91-44-2257 4675 (0); <u>nrbabu@iitm.ac.in</u> http://mech.iitm.ac.in/Faculty/nrb/home.php



Automation in Manufacturing

- Automation concepts in sheet metal bending, laser and water jet machining
- Motion planning of multiple robots for cooperative and coordinated manipulation
- Reverse engineering of PLC control programs
- Tool path generation for complex surface machining

HEEL HEAD

SCANNING OPTICS

Advanced Machining Processes

- Development of Next Generation Precision Grinding Machine Tool
- Laser Dressing of Super abrasive Grinding Wheels
- Macro and micro abrasive waterjet machining
- Ice bonded abrasive polishing process



Motion planning of Multiple Robots





Laser Dressing of Grinding wheel

LASER HEAD

Micro abrasive waterjet machining Back to Top



Dr. Ramkumar Penchaliah PhD, University of Southampton, UK Assistant Professor, Mechanical Engineering 044-22574816; <u>ramkumar@iitm.ac.in</u> <u>http://home.iitm.ac.in/ramkumar</u>



Major Areas of Research

- Automotive Tribology and Tribo design of Machine Components
- Wind Turbine Gearbox Bearing Failures (WEC)
- Surface Engineering : Surface Texture and Coatings (Bio-implants/PRCL)
- Wear Simulation models for Prediction









Dr. Ratna Kumar Annabattula

PhD, University of Groningen, The Netherlands Associate Professor, Mechanical Engineering 044-2257-4719; <u>ratna@iitm.ac.in</u> <u>http://home.iitm.ac.in/ratna</u>

Major Areas of Research

- Thermo-mechanics of Granular Materials
- Nuclear fusion, Li-Ion batteries, Thermal energy storage
- Nature Inspired Microsystem Design
- Multi-Scale Modeling of Materials







Dr. G L Samuel

Professor, Mechanical Engineering samuelgl@iitm.ac.in http://mech.iitm.ac.in/Faculty/gls/home.php



- Micro machines process modeling
- Metrology and Computer Aided Inspection measurement and evaluation of surface characteristics
- Wire Electrical Discharge Machining study of machining process and characterization



Micro Machining set-up



3D profiles measured using Capacitance sensor



Wire EDM Turning set-up





Dr. Sarit Kumar Das PhD, Sambalpur University, India Professor, Mechanical Engineering 044-2257-4655; <u>skdas@iitm.ac.in</u>





Dr. Sateesh Gedupudi

PhD, IIT Madras, India Assistant Professor, Mechanical Engineering 044-2257-4721; <u>sateeshg@iitm.ac.in</u>



- Phase-change heat transfer(flow boiling and pool boiling) and flow instabilities
- Heat exchangers
- Non-conventional energy sources





Video images of bubble growth in a 0.6 mm D_h channel (a)without inlet compressibility and (b) with inlet compressibility (flow reversal)



Dr. Sathyan Subbiah

PhD, IIT Madras, India Assistant Professor, Mechanical Engineering 044-2257-4669; sathyans@iitm.ac.in



Expertise

Industry Related Experiences

- Machining (at all scales (meso, micro to nano)
- Abrasive polishing
- Experimental and process simulation

- Worked in US-Automotive manufacturing industry for 3 years
- While in academia, collaborated/ing with following industries:
- Aerospace (Rolls Royce Singapore)
- > Reliance Petrochemical
- Ace Micromatic Grinding
- Saint Gobain Research India
- SVP Laser
- > Titan

Machining (at all scales (meso, micro to nano)





micro-machining



propeller



A Seshadri Sekhar

PhD, IIT Madras, India Professor, Mechanical Engineering 044-2257-4709; <u>as_sekhar@iitm.ac.in</u> http://www.iitm.ac.in/component/faculty/78/as_sekhar/



- Rotor Dynamics
- Fault Identification and Condition Monitoring
- Tribology- Rolling element bearings and Hydro dynamic bearings



Rotating machinery:

Composite shafts dynamics; Fault modeling and detection; MCSA



Wind turbine:

Gearbox dynamics condition monitoring

and



RE bearing defects; Fluid film bearing roughness effects; CFD of Seals





Dr. Shaligram Tiwari

PhD, IIT Kanpur, India Professor, Mechanical Engineering 044-2257-4729; <u>shaligt@iitm.ac.in</u> https://home.iitm.ac.in/shaligt/about.html





Dr. Shamit Bakshi

PhD, IISc Bangalore, India Professor, Mechanical Engineering 044-2257-4700; <u>shamit@iitm.ac.in</u> http://www.iitm.ac.in/component/faculty/78/shamit/



- IC Engine process simulation
- Atomization and sprays





Dr. Shankar Krishnapillai PhD, University of Oxford, UK Professor, Mechanical Engineering 044-2257-4701; skris@iitm.ac.in



- **Optimization Methods**
- Vibrations
- Machine Design
- Socially Relevant Technology

Optimization Methods:

- 1. Multi-Objective Optimization
- 2. Improved Algorithms
- 3. Hybrid methods
- 4. Applications to Machine Design, **Dynamics** problems

Vibrations:

- Structural Dynamics 1.
- Machine Dynamics 2.
- 3. Vibration Control
- 4. Inverse problems and Health Monitoring



- 1. General Machine Design
- **Design for Socially Relevant** 2. **Applications**
- 3. Alternative Energy for **Rural** applications













Dr. Shyama Prasad Das PhD, Indian Institute of Science, India Asst. Professor, Mechanical Engineering 044-2257-4667; <u>spdas@iitm.ac.in</u> <u>http://mech.iitm.ac.in/Faculty/sydas/home.php</u>



- Unsteady Hydrodynamics, Aerodynamics and Turbomachines
- Interfacial Hydrodynamics and Transport
- Phase Change Heat Transfer in Mini System



Hydrodymaic instability and boundary layer separation a





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Dr. Sivasrinivasu Devadula PhD, IIT Madras, India Assistant Professor, Mechanical Engineering 044-2257-4704; <u>devadula@iitm.ac.in</u> <u>https://mech.iitm.ac.in/meiitm/personnal/dr-sivasrinivasu-devadula/</u>





Dr. Somashekhar S Hiremath

PhD, IIT Madras, India Assistant Professor, Mechanical Engineering

044-2257-4681; somashekhar@iitm.ac.in http://mech.iitm.ac.in/PEIL%20HOME%20PAGE/Members/Prof.Somasekhar/Soma%20sekhar.html



- Fluid Power System
- Electro hydraulic Servovalves, Autonomous Actuators, Hydraulic Hybrids

- Micromachining \geq
- Mechatronic System
- **Robotics**
- Modeling & Simulation
- Micro-EDM, Micro ECSM, Micro-AJM, Micro-HAJM
- Sensor and Actuator Integration to Precision Mechanical System
- Trajectory Planning and Control, Obstacle Avoidance etc
 - Optimization of process parameters



Cutting-edge Interdisciplinary Research Activities and Provide Technology Transfer and Consultancy Services to Industry and Governmental agencies

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Dr. S Soundarapandian

PHD, Southern Methodist University, USA Assistant Professor, Mechanical Engineering 044-2257-4718; <u>sspandian@iitm.ac.in</u>

http://www.iitm.ac.in/component/faculty/78/sspandian/



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Dr. Sourav Rakshit

Assistant Professor, Mechanical Engineering 044-2257-4693; <u>srakshit@iitm.ac.in</u> <u>https://mech.iitm.ac.in/meiitm/personnal/sourav-rakshit/</u>



Optimization in biomechanics



Topology optimization



Robotics and motion planning





Dr. Srikrishna Sahu

PhD, Imperial College London, UK

Assistant Professor, Mechanical Engineering 044-2257-4713; ssahu@iitm.ac.in

- Optical experimental methods for two-phase flow and combustion research: ILIDS, PIV, PLIF, Optical Connectivity
- Spray-turbulence interaction, spray evaporation, liquid jet atomization
- Image processing, POD analysis \succ







Swirling flow atomizer



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Dr. K Srinivas Reddy

PhD, IIT Delhi, India Professor, Mechanical Engineering 044-2257-4702; <u>ksreddy@iitm.ac.in</u> <u>http://mech.iitm.ac.in/Faculty/ksr/home.php</u>



- Estimation & Measurement of Thermo-physical Properties/Thermal Conductivity
- Energy & Environment/ 4E (Energy-Exergy-Environmental-Economic) Analyses



Design and Development of Solar Parabolic Dish Cavity Receiver Systems for Power Generation and Hydrogen Production



Integration and Optimization of High Performance Solar Concentrating Photovoltaic Systems for Cogeneration and Tri-generation



Estimation of effective thermal conductivity of two-phase engineering materials



Dr. K Srinivasan PhD, IIT Kanpur, India Professor, Mechanical Engineering +91 (44) 2257-4703; <u>ksri@iitm.ac.in</u> <u>http://goo.gl/w6f6x</u>

- Jet Flow and Noise
- Active and Passive Control of Flow, Noise and Combustion
- Resonant Acoustics





Dr. Sujatha Chandramohan

PhD, IIT Madras, India Professor, Mechanical Engineering 044-2257-4682; <u>sujatha@iitm.ac.in</u> <u>http://www.iitm.ac.in/component/faculty/78/sujatha</u>

- Vehicle Dynamics
- Machine Dynamics
- Vibration Signal Analysis
- Human Body Vibration







Dr. Sujatha Srinivasan PhD, The Ohio State University, USA Associate Professor, Mechanical Engineering 044-2257-4728/5695; <u>sujsree@iitm.ac.in</u> <u>https://home.iitm.ac.in/r2d2</u>

- Prosthetics, Orthotics and Assistive Devices
- Mechanisms
- Movement Biomechanics





Dr. Sundararajan T

PhD, University of Pennsylvania, USA Professor, Dept. of Mechanical Engineering 044-2257-4683; <u>tsundar@iitm.ac.in</u>





Dr. Sundararajan Natarajan PhD, Cardiff University, Wales, UK

Associate Professor, Mechanical Engineering 044-2257-4656; <u>snatarajan@iitm.ac.in</u> <u>http://home.iitm.ac.in/snatarajan</u>



- Free and moving interfaces
- Multi-field coupled problems
- Computational Mechanics (FEM, XFEM, Meshless, Isogeometric analysis, Polygonal FEM, Scaled Boundary FEM)
- Multiscale methods





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Dr. Sushanta Kumar Panigrahi PhD, IIT Roorkee, India Associate Professor, Mechanical Engineering 044-2257-4742; <u>skpanigrahi@iitm.ac.in</u> http:// <u>http://mech.iitm.ac.in/Faculty/ssk/home.php</u>



- Development /manufacturing of advanced materials (Bulk ultrafine/nano grained materials, metal matrix composites, nano composites, high strain rate superplastic materials, advanced materials as per design etc.)
- Fundamental behavior of advanced materials (Materials characterization, mechanical properties and machining related studies)
- Joining and processing of similar and dissimilar materials





Dr. S Varunkumar Assistant Professor, Mechanical Engineering 044-2257-4717; <u>varuns@iitm.ac.in</u>

Major Areas of Research

- Biomass gasification and combustion
- CO kinetics and emission prediction
- Combustion instability in solid rocket motors





Dr. G Venkatarathnam

Professor of Mechanical Engineering 044-2257-4685; gvenkat@iitm.ac.in

Major Areas of Research

- Development of new generation of refrigerators and liquefiers
- Mixed refrigerant processes, refrigerant mixtures, low GWP refrigerants
- High efficiency heat exchangers, Thermodynamics, Process Simulation





Dr. Vishal V R Nandigana PhD, University of Illinois at Urbana-Champaign,USA Assistant Professor, Mechanical Engineering 044-2257-4668; <u>nandiga@iitm.ac.in</u> <u>https://home.iitm.ac.in/nandiga/index.html</u>



- Computational Nanofluidics Understanding fundamental ion transport in solidstate nanochannels and nanopores
- Nanomaterials Energy harvesting using advanced 2D MoS₂ nanomaterials
- Nano circuits Nanofluidic based circuits like nanofluidic diodes for sensor applications




Dr. Viswanath K Assistant Professor, Mechanical Engineering

044-2257-4664; viswanathk@iitm.ac.in







INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING

LIST OF FACULTY

Ajay Kumar Shukla

Anand K Kanjarla

Balasubramanian M

Bhattacharya S S

Gandham Phanikumar

Ganesh Sundara Raman S

Hari Kumar K C

Janaki Ram G D

<u>Kamaraj M</u>

Ravi Sankar Kottada

Lakshman Neelakantan

Manas Mukherjee

Murty B S

Murugaiyan Amirthalingam

Parasuraman Swaminathan

Pradeep K G

Prathap Haridoss Ranjit Bauri Ravikumar N V Sabita Sarkar Sampath V Sampath Kumar T S Sankaran S Satyesh Kumar Yadav (Profile yet to be uploaded) Somnath Bhattacharyya Sreeram K Kalpathy Srinivasa Rao Bakshi Subramanya Sarma V Tiju Thomas

Uday Chakkingal



Dr. Ajay Kumar Shukla Assistant Professor, Metallurgical and Materials Engineering 044-2257-4762; <u>shukla@iitm.ac.in</u>



Major Areas of Research

- Process modeling, control and optimization of iron and steelmaking
- Computational thermodynamics and its application to high temperature metallurgical processes
- > Application of Artificial Intelligence (ANN, GA) to metallurgical processes



Dr. Anand K Kanjarla

Assistant Professor, Metallurgical and Materials Engineering 044-2257-4753; kanjarla@iitm.ac.in

Major Areas of Research

- Micromechanical modelling of polycrystalline materials.
- Mechanical anisotropy of materials : crystallographic texture
- Mechanics of irradiated microstructures

Effect of grain morphology on shear band formation in an Aluminum alloy



Occurrence of stress concentrations close to grain boundaries in deformed Zirconium sample







Dr. M Balasubramanian

Professor, Metallurgical and Materials Engineering 044-2257-4767; <u>mbala@iitm.ac.in</u> <u>https://mme.iitm.ac.in/mbala/</u>

Major Areas of Research

- Processing of advanced ceramics
- Processing of composite materials including nanocomposites



Clay-polyester nanocomposite



Alumina-zirconia minispheres





Microstructure of porous mullite



Alumina platelets formed on eggshell membrane bio-templateBack to Tor





S S Bhattacharya

Professor, Metallurgical and Materials Engineering Nano Functional Materials Technology Centre, Materials Testing Facility - Materials Forming Lab 044-2257-4765; <u>ssb@iitm.ac.in</u> <u>http://mme.iitm.ac.in/ssb</u>



Major areas of research

- Synthesis, Consolidation and Sintering of nanostructured materials
- Characterisation of Structural and Functional Nanocrystalline Ceramics
- Super plasticity (SP) and Superplastic Forming (SPF) of Materials
- Metal Forming and Mechanical Behaviour of materials



SPF of Ti-6AI-4V



SPF - FE Modeling



SP of nano zirconia SPF/DB of nanoceramics







Nanocrystalline alumina



A nanotitania particle



Nano LSM for fuel cells



NCD coating on tool



Chemical vapour synthesis set-up (top) Flame synthesis set-up (bottom) Back to Top



Dr. Gandham Phanikumar

Professor, Metallurgical and Materials Engineering 044-2257-4770; <u>gphani@iitm.ac.in</u>

Major Areas of Research

- Solidification experiments & modeling
- Phase field simulation of microstructure evolution
- Materials Joining

Electromagnetic Levitatic for under cooling



3D simulation of dendrite



Microstructure evolution







Dr. S Ganesh Sundara Raman

Professor, Metallurgical and Materials Engineering 044-22574768; ganesh@iitm.ac.in

- Fatigue Behaviour of Materials and Weldments
- Fretting Fatigue and Fretting Wear
- Surface Modification, Coatings and Thermal Spray Processing





K C Hari Kumar Professor, Metallurgical and Materials Engineering 044-2257-4766; <u>kchkumar@iitm.ac.in</u>

Major Areas of Research

- Gibbs Energy Modelling of Materials Employing Calphad
- Applications of Density Functional Theory in Materials Science
- Modelling of Diffusion Controlled Transformations in Ferrous and Non-ferrous Alloys





Dr. G D Janaki Ram

Professor, Materials Joining Laboratory Metallurgical and Materials Engineering +91-44-22574780, +91-9840597364, jram@iitm.ac.in



Research Interests: Welding, Additive manufacturing, Failure analysis



Additive manufacturing with friction processes



SiC fiber reinforced titanium composite



Carbide-free bainite, armor steel weld

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Multi-track friction surfaced coating



Friction stir seam weld, AA 2014-T4



Dr. M Kamaraj Professor, Metallurgical and Materials Engineering 044-2257-4768; <u>kamaraj@iitm.ac.in</u>

Major Areas of Research

- Life enhancement of power plants (thermal/hydro/nuclear) components by surface coatings
- Development of coatings for Bio-implants
- Wear properties: Correlations of Microstructure-process parameters







Slurry erosion wear test



Dr. Ravi Sankar Kottada Associate Professor

Metallurgical and Materials Engineering +91 44 2257 4779; <u>ravi.sankar@iitm.ac.in</u>



Primary research interests:

- High temperature deformation of advanced materials
- Multi-component high entropy alloys and their deformation behavior
- High temperature life-term prediction of advanced materials
- Creep of magnesium-base alloys



Dr. Lakshman Neelakantan

Associate Professor, Metallurgical and Materials Engineering 044-2257-4786; <u>nlakshman@iitm.ac.in</u>

Major Areas of Research

- Corrosion characteristics of engineering materials and coatings
- Electrochemical behaviour of NiTi, NiTi-X Shape Memory Alloys (SMAs)
- Smart coatings for corrosion protection
- Electro-dissolution, -planarization and -deposition
- Micro and mechano electrochemistry
- Corrosion behaviour of Metallic Bipolar Plates





Dr. Manas Mukherjee

Assistant Professor, Metallurgical and Materials Engineering +91-44-2257-4782; <u>manas.mukherjee@iitm.ac.in</u> <u>http://mme.iitm.ac.in/manas.mukherjee/</u>

Major Areas of Research

- Metal foams processing and characterization
- Physics of metal foaming
- X-ray tomography-based structural analysis









Dr. B S Murty

Institute Professor, Metallurgical and Materials Engineering 044-2257-4754; <u>murty@iitm.ac.in</u>; <u>www.mme.iitm.ac.in/murty</u>

Major Areas of Research

- Development of structural and functional nano materials
- Development of high entropy alloys and bulk metallic glasses
- In-situ metal matrix composites and metal foams

Research Facilities in the Group

- Fritsch P-5 and Simoloyer high energy ball bills
- Spark plasma sintering and microwave sintering furnace
- Local Electrode Atom Probe (LEAP)
- TEM (Tecnai T12, T20)
- Dual Beam FIB (Helios)
- > XRD (Panalytical)
- Nanoindentor (Hysitron)
- Dilatometer (up to 1650°C)
- DSC/TGA (up to 1500°C)

Local Electrode Atom Probe









Spark Plasma Sintering





Dr. Murugaiyan Amirthalingam

Assistant Professor, Metallurgical and Materials Engg. 044-2257-4784; <u>murugaiyan@iitm.ac.in</u> <u>https://home.iitm.ac.in/murugaiyan/</u>



- Welding metallurgy and welding processes modelling
- Steel product development and thermomechanical processing
- In-situ 3D synchrotron X-ray diffraction and
- Additive manufacturing





Dr. Parasuraman Swaminathan

PhD, University of Illinois at Urbana Champaign, USA Associate Professor, Metallurgy and Materials Engineering <u>swamnthn@iitm.ac.in</u>

- Electronic Materials semiconductor quantum dots
- Nanoparticle assembly by physical vapour deposition
- Nanocalorimetry Phase transformation in thin metal/alloy films





Dr.-Ing K G Pradeep PhD, RWTH Aachen University, Germany Assistant Professor, Metallurgical and Materials Engineering Tel: +91-(0)44-2257-4764; kgprad@iitm.ac.in



- Magnetic materials Rare-earth free permanent magnets and nanocrystalline soft magnets
- Correlative microscopy Methods for hierarchical nano-scale characterisation involving atom probe tomography and multiple electron microscopy methods

Combinatorial alloy design and near atomic scale characterization





Dr. Prathap Haridoss Professor, Metallurgical and Materials Engineering 044-2257-4771; prathap@iitm.ac.in

Major Areas of Research

- Proton Exchange Membrane (PEM) Fuel Cells: Materials and Technology
- Carbon Nanotubes (CNTs): Synthesis and Applications

PEM Fuel Cells



Segmented fuel cell testing



Enhanced Gas Diffusion Layer



Fuel cell powered bicycle, using commercially available components

Carbon Nanotubes



Carbon Nanotubes in different orientations







Dr. Ranjit Bauri Professor, Metallurgical and Materials Engineering 044-2257-4778; <u>rbauri@iitm.ac.in</u>

Major Areas of Research

- Solid Oxide Fuel Cells (SOFC)
- Al and Ti based Metal Matrix Composites
- Friction Stir Processing (FSP)
- EBSD, Microstructure-Property Correlation



SOFC anode







Mini tensile tester









Dr. Rer. Nat. Ravi Kumar, NV Professor, Metallurgical & Materials Engineering 044-2257-4777; <u>nvrk@iitm.ac.in</u> <u>http://mme.iitm.ac.in/nvrk</u>



Major Areas of Research

- Processing/design of molecular precursors for structural and functional applications (Eg: UHT ceramics, transparent ceramics, thermoelectrics, coatings)
- > Biomaterials & biomimetics for technological applications (Eg: Superhydrophobicity, adhesion studies)
- Spectrochemical characterization (NMR, FTIR), structural characterization (XRD, X-ray residual stress analysis, SEM, AFM, TEM)
- Evaluation of properties: Creep, thermal shock, indentation fracture mechanics, novel mechanical testing techniques





Dr. Sabita Sarkar

Assistant Professor, Metallurgical and Materials Engineering 044-2257-4755; <u>sabita.sarkar@iitm.ac.in</u>

Major Areas of Research

- Process modeling/design/intensification of metallurgical and chemical processes
- Modelling and simulation of
 - Flow through packed bed, fluidized bed
 - Heat and mass transfer
 - Granular flow, multi-phase flow, reacting flow etc





Reactor design and optimization <u>Back to Top</u>





Dr. V Sampath

Professor, Metallurgical and Materials Engineering 044-2257-4773; <u>vsampath@iitm.ac.in</u>

Major Area of Research

- Novel Shape Memory Alloys and Smart Materials for Automotive, Aerospace, Biomedical and Commercial applications
- Nanocrystalline shape Memory Alloys for advanced applications
- Composites and Smart composites for structural and other applications
- Physical Metallurgy and Failure analysis of materials







Dr. T S Sampath Kumar Professor, Metallurgical and Materials Engineering 044-2257-4772; <u>tssk@iitm.ac.in</u>



NANOSTRUCTURED BIOMATERIALS

for orthopedic and dental applications

- Nanocrystalline calcium phosphate ceramics, coatings & cements
- Antimicrobial materials & drug delivery systems
- Bioresorable & bioactive nano composites
- Nanostructured metallic implants

Value added engineering of egg shell & corals





Periapical cyst with bone grafts

accelerated processing



Bioactive ball milled Ti-hydroxyapatite





Dr. S Sankaran Professor, Metallurgical and Materials Engineering 044-2257-4776; <u>ssankaran@iitm.ac.in</u>

Major Areas of Research

- Structural materials processing through deformation and solidification techniques
- Microstructure-mechanical behaviour relationships
- Electron microscopy

Deformation processing (rolling mill)

Metal foams





Electron microscopy





Dr. Satyesh Kumar Yadav PhD, University of Connecticut, USA Professor, Metallurgical and Materials Engineering 044-2257-4789; <u>satyesh@iitm.ac.in</u> <u>http://www.iitm.ac.in/satyesh</u>

- Materials design from quantum mechanical modeling
- Machine learning to accelerate materials development
- Device materials modeling and visualization







5

3

1

-1

-3

-5

-7

Driving force (eV)





Dr. rer. nat. Somnath Bhattacharyya

Associate Professor, Metallurgical & Materials Engineering 044-2257-4760; <u>somnathb@iitm.ac.in</u>

https://sites.google.com/site/nanoscopytem/home/

Major Areas of Research

- Studying correlation of the structure and chemistry of materials at atomic scale with physical properties using Transmission Electron Microscopy
- Development of new methodology related to TEM/STEM to study materials
- Studying nano-bio conjugation using electron probe





Dr. Sreeram K Kalpathy

Assistant Professor, Metallurgical and Materials Engineering

044-2257-4761; <u>sreeram@iitm.ac.in</u>

https://www.iitm.ac.in/info/fac/sreeram



Major Areas of Research

- Colloids, Polymers, Soft Matter
- Interfacial Fluid Mechanics
- Physical Chemistry of Surfaces
- Coating and Printing Methods







Dynamics of Colloidal Foams, Bubbles, Drops, Films



Morphological patterns from polymer film dewetting



Srinivasa Rao Bakshi

Associate Professor, Metallurgical and Materials Engineering +91 44 2257 4781; M: 8056073710; <u>sbakshi@iitm.ac.in</u> <u>http://www.mme.iitm.ac.in/sbakshi</u>

Major Areas of Interest

- Carbon nanotube reinforced metal matrix composites
- Thermal spray coatings and bulk structures
- Ultra-high temperature ceramic composites
- Hard metal matrix nanocomposites by reaction sintering
- Nanomechanical testing of materials







Dr. V. Subramanya Sarma Professor, Metallurgical and Materials Engineering : 044 2257 4774; <u>vsarma@iitm.ac.in</u>

Major Areas of Research

- Thermo-mechanical processing
- Bulk ultra fine grained / nanostructured metals and alloys
- Crystallographic texture and grain boundary engineering





Orientation imaging microscoscopy of ultrafine grained Cu-Al alloy

Grain boundary engineered austenitic stainless steel,



Tensile properties of ultra fine grained high strength and ductile Cu-Ag alloy Back to Top





Dr. Tiju Thomas

Assistant Professor, Metallurgical & Materials Engineering 044-2257-4757; <u>tijuthomas@iitm.ac.in</u> <u>http://mme.iitm.ac.in/tijuthomas</u> www.tijuthomas.net

Major Areas of Research

- Energy materials
- Environmental remediation materials
- Nitrides, oxynitrides, oxides (in nano-, meso- and bulk forms)
- Photofunctional materials (for solar cells, photocatalytic applications)
- Optical materials and devices
- Surfaces, interfaces and transformation of nanostructures
- Green approaches to functional nanomaterials



Photofunctional & optical materials

(Zn. Cu)O Cu:ZnO ZnO



Dr. Uday Chakkingal PhD, Rensselaer Polytechnic Institute, USA Professor, Metallurgical and Materials Engineering 044-2257-4775; udaychak@iitm.ac.in http://mme.iitm.ac.in/udaychak

- Metal Forming Processes
- Severe Plastic Deformation Processes
- Sheet Metal Forming
- Advanced High Strength Steels





INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF OCEAN ENGINEERING

LIST OF FACULTY

Abdus Samad

Abhilash Somayajula

Ananthakrishnan P (yet to be ploaded)

Bhattacharya S K (yet to be uploaded)

Deepak Kumar

Jitendra S Sangwai

Krishnankutty P

Murali Kantharaj

Nallayarasu S

Nilanjan Saha (yet to be uploaded)

Panneer Selvam R

Rajesh R Nair

Rajiv Sharma

Sannasiraj S A

Shanmugam P

Srinivasan Chandrasekaran

Sriram V

Surendran Sankunny

Suresh Kumar G

Suresh Rajendran

Tarun K Chandrayadula (yet to be uploaded)

Vijayakumar R



Dr. Abdus Samad

Associate Professor, Department of Ocean Engineering 044-2257-4826; <u>samad@iitm.ac.in</u> <u>http://www.doe.iitm.ac.in/samad/</u>



- Ocean energy: Design and optimization of turbines
- Single and multi-objective optimization: Surrogate modelling, Genetic algorithm
- Multiphase pumps- Artificial lifts: Design optimization, Correlation development




Dr. Abhilash Somayajula PhD, Texas A&M University, USA Professor, Ocean Engineering 044-2257-4823; <u>abhilash@iitm.ac.in</u> http://www.doe.iitm.ac.in/abhilash



- Marine autonomy
- Hydrodynamics of ships and offshore structures
- Data driven methods for ship motion control





Dr. Ananthakrishnan P

Professor, Ocean Engineering 044-2257-4811; <u>ananthakrishnan@iitm.ac.in</u>





Dr. Bhattacharya S K

Professor, Ocean Engineering 044-2257-4803; <u>skbh@iitm.ac.in</u> <u>http://www.doe.iitm.ac.in/skbh/</u>





Dr. Deepak Kumar PhD, IIT DELHI, INDIA Associate Professor, Ocean Engineering 044-2257-4828; <u>deepakkumar@iitm.ac.in</u> <u>http://www.oec.iitm.ac.in/Asst_prof_deepak.html</u>



- Time frequency analysis of nonlinear systems
- Experiments related to structure dynamics and control



Dynamic control of onshore and offshore structures for earthquake, wind, hydrodynamic loadings



Controlling the nature of response of onshore and offshore structures



Development and modification of techniques for analysis of system





Dr. Jitendra S Sangwai PhD, IIT Kanpur, India Associate Professor, Petroleum Engineering Program Ocean Engineering 044-2257-4825: iitendrasangwai@iitm.ac.in



- 044-2257-4825; jitendrasangwai@iitm.ac.in http://www.iitm.ac.in/oedept
- Enhanced Oil Recovery
- Gas Hydrates
- Flow Assurance



Semiclathrate Hydrates



CO₂ sequestration Emulsions and Polymer Flooding Ionic Liquids for EOR



Wax and Asphaltene Dissolution Microbial Degradation of Waxes Nanofluids for Flow Assurnace



Dr. P Krishnankutty PhD, IIT Madras, India Professor, Ocean Engineering 044-2257-4820; <u>pkrishnankutty@iitm.ac.in</u> <u>http://www.oec.iitm.ac.in/krishnankutty.html</u>



- Marine Hydrodydnamics/Wave-Structure Interaction
- Ship Motion/ Passenger Comfort; Ship Maneuvering & Control
- Marine Vehicles/Wave Wash/ Powering & Propulsion





Dr. Murali Kantharaj PhD, IIT Madras, INDIA

Professor, Ocean Engineering 044-2257-4816; murali@iitm.ac.in http://www.oec.iitm.ac.in/Faculty_murali.html



- Computational Hydrodynamics using Potential flow and RANS approaches
- Free surface / dynamic boundary hydrodynamics ALE FEM & Level sets
- Coastal hydrodynamics tsunami storm surge flow vegetation interaction morphodynamics





Dr. K. Narendran Assistant Professor, Dept. of Ocean Engineering 044-2257-4831; knaren@iitm.ac.in



VIV enhancement of oscillatory rotation cylinder for high energy capture.

- Flow control mechanism to increase oscillations
- Widen the synchronization region by inducing oscillatory rotation
- · Harness energy for wide range of flow velocitie
- Investigate the flow structure and vortex dyna



• Power benefit factor is high

CELLIN DI

- Low cost and sustainable renewable energy production
- Suitable for local communities





Dr. Nilajan Saha PhD., IISc. Bangalore, India Professor, Ocean Engineering 044-2257-4827; <u>nilanjan@iitm.ac.in</u> <u>http://www.doe.iitm.ac.in/nilanjan/</u>





Dr. R Panneer Selvam PhD., IIT Madras, India Professor, Ocean Engineering 044-2257-4807; pselvam@iitm.ac.in http://www.oec.iitm.ac.in/Asst_prof_PannerSelvam.html

- Hydrodynamic Analysis of Offshore Structures
- Parameter Identification of Ocean Engineering Systems
- Nonlinear Dynamic Analysis of Offshore Structures



(i) Numerical and Experimental studies on Floaters for offshore wind energy

(ii) Emerging New Concepts of Offshore structures for Oil and Gas industry - Numerical and Experimental studies



(i) Identification of parameters of floating offshore structures includes ships in waves and calm water

(ii) Simulation of motion of ships in seas and calmwater (maneuvering)



Simulation of nonlinear responses of offshore floating systems





Dr Rajesh R N

Associate Professor, Ocean Engineering 044-2257-4824; <u>rajeshnair@iitm.ac.in</u> http://www.iitm.ac.in/component/faculty/80/rajeshnair/

- Seismic Data Analysis & Subsurface reservoir characterization for Oil and Gas
- Ground Penetrating Radar analysis and Shallow subsurface characterization
- Laser Doppler Vibrometer measurements, Hydrofraking (Shale, Coal) and rock anisotropy







Dr. Rajiv Sharma PhD., IIT Kharagpur, India Associate Professor, Ocean Engineering +91-44-2257-4822; <u>rajivatri@iitm.ac.in</u> <u>http://sites.google.com/site/rajivatri/</u>



- Computer-aided design; Design of deepwater drilling solutions and floating structures;
- Computational geometric mechanics; Computer aided geometric design, computational geometry, visualization, and their applications in design, robotics and manufacturing;
- > Dynamic data driven forecasting systems; Participatory/democratic economy; and
- Iso-geometric analysis for fluids and structures.



Figure 1: Designed optimum semi-submersible



Figure 2: CAD model of a propeller.



Figure 3: Computed wake behind a propeller.



Dr. S A Sannasiraj

BE (Civil Engg.), ME (Civil-Structural Engg.), PhD., (Ocean Engg.) Professor & Head, Ocean Engineering Email: <u>sasraj@iitm.ac.in</u>



- Supervised 14 phDs
- 80 Refereed Journal papers
- Completed 16 major research projects
- Involved in 200 Industrial projects



- FEM & SPH simulation of Nonlinear free surface waves
 - Laboratory investigation of Wave Breaking & Wave impact on structures
- Wind-wave modelling and Data Assimilation





Breaking wave impact on
a vertical wallAssimilated wind-wave
Prediction over Indian watersSPH simulation of
Nonlinear sloshing
BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH



Dr. P SHANMUGAM

PhD, Anna University, India Professor, Ocean Engineering

044-2257-4818; <u>pshanmugam@iitm.ac.in</u> http://www.oec.iitm.ac.in/Asst_prof_Shanmugam.html

- Ocean Optics and Imaging / Focus on the study of 3-D character of underwater light fields by experiments and modelling.
- Satellite Oceanography/ Focus on the development of algorithms to retrieve ocean environmental parameters from remote sensing data.
- Ocean acoustics / Focus on the characterization of seafloor (morphology, sediment sequence, minerals, oil seepage, buried objects)

Potential applications: Underwater light fields and visibility, search and recovery, underwater optical communication, underwater object detection and image processing, sediments transport, dissolved carbon transport, detection of ocean biological hazards, Oil spill, bathymetry, internal waves, currents, eddies, fronts, and climate prediction.





Dr. Srinivasan Chandrasekaran PhD, IIT DELHI, INDIA Professor, Ocean Engg 044-2257-4821; <u>drsekaran@iitm.ac.in</u>



- Offshore TLPs and triceratops/ dynamic analysis of deep-water structures
- Renewable energy/Design and development of wave energy devices
- Petroleum engineering/Health, Safety and environmental management applied to oil and gas industries





Dr. V Sriram, BE, PhD., Associate Professor, Ocean Engineering 044-2257 4813; <u>vsriram@iitm.ac.in</u> http://www.oec.iitm.ac.in/sriram.html

Major Areas of Research

- Numerical modeling/computational hydrodynamics, Meshfree methods
- Hydro-elasticity
- Violent wave-current-structure interactions
- Experimental wave generation/ PIV





Wave interactions with offshore wind turbine support structure







Surendran Sankunny PhD., Yokohama National University, Japan Professor, Ocean Engineering 044-2257-4815; <u>sur@iitm.ac.in</u> <u>http://www.oec.iitm.ac.in/surendran_home.html</u>



- Ship shaped hull dynamics(experimental, theoretical & numerical)
 - a) Motion control using active fins
 - b) Influence of moon-pool shapes on moored hull
 - c) Maneuvering and optimization of ship routes
- Fracture Mechanics of metals(isotropic)and non-metals(anisotropic)
- Application of composite materials for marine construction
- Possible high-impact exploratory research themes
 - > a) Applications of 3D printing in Ocean environment
 - b) Application of hydrophobic materials in Ocean environment
 - > c) Wire-free instrumentation using smart phones(standard models eg: android, iphone)





Dr. G Suresh Kumar PhD, IISc (Bangalore), India Professor, Ocean Engineering 044-2257-4814; <u>gskumar@iitm.ac.in</u> http://www.oec.iitm.ac.in/Suresh_kumar_home.html



- Numerical Modeling of Fluid Flow through Fractured Reservoir/ Dual-Continuum
- Numerical Modeling of Coupled Heat and Mass Transfer / Enhanced Oil Recovery
- Anomalous Transport / Non-Darcian, Non-Fickian & Scale-Dependent Phenomena

Groundwater Flow and Contaminant Transport Modeling

Enhanced Geothermal Energy (EGS) System Radio-Nuclide Transport in Geo-Sphere



Dr. Suresh Rajendran

Assistant Professor

044-2257-4830; <u>sureshr@iitm.ac.in</u> http://www.doe.iitm.ac.in/sureshrajendran/

Area of Specialization

- 1. Numerical modelling of nonlinear ship motions and Loads
- 2. Hydro elasticity of ships and offshore structures
- 3. Manoeuvring of ships in waves
- 4. Dynamic Instability of Ships













Dr. Tarun K Chandrayadula PhD, George Mason University, USA Assistant Professor, Ocean Engineering 044-2257-4808; <u>tkchandr@iitm.ac.in</u> <u>http://www.doe.iitm.ac.in/tkchandr/</u>





Dr. R VIJAYAKUMAR PhD, Indian Institute of Technology Delhi, INDIA Asst Professor, Ocean Engineering 044-2257-4829; <u>vijay2028@iitm.ac.in</u> http://www.oec.iitm.ac.in/vijay2028.html



- Ship aerodynamics- smoke nuisance , ship helo interface
- Green ship initiative- Drag reduction methodology
- Autonomous underwater vehicles- Gliders
- Propeller studies- acoustic effect
- Astern Maneuvering study in shallow water



BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH



Dr. Vijay K G PhD, IIT Kharagpur, India Assistant Professor, Dept. of Ocean Engineering 044-2257-4812; <u>vijaykg@iitm.ac.in</u>



Research

- Title of the Project: Fluid Structure Interaction with Permeable Coastal Structures
- Research Areas (or Keywords): Coastal Engineering, Wave hydrodynamics, Fluid Structure Interaction, Dual Boundary Element Method
- Nature of work: Numerical and Experimental studies

Aim and Scope

- The main objective is to provide enhanced protection to coastal infrastructures.
- I propose to investigate various cost-effective barriers (thin slatted) through a systematic approach and quantify the wave forces.

Approach

- The preliminary approach will be based on the numerical studies. I'll develop a generalized numerical code based on the Dual Boundary Element Method (DBEM) to analyse the various configurations.
- Subsequent to finalizing the the well-behaved barrier configuration, I'll initiate works for the physical model studies in the 2m-wave flume in the department of Ocean Engineering, IIT Madras.



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF PHYSICS



LIST OF FACULTY

Abhishek Misra

Aravind G

Arul Lakshminarayan

Ashwin Joy

Ayan Mukhopadhyay

Basudev Roy

Chandra Kant Mishra

Dawood Kothawala

Dillip Kumar Satapathy

Ganesan A R

Harish Kumar N

<u>Jim Libby</u>

Mahaveer Kumar Jain (yet to be uploaded)

Manoj Gopalakrishnan

Manu Jaiswal

Markandeyulu G

Murugavel P

<u>B R K Nanda</u>

Neelima M Gupte

<u>Nirmala R</u>

Panchanana Khuntia

Pattabiraman M

Prabha Mandayam

Prabhat Ranjan Pujahari

Prafulla Kumar Behera

Prahallad Padhan

Prasanta Kumar Tripathy

Prasanta Kumar Muduli (Yet to be updated)

Prem B Bisht

Rajesh Narayanan (et to be uploaded)

Ramachandra Rao M S

Ramaprabhu S

Santhosh P N

<u>Satyanarayana M V</u>

Sethupathi K

Shantanu Mukherjee (yet to be uploaded)

Sivarama Krishnan

Somnath Chanda Roy

Srinivas V

Sriramkumar L

Subramanian V

Sudakar Chandran

Sunethra Ramanan

Sunil Kumar P B

Suresh Govindarajan

Vaibhav Madhok

Vidya Praveen Bhallamudi

<u>Vijayan C</u>

Yasir Iqbal



Dr. Abhishek Misra PhD, EE, IIT Bombay, India Assistant Professor, Physics 044-2257-4859; <u>abhishek.misra@iitm.ac.in</u>



- > Electronic transport in emerging quantum materials.
- Physics and applications of 2D materials and heterostructures.
- Low energy electronics for future AI and IoT based technologies.



BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH Back to Top



Dr. G Aravind PhD., TIFR Mumbai, India Associate Professor, Physics 044-2257-4863; garavind@iitm.ac.in



- Resonances in the anions of astrophysical relevance
- Photoelectron spectroscopy and iontrap studies on interstellar anions
- Multiphoton ionization studies on interstellar molecules

Anion Resonance	lon trap studies	Photoelectron Spectroscopy
The role of anion resonances in the formation of smaller anions from larger ones in space is studied.	Low energy collisions occurring in interstellar medium are studied at low temperatures using multipole iontrap	Photoelectron spectroscopy of anions to decipher the electronic energy levels of interstellar molecules is studied.
Atomic and molecular spectroscopy on interstellar atoms, molecules and ions		



Dr. Arul Lakshminarayan PhD, SUNY Stony Brook, NY, USA Professor, Physics 044-2257-4878; <u>arul@iitm.ac.in</u> <u>http://www.physics.iitm.ac.in/~arul</u>



- Nonlinear Dynamics: Hamiltonian and Quantum Chaos
- Quantum Information: Entanglement. Applications to many body systems
- Statistical Mechanics: Random Matrix Theory and Extreme Value Statistics





Dr. Ashwin Joy PhD, Institute for Plasma Research, Gandhinagar Assistant Professor, Physics 044-2257-4892; ashwin@iitm.ac.in https://physics.iitm.ac.in/ ashwin/



I work in soft condensed matter theory and fluid mechanics



-25 -75

Slow Moving Clusters in an Active Liquid





Dr. Ayan Mukhopadhyay 044-2257-4842; <u>ayan@iitm.ac.in</u>

Major Areas of Research

- Developing a new fundamental theoretical framework for strongly interacting & strongly correlated systems
- Applications of novel non-perturbative paradigm to confinement in QCD, Quark-Gluon Plasma and high-Tc superconductivity
- > To understand the fundamentals of the holographic correspondence of string theory
- Infrared issues in quantum gravity with ramifications on the information loss paradox of black holes and the stability of our Universe









Dr. Basudev Roy PhD, IISER Kolkata, India Assistant Professor, Physics 044-2257-4843; <u>basudev@iitm.ac.in</u> <u>http://basudevroy.wixsite.com/website</u>



- Soft matter using optical tweezers
- Cell biology and biophysics using optical tweezers
- High resolution imaging





Dr. Chandra Kant Mishra PhD, IISC,India Assistant Professor, Physics 044-2257-4860; <u>ckm@iitm.ac.in</u> <u>https://physics.iitm.ac.in/ckm</u>



- Gravitational Waves / Waveform modelling
- Gravitational Waves / Signal processing
- Gravitational Waves / Observational tests using dynamical spacetimes



PHYSICAL REVIEW D 96, 124010 (2017)

Measuring parameters that characterise the true nature of compact object in a binary undergoing merger

PHYSICAL REVIEW D 100, 104019 (2019)



Dr. Dawood Kothawala

PhD, IUCAA, PUNE Assistant Professor, Physics 044-2257-4848; <u>dawood@iitm.ac.in</u>



- Thermodynamically aspects of gravity, Black hole entropy
- Statistical mechanics and thermodynamics in curved space-time
- Implications of a "minimal space-time interval"

Thermodynamically aspects of gravity, Black hole entropy:

- Thermodynamic structure of gravitational field equations
- Hawking radiation and semi-classical aspects of black hole entropy
- Horizon thermodynamics in higher derivative theories

Statistical mechanics and thermodynamics in curved space-time:

- Thermal systems in curved space-times
- Entropy of selfgravitating systems and horizon entropy
- Interplay between quantum and thermal fluctuations

Implications of a "minimal space-time interval":

- Quantum field propagators in presence of a minimal length
- Minimal length and spacetime singularities
- Quantum field theories based on deformed quantization



Dr. Dillip Kumar Satapathy PhD, Humboldt University, Germany Associate Professor, Physics 044-2257-4899; <u>dks@iitm.ac.in</u> <u>https://www.physics.iitm.ac.in/people_files/faculty/dilip.html</u>

- Soft matter in confinement (confined fluids)
- Physics of complex oxide heterostructures
- Structure and dynamics of materials by X-ray and neutron scattering





Dr. A R Ganesan PhD, IIT Madras, India Professor, Physics 044-2257-4891; <u>arg@iitm.ac.in</u> <u>https://www.physics.iitm.ac.in/people_files/faculty/ganesan.html</u>

- Applied Optics and Laser Instrumentation
- Holography and Speckle Metrology
- Adaptive Optics and Vision Science




Dr. N Harish Kumar PhD, University of Hyderabad, India Professor, Physics 044-2257-4879; <u>nhk@iitm.ac.in</u> <u>http://www.iitm.ac.in/component/faculty/81/nhk/</u>



- Research Area/Focus 2 Spintronics
- Research Area/Focus 3 Novel Magnetic Materials







- Experimental particle physics
- > CP violation origin of the matter anti-matter asymmetry in the universe
- Neutrino physics studies with the India-based Neutrino Observatory (INO)





Jatin Rath Professor, Department of Physics +91 44 2257 4855, jkr@iitm.ac.in https://physics.iitm.ac.in/jkr

(Nano) materials



(CVD) Processing

<complex-block>

Devices

Overlay image



STEM SiGe np

Solar cells on cheap plastics

layers



Dr. Jayeeta Bhattacharyya PhD Tata Institute of Fundamental Research Assistant Professor, Physics 044-2257-4856; jayeeta@iitm.ac.in

Major Areas of Research

- Spectroscopic study of organic semiconductor's
- Time resolved measurements Ultrafast spectroscopy
- Investigation of carrier dynamics in THz domain









Dr. Kasiviswanathan S

PhD, IIT Madras, India Professor, Physics

044-2257-4868; <u>kasi@iitm.ac.in</u> https://physics.iitm.ac.in/kasi





Dr. C V Krishnamurthy PHD, IIT Madras, India Associate Professor, Physics 044-2257-4864; <u>cvkm@iitm.ac.in</u> <u>http://www.iitm.ac.in/</u>



- Acoustic/Elastic Wave Propagation (Simulations / Experiments)
- Electromagnetic Wave Propagation (Simulation / Experiments)
- Thermal physics (Molecular Dynamics based approach / Experiments)
- High resolution capacitance sensing (Computational / Experimental aspects)

Linear and Nonlinear Wave-Matter Interactions for Imaging Applications Heat absorption and transport in meso- and nano-scales (Fourier / non-Fourier heat conduction in complex media; and thermal imaging)

Dielectric response of materials on meso- and nano-scales



Dr. S Lakshmi Bala PhD, Madras University, India Professor, Physics 044-2257-4869; <u>slbala@physics.iitm.ac.in</u>



- Open quantum systems
- Dynamical systems
- Anholonomies in classical and quantum systems





Dr. Mahaveer Kumar Jain PhD, IIT Delhi, India Associate Professor, Physics 044-2257-4880; <u>mkjain@iitm.ac.in</u> <u>https://physics.iitm.ac.in/mkjain</u>







Dr. Manoj Gopalakrishnan PhD, Institute of Mathematical Sciences, India Associate Professor, Physics 044-2257-4894; <u>manojgopal@iitm.ac.in</u> <u>http://www.physics.iitm.ac.in/~manoj</u>

THEORETICAL STUDIES IN BIOPHYSICS AT THE LEVEL OF THE CELL

- Noise and its impact on cellular functions
- Active transport in the cell and its properties





Dr. Manu Jaiswal

Graphene & 2D systems Lab Associate Professor, Physics 044-2257-4893; manu.jaiswal@iitm.ac.in http://www.physics.iitm.ac.in/~manu_jaiswal/

Major Areas of Research

- Basic physics of 2D membranes. Graphene & 2D systems for flexible electronics
- Structure, dynamics of water in confinement. Water purification
- Interfacial phenomena in 2D. Devices and Sensors. Van der Waals heterostructures
- Mesoscopic physics of graphene & 2D systems
- Conducting polymers soft matter and electrical transport





Dr. G Markandeyu PhD, IIT Madras, Post-Doc, IIT Kharagpur& TIFR Professor, Physics 044-2257-4893; <u>mark@iitm.ac.in</u> <u>http://www.iitm.ac.in/physics</u>



Magnetic Materials and their applications

Magnetoimpedance in Fe and Co based ribbons and thin films Magnets with larger energy products than offered by ferrite magnets - proposal



Magnetic field sensor using ribbons / thin films exhibiting magnetoimpedance

Rare earth doped ferrite magnet materials and magnets Magnetostriction:

rare earth iron intermetallic; rare earth doped ferrites

Magnetostrictive active elements for high frequency applications and field sensing applications - proposal,



Dr. P Murugavel

Associate Professor, Physics Ph: 044-2257-4897; Email: <u>muruga@iitm.ac.in</u>

- Magnetic and dielectric studies on rare earth manganites RMnO₃ (R =rare earth)
- Magnetoelectric effect in ferroelectric-ferromagnetic nanocomposites and solid solutions
- Photoelectric effect on nonconventional oxide ferroelectrics





Dr. B R K Nanda

PhD, IIT Bombay Associate Professor, Physics

+91-44-2257-4887, <u>nandab@iitm.ac.in</u> http://www.physics.iitm.ac.in/~nandab/



Condensed Matter Theory & Computational

- Nanoscale Electronic and Magnetic Properties:
- Oxide Interfaces/Superlattices

3D Polaron

2D Polaron

2D Metalli

0.09

3D Metallic

2D Polaron

0.06

Graphene

(eV) کر (eV)

0

0.6





0.03

Scope for spintronic applications

Induced Spin density in monolayer graphene with a single vacancy S = n - n (+ve green ↑ ↓ -ve blue) Scope for magnetism in graphene

Energy Research:

Lithium based Cathode Materials



Electric field induced Fermi surface in hexagonal bilayer graphene:

Scope for hole and electron doping



Dr. Neelima M Gupte

Professor, **Physics**

044-2257-4861; gupte@iitm.ac.in https://www.physics.iitm.ac.in/people/faculty/gupte.php

Major Areas of Research

- Dynamics of spatially extended systems
- Explosive collective phenomena
- Dynamics and statistics of impurities in flows \succ



Explosive percolation





• Structure-Property relationships in Rare earth intermetallic compounds, alloys and oxides

Temperature (K)

T (K)

0

Angle, 20 (deg)

- Magnetic entropy changes near magneto-structural transitions materials for Magnetic cooling/heating applications
- Microstructure and Particle size dependence of magnetic properties



Dr. Panchanana Khuntia

Assistant Professor, Physics 044-2257-4847; <u>pkhuntia@iitm.ac.in</u> <u>https://physics.iitm.ac.in/pkhuntia</u>



Major Areas of Research

- > Design, growth, characterization, and investigation of novel quantum materials
- Exploring dynamic properties of correlated electron systems by NMR, µSR and Neutron Scattering encompassing a wide range of energy scales and sensitive to spin, charge and orbital degrees of freedom
- Microscopic insights into topological order and elementary excitations in quantum materials





Dr. M Pattabiraman PhD, IIT, Madras, India Associate Professor, Physics 044-2257-4890; pattu@iitm.ac.in http://www.iitm.ac.in/component/faculty/81/pattu/



Research Area: Experimental Atomic Physics and Quantum Optics

We study the coherent interaction of light with atoms in order to control and manipulate their optical properties

Applications:

- Measurement of ultra-low magnetic fields
- Low-noise frequency standards for atomic clocks



Dr. Prabha Mandayam PhD, California Institute of Technology Assistant Professor, Physics 044-2257-4853; prabhamd@iitm.ac.in http://www.physics.iitm.ac.in/~prabhamd



Major Areas of Research

- Quantum Error Correction : Modelling decoherence in physical systems and evolving schemes to tackle such decoherence efficiently
- Quantum Cryptography & Foundations : Understanding the interplay between complementarity and incompatibility





Dr. Prabhat Ranjan Pujahari PhD, Indian Institute of Technology Bombay Assistant Professor, Physics 044-2257-4844; p.pujahari@iitm.ac.in https://physics.iitm.ac.in/p.pujahari



- Experimental High Energy Heavy-Ion Physics in CMS at the Large Hadron Collider, CERN, Geneva
- Study the properties of a new form of matter at extreme conditions of temperature and energy density known as Quark Gluon Plasma (QGP)
- The physics of 'Origin of Mass' and the different phases of the early Universe
- Two-particle correlation, azimuthal anisotropy, charge balance function
- CMS silicon tracker detector up gradation program at LHC





Dr. Prafulla Kumar Behera PHD, KEK supported, Japan Associate Professor, Physics 044-2257-4898; <u>behera@iitm.ac.in</u> http://www.physics.iitm.ac.in/~behera



- Focus: Measuring properties of neutrinos using experimental tools. A member of India-based Neitrino Observatroy (INO). Actively involved in ICAL Detector development and detector simulation.
- Understand the matter and antimatter assymetry in the Universe and the origin of mass as part of the BELLE, KEK, Japan and ATLAS experiment, CERN, Switzerland.



Experimental High Energy Physics: Atmospheric Neutrino, e⁺e⁻ and pp collider physics. Back to Top



Dr. Prahallad Padhan

PhD, IIT Madras, India Associate Professor, Physics 044-2257-4884; padhan@iitm.ac.in

<u>1</u>

https://www.physics.iitm.ac.in/people_files/faculty/padhan.html

- Research Area/Focus 1 : Transition metal oxide Multilayers/Superlattices
- Research Area/Focus 2 : Thin film devices
- Research Area/Focus 3 : Transition metal oxide nanostructures





Dr. Prasanta Kumar Tripathy PhD, Utkal University, India Associate Professor, Physics 044-2257-4889; prasanta@iitm.ac.in http://www.physics.iitm.ac.in/~prasanta



- Calabi-Yau Compactification
- Black Holes, Super gravity
- Attractor Mechanism





Dr. Prasanta Kumar Muduli

PhD, IIT Kanpur, India Assistant Professor, Physics 044-2257-4837; muduli@iitm.ac.in





Dr. Prem B Bisht PhD, Kumaun University, India Professor, Physics 044-2257-4866; <u>bisht@iitm.ac.in</u> <u>https://www.physics.iitm.ac.in/~prem/</u>



- Whispering gallery modes of single microcavity; fluorescence microscopy
- Materials probed with ultrafast laser pulses for photonic applications



Ultrafast Lasers and Optical Amplifiers Lab





Dr. Rajesh Narayanan PhD, University of Oregon, USA Professor, Physics 044-2257-4858; <u>rnarayanan@iitm.ac.in</u> https://physics.iitm.ac.in/rnarayanan





Dr. M S Ramachandra Rao

Professor, **Physics**

Nano Functional Materials Technology Centre and MSRC 044-22574872; <u>msrrao@iitm.ac.in</u> http://www.physics.iitm.ac.in/~msrrao



Research Theme: "Oxide electronics, Thin Film Nanostructures and Energy Harvesting"

<u>Research Areas</u>: Physics and applications of oxide electronics; ZnO nanostructures for light emission; Physics of doping in ZnO; Physics of diffusion in oxide nanoparticles; Magnetic nanoparticles; Spintronics and Tunnel junctions; Nanocrystalline diamond for mechanical applications; CIGS/CZTS nano-ink for photovoltaic applications; Topological insulators; Physics of strongly correlated systems; Quantum effects in nanosystems; Materials for energy harvesting.

Physics and Applications of Nanostructured Thin Films and Nanomaterials





Dr. S Ramaprabhu PhD, IIT Madras, India Emeritus Professor, Physics 044-22574862; <u>ramp@iitm.ac.in</u> http://www.physics.iitm.ac.in/~ramp



Nanomaterials/Synthesis of Carbon NanoTubes and graphene; application to Fuel cell; PV; water purification; CO₂ capture; supercapacitor; biosensors

- Hydrogen Storage in Nanomaterials
 Nanofluids/synthesis: coolant application
- Nanofluids/synthesis; coolant applications



a) Carbon Nanotubes synthesized by CCVD technique

b) Graphene synthesized by hydrogen exfoliation

Hydrogen adsorption isotherms of (a) Nitrogen doped Graphene (N-G) and (b) Pd-N-G in the ranges 25-100°C and 0.1-4 MPa.





Dr. Santhosh P N PhD, University of Pune , India Professor, Physics 044-2257- 4882 http://www.iitm.ac.in//people_files/faculty/santosh.html

- Experimental Condensed Matter Physics:/Multiferroics
- Structure-property correlations, DFT calculations of Advanced Oxide Materials
- Magnetic and semiconducting nano particles





- Quantum Optics/ Optical Coherence, Non-classical states of radiation
- Quantum Mechanics/ Entanglement role of squeezing and antibunching, atom-radiation interaction
- Fresnel Optics/ connection between squeezing and Fresnel propagation

I am interested in non-classical states of radiation like squeezed and antibunched states - its generation and applications to novel sources of radiation. I am also interested in interaction of such states of radiation with atoms and molecules for the purposes of lasing. In this process I also study the role of entanglement in quantum optics. Recently, I am looking into the connection between Fresnel optics and squeezing. Essentially, my interests are in the dynamics of atom(s)-radiation interaction(s) with applications to novel sources of light.



Dr. K Sethupathi PhD, Moscow State University, Russia Professor, Physics 044-2257-4875; <u>ksethu@iitm.ac.in</u> <u>http://www.iitm.ac.in/</u>



- > Novel materials in the bulk, thin film and nanocrystalline forms
- High Temperature Superconductors and
- Cryogenic Insulation

Novel materials that exhibit large magnetoresistance for magneto resistive sensors and spintronic device applications Magnetic refrigeration materials for cooling applications New materials for electronic cooling



Dr. Shantanu Mukherjee PhD, University of Wisconsin-Milwaukee, USA Assistant Professor, Physics 044-2257-4845; <u>shantanu@iitm.ac.in</u> <u>https://physics.iitm.ac.in/shantanu</u>



Dr. Sivarama Krishnan, PhD,

Assistant Professor, Physics 044-2257-4857; srkrishnan@iitm.ac.in



Femto- and atto-second physics of nanoscale atomic & molecular systems

Synchrotron physics of nanoscale systems

Dynamics in Nanoscale superfluids





Nanolithography next generation technologies



Dr. Somnath Chanda Roy PhD, IIT Delhi, India Associate Professor, Physics 044-2257-4886; <u>somnath@iitm.ac.in</u> <u>http://www.physics.iitm.ac.in/~somnath</u>



- Synthesis and characterization of metal-oxide nanostructures and thin films
- Study of Electronic conduction and Photo-catalytic properties
- Use of nano-materials for clean Energy and Environment







Dr. L Sriramkumar PhD, IUCAA, Pune Professor, Physics

044-2257-4854; <u>sriram@iitm.ac.in</u> http://www.physics.iitm.ac.in/~sriram/

- Origin of perturbations during inflation
- Signatures on the Cosmic Microwave Background (CMB) 344
- Semi-classical gravity and the physics of black holes

Origin of perturbations during inflation

- Deviations from slow roll and features in the primordial power spectrum
- Generation of primordial non-Gaussianities
- Evolution of power and bispectra post inflation

Signatures on the CMB

- Comparison of inflationary models with the recent WMAP and Planck data
- Efficient numerical computation of inflationary bispectra (figure above)
- Imprints of primordial bispectra on the CMB

Semi-classical gravity and the physics of black holes

- Issues related to the origin of Hawking radiation and black hole entropy
- Possible quantum gravitational corrections
- Phenomenological models of quantum gravity







Dr. V Subramanian

PhD, IIT Madras, India Professor, Microwave Laboratory, Physics 044-2257-4883; <u>manianvs@iitm.ac.in</u> http://www.physics.iitm.ac.in/~manianvs/index.html



- Dielectrics, Relaxors and Multiferroics
- Photonic Crystals and Metamaterials
- Non-Destructive Evaluation at Microwave Frequencies
- Microwave Imaging
- Magneto-impedance studies at microwave frequencies



Negative Refraction - Slabs Oriented at 60°



Microwave Near-Field Imaging of a Stripline on RT Duroid Substrate





Spatial Beam Compressor - Based on Photonic Crystal


Dr. Sudakar Chandran PhD, IISc Bangalore, India Associate Professor, Physics 044-2257-4895; csudakar@iitm.ac.in https://home.iitm.ac.in/csudakar/



- Materials for energy generation (solar cells) and storage (Li-ion batteries) applications
- High power density cathode and anode materials for quick charge Li-ion batteries
- Novel multifunctional materials with interesting properties for advanced applications
- Defect structure property correlations on composition/microstructure tailored materials
- Nanomaterials for solar cell and LED applications



Nanostructured metal oxides for Li ion battery cathode and anode materials; controlling the crystal defect structures and the microstructure to tune the specific capacity and the power density





Functional DSSC, materials for QDSSC, Perovskite solar cell applications, bandgap engineer- ing sensitizers, fabricating high in performance photoanodes for enhancing efficiency

Multifunctional materials and Defect-structure property correlations



Role of oxygen/nitrogen defects and surface/interface effects on the physical properties of semiconducting oxides and nitrides and multiferroics; electrical, optical and magnetic properties studies

MULTIFUNCTIONAL MATERIALS LABORATORY (MFML)

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Dr. Sunethra Ramanan

PhD, The Ohio State University, USA Assistant Professor, Physics 044-2257-4871; suna@iitm.ac.in; <u>suna@physics.iitm.ac.in</u> <u>http://www.physics.iitm.ac.in/~suna</u>



- Effective Field theories and Renormalization Groups
- Nuclear Structure





Dr. P B Sunil Kumar PhD,1995 Raman Research Institute, India Professor, Physics 044-2257-4876; <u>sunil@iitm.ac.in</u> http://www.physics.iitm.ac.in/~sunil



- Soft Condensed Matter Physics
- Biological Physics
- Computational Physics



Lipid Membranes: Modeling equilibrium and dynamical properties of lipid membranes and membraneprotein complexes. Response of membranes to external forces.



Active soft matter: Dynamics of molecular assemblies, that convert chemical energy to mechanical work internally.



Dynamics of polymers.: Rheology and shear induced transitions in polyelectrolytes and living polymer suspensions. Developing coarse grained models for polymers.

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Dr. Suresh Govindarajan PhD, University of Pennsylvania, USA Professor, Physics 044-2257-4867; <u>suresh@iitm.ac.in</u> <u>http://www.physics.iitm.ac.in/~suresh</u>

- String Theory and Conformal Field Theory
- Black Holes and Counting of BPS states
- Mathematical Physics (Partitions, Mathieu Moonshine, Modular Forms)





Dr. Vaibhav Madhok

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Major Areas of Research

- Physics of Information, Quantum Information Theory
- Chaos: Quantum and Classical Chaos
- Mathematical Biology and Complex Systems
 - Quantum Computation

Quantum-Classical Transition

How do species arise?



Drawing by Michael Ramus, 1991. © American Institute of Physics







Dr. Vidya Praveen Bhallamudi PhD, Ohio State University, USA Professor, Physics and EE 044-2257-4948; <u>Praveen.bhallamudi@iitm.ac.in</u> https://physics.iitm.ac.in/praveen.bhallamudi



- Condensed Matter experimental
- Microscopy: Fluorescence and Scanned probe microscopy
- Magnetism and Magnetic Resonance





Dr. C Vijayan Professor, Physics 044-2257-4877; <u>cvijayan@iitm.ac.in</u> www.physics.iitm.ac.in/~cvijayan



Major Areas of Research

Light-Matter Interaction in Novel Nano Composites and Random Media, Nanophotonics and Plasmonics





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Dr. Yasir Iqbal PhD, University of Toulouse, France Assistant Professor, Physics 044-2257-4841; yiqbal@iitm.ac.in https://physics.iitm.ac.in/yiqbal



- Frustrated Magnets
- Quantum Spin Liquids
- Numerical Quantum Many-Body Techniques

