Title	Remark	Faculty
List of Projects for the 2021-2022-I		
Finite density effects on reheating and its implications for dark matter production		Debtosh Chowdhury
Primordial black holes as a dark matter candidate		
Investigation of arrow of time from multiscale physics perspective		Mahendra Verma
Modelling and forecasting COVID-19 pandemic using Monte-Carlo simulations		
Investigation of anisotropic turbulence using structure functions		
Magnetic field generation in neutron stars		
Study of convergence of Penalty method for inverse Kohn-Sham problem of density functional theory		Manoj K. Harbola
Study of accuracy of orbital-free kinetic energy functionals in connection with the Pauli potential		
Study of exchange-correlation potential in Hartree theory via quantal density-functional method		
Electronic and optical study in two-dimensional materials	This project is for MSc-PhD dual degree students or MSc students. The prerequisite is a good underrgraduate level understanding of solid state physics, electronics and quantum mechanics.	Sudipta Dubey
Elastic instabilities in Soft Matter	for MSc 2 yr and MSc PhD Dual Degree students	Krishnacharya
Manipulation of wetting behavior using external stimuli		
Dynamical systems analysis of bouncing cosmologies.		Kaushik Bhattacharya
Study of causality problem in teleparallel gravity.		
Thermal convection in ferrofluids (M. Sc or advanced UG students)	A background of fluid dynamics is preferred. Numerical knowledge is required.	SupratikBanerjee
Turbulence in polar microswimmers (M. Sc or advanced UG students)		

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List of Projects for the 2021-2022-I		
Exceptional points and asymmetric mode conversion in optical waveguides		Saurabh Mani Tripathi
Exceptional points in plasmonic waveguides		
machine learning in physics.		Dipankar Chakrabarti
Pressure and shear distributions in proton.		
A topic in Photonic Crystals	Both the topics are only for 5th yr-(BS)MS / 2nd yr M.Sc projects in 2021-22-I semester (essential: should have completed at least one Optics-related course at IITK)	R.Vijaya
A topic overlapping MHz-GHz-THz-PHz		
Study of timing and spectral properties of a micro-quasar in our galaxy		J S Yadav
Quantum memories with higher order spin systems	Phy 563/565	Saikat Ghosh
Out of time order correlations using post-processed statistical analysis	Phy 500/501/502:	
Side-band cooling of molecular and phononic systems towards quantum ground state.		
Adiabatic Gauge Potentials in Periodically Driven Systems and their Applications.		Arijit Kundu
Non-linear Responses in Quantum Systems and their Applications.		
Shear Induced Deviations in the Dispersion Behavior of Polymer Grafted Nanoparticles - A Molecular Dynamics Study	for M. Sc. Students	Sivasurender Chandran
Lifetime of Preparation-Induced Nonequilibrium Behavior of Polymer Melts	for B. Sc. students	
Scattering kernels for exactly solvable deformations	PHY557/558	Diptarka Das
Integrable theories and techniques	PHY500/501/502	
Thermalization in lattice and matrix models	PHY563/565	
Bacteria swimming dynamics in complex environments.		Manas Khan
Vacancy defect relaxation in entropic colloidal crystals.		
Rheology of micellar solution using molecular simulations.		taraknath
Structures and elastic properties of mixed lipid bilayers.		

Title	Remark	Faculty
List of Projects for the 2021-2022-I		
Understanding plasma floating potential fluctuations in cold atmospheric pressure micro-plasma jets : role of thermal, fluid, and ionization driven instabilities		Sudeep Bhattacharjee
Modeling micro-conical array of field emitters on atomically heterogeneous surface, created using plasma based low energy ion beams role of structure formation and heterogeneity introduction on field emission*		
heoretical calculation of quantum mechanical corrections to the thermophysical and transport properties of Helium at low temperatures :employing insights from Molecular Dynamics simulation		
Auger electron spectroscopy - energy and angular distribution.	This would involve data analysis of experimental results along with reading the basics.	Aditya H. Kelkar
Design and simulation of an ion trap/penning ionization source using SIMION.	This is mainly dealing with ion optics simulation and design.	
Review of adaptive dynamics in evolutionary game theory	PHY501A :dual-degree project	Sagar Chakraborty
The tragedy of the commons in nonoverlapping population	MSc project	
The tragedy of the commons in dispersing population		
Evolutionarily stable strategy and state in bimatrix games		
Coevolution of cooperation, synchronization, and rationality		
Low dimensional models in turbulence	BS project	
Overlap of information and game theories		
Swarm Intelligence of a Self-organized Super-organism: "Mind" of an Ant Colony without a Brain		D. Chowdhury
Noise-induced Transitions in Complex Adaptive Ecosystems: Dynamic Forest Vegetation Pattern		

Title	Remark	Faculty
List of Projects for the 2021-2022-I		
Numerical Simulation of Pulse propagation in highly dispersive media		Harshawardhan Wanare
Angular spectrum method for Orbital Angular Momentum beams and propagation through turbulence		
Vectorial beams and energy flow across optical elements		
Galilean Conformal Field Theories with additional symmetries		Arjun Bagchi
Modular aspects of BMS field theories		
Micromagnetic simulations of ultrathin ferromagnetic thin films using OOMMF.		Chanchal Sow
Band structure calculations of transition metal oxides using Quantum Expresso		
Topology of quantum critical systems		Amit Dutta
Quantum dynamics in connection to chaos		
PROJECT TITLE: TOPOLOGICAL DEFECTS		Joydeep Chakrabortty