

# Motor Proteins and Molecular Motors

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## Overview

Living cells are complex dynamic heterogeneous systems that operate under non-equilibrium conditions, supporting a variety of biochemical and biophysical processes, including transcription, gene replication, translation, cell motility, cellular transport, cell division and many others. A key role in sustaining cellular functions is played by several classes of active enzymatic molecules, which are generally called motor proteins or biological molecular motors. Motor proteins are able to transfer the chemical energy of reactions that they catalyze into the mechanical work needed to maintain various cellular processes. It is one of the most important fundamental problems to understand how such transformations are taking place.

Significant research activities have been undertaken in order to explain the molecular mechanisms of motor protein functioning. Furthermore, these efforts are also stimulated by the technological and medical needs of developing new drugs, nanoscale devices and materials that would lead to desirable biochemical and biophysical properties of biological molecular motors. Multi-disciplinary nature of motor proteins has attracted researchers from various fields, including Cell Biology, Biochemistry, Biophysics, Theoretical Chemistry, Materials Science and Bioengineering. Thus, it is critically important to develop a unified molecular picture of motor protein dynamics.

Our goal is to present a systematic theoretical framework for understanding motor proteins, which is based on fundamental concepts and ideas from Physics and Chemistry. The course will be presented using simple arguments without heavy mathematical derivations in order to develop a more intuitive physical understanding of these complex phenomena. This will also help to broaden the potential audience.

<b>Modules</b>	<b>A: Duration</b> : <b>04 February 2019 - 08 February 2019</b> <b>B: Venue</b> : <b>Indian Institute of Technology Ropar</b> <b>Number of participants for the course will be limited to forty.</b>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>• Executives, engineers and researchers from manufacturing, service and government organizations including R&amp;D laboratories.</li><li>• M.Sc/ M.tech Students/ Ph.D. Scholars/ Postdocs or Faculties from reputed academic institutions and technical institutions.</li></ul>
<b>Fees</b>	The participation fees for taking the course is as follows: <b>Participants from abroad :</b> <b>US \$ 500</b> <b>Industry/ Research Organizations within India:</b> <b>Rs. 10000</b> <b>Faculty/Staff from Academic Institutions within India:</b> <b>Rs. 5000</b> <b>Students from India:</b> <b>Ph.D./Post-doctoral</b> <b>Rs. 2000</b> <b>M.Tech./M.Sc.</b> <b>Rs. 1000</b> The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

## The Faculty



**Anatoly B. Kolomeisky** is a Professor of Chemistry and Chemical and Biomolecular Engineering at Rice University in Houston, Texas. He is also a Primary Investigator at the Center for

Theoretical Biological Physics at Rice University. He is a Fellow of the American Physical Society (2015). His research interest includes concern the mechanisms of motor proteins, cytoskeleton proteins dynamics, protein nucleation and crystallization, development of morphogen gradients, facilitated target search of proteins on DNA, polymer translocation and non-equilibrium transport through channels and pores, kinetic proofreading mechanisms and the current generation in porous materials.



Dr. Arvind Kumar Gupta is an Associate Professor in the Department of Mathematics and presently the associate Dean, Sponsored research at IIT Ropar. His research interests lie in the areas of

statistical mechanisms of motor protein transport, mathematical modeling of traffic flow, lattice hydrodynamics modeling and cellular automata.

## Course Co-ordinator

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