

PHY606A  
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Soft Matter: Concepts and Methods  
Dr. Manas Khan

Course Content :

<b>1</b>	<b>Review of fundamentals</b> Colloids, polymers, amphiphiles, liquid crystals Forces, energies, timescales Brownian motion and related topics Fluctuation dissipation theorem Colloidal dispersions van der Waals attractions, electrostatics, ions, and DLVO Structure of macromolecules Viscoelasticity Surface tension, interfacial tension and capillary action Wetting, adhesion and friction	<b>10</b>
<b>2</b>	<b>Microscopy Techniques</b> Bright field, polarization, phase contrast microscopy Fluorescent and confocal microscopy Imaging, Image processing and particle tracking	<b>6</b>
<b>3</b>	<b>Rheology</b> Measuring stress-strain properties Different measurement geometries	<b>6</b>
<b>4</b>	<b>Microrheology</b> Passive microrheology Active Microrheology	<b>6</b>
<b>5</b>	<b>Optical Micromanipulations</b> Optical forces at different regimes Calibration of optical forces Measuring and applying forces using optical tweezers	<b>6</b>
<b>6</b>	<b>Scattering techniques</b> Dynamic light scattering Diffusive wave spectroscopy Small angle X-ray / neutron scattering (SAXS / SANS)	<b>6</b>
<b>7</b>	<b>Soft Matter Food Physics</b> (Additional lectures if time permits or in weekends) Physics of foodstuffs and cooking	<b>2</b>

Text books and References:

**Textbook** – “Soft Condensed Matter” by R.A.L. Jones.

**References**–“Soft Matter Physics” by M. Doi,

“Fundamentals of Soft Matter Science” by Linda S. Hirst;

Additional topic-specific references will be communicated to the class in time of teaching.

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