

Syllabus for CH924 (2006)

Topic	Biology	Physics/Chemistry	Mathematics
Cellular homeostasis	membrane potential, Donnan equilibrium, electrogenic pump	diffusion, osmosis	manipulating logarithms, analysis of equilibrium of system of ODEs
Signal transduction I: differential pressure & shear stress gauging in endothelial cells	stretch-sensitive ion channels, cytoskeleton: actin filaments	deformation theory: stresses & strains, Hooke's law	geometry, trigonometry
Signal transduction II: intracellular pathways	2 <sup>nd</sup> , 3 <sup>rd</sup> . . . messengers, amplification cascade, scaffold sites	reaction kinetics	elementary phase plane analysis
Genetic switches: 2-gene switch, 4-gene oscillator	transcriptional regulation, feedback	reaction kinetics	further phase plane analysis