MCB 100B Spring 2014

Part A. Specificity and Signaling - John Kuriyan
Textbook resources:
1. The Molecules of Life by Kuriyan, Konforti & Wemmer. Chapters 11, 12, 13 and 17. (The course will build on material covered in MCB 100A).
2. Lehninger's Biochemistry, Chapter 12.

Lecture 1 Binding affinity and specificity in molecular interactions. Analysis of binding with multiple targets.

Lecture 2 Protein-protein interactions, protein-nucleic acid interactions.

Lecture 3 Random walks, diffusion and Brownian motion. Chemotaxis.

Lecture 4 Molecular flux and transport. Fick's laws. Measurement of diffusion constants.

Lecture 5 Membrane potentials, the Nernst Equation, free energy of transporting ions

Lecture 6 Ion pumps and transporters

Lecture 7 The transmission of action potentials in neurons

Lecture 8 Second messenger and G protein-coupled receptor signaling

Lecture 9 Receptor tyrosine kinases and protein-protein interaction networks

Part B. Introduction to Metabolism and Molecular Physiology. – Mark Alper
Textbook resources:
Lehninger's Biochemistry. Chapter's 10, 13, 14, 15, 16, 19.

Lecture 1. Introduction to Metabolism.

Lecture 2. Bioenergetics.

Lecture 3. Oxidation and reduction.

Lecture 4. Enzyme mechanisms and glycolysis.

Lecture 5. The Krebs Cycle.

Lecture 6. Membrane and electron transport.

Lecture 7. Oxidative phosphorylation.

Lecture 8. Glyoxylate pathway and the pentose shunt.

Lecture 9. Sugars and the regulation of pathways.

Part C. Molecular Physiology continued – Dave Savage
Textbook resources:
Lehninger's Biochemistry. Chapter's 14, 15, 17, 18, 19, 20, 21, 22.

Lecture 1. The regulation and storage of sugar in the cell.

Lecture 2. Techniques for quantitating metabolism.

Lecture 3. Fatty acid degradation.

Lecture 4. Amino acid degradation and the urea cycle.

Lecture 5. Photosynthesis and the Light Reactions.

Lecture 6. Carbon assimilation and the Dark Reactions.

Lecture 7. Lipid Biosynthesis.

Lecture 8. Synthetic Biology and Engineering Metabolism.

Lecture 9. Amino acid and nucleotide biosynthesis.

Lecture 10. Cancer and metabolism.