**BIOCHEMISTRY 673: REGULATION OF METABOLISM** **SPRING, 2012**
**TUTH 1:00-2:15, PHYSICS 0405** **SYLLABUS**

**Assoc. Prof. Jason D. Kahn, Dept. of Chemistry and Biochemistry, UMCP**
Office: Chemistry 2500A (Biochemistry, Wing 5 of the Chemistry complex)
Office hours: Thurs. 11:00 a.m.-12:30 p.m., Weds. 2:00 p.m.-3:30 p.m., Chemistry 2500A; there is no TA for the course
Contacting me: jdkahn@umd.edu much preferred to 301-405-0058.
Web and email: Class documents will be available on ELMS (elms.umd.edu), and an e-mail reflector.

This course will cover several examples of regulation and regulatory networks in biochemistry and molecular cell biology. It will be a combination of lectures, discussions of current literature, and student presentations. The final grade will be will be based on class participation, a student presentation and short paper, one in-class exam, and the final exam.

The general areas to be covered will be the following:

- Transcriptional regulation by nuclear hormone receptors and the role of Hsp90
- Bacterial chemotaxis and its regulation
- Metabolism of carbohydrates and fats, insulin signaling, and diabetes
- G proteins and G-protein coupled receptors
- Identification, modeling, emergent properties, and creation of gene regulation networks

Unifying themes:

- How are the activities of enzymes and other proteins regulated at the molecular level? Mechanisms include subcellular localization, phosphorylation cascades and other covalent modifications, proteolysis, receptor dimerization/multimerization/trafficking, allostery, synthesis of second messengers, and mechanical strain.
- What are some essential techniques used for the analysis of signal transduction pathways and networks? These will be explored largely through in-class discussion of papers from the research literature.
- What additional complexities arise when we consider networks rather than just isolated proteins or pathways?

**Textbooks and Other Sources:**

Recommended:

B.D. Gomperts, I.M. Kramer, and P.E.R. Tatham (2009). *Signal Transduction*. 2nd edition. Elsevier Academic Press. Useful background. Available at Amazon. ISBN 978-0-1-2369441-6.

U. Alon (2007). *An Introduction to Systems Biology: Design Principles of Biological Circuits*. Chapman & Hall/CRC/Taylor and Francis Group. Available at Amazon. ISBN 978-1-5-8488642-6.

Other sources:

D. S. Latchman (2003). *Eukaryotic Transcription Factors*. 4th ed. Academic Press.

Lodish, Berk, Zipursky, Matsudaira, Baltimore, and Darnell (2000). *Molecular Cell Biology*. 4th ed. W.H. Freeman. Or Alberts et al., Molecular Biology of the Cell, 4th ed. Both are searchable free on the web at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=Books.

E. Davidson (2006). *The Regulatory Genome: Gene regulatory Networks in Development and Evolution*. Academic Press.

## Procedures and Grading

The final grade will be will be based on class participation (50 pts), a student presentation and short paper (100 pts), one in-class exam (100 pts), and the final exam (150 pts). Your course grade will be based on your performance relative to a curve and to my expectations. I anticipate roughly 50:50 A's:B's. The curve does not require C's and D's but I will give them without hesitation if necessary. Plus/minus final grades will be given.

The class participation grade (50 pts over the semester) will be assigned based upon your ability and willingness to comment accurately and critically on assigned readings during class periods set aside for discussion. For example, you may be called upon to explain how the experiment in Figure 3 works, or propose the most useful next steps are in dissecting a pathway, or discuss the relationship between the paper we are reading and other work in the field that we have covered. I also encourage discussion during lectures, but it will not affect grading.

The student presentation and paper will be a ~30 minute presentation of a research paper in one of our focus areas, laying out the importance of the work, the experimental rationale, the results, and any problems with it. You will provide the class with a reference to your paper in advance and a 2-page summary of your presentation.

The midterm exam and the final will cover lecture material and the required reading. If you absolutely must miss the midterm, you must call me in advance or within 24 hours after the exam, and you must also present a valid University excuse (please secure a note from the Health Services if possible). Do not miss the final exam.

I expect and enforce adherence to the University's Code of Academic Integrity, found at http://www.studenthonorcouncil.umd.edu/code.html. I expect you to write out and sign the University honor pledge on each exam: "**I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination."** Also, you are hereby notified that "plagiarism" will be interpreted in its broadest sense: ideas from others must be referenced; words from others must be in quotation marks and referenced. Paraphrasing without referencing will be considered plagiarism. Extensive paraphrasing from a single source is unacceptable, referenced or not. As a condition of remaining in the class, you are specifically directed to read my own web page on this: http://www.biochem.umd.edu/biochem/kahn/plagiarism.html.

## Course Schedule

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| January 26, 31, February 2, 7, 9 | Nuclear Hormone Receptor Signaling |
| February 14, 16, 21, 23, 28 | Bacterial Chemotaxis |
| March 1, 6, 8, 13 | Insulin Signaling and Diabetes |
| **March 15** | **Midterm Exam** |
| March 20, 22 | Spring Break |
| March 27, 29 | Insulin Signaling and Diabetes |
| April 3, 5, 10, 12, 17 | G-proteins and GPCRs |
| April 19, 24, 26, May 1, 3, 8 | Systems Biology and Networks |
| **May 16** | **Final Exam** |