

1. **Title:** EE260: Computational Bioimaging
2. **Prerequisite:** Advanced calculus, Programming Languages, EE140, or EE152, or EE146, or consent of instructor
3. **Instructor:** Bahram Parvin
4. **Time and Location:** Friday, 11-2pm, Stat-Comp 1626-D
5. **Units:** 4 (3 lecture and 1 lab)
6. **Description:** The course introduces computational bioimaging within the context of Systems Biology. Instructor will provide a review of molecular and cell biology for Graduate students majoring in Engineering and Computer Science and proceed with issues and techniques in computational bioimaging and bioinformatics systems.
7. **Course outline:**
 - *Week one:* review of cell and molecular biology for Engineers/Computer scientists and overview of the course project
 - *Week two:* review of microscopy techniques, experimental design process, and computational methods in cytometry
 - *Week three:* Introduction to variational calculus and differential geometry
 - *Week four:* Introduction to variational approach for segmentation and shape analysis
 - *Week five:* Level set methods for morphological analysis
 - *Week six:* Spatial voting techniques for morphological and protein localization
 - *Week seven:* Learning methods for shape representation (PCA and ICA)
 - *Week eight:* Experimental design, high throughput screening informatics systems, and project presentation by students
 - *Week nine:* Large scale imaging bioinformatics systems and project presentation by students
 - *Week ten:* Final exam
8. **References:** Instructor will provide papers and handouts. Other references are:
 - Sethian, J. “Level Set Methods and Fast Marching Methods: Evolving Interfaces in Computational Geometry, Fluid Mechanics, Computer Vision, and Materials Science,” Cambridge University Press, 1999.
 - Andres Kriete (editted), “Systems Biology,” Elsevier, 2006, In press.
 - Bruce Alberts, et al, “Molecular Biology of the Cell,” 4th edition, Garland Publitioning, Inc.
 - **Grading:** project presentation
 - **Quarter:** Fall 2005