**BIOINFORMATICS IN MEDICINE AND BIOLOGY**
Biol-UA 103

**Sessions:** One 2 hour and 45-minute lecture class per week (Tuesday 2:00-4:45)
Office Hours (TBA)

**Location:** Computer laboratory classroom

**Required texts:**  
*R in Medicine and Biology*  
Paul D. Lewis (2010, Jones & Bartlett Publishers)

**Instructor:** Professor Manpreet S. Katari

**Course Aims:** The goal of the course is to give students “hands-on” experience with Biomedical data sets related to disease. The students will learn basic concepts in statistics and the programming language R, in order to analyze different forms of high-throughput genomic data.

**Prerequisites:** Principles of Biology I  
Principles of Biology II

**Grading:**

- Weekly assignments: 40%
- Midterm: 15%
- Final: 15%
- Final Project: 20% (presentation 5%)
- Attendance/Participation: 10%

**Course Description:**

The course is divided into three sections: 1) Introduction to R 2) Doing Statistics in R, and 3) Analysis of Biomedical data using R. In the last section of the course, we will start using several packages, including bioconductor, to analyze high throughput disease related datasets such as Microarray, array-CGH (Comparative Genome Hybridization) and also do GO-term enrichment analysis. By the end of the course students will have a good understanding of R and be able to apply their knowledge to any dataset.

**Assignments and Projects:**

Homeworks and Projects will be assigned at the end of class every week and will be due at the beginning of following class. Late assignments and projects will be penalized 10% for each day it is late. The midterm will cover statistics and programming in R. For the final projects, students will be assigned a dataset that they must analyze and present at the end of the year.
Course Syllabus

Part I: Introduction to R

Week 1: Fundamentals of R: Packages and Data structures

  Reading: Chapters 2 & 3

Week 2: Descriptive Statistics and Plotting Data

  Reading: Chapters 4 & 10

Week 3: Inferential Statistical Analysis & Importing and Exporting Data in R

  Reading: Chapter 6 & 11

Week 4: Apply function family and writing functions in R

  Reading: Chapter 12.

Part II: Statistics in R

Week 4: Looking for association: Correlations and Hypergeometric test

  Reading: Chapter 11

Week 5: Code Review

Week 6: Midterm

Part III: Analysis of Biomedical Data

Week 7: Retrieving Public Microarray Datasets

  Reading: Chapter 18 & 19

  Select Experimental dataset for Final Project.

Week 8: Annotating Microarray Gene Lists

  Reading: Chapter 20

Week 9: Multivariate Analysis in R.

  Reading: Chapter 13.

Week 10: BioMarker Discovery
Reading: TBD.

Week 11: RNA-seq

Reading: TBD.

Week 12: CHIP-seq

Reading: TBD.

Week 13: Case Studies/Review

Week 14: In class presentation

Finals Week: Final Exam.