

## BISC576: Practical Statistics and Bioinformatics

**Time and Location:** Tue 2:00 – 3:50 pm, RRI-301

### Instructors:

Dr. Andrew Smith	213-821-4142	andrewds@usc.edu	RRI 408E
Dr. Remo Rohs	213-740-0552	rohs@usc.edu	RRI 404C

### Description:

This course provides basic training and practical experience in statistics and bioinformatics. Students will learn basic statistical and bioinformatics methods and apply them to the state-of-the-art biological applications.

### Goals:

- To develop basic analytical skills in statistics and bioinformatics.
- To gain familiarity and competency in statistics and bioinformatics software packages applicable to molecular biology, genomics analysis, and structural bioinformatics and their underlying principles.

### Recommended Textbooks

Computational Genome Analysis. An introduction by Deonier, Tavare and Waterman (Springer 2005)

Introduction to Proteins. by A. Kessel and N. Ben-Tal (Chapman & Hall/CRC Press, 1<sup>st</sup> Edition, 2011).

The Molecules of Life. First Edition, 2012. J. Kuriyan, B. Konforti, and D. Wemmer. Garland Science.

The Practice of Statistics in the Life Sciences (second edition) by Brigitte Baldi and David S. Moore (W.H. Freeman 2010).

Bioinformatics: Sequence and Genome Analysis (second edition) by David W. Mount.(Cold Spring Harbor Lab 2004)

**Course Contents:** This course will cover three major areas of bioinformatics: statistics for biological sequence analysis, computer algorithms for sequence alignment, molecular structural analysis. More specifically, it includes the following topics: discrete and continuous random variables, parametric and nonparametric statistics, NCBI resources, pairwise sequence alignment, multiple sequence alignment, BLAST searching, phylogenetic trees, UCSC genome browser, clustering, analysis of the high-throughput sequencing data, molecular structure analysis and prediction.

**Homeworks and Grade:** Eight sets of homework will be assigned by the instructors. Students should hand in each homework by the specified due date. Points will be

subtracted for projects submitted after the due date. The course grade will be based upon homeworks.

### **Tentative Course Schedule:**

<b>Class</b>	<b>Topic</b>
1	Introduction to probability (08/27/13) (Smith)
2	DNA motif finding (09/03/13) (Smith)
3	Introduction to computers and algorithms (09/10/13) (Smith)
4	Pairwise sequence alignments (09/17/13) (Smith)
5	Multiple sequence alignments (09/24/13) (Smith)
6	Hierarchical clustering (10/01/13) (Smith)
7	Blast and statistics (10/08/13) (Smith)
8	Protein I: Secondary structure elements and structural alignment (10/15/13) (Rohs)
9	Protein II: Homology modeling and molecular simulations (10/22/13) (Rohs)
10	Protein III: Function prediction and annotation (10/29/13) (Rohs)
11	RNA: Secondary structure prediction and folding (11/05/13) (Rohs)
12	DNA: Sequence-dependent structure analysis and prediction (11/12/13) (Rohs)
13	Protein-Nucleic acid interactions: Annotation of readout modes (11/19/13) (Rohs)
14	High-throughput approaches to derive DNA binding specificity (11/26/13) (Rohs)
15	Protein-Protein interactions: Docking and energetics of binding (12/03/13) (Rohs)

### **Statement for Observance of Religious Holidays:**

The university's policy grants students excused absences from class to observe religious holidays (<http://orl.usc.edu/religiouslife/holydays/absences.html>). In this case, please contact your instructor in advance to agree on alternative course requirements.

### **Statement for Students with Disabilities**

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

### **Statement on Academic Integrity**

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus*, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: . Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.