

# **BIOL 505/SCI 477**

## **Bioinformatics/Exploring Genomes**

**Fall 2009**

**Instructor:**

**Dr. Paul T. Smith**

Science Bldg I, Room 219

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Office Hours: MW: 2:00-2:30PM, TTH 11:00-11:30AM, F: 9:00-10:00AM or by appointment

**Meetings:** M: 4:35-6:30PM (SCI III room 120), W: 4:35-6:30PM (SCI I room 125)

**Text:** course readings will be provided as handouts or PDFs available on my website ([www.csub.edu/~psmith3](http://www.csub.edu/~psmith3)).

**Course Description:** Bioinformatics has been defined as the science of examining the structure and function of genes and proteins through the use of computational analysis, statistics, and pattern recognition. In this course we will use a practical, hands-on approach in learning about Molecular Biology Computing. The course will emphasize how to use the computer as a tool for genomic research and there is to be an integration of the basics of computation and analysis along with chemistry and biology throughout the course.

**Specific Course Objectives:** The fields of study in molecular and cell biology continue to grow rapidly. The field of bioinformatics changes so rapidly that it is nearly impossible to keep up with all the different areas of progress. It is therefore necessary to learn how to access new information and how to assimilate it into the whole, in order to continue to learn beyond the limits of this course. It is also necessary to become aware of the tools and techniques used in research and in applications. Therefore, while learning the essentials of bioinformatics, you will also begin to learn to use some of these tools. In doing so, you should find that they help you in learning beyond this course and to see the connections in other courses. Following completion of this course students will possess knowledge and practical experience with: genomic databases, using Entez, BLAST, sequence comparison, PubMed, OMIM, genomic structure, multiple sequence alignment, protein structure, functional analysis, cancer, phylogenetics, and environmental genomics.

### **Attendance, Participation and Policies**

Attendance and participation are critical to your success in this course. In the event that an absence is unavoidable it is your responsibility to find out what you missed and get copies of handouts from a fellow classmate (not me). The only acceptable excuse for a missed exam is illness or death in family, either way you must bring valid documentation to support your absence. Failure to do so will result in a 0 for the exam. You are expected to behave professionally and actively engage in the learning process. If you have questions, ask them!

### **Course format and late assignments**

Prior to each class meeting, students will study assigned reading. We will use a hands-on approach via bioinformatics tutorials. Class time will be used to work on the tutorials, lecture, answer questions about the reading and to allow students opportunity to work on problems and projects.

### **Academic dishonesty**

All University policies regarding classroom conduct and academic freedom as published in the CSUB catalog will be strictly followed. Also, cheating and plagiarism will not be tolerated, and University policies regarding academic dishonesty will be strictly followed.

## Grading scale

Letter grades will be assigned using the following scale as a guide.

|              |              |              |              |
|--------------|--------------|--------------|--------------|
| 93 – 100 = A | 83 – 86 = B  | 73 – 76 = C  | 63 – 66 = D  |
| 92 – 90 = A- | 80 – 82 = B- | 70 – 72 = C- | 60 – 62 = D- |
| 87 – 89 = B+ | 77 – 79 = C+ | 67 – 69 = D+ | < 60 = F     |

## Evaluation

| Date Due | Assignments/Exams         | Points     |
|----------|---------------------------|------------|
| various  | Assignments/Problem Sets/ | ~100       |
| Sep 24   | Exam I                    | 75         |
| Oct 26   | Exam II                   | 75         |
|          | Project                   | 100        |
|          | <b>TOTAL</b>              | <b>350</b> |

**Instructions for your independent projects will be handed out on September 28<sup>th</sup> in class**

## Tentative Course Schedule

| DATE     | TOPIC                                       | READING                          |
|----------|---|----------------------------------|
| M-Sep 14 | Course Introduction                         |                                  |
| W-Sep 16 | Genetics Review I                           | Handout                          |
| M-Sep 21 | Introduction to Genetic Databases           | Tutorial: pp. 1-5                |
| W-Sep 23 | Genetics Review II                          | Handout                          |
| M-Sep 28 | Learning to Use Entrez & Blast              | Tutorial: pp. 6-15               |
| W-Sep 30 | PubMed                                      | Handout online                   |
| M-Oct 5  | OMIM & Huntington Disease                   | Tutorial: pp. 26-29              |
| W-Oct 7  | Genetic Diseases/Huntington Disease         |                                  |
| M-Oct 12 | <b>EXAM I-Distributed</b>                   |                                  |
| W-Oct 14 | Genome Anatomy                              |                                  |
| M-Oct 19 | Finding Conserved Domains                   | Tutorial: pp. 30-33              |
| W-Oct 21 | ClustalX & DNA Sequence Alignment           | Handout                          |
| M-Oct 26 | Clusters of Orthologous Groups              | Tutorial: pp. 34-36              |
| W-Oct 28 | Protein Structure                           |                                  |
| M-Nov 2  | Protein Structure Analysis                  | Tutorial: pp. 37-44              |
| W-Nov 4  | <b>EXAM II</b>                              |                                  |
| M-Nov 9  | Exploring the Cancer Genome Anatomy Project | Tutorial: pp. 45-49              |
| W-Nov 11 | <b>Holiday-No Class</b>                     |                                  |
| M-Nov 16 | Measuring Phylogenetic Distance & MEGA      | Handout +<br>Tutorial: pp. 50-54 |
| W-Nov 18 | Environmental Genomics                      | Tutorial: pp. 55-58              |
| W-Nov 25 | <b>PROJECTS DUE BY 10:00AM</b>              |                                  |

You should complete all exercises at the end of each tutorial, copy & paste into a word document and send it to me via email by the end of the class period: psmith3@csu.edu