**BIOS493/700: Practical Bioinformatics for Biologists**

**Spring 2013, SYLLUBUS**

**Class time:** Tu/Th 9:30-10:45am

**Classroom:** MO444

**Instructor:** Dr. Yanbin Yin (yyin@niu.edu, MO325A)

**Office hours:** Tu/Th 2-4pm

**Website**: <http://cys.bios.niu.edu/yyin/teach/PBB/>

**Course description:**

 This course, **Practical Bioinformatics for Biologists**, will offer hands-on training in using various bioinformatics softwares and web-based tools on Windows and Linux computers. It emphasizes applications of computational tools to solve real biology problems. Students will work on two course projects and present the reports in the end of the semester. Homework will be assigned every two or three lectures.

**Course goals:**

 Students will learn various bioinformatics applications to analyzing DNA/RNA/protein sequence data.

 Applications include web-based databases and servers, Windows-based and Linux-based software packages with graphical user interface (GUI) and without GUI (command-line terminal).

 In order to use softwares on Linux machines, students will also learn how to work in a command-line environment without GUI and also learn how to write simple shell and perl one-liner scripts.

**Class rules:**

 Attendance: students are required to attend all classes. Absences without notifying the instructor in advance will result in 5% reduction in final grade.

 Cheating and Plagiarism: copying materials (figures, tables, sentences) directly from other people, literatures or internet without proper reference are considered as **plagiarism and will lead to a fail of this course**.

**Grading:**

 Attendance: 10%

 Home work: 40%

 Final report: 40%

 -Project 1: 20%

 -Project 2: 20%

 Presentation: 10%

**Books:**

Mainly uses slide notes (materials come from literatures and online training courses), but may refer to:

1. Practical Computing for Biologists by Haddock and Dunn, 2011 Sinauer
2. Building Bioinformatics Solutions with Perl, R and MySQL by Bessamt et al., 2009 Oxford
3. Developing Bioinformatics Computer Skills by Gibas and Jambeck, 2001 O’reilly

**Schedule:**

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| --- | --- | --- |
| Week 1 | 15-Jan | Course overview |
|   | 17-Jan | Overview of major bioinformatics web resources |
| Week 2 | 22-Jan | NCBI resources: pubmed, sequences, handbook |
|   | 24-Jan | NCBI resources: protein family, domain, structure |
| Week 3 | 29-Jan | Practice of NCBI resources with examples |
|   | 31-Jan | EBI resources: Interpro, Pfam, GO |
| Week 4 | 5-Feb | EBI resources: expasy, scop, superfamily, SRS |
|   | 7-Feb | Practice of EBI resources with examples |
| Week 5 | 12-Feb | JGI resources: genomes, metagenomes, gold |
|   | 14-Feb | Overview of popular bioinformatics tools |
| Week 6 | 19-Feb | Database search tools BLAST, FASTA, WUBLAST |
|   | 21-Feb | Alignment and visualization: clustalw, muscle, mafft  |
| Week 7 | 26-Feb | Phylogeny and visualization: MEGA, PHYLIP, PHYML, FastTree, iTOL, www.phylogeny.fr |
|   | 28-Feb | Practice of Windows softwares and web servers |
| Week 8 | 5-Mar | Install Linux and Introduction to project 1 |
|   | 7-Mar | Linux command line basics  |
| Week 9 | 12-Mar | Spring recess |
|   | 14-Mar | Spring recess |
| Week 10 | 19-Mar | Linux command line softwares |
|   | 21-Mar | Practice of Linux command scripting with examples |
| Week 11 | 26-Mar | HMMER and BLAST in command line |
|   | 28-Mar | EMBOSS for sequence analysis |
| Week 12 | 2-Apr | Perl basics 1 |
|   | 4-Apr | Perl basics 2 and Introduction to project 2 |
| Week 13 | 9-Apr | Practice of Perl |
|   | 11-Apr | Perl one-liner and Practice |
| Week 14 | 16-Apr | Bioperl basics |
|   | 18-Apr | Bioperl Practice |
| Week 15 | 23-Apr | R basics for simple hypothesis tests and graphing |
|   | 25-Apr | R practice |
| Week 16 | 30-Apr | Presentation of projects 1 by undergraduate students |
|   | 2-May | Presentation of projects 2 by graduate students |