BIOS 441/641: Practical Bioinformatics for Biologists
Fall 2015, SYLLUBUS

Class time: Tu/Th 11:00-12:15am

Classroom: MO444

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

Office hours: Tue/Thu/Fri 2-4pm

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

Course description:

Bioinformatics is a relatively new discipline at the interface between biology and informatics. It evolved from biology (especially genetics/genomics), serves biology and is driven by biology. However the most fundamental methodologies in bioinformatics came from mathematics, statistics and computer science. Currently, bioinformatics education programs in the US Universities are mostly offered at graduate level and as interdisciplinary/interdepartmental programs with faculty from both biology and informatics sides. The research programs fall into two categories: (i) developing new bioinformatics algorithms/tools and (ii) using bioinformatics tools for biology/medicine/evolution researches.

This course, **Practical Bioinformatics for Biologists**, offered to biology students at both graduate and undergraduate levels, will focus on how to use existing bioinformatics tools. The department offers another two bioinformatics courses: (i) BIOS443/643 covering the theoretical basis of bioinformatics algorithms/tools and (ii) BIOS646 covering computer programing for bioinformatics. Our course BIOS441/641 features practical hands-on skills in using various bioinformatics softwares and web-based tools on Windows (no programming) and Linux computers (Unix bash programming). It emphasizes applications of computational tools to solve real biology problems. Students will work on eight homework assignments and two course projects as well as have a final exam. Homework will be assigned every two or three lectures.

Bring your own laptop if the computer in MO444 is not available.

Course goals:

- Learn various bioinformatics applications to analyzing DNA/RNA/protein sequence data.
- Applications include web-based databases/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, how to write simple shell one-liner scripts and more commonly how to run command-line bioinformatics tools.

Class rules:

- Attendance: students are required to attend all classes. Absences without notifying the instructor in advance will result in 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 fail this class.

Grading:

Attendance: 5%

Home work (8 assignments): 40%

Projects: 30%

-Project 1: 15%, [use web-based tools]

-Project 2: 15%, [use command-line tools]

Final exam: 25%

Grading scales: A (>92%), A- (90-92%), B+ (87-89%), B (83-86%), B- (80-82%), C+ (77-79%), C (73-76%), C- (70-72%), D (60-69%), F (<60%)

Books:

Use my ppt slides (materials come from scientific journal publications and online training courses), but may refer to:

1. Practical Bioinformatics by Agostino, 2013 Garland Science
2. Practical Computing for Biologists by Haddock and Dunn, 2011 Sinauer
3. Developing Bioinformatics Computer Skills by Gibas and Jambeck, 2001 O'reilly

Schedule (subject to change):

Week 1	8/25	Course overview
	8/27	Overview of major bioinformatics web resources
Week 2	9/1	NCBI resources I: databases and Entrez
	9/3	NCBI resources II: web-based BLAST
Week 3	9/8	NCBI resources III: GEO, SRA and ftp resources
	9/10	
Week 4	9/15	EBI resources I: UniProt and GO
	9/17	EBI resources II: Ensembl and InterPro, scop, superfamily
Week 5	9/22	EBI resources III: tools at EBI, ExPASy and DTU
	9/24	
Week 6	9/29	Phylogeny and visualization: Clustalx and MEGA
	10/1	Phylogeny and visualization: MEGA and iTOL
Week 7	10/6	Catch up time
	10/8	
Week 8	10/13	Go over project 1 [**project 1 report due on 11/13**]
	10/15	
Week 9	10/20	Unix command line basics I: files and folders
	10/22	
Week 10	10/27	Unix command line basics II: downloading and controlling files
	10/29	

Week 11	11/3	Unix command line basics III: piping commands for text processing
	11/5	
Week 12	11/10	Install and run bioinformatics softwares on Unix
	11/12	
Week 13	11/17	Go over project 2 [**project 2 report due on 12/10**]
	11/19	
Week 14	11/24	**Holiday break**
	11/26	
Week 15	12/1	Catch up time: finish project 2
	12/3	
Week 16	12/8	**Final exam**