The Ohio State University College of Medicine, Department of Biomedical Informatics
BMI 5730 – Introduction to Bioinformatics
3 credit hours – Spring 2014

Instructor: James L. Chen, MD
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Class Time and Location: Wednesdays and Fridays, 2:20 – 3:40 PM. Room 245, Lincoln Tower
Instructor's Office Hours: By appointment: james.chen@osumc.edu

Course description: This course Introduces students to basic topics of bioinformatics, including: sequence analyses, proteomics, microarrays, regulatory networks, and sequence and protein databases. *A familiarity or background in molecular biology and computer science is strongly recommended.*

Class Format: Lectures (Wednesday) and Labs/roundtable discussions (Fridays). Guest lecturers will be brought into the class as content experts to demonstrate various aspects of the bioinformatics research domain.

Course Objectives: The goal of this course is to introduce trainees to the basic definitions, theories, and methods that serve as the foundations for the sub discipline of Biomedical Informatics known as bioinformatics.

Upon completion of this course students will be familiar with core concepts of bioinformatics and have:

1. An appreciation for different scales of biological data, in particular their origin, derivation, and utility;
2. An understanding of the contributing theoretical frameworks that underlie modern bioinformatics analysis of these biological datasets; and
3. Critical evaluation skills that allow for the analysis and application of informatics interventions informed by items (1) and (2) to address real-world clinical problems.

Text/Readings:
Course book: Pevsner, Jonathan. *Bioinformatics and Functional Genomics*. 2nd. Hoboken,New Jersey: John Wiley & Sons, Inc., 2009.

Additional readings, as assigned by the week's instructor, may be found on the Carmen site.

Grading:
During the course of the semester, students will be graded on:

1. Homework assignments due **before class** of the next week. (10%)
2. Midterm exam (20%)
3. Final Project Write-up and In-class presentation (30%)
4. Final exam (30%)
5. Class participation (10%)

Exams

The course will include both a midterm and final exam. These exams are in-class and will be composed of multiple choice, short answer, and essay questions. Materials covered in this exam will derive from in-class lectures and discussions as well as course reading materials. *Students are encouraged to schedule time to meet with me if there are any topics that we have covered in class that are not understood.*

Assignments

Homework assignments will be an integral part of each educational module. Assignments will be handed out at the beginning of each section and they will be due for grading on the first day of the next week. Assignment materials will be posted to Carmen in the content section. Any alterations to assignments or delivery due dates will be discussed in class and conveyed by email to the class.

The course will culminate with a final project. All students are required to discuss with the instructor for advice and selection of their research projects. Each student is required to submit a final report in the form of: 1) a 10-12 page review paper focusing upon a clinical problem agreed upon in advance with the course instructors (double-spaced, 12-point font, 1" margins); and 2) a 10-15 minute oral presentation summarizing the findings of the review paper. This *final project will be due the final week of the semester*.

Carmen

Carmen will be the primary delivery method for lecture notes, additional reading assignments, and guidelines for the final project. Readings will be posted two weeks in advance of class room participation; lectures will be posted before class for students to review and bring to class for note-taking purposes.

Class Policies

What you take away from this course will be a direct function of the effort you put forth inside and outside of class. While voluntary contribution is preferred, you can expect that you may be called upon at any time. After each class, the instructor will take notes on students' contributions to the class session. **If you do not attend class, it is impossible to receive credit for class participation.**

Effective class contribution entails providing good answers to questions. Effective comments add to our understanding of the underlying conceptual material, challenge, and clarify the ideas expressed by others, integrate material from past class work or other courses, and shows evidence of analysis rather than mere opinion or "gut feeling". Effective responses demonstrate that you have thought deeply about the material and can develop creative and innovative insights through this analytic effort.

Office of Disability Services

Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office for Disability Services at 614-292-3307 in 150 Pomerene Hall to coordinate reasonable accommodations for students with documented disabilities.

Academic integrity

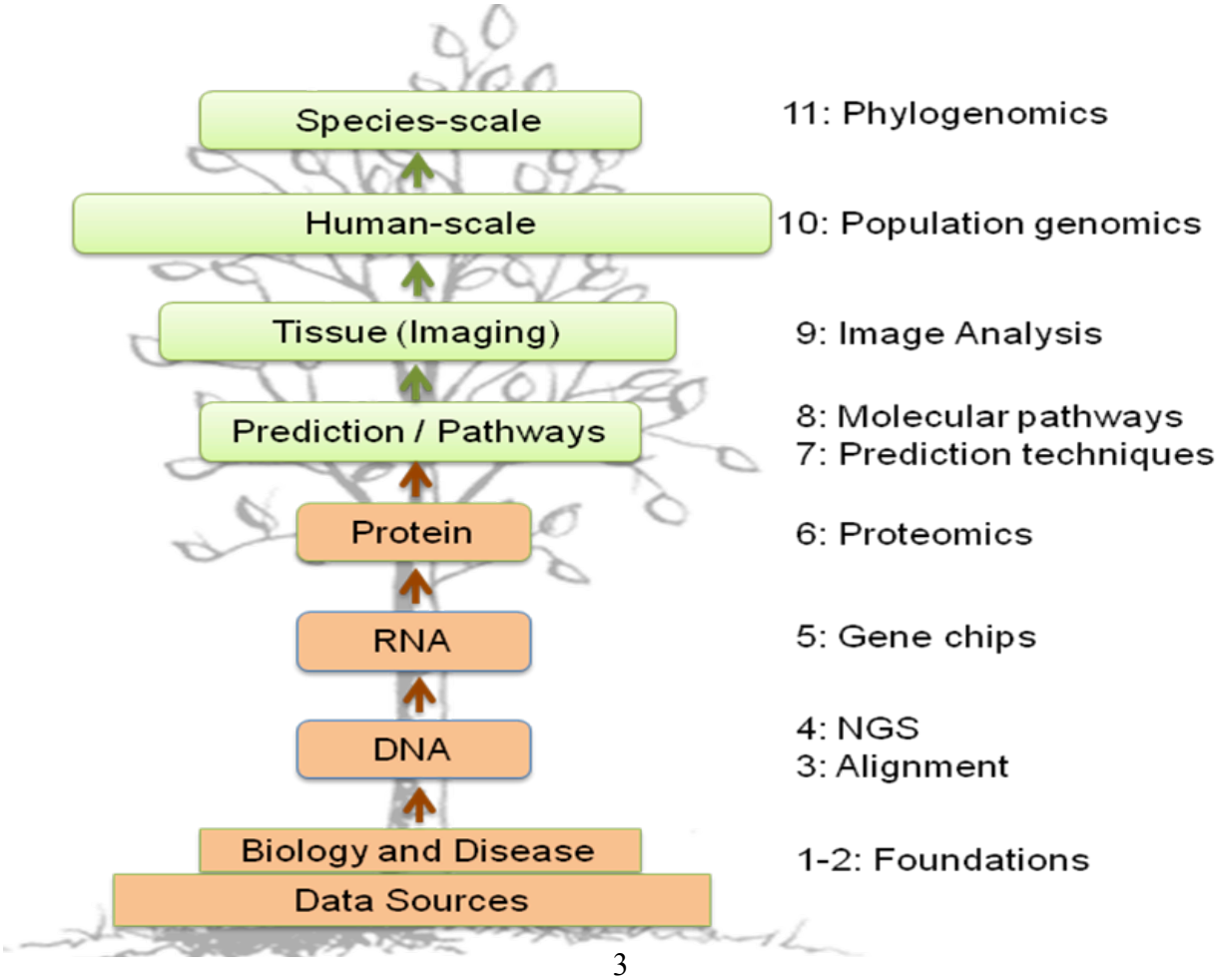
Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University, the College of Public Health, and the Committee on Academic Misconduct (COAM) expect that all students have read and understood the University's *Code of Student Conduct* and the School's *Student Handbook*, and that all students

will complete all academic and scholarly assignments with fairness and honesty. The *Code of Student Conduct* and other information on academic integrity and academic misconduct can be found at the COAM web pages (http://oaa.osu.edu/coam.html). Students must recognize that failure to follow the rules and guidelines established in the University's *Code of Student Conduct*, the *Student Handbook*, and in the syllabi for their courses may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Please note that the use of material from the Internet without appropriate acknowledgement and complete citation is plagiarism just as it would be if the source were printed material. Further examples are found in the *Student Handbook*. Ignorance of the *Code of Student Conduct* and the *Student Handbook* is never considered an "excuse" for academic misconduct.

If I suspect a student of academic misconduct in a course, I am obligated by University Rules to report these suspicions to the University's Committee on Academic Misconduct. If COAM determines that the student has violated the University's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Course Outline



Days	Topic	Readings* / Instructor
1/08, 1/10	Course and Bioinformatics Overview Primer: Data Sources and Provenance	Chen **CH 1** 3-13; **CH 2** 13-47
1/15, 1/17	Bio Primer: Central Dogma Bio Primer: Laboratory techniques	Parvin **CH 12** 461-517
1/22, 1/24	DNA: Sequence Alignment DNA: Alignment Applications	Kun Huang **Ch 3** 47-101; **Ch 6** 179-215
1/29, 1/31	DNA: NGS Data DNA: Precision Medicine with NGS	Dale Hedges **Ch 9** 331-379
2/05, 2/07	RNA: Gene expression technology RNA: Gene expression signatures	Chen **Ch 9** 331-379
2/12, 2/14	Protein: Proteonomics fundamentals Protein: Proteonomic applications	John Hays **Ch 10** 379-416
2/19, 2/21	Genomic Prediction: Fundamentals Genomic Prediction: Application	Dalton **Ch 9** 331-379 **Ch 13** 517-567 **CH 16** (667,688 – prediction software)
2/26, 2/28	Pathways: Basics and databases Pathways: GSEA & Gene Enrichment	Chen **CH 9** (GSEA)
3/05 **3/07**	**Midterm Review** **Midterm exam**	Chen
3/12, 3/14	**SPRING BREAK. NO CLASSES**	
3/19, 3/21	Genomics Lab 1 Genomics Lab 2	Chen **CH 12** 461-517
3/26, 3/28	Tissue (Imaging): Image Analysis	Gurcan (**CH 12** Tissue Microarrays: 494)
4/02, 4/04	Population Genetics	Daniel Kinnamon
4/09, **4/11**	Phylogenomics	Samuel Handelman
4/16, 4/18	**Final Project Presentations**	Chen *Presentation by students of final projects*
4/23	**Final Exam 4:00 – 5:45 PM**	Chen