

# ***Genomics and Bioinformatics – GMS6181***

***(3 credits)***

## **COURSE DESCRIPTION:**

Principles of genomic characterization and bioinformatic analysis of eukaryotes, including an overview of analytical platforms, computational tools, experimental design, analysis methods and databases used to study DNA sequence, gene expression and protein levels.

**COURSE OBJECTIVES:** Understanding the principles of genomic analysis of eukaryotes at various levels (DNA, mRNA and protein), and bioinformatics methods used in these analysis.

**MEETING PERIODS:** Tuesday (10:40-12:35) & Thursday (10:40-11:30).

**MEETING ROOM:** UFGI 451A (4<sup>th</sup> floor of UF Genetics and Cancer Research Complex, between the Cancer and Genetics wings)

**OFFICE HOURS:** By appointment.

**COURSE WEBSITE:** <http://bioinformatics.ufl.edu/courses/GMS6181/>

## **COURSE PREREQUISITE:**

STA6166 (Statistical Methods in Research I) and PCB5065 (Advanced Genetics) or permission from the instructor.

## **INSTRUCTORS:**

Dr. Sixue Chen

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Dr. Matias Kirst (Course leader)

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**REFERENCES:**

A Primer of Genome Sciences (2<sup>nd</sup> edition, 2004), by Greg Gibson and Spencer V. Muse, Sinauer Associates, ISBN: 0878932321 (optional).

Discovering Genomics Proteomics and Bioinformatics (2<sup>nd</sup> edition, 2005), by A. Malcolm Campbell and Laurie J. Heyer, Cold Spring Harbor Laboratory Press and Benjamin Cummings, ISBN: 0805347224 (optional).

**GRADES:** Each section worth 20% of the final grade. Grading of each section will be defined by the instructor in the beginning of the section. Grading of Section “Genome Sequencing” will be calculated from two weekly (5% each) and one final session project (10%).

**ACADEMIC HONESTY.** As a result of completing the registration form at the University of Florida, every student has signed the following statement: “ I understand that the University of Florida expects its students to be honest in all of their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University”.

**ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES:** Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodations.

**UF COUNSELING SERVICES:** Resources are available on campus for students having personal problems or lacking clear career and academic goals, which interfere with their academic performance. These resources include:

1. University Counseling Center, 301 Peabody Hall, 2-1575, personal and career counseling;
2. Student Mental Health, Student Health Care Center, 2-1171, personal counseling;
3. Sexual Assault Recovery Services (SARS), Student Health Care Center, 2-1161, sexual assault counseling;
4. Career Resource Center, Reitz Union, 2-1601, career development assistance and counseling.

## TENTATIVE CLASS SCHEDULE

| Week | Day       | Topic (Instructor)   |
|------|-----------|--|
| 1    | January 8 | Introduction, DNA sequencing (K)                             |
|      | 10        | DNA sequence quality and alignment (K)                       |
| 2    | 15        | Genome resources (R)   |
|      | 17        | Gene prediction and annotation (R)                           |
| 3    | 22        | Genome sequencing and assembly (K)                           |
|      | 24        | Comparative genomics (K)                                     |
| 4    | 29        | Comparative genomics (VDC) / SNP genotyping tools (K)        |
|      | 31        | Association genetics and population structure (M)            |
| 5    | 5         | Population structure analysis (K)                            |
|      | 7         | Overview association genetic tests (M)                       |
| 6    | 12        | Association genetic tests in JMP Genomics (R)                |
|      | 14        | Association genetics - Paper discussion (All)                |
|      | TBA       | Statistics refresher (M)                                     |
| 7    | 19        | Differential gene expression and ANOVA (M)                   |
|      | 21        | Time series gene expression / clustering (M)                 |
| 8    | 26        | Gene expression analysis in JMP Genomics (M)                 |
|      | 28        | Other gene expression analysis platforms (SOLiD, Solexa) (K) |
| 9    | March 4   | Paper discussion – SNP detection by microarrays (All)        |
|      | 7         | Paper discussion – Association genetics (All)                |
|      | 10-14     | Spring Break – No Class                                      |
| 10   | 18        | Proteomics Introduction (C)                                  |
|      | 20        | Protein separation and fractionation (C)                     |
| 11   | 25        | Mass spectrometry (C)  |
|      | 27        | Protein database and MS data analysis (C and M)              |
| 12   | April 1   | Proteomics applications (C)                                  |
|      | 3         | Introduction to bioinformatics tools (R)                     |
| 13   | 8         | Paper discussion (All)                                       |
|      | 10        | Bioinformatics tools (R)                                     |
| 14   | 15        | Paper discussion (All)                                       |
|      | 17        | Bioinformatics tools (R)                                     |
| 15   | 22        | Course evaluation (All)                                      |