Department of Computer and Electrical Engineering and Computer Science
Florida Atlantic University
Course Syllabus

1. Course title/number, number of credit hours	
Genomics Analysis – BME 6935	3 credit hours
2. Course prerequisites, corequisites, and where the course fits in the program of study	
Prerequisites: Graduates and seniors in all engineering disciplines, as well as biology, nursing, and IT majors.	
3. Course logistics	
Term: Spring 2019 This is a course with live and distance learning sections. Lectures will be videotaped and made available via Canvas LMS. *Class location and time*: TBA	
4. Instructor contact information	
Instructor's name *Office address* *Office Hours* *Contact telephone number* *Email address*	Ravi Shankar, Professor Engineering East (EE) Bldg., Room 513 TBA. 561-297-3470 shankar@fau.edu
5. TA contact information	
TA's name *Office address* *Office Hours* *Contact telephone number* *Email address*	NA
6. Course description	
We carry 3 billion base pairs of nucleotides in our nuclear DNA sequence. Only a tiny part of this genome sequence represents protein coding genes, with much of the remainder sequence involved in gene regulation and consequent expressed levels of these proteins. Regulation is dependent on the tissue type and our individual profile (dietary, lifestyle and environmental factors). Genomic origins of rare diseases is better understood than for common and complex diseases such as cancer, heart disease, diabetes, and Alzheimer's, as well as the processes of aging and cell death. Potential heritability of traits (such as height) and disease risk (as with, say, heart attack) has been determined by twin, family, and ethnic studies, to be around 40 to 60 %. However, heritability as explained by known gene-sequence variants is less than 10 %. Thus the new challenge for bioinformatics is to integrate, and gain insight from, the massive amounts of knowledge and data acquired across species, genes, proteins, and biological processes, as well as clinical studies. The eventual goal is to provide personalized medicine. Multiple concurrent approaches are being explored at present. The course will use a hierarchical multi-layer model to integrate all the concepts and help develop a contemporary perspective of genomics analysis. The skill set you develop can be easily mapped to other common and complex diseases and conditions.	
7. Course objectives/student learning outcomes/program outcomes	
Course objectives	Bioinformatics application at the genomic level. Integration of bioinformatics, biology, and medical application. Build an infrastructure to map genomic information to human disease states. No emphasis on

	programming or math. Relevant biology concepts will be covered from a systems perspective

8. Course evaluation method

Five assignments: 40 %; Mid-term exam: 30 %; and Project: Report (30 %). Project topic depends on the student's background and interest (Research paper). **Bonus** – find resources, examples, and tools useful to the class: 10 % (post at Canvas). Assignment topics: Choose a risk factor for a specific disease; review literature and write reports based on 5 of the 8 layers discussed in the class (i.e., relevance of that layer on the disease process chosen). Project: Integrate reports onto a publishable conference paper. Project ideas to combine research and development are welcome!	*Note*: The minimum grade required to pass the course is C.

9. Course grading scale

Proposed Grading Scale:
90-100 for "A" and "A-";
80-89 for "B+", "B", or "B-";
70-79 for "C+", "C", or "C-";
60-69 for "D+", "D" ,or "D-";
50 and below: "F"

10. Policy on makeup tests, late work, and incompletes

All assignments and exams are online and open-book and open notes. Late assignments will be accepted with a 10% penalty per week for 2 weeks. The Project assignment is due before the reading day.

11. Special course requirements

12. Classroom etiquette policy

University policy requires that in order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular phones and laptops, are to be disabled in class sessions. High level well behavior and class discipline are expected.

13. Disability policy statement

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodations due to a disability to properly execute coursework must register with the Office for Students with Disabilities (OSD) located in Boca Raton campus, SU 133 (561) 297-3880 and follow all OSD procedures.

14. Honor code policy

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and place high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. See University Regulation 4.001 at www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf

15. Required texts/reading

Collection of recent (2012-2019) papers, tools and websites on GWAS and biological pathways.

16. Supplementary/recommended readings

17. Course topical outline, including dates for exams/quizzes, papers, completion of reading

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We use an eight-layer hierarchical model to integrate the field for genome-to-phenome mapping.

- Layer 1 – DNA sequences and sequence similarity across species
- Layer 2 – Mitochondria and early migratory patterns.
- Layer 3 – Genome-Wide Association Studies (GWAS) and hypothesis free predictions
- Layer 4 – Quantitative protein express in analysis
- Layer 5 – Epigenomics and differential gene expression in tissues
- Layer 6 – Biological processes – similarities and dissimilarities
- Layer 7 – Disease processes – overlaps and non-overlaps
- Layer 8 – Impact of environment, diet, and life style on genomics and epigenomics.