

BSC-4434 CRN# ()

Spring, 2017
Fri (11:00 AM-1:50 PM)- BU 405

Department of Biological Sciences
Charles E. Schmidt College of Science
Florida Atlantic University

Concepts in Bioinformatics (BSC 44434)
3 credits
Course Syllabus

Instructor: Dr. Ramaswamy Narayanan
E-mail: rnarayan@fau.edu

Office Hours: Sanson Science (Biology building) Room SC 216 M,W 10-11:30 AM or by appointment. (*E-mail is the most effective way of reaching me*)
Tel: 561 297 2247. Office: SC 216

TA Contact Information: Karlis Justs (kjusts@my.fau.edu) SC 227

This syllabus applies to all sections taught by this instructor and is subject to change at any time by the instructor. Changes may be announced online via blackboard or verbally in class.

Course Location: BU 405

Course Description/Student learning outcomes:

This three credits lecture and computer lab course is designed for students majoring in biological Sciences, biochemistry, premed and bioengineering who are considering future careers in genomics, biotechnology and medicine. This course will introduce the concepts underlying the genome databases. Bioinformatics datamining tools will be used to harness the human genome to learn to discover the gene targets for the diagnosis and treatment of major diseases. Students are expected to leave this course with a working knowledge of the material and concepts presented. This means not just memorizing the material, but also being able to understand and apply it.

Rationale:

- The completed human genome sequencing efforts offer new ways to approach Biology and drug discovery
- Most of this information is in the public domain database
- Parallel efforts to sequence the genome of bacteria, yeast, plants and other species are underway

- The information contained in these genes (Bioinformatics) will shape the future of biological and biomedical research
- To benefit from this vast sequence information, training in identifying a gene target for follow up studies in the lab is essential

What is this course about?

- The aim of this course is to meet the growing demands of industry and academia in the genomics area
- Provide practical experience to taking gene sequence information from the computers to the lab
- Ask key questions to define targets for further study
- To identify appropriate databases to search for query
- To understand the interdisciplinary nature of Bioinformatics
- To develop a group research experience

Expected outcome:

To enable the participants to join a genomic/Bioinformatics group across diverse areas of research in Biology, Medicine and Engineering.

Format: Lecture followed by practice assignments, discussions and debates.

Course Materials:**Recommended:**

- Bioinformatics for Dummies. ISBN-13: **978-0470089859**. Jean-Michel Claverie, Cedric Notredame

Bioinformatics For Dummies is packed with valuable information that introduces you to this exciting new discipline. This easy-to-follow guide leads you step by step through every bioinformatics task that can be done over the Internet. Forget long equations, computer-geek gibberish, and installing bulky programs that slow down your computer. You'll be amazed at all the things you can accomplish just by logging on and following these trusty directions. You get the tools you need to:

- Analyze all types of sequences
- Use all types of databases
- Work with DNA and protein sequences
- Conduct similarity searches
- Build a multiple sequence alignment
- Edit and publish alignments
- Visualize protein 3-D structures

- Construct phylogenetic trees

This up-to-date second edition includes newly created and popular databases and Internet programs as well as multiple new genomes. It provides tips for using servers and places to seek resources to find out about what's going on in the bioinformatics world. *Bioinformatics For Dummies* will show you how to get the most out of your PC and the right Web tools so you'll be searching databases and analyzing sequences like a pro!

Course Prerequisites

Permission of instructor. Knowledge in genetics is necessary. Knowledge in Molecular and Cell biology and Statistics would be an advantage.

Course Policies and Procedures:

1. Course Evaluation:

Attendance: Mandatory

Lab assignment. Each lecture module is accompanied by an assignment, which includes background reading, practice examples and test queries. This is for practice. Store results in Flash drive and hard copy binder.

Mid term- A written test/ report/PP on bioinformatics query **(50% of evaluation)**.

Special research project (final)- Preparation, writing of report or a PP and E-mail submission of a special project **(50% of evaluation)**. A group research project.

Tests and quizzes. This will be part of the overall course to assess the progress made in learning. This will be **part** of the final project evaluation.

Active participation: Expected.

Deadlines: Strict adherence is mandatory.

The exams will consist of bioinformatics queries. Deadlines for submission will be announced using Black Board. Strict adherence to the deadline is expected. Students who fail to submit the exam results on time will not receive extra time to complete an exam. If a student misses an exam, they must notify the instructor by email within 2 days of the missed test and provide a valid excuse along with the proper documentation as defined by the FAU Academic Policies and Regulations (http://www.fau.edu/academic/registrar/09-10_catalog/academics.html) A student with a valid excuse and proper documentation may make up a single missed exam by taking a cumulative written exam following the final examination.

Grading Scale: The following scale will be used for computing the final grade.

A = 90-100%
B = 80-89%
C = 70-79%
D = 60-69%
F = < 60%

Mid term: 50%

Finals: 50%

2. **Attendance Policy:** Attendance for normal lecture days and exams is **required**. Any student who is more than 15 minutes late to class may not be admitted. If a student cannot attend an exam on time due to circumstances beyond their control then the instructor may assign appropriate make-up work. Students will not be penalized for absences due to participation in University-approved activities, including athletic or scholastics teams, musical and theatrical performances, and debate activities. These students will be allowed to make up missed work without any reduction in the student's final course grade. Reasonable accommodation will also be made for students participating in a religious observance.

3. **Incomplete Grade:** A grade of Incomplete ("I") is reserved for students who are passing a course but have not completed all the required work because of exceptional circumstances. A grade of "I" will only be given under certain conditions and in accordance with the academic policies and regulations put forward in FAU's University Catalog. The student must show exceptional circumstances why requirements cannot be met. A request for an incomplete grade has to be made in writing with supporting documentation, where appropriate. As per university policy, an incomplete grade will only be given to a student who fulfills all of the following criteria:

- a. Misses multiple exams or the final examination due to a legitimately documented emergency as defined by the FAU Academic Policies and Regulations (http://www.fau.edu/academic/registrar/09-10_catalog/academics.html)
- b. has a grade of C or better
- c. submits evidence of the emergency and signs an incomplete agreement.

4. **Safety:** No food or drinks are permitted in the lecture hall.

5. **Classroom Etiquette Policy:** University policy on the use of electronic devices states: "In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions." You may be asked to leave the class session for noncompliance.

6. **Student Honor Policy:** Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, 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 an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001 at http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf

Cheating is a serious offense. If you are caught cheating, you will receive an F in the course. In addition, you will be referred to the Dean of Student Services and charged with an academic crime. Test procedures and rules will be stated at the beginning of each exam. Keep your eyes on your own exam.

7. Disabilities Statement: *In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS)—in Boca Raton, SU 133 (561-297-3880); in Davie, LA 203 (954-236-1222); or in Jupiter, SR 110 (561-799-8585) —and follow all SAS procedures.*

8. Blackboard

Blackboard will be used for e-mail communications, posting changes in the course syllabus and grades, downloading lecture notes and podcasts as well as other items of interest. You are expected to access the Blackboard website regularly to check for syllabus updates, announcements, assignments, and other course materials.

9. Lecture Notes

The slides for the upcoming lecture can be downloaded in advance from Blackboard. These lecture notes are provided in PowerPoint/Word format.

10. Hurricanes

In the event of a hurricane warning or watch, the class will meet in accordance with the university policy. Classes cannot be individually cancelled by the instructor, although assignments and exams may be modified or postponed in the event of a hurricane. Students should monitor Blackboard announcements regarding any weather-related course issues.

Important Dates: The following dates are based upon the current university academic calendar. Changes to these critical dates have occurred in the past and you are responsible for checking the academic calendar on the university website for any changes during the academic term.
<http://www.fau.edu/registrar/pdf/Docs/acadcal1213.pdf>

Last day to withdraw w/o receiving a "W"	- January 15 th
M.L.K. Jr. Holiday	- January 18
Last day to withdraw w/o receiving an "F"	- Feb 8 th
Spring Break	- March 7 – 13
Last day of classes	- April 25
Final Examinations	- April 28– May 4

University Final exam Schedule

<http://www.fau.edu/registrar/registration/calendar.php>

Concepts in Bioinformatics Spring 2016 Schedule
FAU Boca Raton Campus
Spring, 2016
(Fri 11:00 AM-1:50 PM) – BU-405

This schedule applies to all sections taught by this instructor and is subject to change at any time by the instructor, depending on the needs of the class. Changes may be announced online via blackboard or verbally in class. Each class will have practice assignments for the tools learned. Review sessions will be used to provide additional help and clarifications on items covered.

Instructor: Dr. Ramaswamy Narayanan

<u>Schedule</u>	<u>Topics</u>	<u>Out of class Assignment</u>
Week 1	Intro to Syllabus, course description, Assignments details Bioinformatics at the crossroads to Biology, Computer Science and Medicine Assignment	Guide to your genome review; Review biotech basis
Week 2	Literature Mining: Query definition and to find relevant information Assignment	PubMed review
Week 3	Gene Identifier: Format and database entry for genes Assignment	NCBI RefSeq databases review
Week 4	Gene Ontology and pathways: Knowledge of gene and function within the cell Assignment	NCBI Gene and KEGG Pathway bioinformatics tool review
Week 5	Genes to information: How to go from gene names to comprehensive information? Assignment	GeneCards and UniProtKB tools review
Week 6	NCBI BLAST: Find sequence similarity and learn impact of statistics Assignment	Review of NCBI BLAST tools
Week 7	Protein analysis: Learn about protein sequences and functional class prediction	Review of Proteomics tools

	Assignment	
Week 8	Personalized Medicine: Impact of the genome in healthcare Assignment, Review session	Review of pharmacogenomics database
Week 9	Spring Break: No classes	
Week 10	Mid term project In class and take home	
Week 11	PCR Primer design: Learn about gene expression analysis Assignment	Review of microarray technology
Week 12	Non Coding RNAs: The fourth dimension of the genome Assignment	Review of micro RNA databases
Week 13	Final project preparation	Work on Project presentation
Week 14	Finals project presentation	Work on Project presentation
Week 15	Finals project presentation	Work on Project presentation
Week 16	Review	Study for Final Exam
Finals Week	April 28 th - May 4 th Exam (Presentations may be earlier)	

Subject: RE: Support letter for UG Concepts in Bioinformatics

Date: Tuesday, January 12, 2016 at 2:10:04 PM Eastern Standard Time

From: Zvi Roth

To: Ramaswamy Narayanan, Perambur Neelakantaswamy

Dear Ram,

I strongly support your course number proposal for the undergraduate Concepts in Bioinformatics course. As a faculty advisor for the MS in Bioengineering program I have seen that your course has been a popular elective for many of our MSBE students.

We all value the importance of the field of Bioinformatics within the field of Bioengineering, and therefore we strive to provide the students with in-depth education and training on the subject. Your proposed course complements nicely our BME 6762 "Bioinformatics: Bioengineering Perspectives" core course for the MS in Bioengineering program, and your comprehensive hands-on Bioinformatics graduate level course.

Our college will soon start the planning process for a new BS in Bioengineering degree program. I believe that your proposed course can become a core course in our new program.

Many thanks for your ongoing support of the Bioengineering program. I am looking forward to our continuing collaboration.

Regards,

Zvi

Dr. Zvi Roth

Professor

Department of Computer & Electrical Engineering & Computer Science

Florida Atlantic University

777 Glades Road

Engineering East Building, Room 519

Boca Raton, FL 33431

561-297-3471

From: Ramaswamy Narayanan

Sent: Tuesday, January 12, 2016 11:45 AM

To: Zvi Roth; Perambur Neelakantaswamy

Subject: Support letter for UG Concepts in Bioinformatics

Dear Zvi and Neelakana,

Greetings!. Happy New Year to you. As you know I have been offering an Undergraduate, 2 credit Bioinformatics course in the Spring as a special topics course. This semester it will be for the third time. I am putting a new course application for this course through the committees in the next two weeks. I have attached the current syllabus. This course is going to be a 3 credit course with lecture and lab. I have always enjoyed having the Bioengineering students

in this class. Once in place, we will have three courses (2 graduate and one UG) in bioinformatics across Biology and Bioengineering. We can expand these efforts into a certificate program across our depts. I would appreciate a letter of support which I can attach to the application. E-Mail response will be fine. Let me know if you need any additional information.

Thanks!.

Best regards,

Ram

**---Dr. Ramaswamy Narayanan,
Professor, Biological Sciences
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Boca Raton FL 33431
Tel 561 297 2247; Fax 561 297 2759**

<http://www.science.fau.edu/biology/faculty/narayanan.html>

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