FAU

FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

Department EECS

College College of Eng & Comp Science
(*To obtain a course number, contact **erudolph@fau.edu***)

Prefix **BME**	(L = Lab Course; C = Combined Lecture/Lab; add if appropriate) **Lab Code**	Type of Course **Lecture**	Course Title **Algorithms in Bioinformatics**
Number **6767**			

Credits (See *Definition of a Credit Hour*) **3**	**Grading** (Select One Option)	**Course Description** (*Syllabus must be attached; see Template and Guidelines*) This course covers the data structures and algorithms commonly used in the field of bioinformatics. Emphasis will be placed on topics related to classical and modern techniques employed for biological sequence and peptide analysis.
Effective Date (TERM & YEAR) **Spring 2023**	**Regular** ⦿ **Sat/UnSat** ◯	

Prerequisites CAP 5548 or COP3410 or COP 3530 or permission of instructor	**Academic Service Learning (ASL) course** ☐
	Academic Service Learning statement must be indicated in syllabus and approval attached to this form.

	Corequisites	**Registration Controls** (*For example, Major, College, Level*)

Prerequisites, Corequisites and Registration Controls are enforced for all sections of course.

Minimum qualifications needed to teach course: PhD in BME or related fields	**List textbook information in syllabus or here** Refer to the syllabus

Faculty Contact/Email/Phone Hanqi Zhuang/zhuang@fau.edu/561-297-3413	**List/Attach comments from departments affected by new course**

Approved by		**Date**
Department Chair		9/26/2022
College Curriculum Chair	Francisco Presuel-Moreno Digitally signed by Francisco Presuel-Moreno DN: cn=Francisco Presuel-Moreno, o, ou, email=fpresuel@fau.edu, c=US Date: 2022.10.03 14:59:57 -04'00'	10/03/2022
College Dean	Mihaela Cardei Digitally signed by Mihaela Cardei DN: cn=Mihaela Cardei, o=Florida Atlantic University, ou, email=mcardei@fau.edu, c=US Date: 2022.10.03 20:24:41 -04'00'	10/03/2022
UGPC Chair	Mihaela Cardei (Nov 16, 2022 16:54 EST)	Nov 16, 2022
UGC Chair		Nov 16, 2022
Graduate College Dean		Nov 16, 2022
UFS President		
Provost		

Email this form and syllabus to UGPC@fau.edu 10 days before the UGPC meeting.

BME 6767
Algorithms in Bioinformatics
DAY xx:xx – xx:xx
3 credits

Semester, Year
Prof. Michael DeGiorgio
Office: EE 418
Office hours: TBD
Classroom: XXXX
Telephone: 561-297-0003
Email: mdegiorg@fau.edu
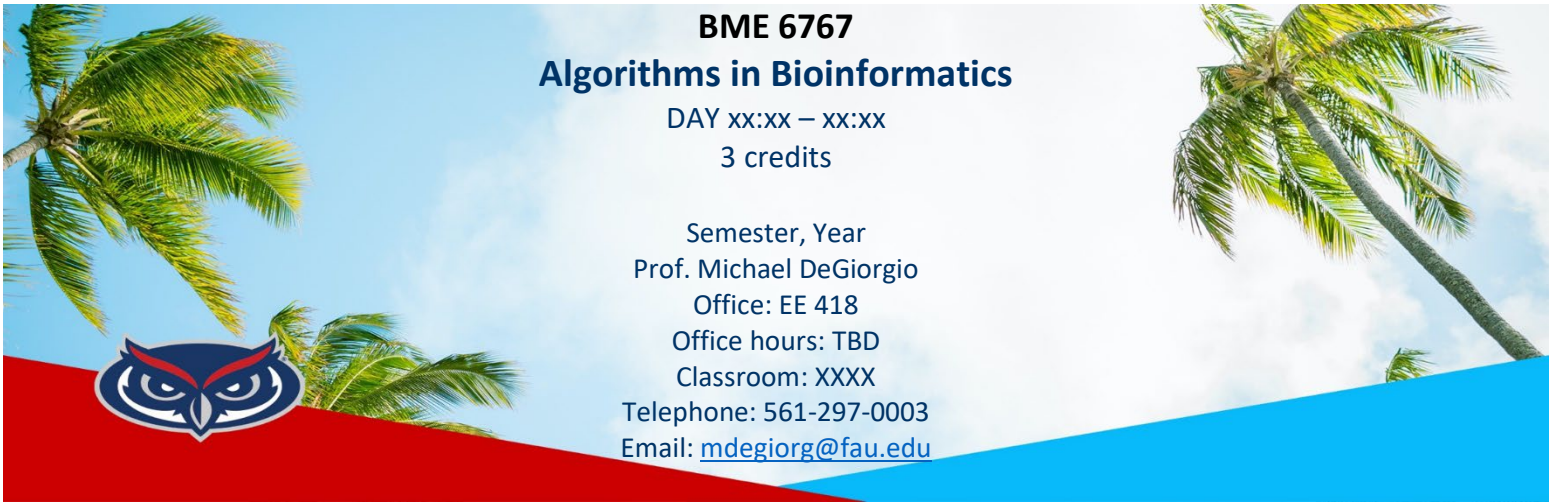
TA name	TBD
Office	TBD
Office hours	DAT xx:xx – xx:xx
Telephone	561-297-xxxx
Email	xxxxxx@fau.edu

Course Description

This course covers the data structures and algorithms commonly used in the field of bioinformatics. Emphasis will be placed on topics related to classical and modern techniques employed for biological sequence and peptide analysis.

Instructional Method

This class is designated as "In-Person w/Recorded Lecture" (section XXX) or "Videotaped Class" (section YYY). In-person class sessions will be automatically recorded and uploaded to Canvas within 24 hours. Student enrolled in section XXX may choose to attend in-person classes or view recordings, whereas students enrolled in section YYY are only able to view recordings.

Prerequisites/Corequisites

Data Structures and Algorithm for Bioinformatics (CAP 5548) or COP3410 or COP 3530 or permission of instructor

In this course, students will:
1. Learn core concepts of biological sequence and peptide analysis
2. Demonstrate proficiency in choosing optimal algorithms for bioinformatics problems
3. Identify and apply bioinformatics algorithms to high-throughput sequence datasets

Course Evaluation Method

	Description	Weight
Four homework assignments	Programming and data applications	100% (25% each)

Course Grading Scale

Grade	Total (%)
A	[93 – 100]
A-	[90 – 92)
B+	[87 – 89)
B	[83 – 86)
B-	[80 – 82)
C+	[77 – 79)
C	[73 – 76)
C-	[70 – 72)
D+	[67 – 69)
D	[63 – 66)
D-	[60 – 62)
F	[0 – 59)

Policy on Makeup Tests, Late Work, and Incompletes (if applicable)

There will be no exams, and therefore no makeup exams, in this course.

Late work will not be accepted. All assignments will be posted well in advance, and students may submit assignments early. Any assignment not turned in by the due date will result in a zero.

Incomplete grades are against the policy of the department, and they will only be assigned if there is solid evidence of medical or otherwise serious emergency situation.

Classroom Etiquette Policy

Students are required to comply with all requirements specified in the student code of conduct and not in any way disrupt the class or prevent other students from benefiting from the class. Students are to speak and behave respectfully to each other and to all FAU faculty and staff.

Policy on the Recording of Lectures

Students enrolled in this course may record video or audio of class lectures for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording class activities other than class lectures, including but not limited to student presentations (whether individually or as part of a group), class discussion (except when incidental to and incorporated within a class lecture), labs, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations between students in the class or between a student and the lecturer, is prohibited. Recordings may not be used as a substitute for class participation or class attendance and may not be published or shared without the written consent of the faculty member. Failure to

adhere to these requirements may constitute a violation of the University's Student Code of Conduct and/or the Code of Academic Integrity.

Attendance Policy

Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.

Counseling and Psychological Services (CAPS) Center

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to http://www.fau.edu/counseling/.

Disability Policy

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) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at www.fau.edu/sas/.

Code of Academic Integrity

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 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.

Required Texts/Readings

Bioinformatics Algorithms: An Active Learning Approach, by Phillip Compeau and Pavel Pevzner. 2015, 2nd Ed., ISBN-13: 978-9-9903746-1-9

Course Topical Outline

Topic 1 (DNA replication):

Minimum skew, hamming distance, approximate pattern matching, frequent words, and clump finding problems

Topic 2 (Is there a "clock" gene):

Implanted motif, motif finding, equivalent motif finding, median string, and profile-most probable *k*-mer problems; randomized search; Gibbs sampling

Topic 3 (Genome assembly):

String reconstruction, string spelled by a genome path, overlap graph, Hamiltonian path, de Bruijn graphs from a string, Eulerian path, de Bruijn graph from *k*-mers, Eulerian cycle, k-universal circular string, and string reconstruction from read-pairs problems

Topic 4 (Sequencing antibiotics):

Mass spectrometry; branch-and-bound; protein translation, peptide encoding, generating theoretical spectrum, cyclopeptide sequencing with and without errors, counting peptides with given mass, cyclopeptide scoring, and spectral convolution problems

Topic 5 (Comparing sequences):

Dynamic programming; Longest common subsequence, Manhattan tourist, longest path in a directed graph, longest path in a DAG, change, global and local alignment, edit distance, fitting alignment, overlap alignment, alignment with affine gap penalties, and middle edge in linear space problems

Topic 6 (Fragile regions):

Reversal distance, sorting by reversals, number of breakpoints, two-break distance, and two-break sorting problems; synteny blocks