

	Course	MATH 6343, Computational Biology
	Instructor	Dr. Mieczyslaw K. Dabkowski
	Term	Fall 2006, Thur. 8/17 (classes begin), Mon. 11/27 (classes end)
	Meetings	TR, 8:30-9:45PM, CB 1.122

Instructor's Contact Information

Office Phone	(972)883-4435
Office Location	ECSN 3.914
Email Address	mdab@utdallas.edu
Office Hours	TR, 5:30-6:30PM

General Course Information

Pre-requisite	Math 2418, Math 2451
Co-requisite	None
Course Description	Mathematical and computational techniques to analyze and understand problems in molecular biology. Topics covered during this class will include sequence alignment, phylogenetic trees, structure prediction, applications of techniques from knot theory in the study of DNA recombination.
Learning Outcomes	<ol style="list-style-type: none"> 1. Students will be able to articulate the concept of sequence alignment, phylogenetic tree and RNA secondary structure. 2. Students will be able to use and analyze the existing algorithms for sequence alignment and clustering algorithms for finding phylogenetic tree. 3. Students will be able to use the likelihood methods to determine the maximum likelihood phylogenetic tree. They will be able to apply algebraic technique of Gröbner basis (when appropriate) in the process of finding the maximum likelihood phylogenetic tree. They will be able to apply the knot theoretical model for DNA recombination.
Required Texts & Materials	<i>"Computational Molecular Biology - An Introduction"</i> by P. Clote & R. Backofen
Suggested Texts, Readings, & Materials	<i>"Inferring Phylogenies"</i> by J. Felsenstein and Class Handouts

Assignments (general rules)

Four assignment will given during the class. Each one of them is going to have a specific deadline. Students are expected to work on each assignment individually and turn it by the specified deadline. Students are strongly encouraged to work more than the class assignments.

Exams (general rules)

All students are expected to take the examinations at the announced time. Students are required to inform the instructor of suspected honor code violations. Show all details of your work for each problem you solve during exams (unsupported answers will receive little or no credit). Graded exams and class assignments will be returned to you as soon as possible. Any document not picked up by the end of finals week will be destroyed. Final exam will not be returned to the students but held for review for one year.

Important Dates

9/1	Last day to drop a class without a "W"
10/30	Last day to withdraw with a "W"

*Please check comet calendar for signature procedures.

Academic Calendar (subject to change)

Weeks	Topics	Course materials	Assignments & Tests
1, 2	Basic notions: nucleic acids, proteins, combinatorial structures and optimization	Chapters 1 & 2, Handouts	
3	Sequence alignment, distance methods	Chapter 3, Handout	Assignment 1
4	Alignment with tandem duplication, similarity methods	Chapter 3, Handout	
5	Multiple sequence alignment, maximum-weight trace, genomic rearrangements	Chapter 3, Handout	Exam 1
6	Phylogenetic trees, counting evolutionary changes, finding the best tree by heuristic search	Chapter 4, Handout	
7	Distance matrix methods: distances, clustering algorithms	Chapter 4, Handout	Assignment 2
8, 9	Likelihood methods: computing the likelihood of a tree, finding maximum likelihood tree	Chapters 3 & 5, Handout	
10	Hadamard methods: the edge length spectrum and conjugate spectrum, the closest tree criterion, DNA models	Handout	Exam 2
11	Structure prediction: RNA secondary structure, lattice models of proteins	Chapter 6, Handout	Assignment 3
12	Protein threading	Chapter 6	
13-15	Applications of knot theory to DNA study	Handout	Assignment 4
Exam 1		8:30p.m, Thursday, Sep. 21	
Exam 2		8:30p.m, Thursday, Oct. 26	
Final Exam		8:30p.m, Thursday, Nov. 30	

*Students are responsible for all announcements made by the instructor concerning changes in the schedule for the class.

Course Policies

Grading Criteria	The course grade is based on the following			
	Two Exams	See schedule for dates		
	4 Assignments	Dates will be specified for each one separately.		
	Final Exam	See schedule for dates		
	Weights			
	20%	Class Assignments		
	50%	Exam 1 (25%) & Exam 2 (25%)		
	30%	Final Exam, not optional (the final exam score, if higher, will replace the lower score of the two exams).		
	Grade Scale			
	[86, 100] → A	[76, 86) → B	[66, 76) → C	
	[0, 66) → F			
	Example			
	Exam 1	Exam 2	Assignments %	Final Exam
	83	74	70	87
Course percent	$0.2 \times 70 + 0.25 \times (83 + 87) + 0.3 \times 87 = 82.6$			
Course grade	B			
Make-up Exams	If you miss an exam, the grade will be recorded as zero unless you contacted your instructor IN ADVANCE and agreed upon a procedure to make it up.			

Late Work and Special Assignments	Occasionally there may be an assignment that is to be completed outside the classroom. Any such assignment will have a specific deadline. Failure to meet the deadline will result in a 25% reduction per each 12 hours late, of the point value for the assignment.
Class Attendance	Attendance is not mandatory except for exams.
Classroom Citizenship	Any action which disturbs your classmates or interrupts the lecture is unacceptable. <i>Examples of such actions include the following:</i> <ol style="list-style-type: none"> 1. Entering the classroom late. Please be punctual. 2. Leaving the classroom before the end of lecture. 3. Cell phones, ringers, etc., need to be turned off unless you are a member of an emergency response team. An apology is expected from anyone creating such a disturbance. Student participation in class is desired, however, please raise your hand to speak and avoid having side conversations with your classmates.

Student Conduct and Discipline

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, A to Z Guide, which is provided to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3, and in Title V, Rules on Student Services and Activities of the university's Handbook of Operating Procedures. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391).

A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

Academic Integrity

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.

Email Use

The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email

correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.

Withdrawal from Class

The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

Student Grievance Procedures

Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's *Handbook of Operating Procedures*.

In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the dean will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties.

Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

Incomplete Grades

As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of **F**.

Disability Services

The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m.

The contact information for the Office of Disability Services is:

The University of Texas at Dallas, SU 22
PO Box 830688
Richardson, Texas 75083-0688
(972) 883-2098 (voice or TTY)

Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom

prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.

Religious Holy Days

The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment.

If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.

Off-Campus Instruction and Course Activities

Off-campus, out-of-state, and foreign instruction and activities are subject to state law and University policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be found at http://www.utdallas.edu/BusinessAffairs/Travel_Risk_Activities.htm. Additional information is available from the office of the school dean.

These descriptions and timelines are subject to change at the discretion of the Instructor.