BIOL, PHYS, CHEM, and GEOL 4343: Research Methods
Spring 2019

Instructor: Dr. Greg Hale
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Section Information: BIOL, PHYS, CHEM, GEOL 4343-001, plus 4343-101 or 4343-102

Time and Place of Class Meetings:
Lecture: Fridays, 4:00-5:50 p.m., 226 Science Hall
Laboratory (section 101): Tuesdays, 3:30-5:20 p.m., 138 Life Science
Laboratory (section 102): Wednesdays, 4:00-5:50 p.m., 138 Life Science

Description of Course Content: This course will enable UTeach students to experience hands-on the tools that scientists use to solve scientific problems. There will be a focus on the mathematics used by scientists in the way that scientists use it. Students will engage in designing experiments, formulating hypotheses, collecting data, using statistics, reading and evaluating the scientific literature, writing and reviewing scientific papers, and making oral presentations of scientific research.

Student Learning Outcomes: Students will gain experience in conducting scientific experiments, analyzing data, and giving written and oral presentations of their results. They will also be reviewing each other's presentations. Students will be immersed in the process of scientific inquiry so that when they become teachers, they will be able to instruct their own students in how to approach questions scientifically.

Required Textbooks and Other Course Materials:

1. *Research Methods for Science* by Michael P. Marder, 2011, Cambridge University Press. Students will be provided with the text and other course handouts via the course's Blackboard site. Additional reading will be required of literature available electronically through UT Arlington's library.
2. A lab notebook.
3. Tk20: (If you have already purchased Tk20, you may still access the software this semester and do not need to purchase it again.) The College of Education has implemented Tk20, a comprehensive data management system that provides powerful tools to manage growth and streamline processes to meet your needs more efficiently and effectively. The set of tools that is required as a course text is called *TK20 HigherEd*. The following is a partial listing of what the Tk20 system will enable you to do:
   - Create your key assessments and performance artifacts online, which you will be able to access and use beyond graduation. This will enable you to present documented performance data and information to prospective employers, who are increasingly interested in data-supported evidence of an individual's current and potential performance.
   - Submit forms online, including applications for field-based experiences such as student teaching, practicum, internships, or other clinical practice required for teacher or administrator certification, and receive timely notification of placement details sent to your Tk20 account.
   - Create multimedia portfolios for documenting your work for presentation to faculty and prospective employers that can be exported to CDs or other media.
   - Monitor your progress throughout the program and have access to a fully documented record of your program performance, creating a vested partnership between you and faculty in your progress through your academic program.

   On-line tutorials and training materials will orient you to the Tk20 system and its use. For additional information, go to https://www.uta.edu/coed/academics/tk20/.

Attendance: At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I have decided that attendance is mandatory and will be incorporated into the student's grade.

Grading: Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels. Grades will be calculated as follows:

10 pts.	Attendance
25 pts	Homework assignments
5 pts	Inquiry 1
2 pts	Inquiry 2 proposal
3 pts	Inquiry 2 draft
3 pts	Inquiry 2 oral presentation
10 pts	Inquiry 2 final writeup (will only be graded if preceding assignments were completed)
10 pts	Inquiry 3 writeup
2 pts	Inquiry 4 proposal
5 pts	Open Question presentation
5 pts	Inquiry 4 draft
5 pts	Inquiry 4 oral presentation
15 pts	Inquiry 4 final write-up (will only be graded if preceding assignments were completed)

Late assignments will lose 10% of the value of the assignment for each day it is late. The Inquiry final write-ups will be graded according to a rubric in your course packet. Final Inquiries must be related to the subject for which you have enrolled, e.g., if you are in BIOL 3310, your final inquiry must be a biology inquiry. There will be no exams in this course.

Final grades will be determined on a strict scale: 90.0-100 A, 80.0-89.9 B, 70.0-79.9 C, 60.0-69.9 D, 0-59.9 F.

Descriptions of major assignments and examinations: Students are required to complete 11 homework assignments and four major inquiries over the course of the semester that include oral or written assignments. Assignments are available in Blackboard. In addition, there is one presentation of an open question topic.

Expectations for Out-of-Class Study: Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend at least an additional 2-6 hours per week of their own time in course-related activities, including reading required materials, completing assignments, etc.

Campus Carry: Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit http://www.uta.edu/news/info/campus-carry/

Grade Grievances: Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current University Catalog.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance**. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (http://wweb.uta.edu/aao/fao/).

Course Schedule

Date	Topic	Project in Progress	Reading	Homework Start	**Due Dates**
Lab (1/15,16)	Balloons: Inquiry I preparation	Inquiry I		1 (Inquiry Grading)	
18 Jan	Falling objects: Experimental design		Chapters 1 & 2		
Lab (1/22,23)	Safety, Inquiry II	Inquiry II	Chapter 5		Inquiry I
25 Jan	Evaluate Seilman Paper; Sagan Paper Analysis		Sample Inquiries		Homework 1
Lab (1/29,30)	Graphical analysis of data; Inquiry II			3 (Human Subjects)	Inquiry II proposal
1 Feb	Statistics: sampling, averaging		Appendix A, Chapter 3		
Lab (2/5,6)	Inquiry II				Homework 2
8 Feb					
Lab (2/12,13)	Inquiry II			4 (Statistics)	Homework 3
15 Feb	Scientific literature: existence and searching; Statistics: standard deviation, standard error			2 (Excel) 6 (literature)	
Lab (2/19,20)	Inquiry III	Inquiry III			Homework 4
22 Feb	Statistics: distributions, central limit				
Lab (2/26,27)	Inquiry III and χ^2			7 (χ^2)	Homework 6
1 Mar	Statistics: Z tests, t tests				
Lab (3/5,6)	Inquiry IV planning				Homework 7
8 Mar	Inquiry II Partner Grading			5 (assess inq)	Inquiry II draft Homework 5
Lab (3/19,20)	Inquiry IV proposal review	Inquiry IV			Inquiry IV Proposal draft
22 Mar	Inquiry II presentations				Inquiry II Pres.
Lab (3/26,27)	Inquiry IV			10 (open question)	Inquiry IV Proposal
29 Mar	Stats: Inquiry III Examples				Inquiry II Final
Lab (4/2,3)	Inquiry IV				
5 Apr	Modeling: Order of Magnitude		Chapter 4	8 (Estimation)	
Lab (4/9,10)	Inquiry IV		Presentation articles		Homework 8
12 April	Modeling: M&M's			9 (M&Ms)	Inquiry III
Lab (4/16,17)	Inquiry IV				Homework 9
19 Apr	Open Question Presentations				Open Q Pres.
Lab (4/23,24)	Inquiry IV				Homework 10
26 April	Stats: Inquiry IV Examples				
Lab (4/30,5/1)	Inquiry IV partner discussions			11 (Inquiry Grading)	Inquiry IV draft Homework 11
3 May	Inquiry IV Help Session				
Final Exam Week	Inquiry IV Presentations (Tue 5/7 3:30-6:00; Wed 5/8 4:00-6:30)				Inquiry IV Final turn in on Tk20

As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. – Dr. Greg Hale

Disability Accommodations: UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including *The Americans with Disabilities Act (ADA), The Americans with Disabilities Amendments Act (ADAAA),* and *Section 504 of the Rehabilitation Act.* All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a letter certified by the **Office for Students with Disabilities (OSD).** Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:
The Office for Students with Disabilities, (OSD) www.uta.edu/disability or calling 817-272-3364.
Counseling and Psychological Services, (CAPS) www.uta.edu/caps/ or calling 817-272-3671.

Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Title IX Policy: The University of Texas at Arlington ("University") is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. *For information regarding Title IX, visit* www.uta.edu/titleIX or contact Ms. Michelle Willbanks, Title IX Coordinator at (817) 272-4585 or titleix@uta.edu

Academic Integrity: Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.
I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code in their courses by having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University. Additional information is available at https://www.uta.edu/conduct/. Faculty are encouraged to discuss plagiarism and share the following library tutorials http://libguides.uta.edu/copyright/plagiarism and http://library.uta.edu/plagiarism/

Lab Safety Training: Students registered for this course must complete all required lab safety training prior to entering the lab and undertaking any activities. Once completed, Lab Safety Training is valid for the remainder of the same academic year (i.e., Fall through Summer II) and must be completed anew in subsequent years. There are no exceptions to this University policy. Failure to complete the required training will preclude participation in any lab activities, including those for which a grade is assigned.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at http://www.uta.edu/oit/cs/email/mavmail.php.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as "lecture," "seminar," or "laboratory" shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit http://www.uta.edu/sfs.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is located to the right as you exit the lab (138 Life Science) and as you exit the classroom (226 Science Hall). When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at http://www.uta.edu/universitycollege/resources/index.php.

The IDEAS Center (2nd Floor of Central Library) offers **free** tutoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. To schedule an appointment with a peer tutor or mentor email IDEAS@uta.edu or call (817) 272-6593.

The English Writing Center (411LIBR): The Writing Center Offers free tutoring in 20-, 40-, or 60-minute face-to-face and online sessions to all UTA students on any phase of their UTA coursework. Our hours are 9 am to 8 pm Mon.-Thurs., 9 am-3 pm Fri. and Noon-6 pm Sat. and Sun. Register and make appointments online at http://uta.mywconline.com. Classroom Visits, workshops, and specialized services for graduate students are also available. Please see www.uta.edu/owl for detailed information on all our programs and services.

The Library's 2nd floor Academic Plaza offers students a central hub of support services, including IDEAS Center, University Advising Services, Transfer UTA and various college/school advising hours. Services are available during the library's hours of operation. http://library.uta.edu/academic-plaza

Librarian to Contact:			
Biology	Gretchen Trkay	817.272.5352	gtrkay@uta.edu
Chemistry	Antoinette Nelson	817.272.7433	nelson@uta.edu
Geology	Andy Herzog	817.272.7517	amherzog@uta.edu
Math	C.D. Walter	817.272.5336	cdwalter@uta.edu
Physics	Andy Herzog	817.272.7517	amherzog@uta.edu