**Course Syllabus – Spring 2023**

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**Course Information**
BIOL/CHEM 3361 section 003
Biochemistry 1
Spring 2023
**MWF, 1:00–1:50 PM, SCI 1.210,**

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**Professor Contact Information**
Dr. Sheel Dodani Office: BSB 11.439 Email: sheel.dodani@utdallas.edu
Office hrs: TBA
Dr. Sandhya Gavva Office: SLC 3.501 Email: sgavva@utdallas.edu
Office Hrs: MW 11:00 AM -12 :00 noon
Office Hours are hosted by Graduate TAs (MS Teams meeting link is available on eLearning)
Evan Francios Bonnand: Monday and Wednesday, 4:00 to 5:00 PM
Fernando Montalvillo: Tuesday and Thursday, 1:00 -2:00 PM

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**Course Pre-requisites, Co-requisites, and/or Other Restrictions**
CHEM 2323 (or equivalent); CHEM 2325 (or equivalent).
Concurrent registration in Biochemistry Workshop I (BIOL 3161, Sections 001 – 009) is required for both BIOL and CHEM 3361 students.

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**Course Description**
Structures and chemical properties of amino acids; protein purification and characterization; protein structure and thermodynamics of polypeptide chain folding; catalytic mechanisms, kinetics and regulation of enzymes; energetics of biochemical reactions; metabolism; roles of coenzymes and prosthetic groups in redox reactions; pathways for carbohydrate oxidation; glycogen metabolism; glucose synthesis; electron transport and oxidative phosphorylation.

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**Student Learning Objectives/Outcomes**
This undergraduate core course is the first of a two-course sequence that provides students with a working knowledge of the macromolecules and fundamental metabolic pathways of prokaryotes and eukaryotes, with emphasis on human systems. Biochemistry I is devoted to mastering: 1) the structure and function of amino acids and proteins, and 2) central metabolism

and energy conservation, as a means of understanding biological processes in general and developing problem-solving skills in biochemistry. Fundamental thermodynamic principles that drive life processes and the regulatory mechanisms that fine-tune them are stressed to provide the rationale and framework for students to master the necessary molecular structure and pathways. Relevance to human physiology, medicine, and genetics is used to stimulate students to begin the integration of biochemistry with other disciplines.

At the end of the course, students will be able to:

1. Explain the basic thermodynamics governing biochemical reactions and use this information to solve problems involving biochemical thermodynamics.
2. Recognize the molecular structures and describe the chemical properties of proteins, their amino acid residues, and carbohydrates; and solve related pH problems.
3. Explain enzyme catalysis and regulation and apply enzyme kinetics in problem solving.
4. Describe the central pathways for the catabolism of glucose and complex carbohydrates, and gluconeogenesis, and apply them in problem solving.
5. Understand the organization of electron transport chains and the different mechanisms for ATP synthesis, and apply them in problem solving.

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**Required Textbooks and Materials**

R.H. Garrett and C.M. Grisham: Biochemistry, 6h edition, from Cengage Learning.

*eBook Purchasing Options:*

1. Direct purchase through Blackboard

Click on the "eBook" link on the left navigation of your course homepage on eLearning/BbCollaborate. When you purchase the Cengage eBook directly through Blackboard, you will not need an ISBN.

OR

2. Purchase through Bookstore

When you purchase through the bookstore, you will purchase Cengage Unlimited eTextbooks ISBN 9780357693933

The text is available either alone or bundled with OWLv2.

OWLv2 is an online set of study materials for each of the 15 chapters covered in the course, which you may wish to use. To register and log in go to login.cengagebrain.com. If you need an ID, use your UTD net ID. **The OWLv2 questions will NOT be graded by UTD staff, and OWLv2 is NOT required for the course. But, it may be cheaper to buy the text with OWLv2, rather than the text alone.**

Textbooks and some other bookstore materials can be ordered online or purchased at the UT Dallas Bookstore.

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**Assignments & Academic Calendar**

| DATE | TOPIC(S) | Book Chapter | Instructor |
|---|---|---|---|
| Wed Jan 18 | **Lecture 1:** Introduction | Chap 1 | Gavva |
| Fri Jan 20 | **Lecture 2:** Weak interactions / Water | Chap 1 & Chap 2 | Gavva |
| Mon Jan 23 | **Lecture 3:** Acid/Base Properties | Chap 2 | Gavva |
| Wed Jan 25 | **Lecture 4:** Thermodynamics of Biological Systems I | Handout on eLearning as substitute for Chap 3 | Gavva |
| Fri Jan 27 | **Lecture 5:** Thermodynamics of Biological Systems II | Handout on eLearning as substitute for Chap 3 | Gavva |
| Mon Jan 30 | **Lecture 6:** Thermodynamics of Biological Systems III / Hydrophobic interactions | Handout on eLearning as substitute for Chap 3 | Gavva |
| Wed Feb 1 | **Lecture 7:** Amino Acids I | Chap 4 | Gavva |
| Fri Feb 3 | **Lecture 8:** Amino Acids II | Chap 4 | Gavva |
| Mon Feb 6 | **Lecture 9:** Protein Purification and Characterization I | Chap 4.7 & 5.1-5.2, 5.7-5.8 | Gavva |
| Wed Feb 8 | **Lecture 10:** Protein Purification and Characterization II | Chap 4.7 & 5.1-5.2, 5.7-5.8 | Gavva |
| Fri Feb 10 | **Lecture 11:** Proteins: Primary structure, Sequencing and Mass spectrometry I | Chap 4.7 & 5.3-5.6; Chap 6 | Gavva |
| Mon Feb 13 | **Exam 1 – TBD** | | Gavva |

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| Wed Feb 15 | **Lecture 12:** Proteins: Mass spectrometry II, Sequence Alignments and Structures | Chap 4.7 & 5.3-5.6 Chap 6 | Gavva |
| Fri Feb 17 | **Lecture 13:** Protein Structure and Protein Folding | Chap 6 and Chap 31.1 on PP 1132-1140 | Gavva |
| Mon Feb 20 | **Lecture 14:** Enzyme kinetics I | Chap 13 | Gavva |
| Wed Feb 22 | **Lecture 15:** Enzyme kinetics II and Inhibition kinetics I | Chap 13 | Gavva |
| Fri Feb 24 | **Lecture 16**: Inhibition kinetics II | Chap 13 | Gavva |
| Mon Feb 27 | **Lecture 17:** Bisubstrate Reactions | Chap 14 | Gavva |
| Wed Mar 1 | **Lecture 18:** Enzyme mechanisms I | Chap 14 | Gavva |
| Fri Mar 3 | **Lecture 19:** Enzyme mechanisms II | Chap 14 | Gavva |
| Mon Mar 6 | **Exam 2 – format TBD** | | |
| Wed Mar 8 | **Lecture 20:** Enzyme regulation | Chap 15 | Dodani |
| Fri Mar 10 | **Lecture 21:** Enzyme regulation II | Chap 15 | Dodani |
| **Mon Mar 13- Fri 17** | **Spring Break** | **No classes** | Dodani |
| Mon Mar 20 | **Lecture 22:** Allostery in hemoglobin | Chap 15 | Dodani |
| Wed Mar 22 | **Lecture 23:** Overview of metabolism | Chap 17 | Dodani |
| Fri Mar 24 | **Lecture 24:** Carbohydrates | Chap 7 | Dodani |
| Mon Mar 27 | **Lecture 25:** Glycolysis I | Chap18 | Dodani |
| Wed Mar 29 | **Lecture 26:** Glycolysis II | Chap 18 | Dodani |
| Fri Mar 31 | **Lecture 27:** Glycolysis III | Chap 18 | Dodani |
| Mon Apr 3 | **Lecture 28:** Gluconeogenesis | Chap 22 | Dodani |
| Wed Apr 5 | **Lecture 29:** Gluconeogenesis/Glycogen metabolism | Chap 22 (part 1) | Dodani |
| Fri Apr 7 | **Lecture 30:** Glycogen metabolism | Chap 22 (part 2) | Dodani |
| Mon Apr 10 | **Exam 3 – format TBD** | | Dodani |
| Wed Apr 12 | **Lecture 31:** Pentose phosphate pathway | Chap 22 (part 2) | Dodani |
| Fri Apr 14 | **Lecture 32:** TCA cycle I | Chap 19 | Dodani |
| Mon Apr 17 | **Lecture 33:** TCA cycle II | Chap 19 | Dodani |
| Wed Apr 19 | **Lecture 34:** TCA cycle III | Chap 19 | Dodani |
| Fri Apr 21 | **Lecture 35:** Electron transport I | Chap 20 | Dodani |

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| Mon Apr 24 | **Lecture 36:** Electron transport II | Chap 20 | Dodani |
| Wed Apr 26 | **Lecture 37:** Electron transport III | Chap 20 | Dodani |
| Fri Apr 28 | **Lecture 38:** ATP synthesis I | Chap 20 | Dodani |
| Mon May 1 | **Lecture 39:** ATP synthesis II | Chap 20 | Dodani |
| Wed May 3 | | | |
| Fri May 5 | **Exam 4 – format TBD** | | |

**Graduate Teaching Assistants**

Bonnand, Evan Francois evan.bonnand@utdallas.edu
Fernando, Montalvillo Fernando.montalvillo@utdallas.edu
Zakia Akter zakia.akter@utdallas.edu
Md Liakat Hossain mdliakat.hossain@utdallas.edu

**Undergraduate Teaching Assistants**

Allan Jacob allan.Jacob@utdallas.edu
Arman Kavoussi Arman.Kavoussi@utdallas.edu
Azophi Moffat Azophi.Moffat@utdallas.edu
Binoy, Anjali Rose Anjali.Binoy@utdallas.edu
Eunice Lee Eunice.Lee@utdallas.edu
Hanin Shakeel Hanin.Shakeel@utdallas.edu
Krish Patel Krish.Patel@utdallas.edu
Mustafa Alrawi Mustafa.Alrawi@utdallas.edu
Sarvani Ganapavarapu Sarvani.Ganapavarapu@utdallas.edu
Sivi Palanisami Sivi.Palanisami@utdallas.edu
Sreeja Eadha Sreeja.Eadha@utdallas.edu
Talha Maqsood Talha.Maqsood@utdallas.edu
Valentina Cespedes valentina.cespedes@utdallas.edu

**Supplemental Instruction (SI) and Peer Tutoring:** Supplemental Instruction (SI) is offered for this course. SI sessions are collaborative group study sessions, scheduled two times per week. Sessions are facilitated by an SI Leader, who has taken the course and received a high final grade. Attendance is voluntary. For information about the days, times, and locations for SI sessions, refer to http://www.utdallas.edu/studentsuccess/help-with-courses/supplemental-instruction/

Janavi Devang Mehta janavi.Mehta@utdallas.edu

## Workshop Sections

| Section | Day | Time | Room | TA |
|---|---|---|---|---|
| 001 | Mon | 4:00pm | SCI 2.215 | Sarvani G, Valentina C |
| 002 | Tues | 8:00am | FO 3.616 | Arman Kavoussi |
| 003 | Tue | 1:00pm | FO 3.616 | Anjali Binoy, SiviPalanisami |
| 004 | Wed | 2:00pm | SLC 2.304 | Allan Jacob; Krish Patel |
| 005 | Wed | 4:00pm | SLC 2.304 | Talha Maqsood |
| 007 | Thurs | 1:00pm | FO 3.616 | Sreeja Eadha |
| 008 | Fri | 9:00am | SLC 2.302 | Eunice Lee; Hanin Shakeel |
| 009 | Fri | 12:00pm | FO 3.616 | Azophi Moffat;Mustafa Alrawi |

Teaching assistants will organize workshop sections, hold office hours, conduct exam review ebsessions, post materials, and send e-mails.

## Workshop Schedule

| Week | Dates | Topic | PS Due Date |
|---|---|---|---|
| 1 | Jan 17 – Jan 20 | No Workshop | |
| 2 | Jan 23 – Jan 27 | pH calculations, HH equation | **Feb 3** |
| 3 | Jan 30 – Feb 3 | Thermodynamics | **Feb 10** |
| 4 | Feb 6 – Feb 10 | Aminoacids, Protein purification | **Feb 17** |
| 5 | Feb 13 – Feb 17 | Exam week – No workshops | |
| 6 | Feb 20 – Feb 24 | Enzyme kinetics | **Mar 3** |
| 7 | Feb 27 – Mar 3 | Enzyme mechanisms, protein structure | **Mar 10** |
| 8 | Mar 6 – Mar 10 | Exam week – No workshops | |
| 9 | Mar 13 – Mar 17 | Spring break – No workshops | |
| 10 | Mar 20– Mar 24 | Enzyme Regulation, Carbohydrates | **Mar 31** |
| 11 | Mar 27 – Mar 31 | Glycolysis, Gluconeogenesis, Glycogen Metabolism | **Apr 7** |
| 12 | Apr 3 – Apr 7 | Gluconeogenesis, Glycogen Metabolism | **Apr 14** |
| 13 | Apr 10– Apr 14 | Exam week – No workshops | |
| 14 | Apr 17– Apr 21 | TCA cycle and electron transport | **Apr 28** |
| 15 | Apr 24 – Apr 28 | Electron Transport ATP Synthesis | **May 5** |
| 16 | May 1 – May 5 | Exam week – No workshops | |

**Exam Review Schedule – format and time will be announced**
Exam 1: Sat Feb 11
Exam 2: Sat. Mar 4
Exam 3: Sat. Apr 8
Exam 4: Sat. Apr 29

**Grading Policy**
Problem Sets: 10%
Random Quizzes 10%
Exam 1: 20%
Exam 2: 20%
Exam 3: 20%
Exam 4: 20%

**Workshop Problem Sets:** There will be weekly problem sets that will be graded for completion. The problem sets for a given unit will be posted on e-Learning. Each week, the concepts and problem solving will be covered in workshop. The completed problems will be due the following Monday at 5 PM in eLearning, unless it is a holiday. For full credit, all steps to the solution of problems must be shown. Answer keys to problems will be posted on e-Learning following the due date.

**Quizzes:** There will be in-person quizzes given randomly during the semester. Format of the quiz can be short answers, multiple choice, drawing, calculations, T/F, fill in the blanks, matching etc. Quizzes will account for 10% of the overall grade after dropping the lowest quiz grade.

**Exams:** All exams either on-line or in-person will be taken during the class period.

**Grades:** At the end of the semester an average of the four exam scores plus the problem-set score and problem-set exam will be computed and scaled between 0 and 100 points. Your final letter grade will be no worse than that based on the following scale:

| Letter Grade | Score Range |
|---|---|
| A- to A+ | 90-100 |
| B- to B+ | 80-89 |
| C- to C+ | 70-79 |
| D- to D+ | 60-69 |
| F | < 60 |

**You will receive the same letter grade in both BIOL/CHEM 3361 and BIOL 3161**

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## Course & Instructor Policies

*Make-up exams*

There will be no make-up exams except for the most extreme of documented circumstances or for religious holidays as described under University Policy below. If you do miss an exam, the score will be recorded as 0.

*Late Work*

Problem sets will not be accepted after the due dates. If you do miss a due date, the score will be recorded as 0.

*Class Participation*

Notes and slides used in lecture, problem sets, class announcements, scores, and practice exams will be posted on eLearning, which is accessible through Orion on the UT Dallas Homepage.

*Classroom Citizenship*

Please avoid using cellphones and other behaviors that distract students around you.

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## Class Materials

The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course, however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class, or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

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## Classroom Conduct Requirements Related to Public Health Measures

UT Dallas will follow the public health and safety guidelines put forth by the Centers for Disease Control and Prevention (CDC), the Texas Department of State Health Services (DSHS), and local public health agencies that are in effect at that time during the Spring 2022 semester to the extent allowed by state governance. Texas Governor Greg Abbott's Executive Order GA-38 prohibits us from mandating vaccines and face coverings for UT Dallas

employees, students, and members of the public on campus. However, we strongly encourage all Comets to get vaccinated and wear face coverings as recommended by the CDC. Check the Comets United: Latest Updates webpage for the latest guidance on the University's public health measures. Comets are expected to carry out Student Safety protocols in adherence to the Comet Commitment. Unvaccinated Comets will be expected to complete the Required Daily Health Screening. Those students who do not comply will be referred to the Office of Community Standards and Conduct for disciplinary action under the Student Code of Conduct – UTSP5003.

https://www.utdallas.edu/community-health/covid-19/#utd-health-guidance

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## Class Attendance

The University's attendance policy requirement is that individual faculty set their course attendance requirements. Regular and punctual class attendance is expected. Students who fail to attend class regularly are inviting scholastic difficulty. In some courses, instructors may have special attendance requirements; these should be made known to students during the first week of classes. Faculty have the discretion to set an attendance policy for their in-person meetings, but the absences due to COVID-19 cannot be counted against a quarantined student.

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## Class Recordings

Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student AccessAbility has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the class, or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

The instructor may record meetings of this course. These recordings will be made available to all students registered for this class if the intent is to supplement the classroom experience. If the instructor or a UTD school/department/office plans any other uses for the recordings, consent of

the students identifiable in the recordings is required prior to such use unless an exception is allowed by law.

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**Comet Creed**

*This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:*

"As a Comet, I pledge honesty, integrity, and service in all that I do."

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**Academic Support Resources**

The information contained in the following link lists the University's academic support resources for all students.

Please see http://go.utdallas.edu/academic-support-resources.

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**UT Dallas Syllabus Policies and Procedures**

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please review the catalog sections regarding the credit/no credit or pass/fail grading option and withdrawal from class.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

*The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.*