

HUN 4813C
Laboratory Techniques in Molecular Nutrition
Fall 2023 – Section 21GF (14192)



Instructor: Zhiyong Cheng, PhD
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Office hours: Virtual on Zoom, Tuesdays 2:00 – 3:00 pm,
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Teaching assistants: Jinying “Clary” Yang (yang.jinying@ufl.edu)
Office hours Mondays, 1:00-3:00 PM (via Zoom) or by appointment via email

Class location and meeting times: Online (synchronous)
Mondays, Periods 3-5 (9:35 – 12:35 am)
Wednesdays, Periods 3-4 (9:35 – 11:30 am)

Attendance: Required
Credits: 3

Course Description and Prerequisites: The course focuses on laboratory techniques used to study nutrition at molecular level. It covers the knowledge and application of nutrition, biochemistry, molecular biology, genomics, physiology, and bioinformatics. The class will be administered online (synchronous), where students will engage in (1) discussing the principles and applications of the lab techniques, (2) virtual lab training and simulation, (3) examining and interpreting published research, and (4) addressing real-life research questions regarding molecular nutrition.

Prerequisites: CHM 2211, CHM 2211L, BCH 3025 or BCH 4024

Course Learning Objectives: By the end of this course, students will be able to

1. Explain the principles of laboratory techniques for molecular nutrition research.
2. Choose research methods effectively for accomplish research goals.
3. Design and plan feasible projects to address real-life questions.
4. Interpret and conclude about experimental data with inference.
5. Examine and critique published research.

This course uses the e-Learning (Canvas) system for postings of various class materials, as well as scores for quizzes and assignments. Access to e-Learning requires a Gatorlink account. To establish a Gatorlink account, go to <http://www.gatorlink.ufl.edu/>. Once you have created an account, access the e-learning homepage at <http://elearning.ufl.edu/>. Continue with e-Learning Login using your Gatorlink ID.

Recommended Text: (Optional) There is no required textbook for this course. Power Point slides and reading assignments from various sources (e.g. textbook chapters and current articles, etc.) will be posted at Canvas.

Class/Laboratory Attendance and Make-Up Work: In accordance with the University of Florida’s policy: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>, class attendance and participation are mandatory. Students will behave in an appropriate manner in class, taking care not to

disrupt other students' learning activities. Students are asked to be punctual and submit assignments on time. Make-up work and assignments are consistent with university policies (visit the link shown above).

Student Evaluation: The assessments will be comprised of 6 quizzes (25 points each), 7 research reflections (8 points each), 7 instruction-guided experiment simulations (8 points each), 1 paper (project report, 50 points), 1 oral presentation (project presentation, 40 points), and class participation (48 points). All assessments will be administered in class. Assignment instructions and grading rubrics will be posted at Canvas. Quizzes will be closed book and timed (40 min) and administered on Canvas. Each quiz will consist of 8 'choose an answer among multiple choices' questions and 2 short-answer questions. Quizzes must be taken when scheduled. The lowest quiz grade will be dropped and five quiz grades will be counted towards the final grade. A missed quiz will count as the dropped quiz. Any other missed quizzes will result in a grade of "0" unless there are extenuating circumstances (subject to our discretion) that can be documented to our satisfaction. Extenuating circumstances include unavoidable, unplanned situations such as illness (chart note from physician or clinic; vague notes such as "was seen" are not acceptable); family death (dated obituary); accident (police report); or an interview at a professional school (official invitation), etc. An excused, documented absence from a quiz will result in the grade for the missed quiz being calculated as the average of the other quizzes. For the quality of class participation, a functional camera and audio with minimal background noise are expected, and the grading rubrics can be found in the next page.

| Grade Breakdown | Points |
|---|--------|
| Quizzes (25 pts x 6) | 150 |
| Reflections (8 pts x 7) | 56 |
| Instruction-guided experiment simulations (8 pts x 7) | 56 |
| Research proposal - oral presentation (40 pts) | 40 |
| Research proposal – final paper (50 pts) | 50 |
| Class participation (48 pts) | 48 |
| Total | 400 |

Grading scale (Grades are not curved or negotiable; final grade in % other than arbitrary points)

| | | | | | |
|----------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|----------------------------|
| A = 370-400 92.5-100% | A- = 358-369 89.5-92.25% | B+ = 346-357 86.5-89.25% | B = 330-345 82.5-86.25% | B- = 318-329 79.5-82.25% | C+ = 306-317 76.5-79.25 |
| C = 290-305 72.5-76.25% | C- = 278-289 69.5-72.25% | D+ = 266-277 66.5-69.25% | D = 250-265 62.5-66.25% | D- = 238-249 59.5-62.25% | E = <238 <59.5% |

Current UF Grading Policies: Please see the following link for information on grade point equivalencies: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

Instructor-Initiated Recording of Class: Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Attendance and Participation Rubric

| Criteria | Unsatisfactory-Beginning | Satisfactory-Developing | Excellent-Accomplished | Total |
|---|--|--|--|------------|
| Attendance* | 3 points | 6 points | 12 points | /12 |
| 2 absences are allowed with no questions asked/no penalty. Absences beyond 2 should receive prior approval(s). | 6+ absences (unexcused) | 3-5 absences (unexcused) | Besides the 2 penalty-free absences, attended all class sessions or received approval for necessary absences | |
| Frequency | 3 points | 6 points | 12 points | /12 |
| | Student does not initiate contribution & does not participate without prompting from the instructor. | Student sometimes initiates contribution, but does so infrequently (fewer than half of the class sessions) | Student initiates contribution in at least half of the class sessions | |
| Quality * | 3 points | 6 points | 12 points | /12 |
| For the quality of class participation, a functional camera and audio with minimal background noise are expected. | Comments are uninformative and lacking in appropriate terminology. Heavy reliance on opinion and personal taste. | Comments are sometimes constructive, but not always relevant to the discussion. Student sometimes uses appropriate terminology. | Comments are mostly insightful & constructive; student mostly uses appropriate terminology. | |
| Listening | 3 points | 6 points | 12 points | /12 |
| | Does not listen to others; regularly talks while others speak or does not pay attention while others speak; detracts from discussion; sleeps, etc. | Student is mostly attentive when others present materials and perspectives, but sometimes needs to be reminded of the class focus. | Student listens attentively when others present materials and perspectives, as indicated by comments that build on others' remarks, i.e., student hears what others say & contributes to the dialogue. | |
| | | | | /48 |

Adapted from Carnegie Mellon

In-class Recording by Students: Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor. A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third-party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Lecture materials and other information are the property of the University of Florida and the course instructor and may not be used for any commercial purpose. Students found in violation may be subject to disciplinary action under the University’s Student Conduct Code. Only students formally registered for the course are permitted to attend lectures and take exams.

We the members of the University of Florida community pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

Academic Honesty: As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: “*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*” You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: “*On my honor, I have neither given nor received unauthorized aid in doing this assignment.*”

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

Software Use: All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Email: Students are required to check their email account(s) daily (at least Monday through Friday) and respond to course/program related requests, inquiries, etc. in a timely manner.

Course Evaluation: Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at: <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at: <https://gatorevals.aa.ufl.edu/public-results/>.

Services for Students with Disabilities: The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. Contact information: 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

Campus Helping Resources: Students experiencing crises or personal problems that interfere with their general wellbeing are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

University Counseling & Wellness Center: Counseling Services, Groups and Workshops, Outreach and Consultation, Self-Help Library, Wellness Coaching. 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/

U Matter We Care: If you or someone you know is in distress, please contact us at 352-392-1575 or visit www.umatter@ufl.edu to refer or report a concern and a team member will reach out to the student in distress.

Career Connections Center: First Floor JWRU, 352-392-1601, <https://career.ufl.edu/>

Student complaints: Residential Course: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>. Online Course: <http://www.distance.ufl.edu/student-complaint-process>

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need or visit www.shcc.ufl.edu/.

University Police Department: Call 352-392-1111 (or 9-1-1 for emergencies) or visit www.police.ufl.edu/.

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; www.ufhealth.org/emergency-room-trauma-center.

Field and Fork Food Pantry located behind the FSHN Bldg (520 Newell Dr) is available to assist members of the campus community who experience food insecurity.

Student Success Initiative <http://studentsuccess.ufl.edu>

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. Nighttime and weekend crisis counselors are available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Topics and Schedule: (subject to change)

| Classes/Dates | Topics | Notes |
|----------------------|--|--|
| 1 (8/23, W) | <ul style="list-style-type: none"> • Class overview • Logistics check for experiment simulation • Identifying your # 1 research questions | <ul style="list-style-type: none"> • Reflection 1 |
| 2 (8/28, M) | <ul style="list-style-type: none"> • Approvals needed to carry out your studies <ul style="list-style-type: none"> ✓ IRB (Institutional Review Board) ✓ IACUC (Institutional Animal Care and Use Committee) ✓ IBC (Institutional Biosafety Committee) <ul style="list-style-type: none"> ➢ Working with a fume hood/biosafety cabinet ➢ Preserving biological samples at low temperature | <ul style="list-style-type: none"> • Simulation 1 |
| 3 (8/30, W) | <ul style="list-style-type: none"> • Key factors to consider for project design <ul style="list-style-type: none"> ✓ Study design ✓ Sample size ✓ Sampling bias ✓ Variable control | |
| 4 (9/4, M) | <ul style="list-style-type: none"> • Holiday (No Class Meeting) | |
| 5 (9/6, W) | <ul style="list-style-type: none"> • General lab techniques <ul style="list-style-type: none"> ✓ Sample transfer and handling <ul style="list-style-type: none"> ➢ Pipetting with micropipettor ➢ Pipetting with serological pipettors ✓ Sample preparation with centrifuges | <ul style="list-style-type: none"> • Case study • Schedule proposal outline meetings |
| 5 (9/11, M) | <ul style="list-style-type: none"> • Overview of commonly measured parameters <ul style="list-style-type: none"> ✓ Nutrients and metabolites ✓ Gene expression and variants ✓ Proteins (enzymes, transporters, signal molecules) <ul style="list-style-type: none"> ➢ Hormones and signaling pathways | <ul style="list-style-type: none"> • Reflection 2 |
| 6 (9/13, W) | <ul style="list-style-type: none"> • My research proposal outline – 1 on 1 meetings (I) | |
| 7 (9/18, M) | <ul style="list-style-type: none"> • My research proposal outline- 1 on 1 meetings (II) | |
| 8 (9/20, W) | <ul style="list-style-type: none"> • From nutrients to life: the roles of genes and proteins • Protein-centered lab techniques (I) <ul style="list-style-type: none"> ✓ Spectrophotometry (total protein analysis) ✓ Mass spectrometry (m/z) <ul style="list-style-type: none"> ➢ Proteomics | <ul style="list-style-type: none"> • Quiz 1 |
| 9 (9/25, M) | <ul style="list-style-type: none"> • Protein lab (I) <ul style="list-style-type: none"> ✓ Spectrophotometry (Protein determination) ✓ Microplate reader | <ul style="list-style-type: none"> • Simulation 2 |

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| 10 (9/27, W) | <ul style="list-style-type: none"> • Protein-centered lab techniques (II) <ul style="list-style-type: none"> ✓ Introduction to immuno-assays ✓ WB | <ul style="list-style-type: none"> • Reflection 3 |
| 11 (10/2, M) | <ul style="list-style-type: none"> • Protein lab (II) <ul style="list-style-type: none"> ✓ WB ✓ IHC/ICC | <ul style="list-style-type: none"> • Simulation 3 |
| 12 (10/4, W) | <ul style="list-style-type: none"> • Protein-centered lab techniques (III) <ul style="list-style-type: none"> ✓ IP ✓ ChIP and ChIPseq | <ul style="list-style-type: none"> • Quiz 2 |
| 13 (10/9, M) | <ul style="list-style-type: none"> • Protein lab (III) <ul style="list-style-type: none"> ✓ IP ✓ ChIP | <ul style="list-style-type: none"> • Simulation 4 |
| 14 (10/11, W) | <ul style="list-style-type: none"> • Protein-centered lab techniques (IV) <ul style="list-style-type: none"> ✓ ELISA and Protein array | <ul style="list-style-type: none"> • Reflection 4 |
| 15 (10/16, M) | <ul style="list-style-type: none"> • Protein lab (IV) <ul style="list-style-type: none"> ✓ ELISA | <ul style="list-style-type: none"> • Simulation 5 |
| 16 (10/18, W) | <ul style="list-style-type: none"> • Gene-centered lab techniques (I) <ul style="list-style-type: none"> ✓ Spectrophotometry (total DNA, RNA) ✓ PCR (specific gene expression) | <ul style="list-style-type: none"> • Reflection 5 |
| 17 (10/23, M) | <ul style="list-style-type: none"> • Gene lab (I) <ul style="list-style-type: none"> ✓ qPCR and RT-PCR | <ul style="list-style-type: none"> • Case study • Quiz 3 |
| 18 (10/25, W) | <ul style="list-style-type: none"> • Gene-centered lab techniques (II) <ul style="list-style-type: none"> ✓ DNA/RNA Microarray ✓ Sequencing techniques <ul style="list-style-type: none"> ➤ Sanger Sequencing ➤ NGS | <ul style="list-style-type: none"> • Reflection 6 |
| 19 (10/30, M) | <ul style="list-style-type: none"> • Gene lab (II) <ul style="list-style-type: none"> ✓ NGS platforms and data organization | <ul style="list-style-type: none"> • Potential case study • Simulation 6 |
| 20 (11/1, W) | <ul style="list-style-type: none"> • Hormone-centered lab techniques (I) <ul style="list-style-type: none"> ✓ Nutrients and hormonal signaling ✓ Hormone and functional analysis <ul style="list-style-type: none"> ➤ Gene analysis (e.g., PCR) ➤ Pathway analysis (e.g., ELISA, WB, IHC/ICC) | <ul style="list-style-type: none"> • Quiz 4 |

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| 21 (11/6, M) | <ul style="list-style-type: none"> • Hormone-centered lab techniques (II) <ul style="list-style-type: none"> ✓ Small molecule hormones <ul style="list-style-type: none"> ➤ Hormone level <ul style="list-style-type: none"> ○ LC/MS or GC/MS | <ul style="list-style-type: none"> • Simulation 7 • Schedule proposal-layout meetings |
| 22 (11/8, W) | <ul style="list-style-type: none"> • My research proposal layout - 1 on 1 meetings (I) | |
| 23 (11/13, M) | <ul style="list-style-type: none"> • Nutrient and metabolite-centered lab techniques (I) <ul style="list-style-type: none"> ✓ PCR ✓ WB, ELISA ✓ Research examination | <ul style="list-style-type: none"> • Quiz 5 |
| 24 (11/15, W) | <ul style="list-style-type: none"> • My research proposal layout - 1 on 1 meetings (II) | |
| 25 (11/20, M) | <ul style="list-style-type: none"> • Working on/finalizing my proposal (No Class Meeting) | |
| 26 (11/22, W) | <ul style="list-style-type: none"> • Holiday (No Class Meeting) | |
| 27 (11/27, M) | <ul style="list-style-type: none"> • Nutrient and metabolite-centered lab techniques (II) <ul style="list-style-type: none"> ✓ Spectrophotometry/spectrometry ✓ Metabolomics (MS, NMR, etc.) • Research examination | Reflection 7 |
| 28 (11/29, W) | <ul style="list-style-type: none"> • Research Proposal – Oral presentation (I) | |
| 29 (12/4, M) | <ul style="list-style-type: none"> • Research Proposal – Oral presentation (II) | |
| 30 (12/6, W) | <ul style="list-style-type: none"> • Omics approaches and personalized nutrition <ul style="list-style-type: none"> ✓ Personalized nutrition ✓ Omics in personalized nutrition • Ongoing clinical trials of personalized nutrition | Quiz 6 |
| 31 (12/11, M) | <ul style="list-style-type: none"> • Exam week (No Class Meeting) | |
| 32 (12/13, W) | <ul style="list-style-type: none"> • Exam week (No Class Meeting) | <ul style="list-style-type: none"> • Research Proposal – final paper due at 11:00pm |