

University of Puerto Rico
Río Piedras Campus
College of Natural Sciences
Nutrition and Dietetics Program
Bachelor of Science in Nutrition and Dietetics

Human Biochemistry Laboratory

NUTR 4159

Number of Hours: 3h per week for 15 weeks

Credit: 1 credit

Pre-requisites: QUIM 3015, BIOL 3712, NUTR 4041/4045

Co-requisites: NUTR 4158

Additional

Requirements:

Basic skills in computer use and access to Internet; Microsoft Office 365 (free download at <https://portal.upr.edu>) or equivalent; use of institutional e-mail and Moodle electronic learning platform (<https://online.uprrp.edu/>); intermediate knowledge and skills with experimentation in scientific laboratories, personal safety articles (long-sleeved, knee-length lab coat; OSHA-approved safety glasses/goggles; closed shoes), scientific calculator, updated Hepatitis B vaccine

First Semester, 2018-2019 Academic Year
Sec. 3U1, Saturdays, 9:00 a.m. – 11:50 a.m.
Room NCN-237

Professor: Linda Rivera, Ph.D.

Email: linda.rivera2@upr.edu

Office Hours: Please ask for and make appointments; may include virtual appointments

Lab Technician: Melissa Figueroa, B.S., Ext. 88581, 89086; melissa.figueroa1@upr.edu

Required Text: None – Digital documents and resources for laboratory experiences will be available in the electronic learning platform Moodle or sent by e-mail; use of your institutional e-mail address (firstname.lastname@upr.edu) is required.

Required materials: 8 ½ x 11" graph paper notebook
Ball point pens (blue or black)
Permanent marker for labeling glassware
Calculator

Course Description: A laboratory of scientific experimentation related to the analytical techniques utilized in biochemistry within the conceptual framework of nutrition and metabolism, emphasizing applications in human health and disease.

Course Objectives: Upon completion of the course, NUTR 4159, each student should have acquired the knowledge and skills to:

- 1) Describe the analytical techniques of major importance in the study of foods and biological samples
- 2) Demonstrate effective skills in the utilization of scientific instrumentation and equipment during the experiments
- 3) **Report the results and conclusions of laboratory experiments in an objective and organized manner with scientific rigor and evidence of critical thinking skills** (KRDN 1.3)
- 4) Value the importance of applying ethical criteria in biochemical investigations involving human subjects
- 5) **Demonstrate effective use of technology during searches for information, revision and presentation of the scientific literature in the area of nutritional biochemistry** (KRDN 1.2)
- 6) Contribute to the effective inclusion of fellow students with special needs in course activities.

Knowledge Requirements for Dietitians-Nutritionists (KRDNs): Upon completion of the course, NUTR 4159, each student should have acquired the foundation knowledge and skills, as established by the Academy of Nutrition and Dietetics' Accreditation Council for Education in Nutrition and Dietetics revised standards of 2017, and be able to carry out these additional objectives (as well as those in **bold** above):

- 1) Use current information technologies to locate and apply evidence-based guidelines and protocols. (KRDN 1.2)
- 2) Demonstrate effective and professional oral and written communication and documentation (KRDN 2.1).
- 3) Assess the impact of a public policy position on nutrition and dietetics practice (KRDN 2.3).
- 4) Analyze data for assessment and evaluate data to be used in decision-making for continuous quality improvement (KRDN 4.6).

Mission of the Didactic Program in Dietetics: The mission of the Didactic Program in Dietetics is to provide the academic preparation necessary to form Nutritionists-Dietitians qualified to offer educational, administrative and clinical services in medical nutritional therapy and in the management of food service systems. The Program capacitates professionals to work in different scenarios within an ever-changing and culturally diverse society. The integration of knowledge & skills specialized in foods and nutrition will permit graduates to promote the general welfare of the individual, the family and the community, helping them to obtain optimal nutrition in health or in sickness throughout their life cycle.

Grade Breakdown:

- A. Assignments, performance and practical evaluations = 30%
- B. Written Evaluations = 35%
 1. Opportunities – 2 (50 pts)
 2. Pre-lab quizzes (number and points vary)
- C. Laboratory Notebook and lab reports = 35%

Grade Scale:

90 - 100	A	60 - 69	D
80 - 89	B	≤ 59	F
70 - 79	C		

IMPORTANT NOTE: Remember, it is a requirement for graduation that all Nutrition and Dietetics students pass all science core and NUTR specialty courses with a “C” or better. In addition, students will be required to get special permission to re-take a course more than twice.

Reasonable Accommodation: The University of Puerto Rico complies with all state and federal laws and regulations related to discrimination, including “The American Disabilities Act” (ADA law) and Law #51 from the Puerto Rico Commonwealth (*Estado Libre Asociado de Puerto Rico*). Every student has the right to request and receive reasonable accommodation and Vocational Rehabilitation Services (VRS). Those students with special needs that require some type of particular assistance or accommodation shall explicitly communicate it directly to the professor. Students who are receiving VRS services shall communicate it to the professor at the beginning of the semester so that appropriate planning and the necessary equipment may be requested according to the Disabilities Persons Affairs Office (*Oficina de Asuntos para las Personas con Impedimentos (OAPI)*) from the Students’ Deanship office. Any other student requiring assistance or special accommodation shall also communicate directly with the professor. Reasonable accommodations requests or services DO NOT exempt the student from complying and fulfilling academic and course related requirements and responsibilities.

Student Responsibilities: Students are responsible for keeping up with this course, NUTR 4159-3U1-2018S1, Human Biochemistry Laboratory in Moodle (<https://online.uprrp.edu/>) and through e-mails sent by the professor or technician; this is important to access course documents and assignments for each week. In addition, the selected e-platform may serve as the source for e-mail generated communications from the professor or technician. Students are responsible for following specific instructions, for printing their course materials and for keeping up to date with course assignments and specifications.

Students are also responsible for accessing and following the Student Handbook for the Nutrition and Dietetics Program, available online at the Program web page: <http://nutricion.uprrp.edu/news/74/66/DPD-Student-Handbook-Updated-MARCH-27-2017> (also checking for updates), as well as *El Reglamento de Estudiantes, Recinto de Río Piedras, Universidad de Puerto Rico*, enmendada el 28 de julio de 2011, available online through the institutional web page: <http://procuraduria.uprrp.edu/wp-content/uploads/2017/05/CSA-44-2016-2017-Reglamento-Estudiantes-de-R%C3%ADO-Piedras.pdf> .

Academic Integrity: The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR Students General Bylaws (Board of Trustees Certification 13, 2009-2010) states that academic dishonesty includes, but is not limited to: fraudulent actions; obtaining grades or academic degrees by false or fraudulent simulations; copying the whole or part of the academic work of another person; plagiarizing totally or partially the work of another person; copying all or part of another person answers to the questions of an oral or written exam by taking or getting someone else to take the exam on his/her behalf; as well as enabling and facilitating another person to perform the aforementioned behavior. Any of these

behaviors will be subject to disciplinary action in accordance with the disciplinary procedure laid down in the UPR Students General Bylaws.

ALL of your written assignments and opportunities should be your own intellectual work. Plagiarism, or presenting the words or ideas of another person as your own, is a form of fraud and will not be tolerated. Papers containing plagiarism will automatically receive the grade of "F". Other examples of plagiarism include cutting and pasting from digital / electronic sources; this is inappropriate even if you cite where you got the information. When you are asked to synthesize information from a literature source, it must be in your own words (not a direct quote or direct translation). The learning objective is for the student to demonstrate that he/she sufficiently understands the information obtained from the literature to present it in his/her own words.

Cheating and academic dishonesty will not be tolerated; suspicious activity will result in a zero.

Lab Participation and Notebook: Your participation in laboratories is vital for successful learning. Your participation includes your attendance, as well as your oral and written contributions. A Check-In, Check-Out system will be implemented to ensure you are prepared for the lab experience and have actively written in your notebook during the experimentation.

Observation and evaluation of laboratory skills during experimentation will also occur. Laboratories may only be made up under special circumstances, upon the professor's approval. Please bring copies of medical excuses, and speak to me about your absences in order to determine whether or not there will be a make-up assignment. Tardiness is not acceptable; you must be present on time to receive specific instructions related to lab procedures in order to participate in the laboratory experience. Unexcused absences will result in a failing grade.

Opportunities: An "opportunity" is what many professors call an "exam." It is YOUR OPPORTUNITY to show the professor what you have learned. Although the opportunities are originally scheduled to be held in lab during course hours, opportunities may be held outside of class hours, usually on a Wednesday during "*la hora universal*" or afternoon/evening hours. Any potential conflict of exam hours outside the regular course schedule must be brought to the attention of the professor immediately after the exam announcement to identify possible arrangements. Cell phones and beepers must be turned off, and you must remain in the classroom (no use of cell phone calculators permitted). All answers must be in blue or black ink, not in pencil. If necessary, opportunities may be offered through the Moodle e-learning platform or the traditional format may be altered to a project or special assignment.

Pre-lab Quizzes: Weekly pre-lab quizzes will be completed either on paper in class or electronically using features of Internet and the Moodle e-learning platform. Specific point values will be provided with each quiz. Deadlines are not flexible; late assignments will not be accepted. Tardiness to the lab is not an acceptable excuse to make-up a quiz.

Métodos alternos de enseñanza:

La Certificación Núm 112 (2014-2015) de la Junta de Gobierno define un curso presencial como un curso en el cual 75% o más de las horas de instrucción requieren la presencia física del estudiante y el profesor en el salón de clases. Esto quiere decir que 25% de un curso presencial, pudiera ofrecerse sin requerir la presencia física de los estudiantes y el profesor en el salón de clases. En caso de ser necesario, este curso podrá completar hasta 25% de las horas contacto (11.25 horas) de forma no presencial por métodos alternos como por ejemplo: Videoconferencias, módulos instruccionales, laboratorios virtuales, foros de discusión y cibercharlas entre otros. De ser así, se modificará el calendario/temario para incluir los temas que serán cubiertos por métodos alternos.

Select References

(additional references are included on instruction guides for lab experiences):

- Berg, J. M., Tymoczko, J. L., Gatto Jr., G. J. & Stryer, L. (2015). *Biochemistry* (8th ed.). New York: W. H. Freeman.
- Bergmann, M. M., Gorman, U. & Mathers, J. C. (2008). Bioethical considerations for human nutrigenomics. *Annual Review of Nutrition*, 28, 447-467. doi: 10.1146/annurev.nutr.28.061807.155344
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- Blázquez, N. (2000). *Bioética: La nueva ciencia de la vida*. Madrid: Biblioteca de Autores Cristianos.
- Box, G.E.P., Hunter, J.S., & Hunter, W.G. (2005). *Statistics for experimenters: Design, innovation, and discovery* (2nd ed.). Hoboken, NJ: Wiley-Interscience, John Wiley & Sons, Inc.
- Devlin, T. (Ed.). (2010). *Textbook of biochemistry with clinical correlations* (7th ed.). Hoboken, NJ: John Wiley & Sons.
- Gibson, R. S. (2005). *Principles of nutritional assessment* (2nd ed.). New York: Oxford University Press.
- Gutiérrez, M. & Torres Berríos, C. J. (2001). *Guía a la quinta edición del publication manual of the American Psychological Association*. Retrieved on August 13, 2007, from University of Puerto Rico, Rio Piedras, College of Education Gerardo Sellés Solá Library Web site: http://educacion.uprrp.edu/educacion_files/virtual/bibselles/refp/images/manualapa.pdf.
- Joesten, M. D. (2004). Acid-Base Chemistry. In J. J. Lagowski (Ed.), *Chemistry: Foundations and Applications* (vol. 1, pp. 4-12). New York: Macmillan Reference USA, Gale Virtual Reference Library. Thomson Gale. Universidad de Puerto Rico Rio Piedras. Retrieved on January 21, 2009 from <http://biblioteca.uprrp.edu:2156/gvrl/infomark.do?&contentSet=EBKS&type=retrieve&tabID=T001&prodId=GVRL&docId=CX3400900015&source=gale&userGroupName=uprpiedras&version=1.0>
- Landesberg, J. M. (2010). *Basic laboratory experiments for general, organic, and biochemistry* (1st ed.). Belmont, CA: Brooks/Cole, CENGAGE Learning.
- Linder, M. C. (Ed.). (1991). *Nutritional biochemistry and metabolism with clinical applications* (2nd ed.). New York: Elsevier.
- Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A., Ploegh, H., ... Scott, M. P. (2013). *Molecular cell biology* (7th ed.). New York: W. H. Freeman.

- Madej, T., Lanczycki, C. J., Zhang, D., Thiessen, P. A., Geer, R. C., Marchler-Bauer, A., & Bryant, S. H. (2014). MMDB and VAST+: tracking structural similarities between macromolecular complexes. *Nucleic Acids Research*, 42(Database issue), D297-303.
- Moore, D. S. (2004). *The basic practice of statistics* (3rd ed.). New York: W. H. Freeman and Co.
- Murray, R. K., Granner D. K., & Rodwell, V. W. (2006). *Harper's illustrated biochemistry* (27th ed.). New York: Lange Medical Books/McGraw-Hill.
- National Center for Biotechnology Information (US). (1998-). *Genes and disease* [Internet]. Bethesda (MD): National Center for Biotechnology Information (US). Available from <http://www.ncbi.nlm.nih.gov/books/bv.fcgi?call=bv.View..ShowTOC&rid=gnd.TOC&depth=2>
- National Research Council (U.S.). Subcommittee on the Tenth Edition of the RDAs (1989). *Recommended dietary allowances* (10th ed.). Washington D.C.: National Academy Press.
- Nelson, D. L. & Cox, M. M. (2017). *Lehninger principles of biochemistry* (7th ed.). New York: W.H. Freeman and Company. ISBN-13: 978-1464126116, ISBN-10: 1464126119
- Ninfa, A. J., Ballou, D. P., & Benore, M. (2010). *Fundamental laboratory approaches for biochemistry and biotechnology* (2nd ed.). Hoboken, NJ: John Wiley & Sons, Inc.
- Panel on Dietary Antioxidants and Related Compounds, Subcommittees on Upper Reference Levels of Nutrients and Interpretation and Uses of DRIs, Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine (2000). *Dietary reference intakes for vitamin C, vitamin E, selenium and carotenoids*. Retrieved from http://books.nap.edu/openbook.php?record_id=9810&page=1
- Qiagen. (2003, February). *FlexiGene DNA handbook: For purification of DNA from human whole blood, buffy coat, cultured cells* (pp. 6-11, 18-20). Valencia, CA: Qiagen, Inc.
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- Shils, M. E., Shike, M., Ross, A. C., Caballero, B., & Cousins, R. J. (Eds.) (2006). *Modern nutrition in health and disease* (10th ed.). Philadelphia: Lippincott, Williams & Wilkins.
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- Strong, F. M. & Koch, G. H. (1981). *Biochemistry laboratory manual* (3rd ed.). Dubuque, IA: Wm. C. Brown.
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Voet, D., Voet, J.G., & Pratt, C.W. (2013). *Fundamentals of biochemistry: Life at the molecular level*. (4th ed.). Hoboken, NJ: John Wiley & Sons.

Web pages:

<http://bcn.uprrp.edu/> , Biblioteca, Facultad de Ciencias Naturales, UPR-RP

<https://www.genome.gov/> , National Human Genome Research Institute

<https://www.nap.edu/> , The National Academies Press

<https://www.ncbi.nlm.nih.gov/> , National Center for Biotechnology Information

Content Outline and Course Distribution *

*Activities may be adapted according to the particular circumstances of students with special needs and the availability of laboratory materials.

Topic	Time (hours)
I. Laboratory	
A. Preparation and analysis of experimental data	3.0
1. Notebooks	
2. Microsoft Excel	
B. Information Systems and on-line data bases for experiments and investigation	5.0
in biochemistry and nutrition	
1. Search strategy	
2. Bioinformatics	
3. Bioethics	4.0
C. Laboratory Safety	
1. Seminar on biohazards and exposition to blood-borne pathogens	
2. Laboratory safety	3.0
D. Desoxyribonucleic Acid (DNA)	
1. Extraction and applications (PCR, gel electrophoresis)	
a. plant kingdom or human blood	
E. Protein	6.0
1. Extraction and analysis	
a. Electrophoresis (SDS-PAGE)	
b. Colorimetry or chromatography	
F. Water	3.0
1. Determination of presence and movement	
G. pH and buffer systems	3.0
H. Vitamins	3.0
1. Determination of presence and applications	
I. Minerale	3.0
1. Determination of presence and applications	
J. Enzymology	3.0
1. Spectrometry/Colorimetry – <i>Enzyme-Linked Immunoabsorbent Assay (ELISA)</i>	
K. Sugars	3.0
1. Detection and fermentation	
L. Lipids	3.0
1. Determination of presence and applications	
a. Fat, fiber and Fattaché	3.0
M. Special topics	
<i>Total Contact Hours</i>	45.0