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

NUTR 4158

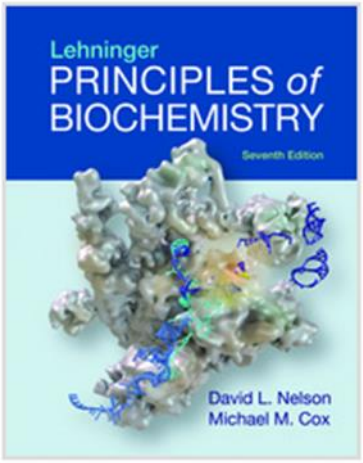
Human Biochemistry

Second Semester 2018-19

Course Title: Human Biochemistry
Course Code: NUTR 4158
Credits: Three (3) credits ; 3 hours per week
Meeting time and days: Section 0U1; Mondays, 1:00 p.m.-3:50 p.m.
Course Location: EFAN 105 Temporarily (EFAN 205 later)
Professor: **Nancy Correa-Matos, PhD, RDN, LND**
Contact Information: nancy.correa@upr.edu; ext. 88581, EFAN 104 (Temporary)
Office hours: By appointment: EFAN 205 (temporarily EFAN 104)
Mondays, 10:00 a.m.-12:00 m.; and Wednesdays, 9:30 a.m.-11:30 a.m.; 2:00 p.m.-3:00 p.m. or by agreement with professor.
Phone number: 787-764-0000 and 88581 (Nutrition Main Office)
Pre-requisites: QUIM 3001, 3002, 3015; BIOL 3711, 3712; NUTR 4041, 4045; evidence of 3 doses of Hepatitis B vaccine.
Co-requisites: Enrolled in NUTR 4159

Additional Requirements: Calculator with log function, basic computer skills, access to the Internet, use of institutional e-mail address (___@upr.edu) and specified electronic learning platforms, such as Moodle.

Required text: Nelson, D.L. & Cox, M.M. (2017). *Lehninger Principles of Biochemistry* (7th ed.). New York: W.H. Freeman and Company**. ISBN-10: 1-4641-2611-9; ISBN-13: 978-1-4641-2611-6, at** https://store.macmillanlearning.com/
Use the website above to purchase the required materials for this course at the lowest cost available. When ordering from this site, your materials will be delivered with FREE SHIPPING (use the promo code SHIPFREE at checkout)! Purchases from this site will also give you instant access to the digital version of the text.



Course Description: The study of the chemistry and metabolism of the principle biomolecules within the conceptual framework of nutrition, emphasizing applications in human health and disease.

Course Objectives: Upon completion of the course, NUTR 4158, each student should have acquired the knowledge and skills to:

1) Explain fundamental concepts related to the nature, importance and function of water and electrolytes, proteins, carbohydrates and lipids in foods and the human body
2) Relate the principal reactions, pathways, and mechanisms of control in the metabolism of macronutrients and bioenergetics pathways
3) Describe the roles of the principal micronutrients and related bioactive molecules involved in macronutrient metabolism and bioenergetics pathways
4) Explain the characteristics, nature, function and control of enzymes, in addition to the consequences of their defects
5) Value the importance of applying ethical criteria in biochemical investigations involving human subjects
6) Demonstrate effective use of current information technologies during the revision and presentation of the scientific literature
7) Contribute to the effective inclusion of fellow students with special needs in course activities.

Learning Outcomes:
Critical Thinking Skills will be assessed using the criteria of:

1) identification of the problem/issue
2) analysis/investigation of the problem/ issue
3) credibility of sources/materials
4) creativity reflecting in-depth student engagement
5) integration of environmental exposures on biochemical processes and health outcomes
6) application of concepts to clinical conditions

Knowledge requirements for registered dietitian nutritionists (KRDN):

- KRDN 1.1: Demonstrate how to locate, interpret, evaluate and use professional literature to make ethical, evidence-based practice decisions.
- KRDN 1.3: Apply critical thinking skills
- KRDN 2.1: Demonstrate effective and professional oral and written communication and documentation.
- KRDN 3.5: Describe basic concepts of nutritional genomics

- KRDN 5.3: Integrate the effects of different environmental exposures on biochemical processes and subsequent health outcomes.
- KRDN 5.3 Learning activities must prepare students for professional practice with patients/clients with various conditions, including, but not limited to overweight and obesity; endocrine disorders; cancer; malnutrition and cardiovascular, gastrointestinal and renal diseases.

Instructional strategies: class discussions, literature reviews, assignments, exams, projects, quizzes, oral and written presentations. If needed, alternative methods such as videoconferences, chats, online instructional modules, online quizzes, assignments, projects and exams.

Minimum requirements of the course*:*

- Computer with internet access
- Computer skills in the use of internet webpages, excel, word and Power Point, email and cell phone applications.
- Calculator
- Email (upr.edu) account and Moodle account

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 com-munity, helping them to obtain optimal nutrition in health or in sickness throughout their life cycle.

Student Evaluation: *

Grade Components

A. Exams = 65%

Exams – 3 (100 pts) & comprehensive final (150 pts)

B. Assignments and quizzes = 15%

1. Weekly/biweekly assignments – Specific instructions and points will be given for each assignment.

C. Oral Presentation and written report = 20%

Grading scale:				
	90 - 100	A	60 – 69	D
	80 - 89	B	$\leq$ 59	F
	70 - 79	C		

- In special situations, exams, projects or assignments can be offered to be completed or submitted online, through Moodle or email.

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. It is important for students to invest sufficient time to keep up with readings, assignments, and related deadlines, and to visit the professor or seek help if difficulties are encountered with understanding course materials.

No "special assignments" will be given or accepted on an individual basis at the end of the semester as a means to better grades.

***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 following this course in Moodle (https://online.uprrp.edu/) in order to access course documents and assignments for each week. In addition, the selected e-platform will serve as the source for e-mail-generated communications from the professors. Students are responsible for following instructions, for printing their course materials if desired, and for keeping up to date with course assignments, whether they are electronic or on paper.

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 , as well as *El Reglamento de Estudiantes, Recinto de Río Piedras, Universidad de Puerto Rico* aprobado el 06 de diciembre de 2016 (Certificación 44-SA-2016-2017), 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.

Certification 112: (Spanish version: Certificación Núm. 112 (2014-2015) de la Junta de Gobierno): "Guía para la creación, codificación uniforme y el registro de cursos en la Universidad de Puerto Rico, establece que es un curso en el cual el 75% o más de las horas de instrucción requieren la presencia física del estudiante y el profesor en el salón de clases. Esta definición posibilita, si así lo decide el profesor, en común acuerdo con los estudiantes matriculados, que el de las horas contacto de un curso presencial se ofrezcan usando otra modalidad. Debe quedar claro que solo hasta un máximo del de las horas contacto del curso, como lo establece la definición de curso presencial, pueden ejecutarse haciendo uso de la tecnología o de otras experiencias de aprendizaje, tales como excursiones, internados, aprendizaje en servicio, visitas instruccionales y otras de igual calidad académica. Por ejemplo, si el curso fue registrado como uno de 45 horas contacto, puede ofrecer hasta un máximo de 11.25 horas contacto haciendo uso de otra modalidad".

Student Handbook:
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/32/66/DPD-Manual-del-Estudiante-actualizado-enero-2015.

Classroom policies:

Civil Behavior: Article 2.9 Student Handbook

It is assumed that all students understand classroom decorum. However, in case there is any question, proper conduct is spelled out here. Proper conduct involves good attentiveness and cooperation in the class. Attentiveness and cooperation are defined as being in class on time, paying full attention to class lectures or other presentations, being involved in discussions, asking appropriate questions or making meaningful comments by raising a hand and being called upon, and remaining in place and attentive until dismissed by the professor.

Inappropriate behavior includes chatting with others during the lecture or discussions; using cell phones for any reason (calls, text messages, pics, etc.); using CD or MP-3 players or related equipment during class; allowing cell phones or pagers to ring (turn them off!); using a personal or university computer in class for reasons not related to this course, and otherwise being disruptive or discourteous to the professor or other students in the class. Using tobacco products of any kind in the classroom is prohibited. You are presumably here voluntarily to learn something. Discourteous or disruptive behavior will not be tolerated because it prevents that learning from taking place. Furthermore, students who are disruptive or discourteous will be dismissed from the class once and only once. If there is a second occurrence, the student will be referred to the Vice President for Student Affairs for permanent expulsion from the course.

Any activity from the student toward the instruction that can be considered a threat, disrespect or violence act will be notified immediately to the campus police and crisis management and a report will be filled against the student.

Use of the computers:

The use of computers in the classroom is allowed in the course.

Email communications:

Respect is expected. You can expect that I will treat you with respect and I will do the same. This infers that you will email me (Dr. Correa-Matos) and your classmates in a respectful manner. Each email should adhere to the following guidelines:

1. Insert in the subject line "NUTR 4158 First Semester 2018-19"...
2. Include your full name.
3. Address me as Dr. Correa-Matos, not Ms. or Mrs.
4. Use proper punctuation and grammar.
3. You are responsible for frequently checking announcements in Moodle and your email.
4. It is your responsibility to understand and comply with all course requirements.

***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.

During exams, cell phones and other electronic or paging devices must be turned off, and you must remain in the classroom (no use of cell phone calculators or sharing of calculators permitted). Calculations will be provided. Final answers must be in blue or black ink.

Assignments/ projects: Weekly/biweekly assignments will be designed to help with the integration and application of biochemistry to nutrition and health. They are to be turned in at the beginning of the class on the due date, according to the specific instructions given. Complete bibliographies (APA style) of references used must be included in all assignments. Deadlines are not flexible; late assignments will not be accepted.

Make-up exams will not be given unless evidence of illness and/or appointment of court are shown. The make-up exams will have a different format from the in-class exam, such as short answer, fill-in the blank, discussion or oral exams, as per professor's choice. Make up exams will be given during at the end of the semester, before finals exams week. Time and place will be notified in advance.

Class Participation: Your participation in classes is vital for successful learning. Your participation includes your attendance, as well as your oral and written contributions. We will be using the interactive Sapling Learning with e-book and smart-phone clicker interface during class periods, helping you to comply with active participation. For this reason, no more than 2 excused absences will be allowed without lowering your grade. Please bring copies of medical excuses, and speak to the professor about your absences in order to determine whether or not there will be a make-up assignment. Tardiness is not acceptable. Three tardiness will count as one unexcused absence.

- The expectation is that when you come to class, you have completed the reading and/or homework assignments at the university level.

- The students can contact the professor sending their questions and comments by email; please include reference to the course code, NUTR 4158, in all e-mail subject headings.

Course Outline:

Schedule NUTR 4158: First Semester 2018-19 Note: Can be changed by professor at any time. Students will be notified by Moodle of any changes.		
Date: 2019	**Assignment**	**Topic**
1/14	Introduction, Syllabus Chapter 1	Introduction to course Overview of structure and characteristics of biomolecules; The cells and organelles
1/21	No class-Holiday	

1/28	Chapter 1,2	(Cont.) Overview of structure and characteristics of biomolecules; The cells and organelles Water, pH, acid/base balance, buffer systems
2/4	Chapter 8, 9, 24, 28	DNA & RNA: Composition and structure; Human Genome Project
2/11	Chapter 8, 9, 24, 28	DNA & RNA: Composition and structure; Human Genome Project **Turn-in literature review**
2/18	No class	Holiday
2/25	Chapter 3, 4, 5	Proteins I: Composition and structure,
3/4	**EXAM 1 (2 hours)**	Chapters 1,2,8,9,24,28
3/11	Chapter 5, 21, 23 (peptide hormones)	Proteins I and II: Structure-function relationships in protein families
3/18	Chapter 6, Chapter 27 **Due: Turn in outline**	Enzymes: Classification, kinetics and control; Protein metabolism
3/25	Chapter 18	Urea Cycle; Amino acid metabolism
4/1	Chapter 22, 23	Amino acid metabolism, oxidation, degradation; Amino acid synthesis, molecules derived from amino acids
4/8	**EXAM #2 (2 hours)**	Chapters 3,4,5,21,22, 23,27,18
4/15	Chapter 13, 16, 19 Chapter 7 Chapter 14	Bioenergetics; Citric Acid Cycle, Electron Transport Chain Carbohydrates and Glycobiology Carbohydrate Structure, Carbohydrate Glycolysis, Gluconeogenesis, and the Pentose Phosphate Pathway Metabolism
4/15	Chapters 7, 14 (cont.) Chapters15, 23 **Due: Written reports of presentations**	Carbohydrates and Glycobiology Carbohydrate Structure, Carbohydrate Glycolysis, Gluconeogenesis, and the Pentose Phosphate Pathway Metabolism
4/29	Chapter 10, 12, 17, 21	Lipid Structure, Lipid Metabolism
5/6, 5/8	**EXAM #3 (2 hours)** **Oral presentations (8 minutes per student)**	5/8 finish oral presentations
5/10-5/17	**FINAL EXAM**	DATE/TIME/ ROOM TBA

Final project:
Integration and Application of Biochemistry to Daily Living

Directions:

Using the knowledge gained in class, identify an issue or need in daily living in which biochemistry plays an important role. Explain how this situation can be solved by applying biochemical concepts learned from class.

General Guidelines:

1. Define the problem, situation or necessity based on the topic assigned.
2. Establish the biochemical aspects need to be applied in order to solve the situation
3. Explain possible solutions. Justify your solutions with evidence-based scientific references.

Specific guidelines:

- You need to work ahead of time
- Your will work with a partner
- ***This work will be divided in three parts:***
    - ***Part 1- Topic assigned (1/14), and literature review (2/4)***
    - ***Part 2- Outline revision (3/11)***
    - ***Part 3-***
        - ***Written presentation 4/8***
        - ***Oral presentation 4/22, 4/29***
- Make sure no one else has your topic. Topic may be given. Your professor will approve the final topic selection.
- Discuss the problem assigned. Follow the evaluation criteria below. In general it is composed of:
    - Abstract
    - Overview of the problem.
    - Literature Review-Include the table of the literature searched. Include the type of study, subjects and statistical data to show relevance.
    - Create a table with the articles as shown below:

Literature Source Tracking

Citation	Purpose/Research Question(s)	Method and Sample Characteristics	Major findings & Main Conclusions
Wiley et al, 2010	What are important family- and personal-level predictors of physical activity among Mexican late adolescents?	16- to 25-year-old (n=3,766), Mexican college applicants underwent a health screen and filled out a questionnaire. Cross-sectional data	Perceived parental PA, enjoyment of PA, and conflicts about PA with parents were all important positive predictors of adolescent PA.

Notes:

    - Describe the molecule or nutrient involved in this condition.
    - Discuss the metabolic aspects leading to the condition. Include a diagram to support your explanation.
    - Which dietary aspects are affected?
    - As a nutritionist, what will be the dietary approach to solve/alleviate this problem.
    - Conclusion- Include your opinion regarding the quality and validity of the studies.

- Show evidence to justify your solution. Select 8-10 scientific articles from 2012-to present.

- Turn in your written work. In text and bibliography must follow APA style. Your work must not exceed 5 pages of information (excluding title page, table of content, appendixes and reference page). Pages must be numbered. Use 12-point, Times New Roman FONT.
- Prepare an 6-8 minutes oral presentation.

General evaluation criteria	**Points**
1. Literature review /Outline (5 points) Good selection of scientific articles	5
2. Abstract (10 points) Write a general idea about the Project: include purpose, objectives, methods, subjects, results and conclusion.	10
3. Overview (10 points) It provides background information (statistics and scope) about the problem and delineates the purpose of the study. Must include objetives and hypothesis.	10
4. Describe the molecule or nutrient involved in this condition (10 points) Describe the project in a concise manner, clear and well organized. How did you realize your search?	10
5. Discuss the metabolic aspects leading to the condition. Include a diagram to support your explanation (20 points) Data was presented in an organized way. Tables and figures are clear and well presented. Tables and figures have captions. Include a diagram of the metabolic pathway occurring due to the lack/presence of such molecule.	20
6. Dietary implications: (**15 points**) Which dietary aspects are affected? As a nutritionist, what will be the dietary approach to solve/alleviate this problem. Show evidence to support your opinion.	15
7.Discussion/Conclusions (**15 points**) Include your opinion regarding the quality and validity of the studies. Reasonable and evidenced-based conclusions. Clear conclusions.	15
8. Content/ Organization (10 points) Work is in students' own words (not copy/paste). Good flow of ideas presented in an organized way, easy to follow. No grammatical or semantic errors, contains in-text references. Expresses knowledge on the topic.	10
9. Bibliography (5 points) Include all references used in APA style from scientific journals, e-journals, e-books and books, recent and from reputable sources.	5
9. Oral presentation (25 points)	50
10. Punctuality (before or at the beginning of class on due day; late work (-5 up to -10)	
Total (125 points)	150

References used in the course:

Berg, J. M., Tymoczko, J. L., Stryer, L. & Gatto Jr., G. J. (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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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

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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

Panel on Dietary Reference Intakes for Electrolytes and Water, Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine. (2005). *Dietary reference intakes for water, potassium, sodium, chloride, and sulfate.* Retrieved from http://books.nap.edu/openbook.php?record_id=10925&page=1 .

Panel on Macronutrients, Subcommittees on Upper Reference Levels of Nutrients and Interpretation and Uses of Dietary Reference Intakes, and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine. (2005). *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids (macronutrients).* Retrieved from http://books.nap.edu/openbook.php?record_id=10490&page=1

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Additional Electronic References:

Institute of Medicine, Food and Nutrition Board. Dietary Reference Intake (DRI) series. Available at http://www.nap.edu.

US Department of Agriculture, *National Nutrient Database for Standard Reference*. Available at http://ndb.nal.usda.gov/.