FDSC 4333/5333 Molecular biology techniques applied to nutrition and food science (CEMB approved course)

Fall 2017

Instructor: Dr. Franck Carbonero
Phone: 479-575-6822
Email: fgcarbon@uark.edu
Lectures location/times: POSC 0133 MWF 8:35-9:25
Office Location: Food Science N-223
Office Hours: Please email me to set up an appointment.

Pre-requisites: Instructor consent

REQUIRED Textbooks:
1. Supplemental reading materials distributed by the instructor.

CATALOG DESCRIPTION: This course will provide advanced knowledge on current molecular biology techniques and how they can be used in nutrition and food science. A specific emphasis will be given on learning how to understand and interpret results generated through these methods. Therefore, the course is of interest to a wider audience, as such analytic skills are valuable for a diverse array of disciplines. Methods covered will include DNA and RNA-based techniques (PCR, microarrays, sequencing, genomics and metagenomics…), protein-based techniques (blots, proteomics…) and other molecules-based techniques (metabolomics, immunoblots…)

LEARNING OUTCOMES: Upon successful completion of this course, the student will:
1. Demonstrate an advanced understanding of current molecular biology techniques principles.
2. Demonstrate a basic understanding of study design and application of molecular biology in the context of nutrition and food science, or in their field of interest.
3. Be able to describe and analyze molecular biology data tables and figures routinely obtained in basic and applied biology research laboratories.
4. Be able to interpret and communicate results to scientific AND lay audiences.

BLACKBOARD Site Information: Announcements, assignments, and lecture notes will be regularly posted in Blackboard. http://learn.uark.edu

COURSE INFORMATION
Lecture: 3 hours/week
Class format: The class format will be a mix of lectures combined with active learning techniques and in class discussion

STUDENT RESPONSIBILITIES
Attendance: Attendance in class is critical to receiving a passing grade in this course and will be monitored. Missing classes will only be allowed when due to documented circumstances, and

advance notification (for example missing class due to attending a conference) will be appreciated.
Participation: Your participation in class discussions will be noted and reflected in your grade
Reading: Assigned reading from the required textbooks and supplemental sources will be posted on Blackboard.
Professionalism: Students are expected to behave in class in a responsible and respectful manner. Disruptions (behavior or language) and sleeping will not be tolerated. If you are being disruptive or are caught sleeping, you will be asked to leave the class. In addition, communication with the instructor via emails should be formal, using complete sentences.

GRADING:	**Undergraduate (200 pts)**	**Graduate (300 pts)**
	Three (3) exams (75%; 150pts)	Three (3) exams (50%; 150pts)
	Presentations (15%; 30 pts)	Presentations (40%; 120 pts)
	Participation (10%; 20 pts)	Participation (10%; 30 pts))

Note: The departmental grade scale is as follows:
90.0 – 100.0% = A
80.0 – 89.9% = B
70.0 – 79.9% = C
60.0 – 69.9% = D
59.9% and below = F

EXAMS: There will be two (2) lecture exams and one (1) cumulative final worth 50 pts each, for a total of three (3) exams worth 150 total points. The final exam will include information presented by the students as case study presentations (see below) The format of each exam will include any combination of the following: multiple choice, short answer, essay, labeling diagrams, and fill in the blank. Exam grades will be returned to you has soon as possible. No make up exams will be allowed, except for documented circumstances. I reserve the right to ask for proof of the extenuating circumstance. If you have a circumstance, you MUST contact me (479-575-6822, fgcarbon@uark.edu) BEFORE missing the exam or you will not be allowed to take the make up exam.
Grades will also be based on case study presentations given alone or by groups of two students (depending on the number of students enrolled) at the end of the semester. Other students will be provided score sheet that will be collected and part of the final evaluation.
Regular participation during the recitation will be expected to score all the participation points. Recurrent unexcused absences will result in the loss of all participation points.

CELL PHONES: Cell phone use of any kind during class will not be permitted.

STUDENTS WITH DISABILITIES: If you need an accommodation due to a disability, please make arrangements to discuss this with me during the first two weeks of the semester.

PLAGIARISM: According to the University of Arkansas Catalog of Studies (p. 404), plagiarism is "the offering as one's own work, the words, ideas, or arguments of another person or using the work of another without appropriate attribution by quotation, reference, or footnote. Plagiarism occurs both when the words of another (in print, electronic, or any other medium) are

reproduced without acknowledgement and when the ideas or arguments of another are paraphrased in such a way as to lead the reader to believe that they originated with the writer. It is not sufficient to provide a citation if the words of another have been reproduced – this also requires quotation marks. It is the responsibility of all University students to understand the methods of proper attribution and to apply those principles in all materials submitted."

Tentative **Lecture Schedule (depending of total number of students, the schedule will be modified to include hands-on bioinformatics training)**

Dates	**Lecture #**	**SUBJECT**
I. DNA/RNA		
August 21	Lecture 1	Introduction; Syllabus; class format; presentations
August 23	Lecture 2	Refresher: Cellular biology
August 25	Lecture 3	Refresher: DNA/RNA
August 28	Lecture 4	PCR techniques: Principles
August 30	Recitation 4a	PCR techniques
Sept 6	Recitation 4b	PCR techniques
Sept 8	Lecture 5	DNA sequencing and other applications
Sept 11	Recitation 5	DNA sequencing and other applications
Sept 13	Lecture 6	DNA sequencing and other applications
Sept 15	Recitation 6a	Next-generation sequencing
Sept 18	Recitation 6b	Next-generation sequencing
Sept 20	Lecture 7	Next-generation sequencing
Sept 22	Recitation 7a	Next-generation sequencing
Sept 25	Recitation 7b	Next-generation sequencing
Sept 27	Lecture 8	Microarrays
Sept 29	Recitation 8a	Transcriptomics/epigenomics
Oct 2	Recitation 8b	Transcriptomics/epigenomics
Oct 4	**EXAM 1**	**Test over lectures/recitations 1-8**
Oct 6		Test 1 review
II. Proteins, metabolites, biomarkers and immunity		
Oct 9	Lecture 9	Refresher: Amino-acids/Proteins, metabolites,

Oct 11	Lecture 10	Proteomics: Principles
Oct 13	Recitation 10a	Proteomics
Oct 18	Recitation 10b	Proteomics
Oct 20	Lecture 11	Refresher: immunity Metabolites/Biomarkers
Oct 23	Lecture 12	Immunity markers: Principle
Oct 25	Recitation 12a	Immunity markers
Oct 27	Recitation 12b	Immunity markers
Oct 30	Lecture 13	Metabolomics: Principles
Nov 1	Recitation 13a	Metabolomics
Nov 3	Recitation 13b	Metabolomics
Nov 6	Lecture 14	Biomarkers: Principle
Nov 8	Recitation 14a	Biomarkers
Nov 10	Recitation 14b	Biomarkers
Nov 13	**EXAM**	**Test over Lectures 9- 14**
Nov 15	Lecture 18	Test 2 review
Nov 17	Lecture 19	Final instructions to prepare the presentations
Nov 20		Hands-on bioinformatics?
III. Presentations		
Nov 27	Lecture 19	Students presentations
Nov 29	Lecture 20	Students presentations
Dec 1	Lecture 21	Students presentations
Dec 4	Lecture 22	Students presentations
Dec 6	Lecture 22	Review and instructions for finals
Dec 14	**EXAM 3**	**Final comprehensive exam**

Week	Topics
1	Introduction and historical perspective
2	Basics of DNA and RNA for molecular biology PCR principle and applications
3	Real-time and quantitative PCR Advanced PCR techniques
4	DNA and RNA microarrays principle and interpretation
5	DNA sequencing: history, principle and data analyses Next-generation sequencing: available platforms and respective use
6	Microbiome: phylogenetic gene makers sequencing: principle and interpretation Metagenomics: Microbial DNA shotgun sequencing: principle and interpretation
7	Genomics: Microbial genomics and food safety EXAM #1
8	Basics of proteins and other important molecules for molecular biology Western, Northern, Eastern and Southern Blots: principle and interpretation
9	Proteomics: Approaches and equipments for protein purification and amino-acids sequencing Metaproteomics: principle and interpretation
10	Metabolomics: principle and interpretation
11	Immunoblots: principle and interpretation Biomarkers: principle and interpretation
12	Remarkable examples of application in various scientific fields EXAM #2
13	Molecular biology in basic and biomedical nutrition research
14	Molecular biology in R&D for food and nutrition industries
15	Case Study: Student Presentations
16	Case Study: Student Presentations
EXAM #3	Cumulative Final Exam (refer to final exam schedule for dates)