

Fall 2015

BIOS 5173

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GENERAL INFORMATION: BIOS 5173 (Molecular Biotechnology)

Time: Tu-Th 11.00-12:15 PM. **Place:** Science Building 1001 **Professor:** Dr. V.V.Sridhar

Office: Computer Center, Room 202A. **Phone:** 504-280-6642

Email: vsridhar@uno.edu. *Office hours:* **Monday & Wednesday 11.00 am- 2.00 pm** email for appointment.

Course content: Biotechnology is a new and exciting scientific discipline that is based on the ability of researchers to transfer specific genes from genetic information from one organism to another to create a useful commercial product. The course will include a detailed lecture on organization and expression of the genes in prokaryotic and eukaryotic organisms. We will also study most popular techniques that molecular biologists use to investigate the structure and function of genes by recombinant DNA technology along with examples of the applications of these methods in

1. Manipulation of gene expression in prokaryotes and eukaryotes.
2. Directed mutagenesis and protein engineering.
3. Molecular diagnostics, Protein therapeutics and Vaccines.
4. Production of commercial products in prokaryotes and eukaryotes.
5. Transgenic plants and animals for useful products.

Learning goals: By the end of this course the students be aware of how the basic studies in different areas of biology is applied in the field of biotechnology. The students will be exposed to various tools and scientific approaches used in biotechnology to solve real world problems particularly in agriculture and medicine. In addition, original papers and reviews will be assigned for reading and students are expected to be able to critically assess the data presented in the paper and discuss the research conclusion in 10-15 pages. *Graduate students will analyze and synthesize a topic in the literature and demonstrate their understanding of a topic in biotechnology.*

Course organization: The course is divided into three sections, each followed by a test on that section. The first part will consider the fundamentals of molecular biotechnology that includes regulation of prokaryotic and eukaryotic gene regulation, recombinant DNA technology techniques and basic information about genomics, proteomics and bioinformatics. In the second segment, we will consider the molecular biotechnology of microbial systems that includes gene expression in prokaryotes, protein engineering, protein therapeutics and vaccines. In the third segment we will consider molecular biotechnology of eukaryotic systems that includes gene expression in eukaryotes, monoclonal antibodies, transgenic plants and animals.

Section 1: Gene structure and regulation of gene expression in prokaryotes and eukaryotes. DNA cloning procedures and large scale genome sequencing. Functional genomics with microarray and serial analysis of gene expression. Separation and identification of proteins, protein microarrays, mass spectrometry, protein-protein interaction mapping. Genome

databases, sequence analysis, pairwise and multiple alignments. Class days: August 20, 25, 27. September 1, 3, 8, 10 Review/Problem Session September 15. **TEST 1: September 17.**

Section 2: Manipulation of gene expression in prokaryotes. Mutagenesis and protein engineering. Vaccines and protein therapeutics. Commercial products by recombinant microorganisms. Class days: September 22, 24, 29. October 1, 6, 8, 13, 14 (Final drop date), 15 (No Class: Mid Semester Break). Review/Problem Session October 20, **TEST 2: October 22**

Section 3: Manipulation of gene expression in eukaryotes, principle and application of genetic engineering in plants and animals. Molecular diagnostics in medicine. Class days: October 27, 29. November 3, 5, 10, 12, 17. Review/Problem Session November 19. **TEST 3: November 24,** 26 (No Class: Thanks Giving). **December 1.** Review/Problem Session December 3.

FINAL: December 8, 10.00 - 12.00 PM

Course materials.

Book: The book for this course is "Molecular Biotechnology- Principles and Application of Recombinant DNA - Fourth Edition" by Bernard Glick, Jack Pasternak and Cheryl Patten 2010. ASM Press. ISBN: 978-1-55581-498-4.

Lecture notes: Power point slides of lecture and research articles for each class will be posted on the Moodle for this course. Please take a print out of the slides before coming to the lecture to take notes.

Assessment:

Grading basis: There will be four tests and one take home assignment, three test during class and one during final. The fourth test (the final) will be comprehensive. Your course grade will be determined by your three best scores and take home assignment. If you are satisfied with your grade after three tests, you will not need to take the final. Take home assignment is compulsory.

There will be no makeup exams, except under truly extreme circumstances. Thus, if you miss a test, you will be required to take the three remaining tests (including the final) and your grade will be based on these three.

Test format: Tests will consist of a variety of question types including multiple choice, short answers, calculation problems and essays. Some questions will be very easy but others will be more challenging, assessing your ability to apply principles to new situations. We will also have a review/ problem session before each of the tests.

Graduate Students: In addition to four tests and home assignment, you will write a 10-15 page paper on some topic of relevance to the course. We will need to get together to agree on a topic and a suitable depth for it. Furthermore, you will give a power point presentation to the class (approx. 20 minutes) on a topic of interest. Your suggestions for additional options are welcome.

General policies: High standards of academic honesty are expected, and cheating will not be tolerated. Reasonable accommodations will be made for students with disabilities.

Academic Integrity

Academic integrity is fundamental to the process of learning and evaluating academic performance. Academic dishonesty will not be tolerated. Academic dishonesty includes, but is not limited to, the following: cheating, plagiarism, tampering with academic records and examinations, falsifying identity, and being an accessory to acts of academic dishonesty. Refer to the Student Code of Conduct for further information. The Code is available online at <http://www.studentaffairs.uno.edu>.

Accommodations

It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities should contact the Office of Disability Services as well as their instructors to discuss their individual needs for accommodations. For more information, please go to <http://www.ods.uno.edu>.