DEPARTMENT OF BIOLOGY
MEDGAR EVERS COLLEGE of the CITY UNIVERSITY OF NEW YORK

SYLLABUS
BIO 461 *** MOLECULAR BIOLOGY

COURSE DESCRIPTION:

This is a study of basic molecular processes and genetic phenomena in eukaryotes and prokaryotes. Topics to be covered include molecular aspects of structure and function, replication, transcription and translation, as well as synthesis and repair of nucleic acids; protein synthesis, control of gene expression and recombinant DNA studies.

COURSE OBJECTIVES:

1. To provide students with the background and familiarity of modern molecular biology.
2. To expose students to the historical development of the science of molecular biology.
3. To expose students to, and enable them to grasp the theory and techniques presently utilized in molecular biology.
4. To enable students to harness their knowledge of the structure of DNA and the enzymology of DNA replication and repair for use in recombinant DNA techniques.
5. To enable students to acquire hands-on experience with different instruments, equipments and protocols used in molecular biology.
6. To encourage students to develop interest in biotechnology as a career goal.

RECOMMENDED TEXTS:

Essential Cell Biology: 2nd edition by Alberts, Bray, Hopkin, Johnson, Lewis, Raff, Roberts, and Walter. Garland Science Publishers.

REFERENCE TEXTS:

1. Genes V, by Lewin. Oxford University Press
2. Molecular Biology of the Cell, 3ed. by Alberts, Lewis & Roberts. Garland Publishers.
3. Recombinant DNA, 2ed. by Watson, Gilman, Witkowski, & Zoller. Scientific American Books.

LECTURE TOPICS

1. Overview - History of molecular biology

2. Genome organization and gene expression

3. Chromosome structure

4. DNA structure and properties

5. RNA structure and properties

6. DNA replication

7. DNA denaturation and repair; recombination

8. Transcription: RNA polymerases, promoter structure

9. Translation: Iniation, elongation, termination, genetic code

10. Genetic regulation: The lactose operon and transcriptional regulation

11. Transcriptional termination

12. Transcription in eukaryotes

13. RNA processing: tRNA, rRNA, mRNA, capping, and RNA splicing

14. Control of RNA processing: Translation, iniation, elongation, and termination

15. DNA synthesis: DNA polymerases, repair, DNA ligase, DNA sequencing

16. Protein synthesis: Translation factors, regulation of activity, enzymes

17. Restriction mapping: RFLP analysis and DNA fingerprinting

18. Polymerase Chain Reaction (PCR)

19. Plasmids

20. Oncogenes

LAB TOPICS

1. Introduction to the laboratory; basic equipments and techniques

2. Preparation of media and reagents commonly used in molecular biology

3. Isolation of chromosomal DNA from natural sources: *E. coli, Vibrio fisceri*

4. Spectrophotometric quantification and analysis of DNA

5. Restriction digestion and agarose gel electrophoresis of plasmid DNA and bacteriophage DNA

6. Construction of a genomic library from *Vibrio fischer*i: Ligation of genomic DNA fragments and vector analysis by gel electrophoresis

7. Isolation of bioluminescent bacteria from natural sources: (*Vibrio fischer*i, and shrimps)

8. Preparation of competent *E. col*i cells

9. Transformation of competent cells

10. Plasmid mini-preps.from bioluminescent clones

11. Restriction digestionof plasmid-mini preps. Analysis of digests by agarose gel electrophoresis

12. Southern Blot analysis I: Genomic DNA isolation from new bioluminescent isolates

13. Southern Blot analysis II: Restriction digestion of genomic DNA from new isolates. Analysis of digests by agarose gel electrophoresis. Transfer of restriction fragments to membrane.

14. DNA sequencing; autoradiography; analysis of DNA sequence

15. Polymerase Chain Reaction (PCR)