Molecular Cell Biology and Genetics (MCBG)
Overall Course Goals and Objectives

Course Goals:
The goal of Molecular Cell Biology and Genetics is:

1. to provide a strong foundation of understanding of the biochemical constituents of cells and the reactions and processes that they undergo.

2. to provide solid grounding in biochemistry, molecular biology, and genetics for an in-depth understanding of the structure, organization, and function of living matter in molecular terms.

3. To highlight clinical correlations and the importance of understanding illness and disease at the molecular level.

Course Learning Objectives:
At the end of the course the student will be able to:

MEDICAL KNOWLEDGE

1. Demonstrate the skills of independent lifelong learning while utilizing the principles of evidence-based medicine to search electronic resources and identify high-quality, unbiased medical literature. [SSOM 1.2 & 1.7]

2. Discuss the structure and function of proteins including the roles of individual amino acids in protein folding, charge, acid/base properties, and protein-protein interactions. [SSOM 1.1 & 1.2]

3. Explain the principles of enzyme kinetics and how enzyme activity can be altered by drugs that act as competitive, non-competitive, or irreversible inhibitors. [SSOM 1.1 & 1.3]

4. Analyze and interpret data and graphs related to protein expression and function, enzyme kinetics, and malfunctions of these processes in disease. [SSOM 1.1 & 1.2]

5. Discuss chromatin structure and how it can be modified to affect gene expression. [SSOM 1.1]

6. Explain the mechanisms of DNA replication and repair, RNA synthesis and processing and protein synthesis in eukaryotic cells. [SSOM 1.1]

7. Describe how gene expression is regulated at the transcriptional and post-transcriptional level. [SSOM 1.1]

8. Analyze and interpret data and graphs generated from common laboratory techniques used to manipulate and amplify DNA, measure RNA expression, detect alterations and mutations in DNA including their role in the diagnosis of disease. [SSOM 1.1 & 1.2]

9. Apply the principles of genetics to produce a family pedigree from a family history and distinguish different patterns of inheritance for single gene disorders linked to autosomes, sex chromosomes and mitochondrial genes. [SSOM 1.1 & 1.2]

10. Describe methods used to determine the relative contribution of genes and environment to common disorders with complex inheritance, and to provide genetic counseling based on empirically derived risk tables. [SSOM 1.1 & 1.2]

11. Demonstrate an understanding of population genetics including allelic frequency, genotypic frequency, and the Hardy-Weinberg equation. [SSOM 1.1]

12. Demonstrate an understanding of cell structure and the functions of organelles. [SSOM 1.1]

13. Describe the mechanisms of vesicular and protein transport to various subcellular sites. [SSOM 1.1]

14. Discuss the mechanisms of cell to cell signaling, including intracellular second messenger pathways. [SSOM 1.1]

15. Analyze and interpret data and graphs related to cell biology and its malfunction in disease. [SSOM 1.1 & 1.2]

16. Explain the cell cycle and its regulation, including the mechanism of mitosis. [SSOM 1.1]

17. Demonstrate an understanding of molecular pathways that are altered in cancers including oncogenes, tumor suppressors, apoptosis, angiogenesis, and DNA repair. [SSOM 1.1 & 1.2]

18. Analyze and interpret data and graphs related to targeted cancer drug therapy involving cultured cells, animal models, and human clinical trials. [SSOM 1.2 & 1.3]

INTERPERSONAL AND COMMUNICATION SKILLS

1. Demonstrate the ability to effectively communicate and work collaboratively with peers in the small group setting to successfully address problems in molecular cell biology and genetics. [SSOM 3.3 & 3.6]

2. Contribute to the education of peers by actively engaging in small group sessions and clearly communicating information in an oral presentation based. [SSOM 3.6]

PRACTICE-BASED LEARNING AND IMPROVEMENT

1. Critically evaluate one's performance in the course to identify strengths and personal limitations in either knowledge or study methods. [SSOM 4.1]

2. Develop learning goals to address any deficiencies and actively seek out assistance from appropriate sources to successfully remediate those deficiencies. [SSOM 4.2 & 4.3]

PROFESSIONALISM

1. Demonstrate professional behavior by completing all course requirements including course evaluations, in a timely manner. [SSOM 5.2]

2. Demonstrate professionalism by behaving in courteous and respectful manner when engaged in course activity or interacting with course faculty and staff. [SSOM 5.1]

3. Demonstrate sensitivity to peers, faculty and staff from diverse backgrounds including diversity in gender, age, culture, race, religion, disability, and sexual orientation. [SSOM 5.4]

4. Demonstrate personal responsibility and accountability by attending and being well-prepared for required course activities. [SSOM 5.2]

5. Demonstrate professional behavior by responding to direct communication from the Course Director in a timely fashion, particularly in circumstances where a face-to-face meeting is requested. [SSOM 5.1]

6. Demonstrate professional and ethical behavior by honestly completing course examinations without attempting to seek an advantage by unfair means; and by reporting any unethical behavior of peers to the course administration. [SSOM 5.6]