Molecular Cell Biology and Genetics:
Overall Course Goals and Objectives

At the end of the course, the student will be able to:

MEDICAL KNOWLEDGE

1. 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, using hemoglobin as one example.

2. Explain the principles of enzyme catalysis and how enzyme activity can be altered by drugs that act as competitive, non-competitive, or irreversible inhibitors.

3. Analyze and interpret data and graphs related to protein expression and function, enzyme catalysis, and malfunctions of these processes in disease.

4. Discuss chromatin structure and how it can be modified to affect gene expression.

5. Explain the mechanisms of DNA replication and repair, RNA synthesis and processing, and protein synthesis.

6. Describe how gene expression is regulated at the transcriptional and post-transcriptional level.

7. Analyze and interpret data and graphs that demonstrate application of cytogenetic assays and techniques used to identify and manipulate DNA and measure RNA expression to the understanding and diagnosis of disease.

8. Apply the principles of genetics to produce a family pedigree from a family history, and to distinguish patterns of inheritance for single gene disorders linked to autosomes, sex chromosomes, and mitochondrial genes.

9. 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.

10. Perform a literature search on a specific genetic disease and inform other students of the findings in a written abstract and an oral presentation.

11. Demonstrate an understanding of cell structure and the functions of organelles.

12. Describe the mechanisms of vesicular and protein transport to various subcellular sites.

13. Discuss the mechanisms of cell to cell signaling, including intracellular second-messenger pathways.

14. Analyze and interpret data and graphs related to cell biology and its malfunction in disease.

15. Explain the cell cycle and its regulation, including the mechanism of mitosis.

16. Demonstrate an understanding of molecular pathways that are altered in cancers, including oncogenes, tumor suppressors, apoptosis, angiogenesis, and DNA repair.

17. Analyze and interpret data and graphs related to targeted cancer drug therapy involving cultured cells, animal models, and human clinical trials.

INTERPERSONAL AND COMMUNICATION SKILLS

18. Demonstrate the ability to effectively communicate and work collaboratively with peers in the small group setting to successfully address problems sets in molecular cell biology and genetics.

19. Contribute to the education of peers by actively engaging in small group sessions, and by clearly communicating information in an oral presentation based on a personal literature search on a specific genetic disease.

PRACTICE-BASED LEARNING AND IMPROVEMENT

20. Critically evaluate one’s performance in the course to identify strengths and personal limitations in either knowledge of molecular cell biology and genetics or study methods; develop learning goals to address any deficiencies and actively seek out assistance from appropriate sources to successfully remediate these deficiencies.

21. Demonstrate an ability to use online resources to objectively identity and evaluate the primary basic scientific and clinical literature relevant to the molecular basis and treatment of disease.

PROFESSIONALISM

22. Demonstrate professional behavior by completing all course requirements, including course evaluations, in a timely manner.

23. Demonstrate professionalism by behaving in a professional, courteous and respectful manner when engaged in course activity or interacting with course faculty and staff.

24. Demonstrate responsibility and accountability by attending and being punctual at all required course activities such as small group, team-based learning exercises, and exams.

25. Demonstrate professional behavior by requesting any excused absence from required course activity well ahead of the scheduled date.

26. Demonstrate professional behavior by responding to direct communication from the Course Director in a timely fashion, particularly in circumstances when a face-to-face meeting is requested to discuss issues related to academic performance.

27. 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.