1. Course number and name: BMED 3600 Physiology of Cellular and Molecular Systems
2. Credits and contact hours: (3-0-0-3)
3. Prepared by: Shannon Barker
5. Specific course information
   a. Catalog description: In depth cell and molecular physiology focused on cellular responses to stimuli, including cell organization/ reorganization, membrane transport/kinetics, cell signaling/ molecular biology, mechanobiology and energy requirements.
   b. Prerequisites or co-requisites: BMED 3100
   c. Required
6. Specific goals for the course
   a. Understand the structure and functional organization of cell organelles, especially membrane, cytoskeleton, extracellular matrix and nucleus (Student Outcome 1)
   b. Understand the quantitative aspects of membrane transport and cell signaling pathways (Student Outcome 1)
   c. Understand mechanisms regulating cell growth, division & death (Student Outcome 1)
   d. Understand basic regulatory mechanisms of gene expression and protein synthesis and apply them to problems in biomedical engineering (Student Outcome 1)
   e. Understand homeostasis and how it is achieved in cell systems and be able to apply this information to product design problems (Student Outcome 1)
   f. Understand how cells interact with their substrate and apply this knowledge to the design of cell-scaffold constructs for tissue engineering (Student Outcomes 1)
   g. Know basic constituents of the extracellular matrix produced by cells and how they contribute to the mechanical properties of cells and tissues (Student Outcome 1)
   h. Read and understand the scientific literature (Student Outcome 7)
   i. Apply course outcomes 1-8 to the study of applications in biomedical engineering (Student Outcome 1)
   j. Design rational hypotheses and experimental approaches toward a biomedical problem (Student Outcome 6)
   k. Generate written and oral communications explaining the rationale of experimental approaches (Student Outcome 3)
7. Brief list of topics to be covered:
   a. The central dogma of biology
      i. Cells and molecules
ii. Transcription
iii. Translation
iv. Proteins
b. Cell receptor-ligand interactions and cell signaling
c. Membranes, cellular compartmentalization, and transport
d. Adhesion, cytoskeleton, and migration
e. The cell life cycle
f. Proliferation
g. Apoptosis
h. The extracellular matrix
i. Molecular biology techniques
j. Manipulation of cells, proteins, and DNA/RNA
k. Design a rational approach to a biomedical problem in cell biology
l. Using literature to generate a logical hypothesis
m. Design appropriate experimental approach toward logical hypothesis