Objective:

This course focuses on understanding the recent advances in Cellular and Molecular Biochemistry. We will cover topics on protein functions, protein sorting, interorganelle protein transport, signaling through receptors, apoptosis, cell cycle, and cancer. In addition, students will discuss research papers on each topic in a “Journal Club” format.

Examination Procedure

There will be three class exams and a final exam. In addition, there will be practice quizzes and journal clubs. Your grades will be as follows:

Point distributions:
Total four exams including the final. 
Best three will be counted | 60%

<table>
<thead>
<tr>
<th>Journal club (journal articles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 papers will be discussed by students</td>
</tr>
</tbody>
</table>
| Take home exams on journal clubs are due on the day of the final exam. | 13%

| Lab | 25%
| Attendance | 2%
| Grand Total | 100%

Notes:
1) Try not to miss any exam or class without proper notification.
2) Attendance is must and everyone needs to sign an attendance roster (5% of your total grade).

Grading Policy
A = 90-100
B = 80-89
C = 70-79
D = 60-69
F = Below 60
Course Materials

I. **Intracellular Compartments and Protein Sorting (Chapter -12)**

The Compartmentalization of Cells
The Transport of Molecules between the Nucleus and Cytosol
The Transport of Proteins into Mitochondria and Chloroplasts
Peroxisomes
The Endoplasmic Reticulum

*(Quiz-1 on Chapter-12)*

II. **Apoptosis (Chapter-18)**

Programmed cell death eliminates Unwanted Cells
Apoptotic cells are biochemically recognizable
Intracellular Proteolytic Cascade and Apoptosis
Death Receptor
Mitochondria and Apoptosis
Bcl2 and apoptosis
Extracellular Survival Factors Inhibit Apoptosis in Various ways

(Quiz-2 on Chapter 18)

Exam-1 (chapters 12 and 18)

III. Mechanism of Cell Communication (Chapter-15)

General principles of cell communication
Signaling through G-protein-coupled
Signaling through enzyme-coupled receptors
Phosphorylation of Receptor Tyrosine Kinases (RTKs)
RTKs serve as Docking Sites for Intracellular Signaling Proteins
SH2 Domains of RTKs
Activation of RTKs
PI-3-Kinase Lipid docking and RTKs
Cytoplasmic Tyrosine Kinases
Jak-Stat Pathways
TGFβ Signaling
Protein Tyrosine Phosphatases
The receptor protein Notch is a latent gene regulatory protein
Hedgehog proteins

(Quiz-3 on chapter-15)

Exam-2: Chapter-15

IV. Cancer (Chapter-20)
Cancer as a Microevolutionary Process
Cancer cells reproduce without restrain and colonize others
Most cancers derive from a single abnormal cell
Cancer cells contain somatic mutations
A single mutation is not enough to cause cancer
Cancers develop gradually from increasingly aberrant cells
The epigenetic changes that accumulate in cancer cells involve inherited chromatin structures and DNA methylation
Tumors induce angiogenesis
The Preventable Causes of Cancer

Quiz on Chapter-20

V. Cell Cycle (Chapter-17)

Overview of the cell cycle
The cell cycle control system
S-phase
Mitosis
Cytokinesis

Quiz on chapter 17

Exam-3: Chapters 20 and 17

Journal Club

Journal Club starts after the Spring Break


Final Exam on May 11, 2020 (1-3.45 PM)