Credits: 3

Time/Location: Spring, MWF @ 1:00 PM, MRB123

Prerequisites: BC 401

Instructor: Dr. Eric Ross: eric.ross@colostate.edu (MRB343)

Course description: This course will focus on specific diseases of current biochemical and medical interest, including genetic and metabolic disorders, chronic diseases, infectious agents and emerging diseases. Through lectures, presentations, and discussions, students will build upon their foundation in biochemistry and molecular biology to better understand the biochemical mechanisms of specific human diseases. Please note that the exact topics to be covered and dates are subject to change.

Student learning outcomes: Upon completion of this course, students will be able to:

- Describe the biochemical basis of a variety of human diseases
- Explain the mechanisms by which cytogenetic and epigenetic abnormalities can lead to human disease
- Critically analyze the limitations of various genetic and biochemical screens
- Describe the mechanisms by which protein misfolding can lead to disease
- Compare and contrast mechanisms of replication employed by different classes of viruses

Methods of evaluation: The course will consist primarily of lectures, complemented with classroom discussion and student presentations. The grade will be based on 4 exams (55%), online quizzes and assignments (25%); an oral presentation (15%), and participation in classroom discussions and activities (5%). As appropriate, homework grades will be incorporated into the exam grade for each section. Plus/minus grading will be used.

Instructional methodology: The teaching mode for this course will consist of a combination of lectures (in person or remote) and discussion, supplemented with student presentations and reading assignments.

Text: Selected review articles and primary literature.

Academic Integrity: This course will adhere to the CSU Academic Integrity policy as found in the General Catalog (https://catalog.colostate.edu/general-catalog/policies/students-responsibilities/#academic-integrity) and the Student Conduct code (https://resolutioncenter.colostate.edu/conduct/code/). Academic integrity lies at the core of our common goal: to create an intellectually honest and rigorous community. Because academic integrity, and the personal and social integrity of which academic integrity is an integral part, is so central to our mission as students, teachers, scholars, and citizens, I will ask that you affirm the CSU Honor Pledge as part of completing your work in this course.

Any coursework materials that are submitted that do not adhere to the CSU Honor Pledge will receive zero credit and will be reported to the administration. This includes the use of online AI resources such as ChatGPT.

Course Topics:

January 17-19:

1. Genetic Diseases:
   - Course Introduction, Introduction to Cytogenetic Disorders
   - Cytogenetic Disorders: Microdeletion/duplication syndromes

January 22-26:

- Cytogenetic Disorders:
  - Microdeletion/duplication syndromes
ii. Imprinting Diseases—Prader Willi/Angelman, etc.
iii. Structural rearrangements

January 29 - February 2:
- Cytogenetic disorders:
  i. Aneuploidy: Autosomes
  ii. Aneuploidy: Sex Chromosomes
  iii. Cytogenetic Disorders: Genetic Testing

February 5-9:
- Cytogenetic Disorders: Wrap-up
- Lysosomal Storage Diseases and treatment—Gaucher, Fabry, etc.
- **Exam #1**: Material through February 5th

February 12-16:
- Metabolic diseases: Aminoacidopathies and treatment—Phenylketonuria, etc.
- Structural defects—Duchenne muscular dystrophy, collagen, etc.
- Defects in Receptor Proteins—hypercholesterolemia, hyperlipoproteinemia, etc

February 19-23:
- Transport defects: Cystic fibrosis
- Hemoglobinopathies—sickle cell disease, thalassemias, etc.
- Mitochondrial Disorders

Feb 26 – March 1:
- Pharmacogenetics—Malignant hyperthermia, G6PD deficiency, etc
- Genetic diseases: Wrap-up
- Student Presentations: Genetic diseases

March 4-8:
- **Exam #2**: Material from February 7th through March 1st
- Trinucleotide Repeat Disorders: Molecular basis; Fragile X
- Student Presentations: Genetic diseases

March 11-15: Spring Break

March 18-22:
- 2. **Protein misfolding disorders**:
  - Trinucleotide Repeat Disorders: Huntington’s Disease
  - Amyloid diseases – overview
  - Student Presentations: Genetic diseases
March 25-29:
- Amyloid diseases – Recent advances
- Prion diseases – Molecular basis
- Student Presentations: Protein misfolding diseases

April 1-5:
- Prion diseases - Kuru, Creutzfeldt-Jakob Disease, Bovine Spongiform Encephalopathy (BSE), Chronic Wasting Disease (CWD).
- Liquid-liquid phase separation in biology & disease
- Student presentations: Protein misfolding diseases

April 8-12:
3. Special Topics
   - Exam #3: Material from March 18th through April 5th
   - Virology overview
   - Student presentations: Protein misfolding diseases

April 15-19:
4. Virology
   - Virology subclasses
   - Influenza
   - Student presentations: Viruses

April 22-26:
- COVID
- Virology: Vaccines & herd immunity
- Student presentations: Viruses

April 29 - May 3:
- Causation versus correlation in medical research
- Vaccines and autism
- Review

Finals week:
- Tuesday, May 7th, 4:10-6:10 PM:
  Exam #4. Material from April 10th to May 3rd.
We are committed to the CSU Principles of Community:

**Inclusion:** We create and nurture inclusive environments and welcome, value and affirm all members of our community, including their various identities, skills, ideas, talents and contributions.

**Integrity:** We are accountable for our actions and will act ethically and honestly in all our interactions.

**Respect:** We honor the inherent dignity of all people within an environment where we are committed to freedom of expression, critical discourse, and the advancement of knowledge.

**Service:** We are responsible, individually and collectively, to give of our time, talents, and resources to promote the well-being of each other and the development of our local, regional, and global communities.

**Social Justice:** We have the right to be treated and the responsibility to treat others with fairness and equity, the duty to challenge prejudice, and to uphold the laws, policies and procedures that promote justice in all respects.