

**Topics for Exam 2****I. Continuous Models: First Order Differential Equations**

- (a) Linear first order equations
  - i. General solution
  - ii. Qualitative analysis: Equilibrium points and stability
- (b) Applications: Conservation Principle and One-Compartment models.

**II. Probabilistic Models**

- (a) Random Variables and Distributions
  - i. Probability Models
    - A. Frequency Interpretation of Probability
    - B. Rules for Computing Probabilities: Independent events; mutually exclusive events
  - ii. Random Variables
  - iii. Expected Values
  - iv. Probability Distributions
    - A. Bernoulli Trial
    - B. Binomial Distribution
    - C. Poisson Distribution
- (b) Random Processes
  - i. State Diagrams
  - ii. The Poisson Process
- (c) Application: Mutation Rates and the Average Number of Mutations

**Relevant Sections in the Text and Class Lecture Notes:**

- Section 4.2 on *An introduction to Probability*, pp. 116–127, in the text.
- Section 4.3 on *Conditional Probability*, pp. 130–134, in the text.
- Chapter 4 on the *Continuous Approach to Modeling Bacterial Growth*, pp. 29–42, in the class lecture notes.
- Chapter 5 on the *Modeling Bacterial Mutations*, pp. 45–63, in the class lecture notes.
- Section 6.1 on the *Modeling the Average Number of Mutations*, pp. 66–67, in the class lecture notes.