Summary :

1. The Concept of Probability

- The field of events and the algebra of events.
- Classical, statistical, and axiomatic definitions of probability.
- Properties of probability derived from axioms.
- Conditional probability and the **Theorem of Total Probability**.
- **Bayes' Formula**.

2. Sequences of Independent Trials

- **Bernoulli trials** and the Binomial distribution.
- Local and integral theorems of **De Moivre-Laplace**.
- **Poisson's Theorem** for rare events.

3. Markov Chains

- Definition of Markov chains and transition probabilities.
- Classification of states (reflexive, transitive, etc.).
- Ergodic theorems and stationary distributions.

4. Random Variables and Distribution Functions

- Definition of a random variable.
- The distribution function and its properties.
- Discrete and continuous random variables.
- Multi-dimensional distribution functions (Joint distributions).

5. Numerical Characteristics of Random Variables

- **Mathematical Expectation** (Mean).
- **Variance** and standard deviation.
- Moments, semi-invariants, and the correlation coefficient.
- **Chebyshev's Inequality**.

6. Characteristic Functions

- Definition and fundamental properties.
- The **Inversion Formula** and the Uniqueness Theorem.
- The Continuity Theorem (Relationship between distribution convergence and characteristic functions).

7. The Law of Large Numbers

- Mass phenomena and the stability of means.
- **Chebyshev's Theorem** and **Khinchin's Theorem**.
- The Strong Law of Large Numbers (Borel and Kolmogorov).

8. The Central Limit Theorem

- The Lindeberg-Lévy Theorem for identically distributed variables.
- **Lyapunov's Theorem** (conditions for convergence to the Normal law).
- The role of the Normal distribution in physical applications.

9. Theory of Stochastic Processes (Introduction)

- Basic concepts of random processes.
- The **Poisson Process**.
- Introduction to stationary processes and spectral theory.