PROBABILITY & STATISTICS

Course Title : Mathematics III(B)
Course Code : MA181301B

Syllabus

Probability:
Probability space,conditional probability, Bayes' Theorem, Independence, Discrete random variables, Independent random variables, Poisson approximation to the binomial distribution,Infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Joint Distribution.

Continuous Probability Distributions: Continuous random variables and their properties with special reference to normal distribution.Test of significance, Chi-square Test, Elements of Markov Chain.

Statistics:
Measures of Central tendency: Moments, skewness and Kurtosis,Correlation and regression–Rank correlation, Curve fitting by the method of least squares-fitting of straight lines.

Some Basic Definitions

Trials & Events : If an experiment is repeated under essentially the same conditions and it result in any one of the several possible outcomes, then the experiment is called a **trial** and the possible outcomes are known as **events**. Eg : Tossing of a coin is **trial** and turning up of head/tail is and **event**.

Exhaustive Events: The outcomes of a random experiment is called **exhaustive events** if it covers all the possible outcomes of the experiment. Eg : In rolling of a die, the outcomes 1,2,3,4,5,6 are exhaustive events.

Favourable Events: The events which entail the required happening are called favourable events. Eg : In throwing of two dice the number of favourable cases of getting sum 7 is **6** viz. (1,6), (6,1), (2,5), (5,2), (3,4), (4,3).

Mutually Exclusive Events: Two or more events are said to be mutually exclusive if occurrence of one of them excludes the occurrence of the other. Eg : While tossing a coin we either get a head or a tail but not both.

Independent Events: Two or more events are said to be independent events if happening or non-happening of one doesn't depend on the happening or non-happening of the other. Eg : Two coins tossed at the same time, the outcome of one is independent of the outcome of the other.

Equally likely events: Two events are said to be equally likely if there is no reason to expect anyone with preference to other. Eg : Head and tail are equally likely to come.

Sample Space: The set of all possible outcomes of an experiment is called sample space. It is denotes by **S**.

Classical Definition of Probability

Let **S** be the sample space and **E** be an event. Then probability of occurrence or happening of **E** is denoted by **P(E)** and is defined as

$$P(E) = \frac{n(E)}{n(S)} = \frac{Number\ of\ favourable\ outcomes}{Total\ number\ of\ outcomes}$$

Axioms of Probability

Let **S** be the sample space and **E** be an event. Then

- $0 \leq P(E) \leq 1$
- $P(S)=1$
- If $E_1, E_2, \ldots, E_n$ be n mutually exclusive events then

$$P(E_1 \cup E_2 \cup \ldots \cup E_n) = P(E_1) + P(E_2) + \ldots + P(E_n)$$