

BMS COLLEGE OF ENGINEERING, BANGALORE – 560019

MATHEMATICS DEPARTMENT

SYLLABUS (2011 - 2012)

FOURTH SEMESTER B.E COURSE – For students of Biotechnology

Course Name	Biostatistics and Biomodeling	Course Code	11BT4DCMAT
Credits	04	L – T - P	3 -1- 0
Contact hours	52 hours (40L+12T)		

Course outcomes:

Students on completion of the course will

- i) Estimate the relation between two variables and perform regression analysis.
- ii) Apply the basic principles of probability and probability distributions to the problems of Bio-technology.
- iii) Calculate transition probabilities using Markov chain.
- iv) Test hypothesis for a given data and conduct ANOVA.
- v) Use model growth equations of microorganisms under different setups.
- vi) Illustrate the use of bio-models for genetic applications.

UNIT-1

Statistics:

[10 hours]

Scope of Biostatistics, Measures of central tendency (mean, median, mode), Measures of dispersion (quartile deviation, mean deviation and standard deviation, coefficient of variation). Correlation and regression , curve fitting (linear, non-linear and exponential curves).

(7 L + 3 T)

UNIT-2

Probability:

[10 hours]

Axioms, addition rule, multiplication rule, conditional probability, Bayes' theorem, Discrete distributions - Binomial, Poisson.

Continuous distributions – exponential, gamma, normal and Weibull distributions .

(8 L + 3 T)

UNIT-3

Markov Chain and Genetic application:

[10 hours]

Markov Chain: Probability vectors, stochastic matrices, fixed points, regular stochastic matrices. Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states

Genetic Applications of Probability, Hardy - Weinberg law, Wahlund's Principle, Forensic probability determination, Likelihood of paternity, Estimation of probabilities for multi-locus/multi-allele finger print systems.

(7 L + 2 T)

UNIT-4

Statistical Inference:

[12 hours]

Introduction, procedure for testing of hypothesis, level of significance and confidence interval estimation.

Test of significance for large samples: mean ,difference between two means, difference of two standard deviations, single proportion ,difference between two proportions, Test of significance for small samples: students t-distribution, F- distribution, Chi -Square distribution, goodness of fit test. Analysis of variance (one-way and two-way classifications).

(9 L + 3 T)

UNIT-5

Biomodeling:

[10 hours]

Microbial Growth in a Chemostat, Growth Equations of Microbial populations, Models of Commensalisms, Mutualism, Predation and Mutation. Volterra's Model for n -interacting Species. Basic Models for Inheritance, Selection and Mutation Models, Genetic Inbreeding Models. (8 L + 2 T)

Text Books:

1. Biostatistics by Wayne W. Daniel, Seventh edition
2. Fundamentals of Biostatistics by Veer Bala Rastogi - Ane books India
3. Mathematical models in Biology by Elizabeth S. Allman - Cambridge university press

Reference Books:

1. Fundamentals of statistics by Khan and Khanum
2. An Introduction to Biostatistics by P.S.S. Sundar Rao and J. Richard - Prentice Hall of India
3. Mathematical Models in Biology and Medicine by J.N. Kapur - East-West Press Pvt. Ltd.,

Question Paper Pattern

1. Each unit consists of one full question .
2. Each full question consists of three or four subdivisions.
3. Five full questions are to be answered.
4. Internal choice in Unit -2 and Unit -4.