KL UNIVERISTY, GUNTUR
FIRST SEMESTER 2010-11
Course Handout
Academic Division

Dated: 07-07-2010

Course No. : BT C206
Course Title : Biostatistics
Course Structure : 3-0-0
Course coordinator : CH Srinivas Kumar

1. Course Description:

This course introduces statistical concepts and analytical methods as applied to data encountered in biotechnology and biomedical sciences. It emphasizes the basic concepts of descriptive statistics for central tendency and dispersion; Topics include probability theory and distributions; linear correlation and regression model; quantitative analysis of data, and statistical inferences. Population parameters and their sample estimates; hypothesis testing and confidence intervals for means, variances, (Large Sample Tests and Small Sample Tests); The chi-square statistic- for independence of attributes, goodness of fit; Experimental design, categorical data analysis; analysis of variance and its use in the analysis of RBD.

The course provides students a foundation to evaluate information critically to support research objectives and product claims and a better understanding of statistical design of experimental trials for biological products/devices.

Prerequisites: Basic mathematics (algebra); scientific calculator

2. Scope and Objective of the Course:

The main aim and objective of this course is to train the students to understand the importance of the biostatistics in Biotechnology field and their use in R &D.

3. Books:

(i) Textbook:

1. a. Norman T.J. Bailey, Statistical Methods in biology (3rd Edition), Cambridge University Press (1995)
2. Richard A Johnson, Probability and Statistics for Engineers, 6th Edition, Prentice Hall, 2000.

(ii) Reference Book:

1. Bernard Rosner, Fundamentals of Biostatistics, 5th Edition, Thomson Brooks/Cole, 2000.
2. S.C.Gupta and V.K.Kapoor –Fundamentals of Mathematical Statistics, 9th Extensively revised edition, Sultan Chand & Sons, 1999

4. Syllabus:

UNIT – 1: Presentation of data & Measures of central tendency

Frequency distribution, graphical presentation of data by histogram, frequency curve and cumulative frequency curves. Mean, medium, mode and their simple properties (without derivation) and calculation of median by graphs, range, mean deviation, standard deviation and coefficient of variation.

UNIT – II: Probability and distribution
Random distributions, events exhaustive, mutually exclusive and equally likely. Definition of probability, definitions and simple properties of binomial, poisson and normal distributions and their inter relations. **Sampling:** concept of population and sample, random sample, methods of taking simple random sample.

UNIT – III: Correlation and Regression
Bivariate data, simple correlation and regression coefficients and their relations. Limits of correlation coefficients, effect of change of origin and scale on correlation coefficient, linear regression and equations of line of regression, association and independence of attributes.

UNIT – IV: Tests of Significance
Sampling distribution of mean and standard error, Large sample tests (Test for an assumed mean and equality of two population means with known SD). Small sample tests (t-test for an assumed mean and equality of means of two populations when sample observation are independent). Paired and unpaired t-test for correlation and regression coefficient. T-test for comparison of variances of two populations. Chi-square test –independence of attributes, goodness of fit, and homogeneity of sample.

UNIT – V: Experimental designs
Principles of experimental design, completely randomized design, randomized block design and Latin square design. Simple factorial experiments of basic types. Confounding in factorial experiments. Analysis of variance (ANOVA) and its use in the analysis of RBD, F-test.

5.Course Plan:

Lecture No	Learning Objectives	Topics to be Covered	Text/ Reference Book
1	Define distributions and frequency tables.	Data, Frequency distribution, Types, Simple Examples	T_2
2	Distinguish between frequency curve and cumulative frequency curve	Graphical presentation of data by histogram, frequency curve and cumulative frequency curves.	T_2
3		Graphical presentation of data by histogram, frequency curve and cumulative frequency curves.	T_2
4	Calculate Summary Statistics (Mean, Median, Mode) from raw data.	Calculation of Mean and its Properties	T_2
5		Calculation of Median, Mode and its Properties	T_2
6	Calculation of median by graphs	Median	T_2
7	Calculate Summary	Range and Mean Deviation	T_2

	Statistics (Range, Mean deviation, Standard deviation, and Coefficient of variation) from raw data.	Calculations	
8		standard deviation	T_2
9		coefficient of variation	T_2
10	Random Experiments and Various Types of Events	Random Experiments and Events	T_2
11		events exhaustive, mutually exclusive and equally likely events	T_2
12	Probability and probability measure	Definition of probability	T_2
13		Simple Theorems on Probability	T_2
14	Probability and probability measure	Problems on Probability	T_2
15			
16	1) Calculate Binomial Probabilities And Binomial Distributions. 2) Apply the binomial distribution to make predictions of the outcomes from situations that conform to the assumptions of the binomial distribution. 3) Calculate the mean and standard deviation of the binomial distribution.	Binomial Probabilities	T_2
17			
18	1) Calculate Poisson Probabilities 2) Calculate the mean and standard deviation of the binomial distribution.	Poisson Probabilities	T_2
19			
20	Normal Distribution and Its Properties	Normal Probabilities	T_2
21	Calculate The Inflection Points Of A Normal Curve, Given Its Mean And Standard Deviation	Normal Probabilities	T_2
22	1) Describe the relationship between probability and the area under the normal curve. 2) Calculate z-scores. And the appropriate probabilities and z-scores from actual data as an answer to a question about the data, assuming the data is normally distributed	Normal Probabilities	T_2
24	Concepts of Populations and Sampling Methods	Concept of population and sample, random sample, methods of taking simple random sample.	T_2

25	Correlation Coefficient and its Calculation	Bivariate Data – Correlation – Properties – Limitations	T_2
26		Calculation of correlation for bivariate data	T_2
27	Regression Coefficients and its equations	Regression and Linear Regression	T_2
28		Regression Coefficients and Simple problems	T_2
29	Relationship in between regression and correlation	Contrast regression and correlation.	T_2
30	Notations and Terminology of Sampling distribution	Sampling distribution	T_2
31	Hypothesis Testing and its types	Large sample tests	T_2
32	Test for an assumed mean with known SD – by using Z-Test	Large sample tests	T_2
33	Test for equality of two population means with known SD – by using Z-Test	Large sample tests	T_2
34	t-Test for Means and Variances , Paired t-Test	Small sample tests	T_2
35		Small sample tests	T_2
36	Test for independence of attributes, goodness of fit, and homogeneity of sample	Chi-square test	T_2
37		Chi-square test	T_2
38	Principles – Notations and Terminology	Experimental Designs & ANOVA	T_2
39	Design of experiments	Principles of experimental designs	T_2
40	Data Setup-Statistical Analysis	Completely Randomized Design	T_2
41			
42	Data Setup-Statistical Analysis	Randomized Block Design	T_2
43	Data Setup-Statistical Analysis	Latin Square Design	T_2
44	Basics and Confounding in factorial experiments.	Factorial experiments	T_2
45			

6.Self learning material:

Unit	Topic	Source
I	Graphical Representation of Central Tendencies of Frequency Distribution	T_2
II	Applications of Binomial, Poisson distributions	T_2
III	Applications of Regression Analysis	T_2
IV	Design of problems based on the concept of Chi-square test	T_2
V	Design of problems based on the concept of CRD, RBD and LSD	T_2

7.Evaluation Scheme:

Component	Duration (minutes)	% Weightage	Marks	Date & Time	Venue
Test-1	50 Min	10	10	14.08.2010 09.30 – 10.20	NSH
Test-2	50 Min	10	10	18.09.2010 09.30 – 10.20	NSH
Assignement submission		5	5	Continuous	NSH
Assignment Test	50 Min	5	5	30.10.2010 09.00 – 10.20	NSH
Quiz	30 Min	5	5	30.10.2010 09.00 – 10.20	NSH
Regular Lab Evaluation	Continuous	0	0		
Comprehensive Lab Exam	3 Hrs	0	0		
Comprehensive Exam	3 Hrs	60	60		
Attendance for Theory & Tutorial		5	5	Continuous	
Attendance for Lab		0	0	Continuous	

8. Chamber consultation hour: Informed in the class in first week.

9. Notices: All notices regarding the course will be put in E-learning website.

10.Tutorial: Tutorial will be conducted by the respective in charge faculty. The tutorials are planned to supplement the material taught in the lectures and clear doubts. Student must attend registered section for tutorial in the respective classroom. Class assignment, class tests and other evaluation components will also be conducted during tutorials. Students must actively participate in the tutorial and come prepared for it.

Course Coordinator