15MA210	BIO STATISTICS	L	T	P	C
		4	0	0	4
Co-requisite:	NOT APPLICABLE				
Prerequisite:	15 MA104				
Data Book / Codes/Standards	NA				
Course Category	B CORE MATHEMATICS				
Course designed by	Department of Mathematics				
Approval	-- Academic Council Meeting -- , 2016				

PURPOSE	To develop an understanding of the methods of probability and statistics which are used in the field of bio engineering problems.	
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**
At the end of the course, student will be able to		
1	To gain knowledge in measures of central tendency, dispersion, moments, correlation and regression lines.	**a e**
2	To appropriately choose, define and/or derive probability distributions such as the Binomial, Poisson and normal distribution to solve engineering problems.	**a e**
3	To learn how to formulate and test the hypotheses about means, proportions and standard deviation to draw conclusions based on the results of statistical tests in large sample.	**a e**
4	To learn how to formulate and test the hypotheses about means, variances for small samples using t and F test for small sample and have knowledge on ANOVA.	**a e**
5	To understand the fundamentals of quality control and the methods used to control systems and processes.	**a e**

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
	UNIT I – INTRODUCTION TO BIO-STATISTICS (numerical problems only)	**14**			
1.	Introduction – Ungrouped, Discrete and Continuous types of Statistical Data.	1	C	1	1,2,3,8
2.	Measures of central tendency Arithmetic Mean, Median, Mode.	2	C,I	1	1,2,3,8
3.	Measures of central tendency Geometric Mean, and Harmonic Mean.	2	C,I	1	1,2,3,8
4.	Measures of dispersion Range, Quartile Deviation, Mean Deviation, and Standard Deviation.	2	C,I	1	1,2,3,8
5.	Coefficients of dispersion - Coefficient of Variation.	1	C,I	1	1,2,3,8
6.	Moments - Central moments and Moments about the point.	1	C,I	1	1,2,3,8
7.	Skewness - Measures of Skewness & Kurtosis.	1	C,I	1	1,2,3,8
8.	Karl Pearson's coefficient of Correlation.	1	C,I	1	1,2,3,8
9.	Spearman's Rank correlation coefficient.	1	C,I	1	1,2,3,8
10.	Regression lines and its applications.	2	C,I	1	1,2,3,8
	UNIT II: PROBABILITY & THEORETICAL DISTRIBUTIONS (Problems only)	**14**			

11.	**PROBABILITY** Introduction – Probability concepts - Random experiment, Trial, Sample space, Sample size, Events, (Only definitions, properties without proof and simple problems).	1	C,I	2	1 – 10
12.	**PROBABILITY** Types of Events: Impossible, Simple, Mutually Exclusive, Mutually exhaustive and Independent Events. (Only definitions, properties without proof and simple problems).	1	C,I	2	1 – 10
13.	**Conditional Probability** – Problems based on Addition and Multiplication Theorems.	1	C,I	2	1 – 10
14.	Baye's Theorem (without proof) and its applications.	2	C,I	2	1 – 10
15.	Introduction – One dimensional random variables.	1	C	2	1 – 10
16.	Discrete Random Variable – Probability mass function - Cumulative function – properties (without proof) – applications.	1	C,I	2	1 – 10
17.	Continuous Random Variable – Probability density function - Distribution function – properties (without proof) – applications.	1	C,I	2	1 – 10
18.	Mathematical Expectation – Mean and Variance – Properties (without proof) – applications.	2	C,I	2	1 – 10
19.	THEORETICAL DISTRIBUTIONS Discrete Type - Binomial (Bernoulli) Distribution.	1	C,I	2	1 – 10
20.	THEORETICAL DISTRIBUTIONS Discrete Type - Poisson Distribution.	1	C,I	2	1 – 10
21.	Continuous Type - Normal (Gaussian) Distribution.	2	C,I	2	1 – 10
	UNIT III: TESTING OF HYPOTHESIS	**12**			
22.	Sampling Theory – Basic concepts Population, Sample, Sampling, Sample size, Sampling Distribution, Population Parameters and Sample Statistics,	1	C,I	3	1 – 10
23.	Testing of Hypothesis, Null and Alternative Hypothesis, Single tailed and Two tailed tests, Type I and Type II errors, Acceptance and Rejection Regions, Level of Significance, degrees of freedom and Confidence (Fiducial) limits.	2	C,I	3	1 – 10
24.	Large sample tests based on normal distribution(Z-test) Z - Test for single proportion and difference of proportions.	2	C,I	3	1 – 10
25.	Z - Test for single mean and difference of means.	2	C,I	3	1 – 10
26.	Z - Test for single standard deviation and difference of standard deviations.	2	C,I	3	1 – 10
27.	Chi-square test for goodness of fit.	1	C,I	3	1 – 10
28.	Chi-square test for Independence of attributes using contingency table.	2	C,I	3	1 – 10
	UNIT IV: ANALYSIS OF VARIANCE	**10**			
29.	Small sample tests based on t-distribution t - Test for single mean.	1	C,I	4	1 – 10
30.	Small sample tests based on t-distribution t - Test for difference of means.	2	C,I	4	1 – 10
31.	Paired t - Test.	1	C,I	4	1 – 10

32.	F – test for equality of variances.	2	C,I	4	1 – 10
33.	ANOVA - One-way classification – applications.	2	C,I	4	1 – 10
34.	ANOVA - Two-way classification – applications.	2	C,I	4	1 – 10
	UNIT V: STATISTICAL QUALITY CONTROL	**10**			
35.	Introduction – Quality , Chance variation, Assignable variation, Statistical Quality Control, Process control , Product control - Control charts (Variable and Attribute	2	C	5	2, 4
36.	Control charts for Variables Sample Mean ($\overline{X}$)and Sample Range (R) chart	2	C,I	5	2, 4
37.	Control charts for Variables Sample Mean ($\overline{X}$)and Sample SD (s) chart	2	C,I	5	2, 4
38.	Control charts for Variables Number of defectives $(n\overline{p})$ chart Proportion of defectives $(\overline{p})$ chart.	2	C,I	5	2, 4
39.	Control charts for Variables Number of defects in a unit $(\overline{c})$ chart.	2	C,I	5	2, 4
	Total Contact Hours	**60**			

LEARNING RESOURCES:	
Sl. No.	**TEXT BOOKS**
1.	S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11th extensively revised edition, Sultan Chand & Sons, 2007.
2.	S.C.Gupta and V.K.Kapoor, "Fundamentals of Applied Statistics", Sultan Chand and Sons, New Delhi, 2003.
3.	V.K.Kapoor, "Statistic – Problems and Solutions", 5th edition, Sultan Chand & Sons, 2007.
4.	T.Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw-Hill Publishing Company Limited, New Delhi, Revised 7th Edition, 2013.
	REFERENCE BOOKS/OTHER READING MATERIAL
5.	Trivedi K S, "Probability and Statistics with reliability, Queueing and Computer Science Applications", Prentice Hall of India, New Delhi, 2nd revised edition, 2002
6.	Allen.A.O., "Probability Statistics and Queuing theory with Computer science applications", Academic Press, 2nd edition, 1990.
7.	Papoulis, Probability, Random variables and stochastic processes, 4th edition, Tata McGraw Hill Company, 2002.
8.	R.S.N.Pillai, & V.Bagavathi, "Statistics – Theory and Practice", Sultan Chand & Sons, 2009.
9.	P.Kandasamy, "Probability and Queuing Theory", Sultan Chand & Sons, 2009.
10.	Sivaramakrishna Das P. and Vijayakumari.C,A Textbook of Probability and Random Processes, PEARSON Academy, 6th Edition, 2013.

Course nature				**Theory**			
Assessment Method (Weightage 100%)							
In-semester	**Assessment tool**	Cycle test I	Cycle test II	Cycle Test III	Surprise Test	Quiz	**Total**
	Weightage	**10%**	**15%**	**15%**	**5%**	**5%**	**50%**
					End semester examination Weightage :		**50%**