SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Applied Mathematics			LP: MA22451
B. Tech	: Biotechnology	Regulation: 2022	Rev. No: 00
Sub. Code / Sub. Name	: MA22451 / Introduction to Biostatistics		Date: 03/01/2024
Unit	: I		

Unit Syllabus: **DESCRIPTIVE STATISTICS**

Data representation and plotting - Measures of Central Tendency - Arithmetic mean, median, mode, geometric mean and harmonic mean, quartiles - Measures of Dispersion – Range, Standard Deviation, Coefficient of Variation - Moments, Skewness, Kurtosis - Curve fitting – Method of Least Squares

Objective: To use basic statistical methods such as descriptive statistics, graphical plots to analyze real world problems arising in medical science, public health, and biology.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to the syllabus and the Unit I	T1, T2, T3	LCD/BB
2	Data representation and plotting	T2, Ch 2, 2.3 – 2.7	LCD/BB
3	Measures of Central Tendency - Arithmetic mean, median, mode	T2, Ch 2, 2.7 – 2.15	LCD/BB
4	Geometric mean and harmonic mean, quartiles	T2, Ch 2, 2.23 – 2.29	LCD/BB
5	Problems		LCD/BB
6	Problems		LCD/BB
7	Measures of Dispersion – Range, Standard Deviation	T2, Ch 2, 2.32 – 2.23, 2.35 – 2.37	LCD/BB
8	Coefficient of Variation , Moments, Skewness, Kurtosis	T2, Ch 2, 2.43 – 2.45, 2.47, 2.52 – 2.55	LCD/BB
9	Problems		LCD/BB
10	Problems		LCD/BB
11	Curve fitting – Method of Least Squares	T3, Ch 3, 327 - 335	LCD/BB
11	Problems		LCD/BB
12	Revision		LCD/BB

Content beyond syllabus covered (if any):

* Session duration: 50 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: MA22451/ Introduction to Biostatistics
Unit : II

Unit Syllabus: **BASICS OF PROBABILITY**

Random Experiment, Sample space, Outcomes and Events, Axioms of Probability, Counting techniques, Conditional Probability, Independent Events, Bayes' Theorem, Random Variables, PMF, PDF, Expectation and Variance of Random Variables, Binomial, Poisson, Exponential and Normal Random Variables

Objective: To apply the concepts of probability and random variables to model and analyze problems in biological sciences.

Session No *	Topics to be covered	Ref	Teaching Aids
13	Introduction to the Unit. Random Experiment, Sample space, Outcomes and Events	T1, T2, T3, T3, Ch 3, 56 – 57	LCD/BB
14	Axioms of Probability, Counting techniques	T3, Ch 3, 60 – 72	LCD/BB
15	Conditional Probability, Independent Events, Bayes' Theorem	T3, Ch 3, 78 – 87	LCD/BB
16	Problems		LCD/BB
	CAT		
17	Random Variables, PMF, PDF	T3, Ch 4, 94 – 96, Ch 5, 135 - 137	LCD/BB
18	Expectation and Variance of Random Variables	T3, Ch 4,107, 111, Ch 5, 138 - 139	LCD/BB
19	Problems		LCD/BB
20	Binomial distribution	T3, Ch 4, 98 – 100	LCD/BB
21	Poisson distribution	T3, Ch 4, 114 – 121	LCD/BB
22	Exponential distribution	T3, Ch 5, 156 – 157	LCD/BB
23	Normal distribution	T3, Ch 5, 140 – 148	LCD/BB
24	Problems, Revision		LCD/BB

`9`6Content beyond syllabus covered (if any):

* Session duration: 50 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: MA22451 / Introduction to Biostatistics
Unit : III

Unit Syllabus: **TWO DIMENSIONAL RANDOM VARIABLES**

Joint distributions – Marginal and conditional distributions – Functions of two-dimensional random variables – Correlation - Regression curve – Central Limit Theorem (for independently and identically distributed random variables).

Objective: To understand and apply the concepts of two dimensional random variables, regression models and their Applications.

Session No *	Topics to be covered	Ref	Teaching Aids
25	Two- dimensional random variables, Joint distribution functions, joint density functions.	T3, Ch 5, 161 - 163	LCD/BB
26	Marginal distribution/density functions, conditional density functions, independent random variables	T3, Ch 5, 163 - 167	LCD/BB
27	Problems		LCD/BB
28	Functions of two-dimensional random variables	T2, Ch 5, 5.54 – 5.60	LCD/BB
29	Problems		LCD/BB
30	Correlation	T2, Ch 10, 10.2 – 10.10	LCD/BB
31	Problems		LCD/BB
32	Problems		LCD/BB
33	Regression curves	T2, Ch11, 11.15 – 11.19	LCD/BB
34	Problems		LCD/BB
35	Problems		LCD/BB
36	Central Limit Theorem, Revision	T2, Ch9, 9.64, 9.68	LCD/BB
	CAT		

Content beyond syllabus covered (if any):

* Session duration: 50 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: MA22451/ Introduction to Biostatistics

Unit : IV

Unit Syllabus: **TEST OF HYPOTHESES**

Sampling distributions, Estimation of parameters, Statistical hypothesis, Large sample test based on Normal distribution for single mean and difference of means and proportion, Tests based on t, and F distributions for mean and variance, Chi-square test for Goodness of fit, Contingency table (test for independence).

Objective: To understand and use hypothesis testing to analyze problems in biological sciences.

Session No *	Topics to be covered	Ref	Teaching Aids
36	Introduction to the Unit	T2, T3	LCD/BB
37	Concept of sampling, Methods of sampling, Sampling distributions and Standard Error	T3, Ch 6, 193 -198, 210 - 212	LCD/BB
38	Estimation of parameters, Statistical hypothesis	T3, Ch 7, 223 - 224, 239 – 231, 244 - 248	LCD/BB
39	Large sample test based on Normal distribution for single mean and difference of means and proportion	T3, Ch 7, 249 -252, T3, Ch 8 269 - 272	LCD/BB
40	Large sample test based on Normal distribution for single mean and difference of means and proportion, Problems	T3, Ch 9 308 - 310	LCD/BB
41	Problems		LCD/BB
42	Problems		LCD/BB
43	Test based on t distribution	T2, Ch16, 16.10 – 16.24	LCD/BB
44	Problems		LCD/BB
45	F test, Problems	T2, Ch16, 16.36 – 16.39	LCD/BB
46	Test for Independence, Test of goodness of fit.	T2, Ch15, 15.26 – 15.38	LCD/BB
47	Problems		LCD/BB
48	Problems using EXCEL		LCD/BB

Content beyond syllabus covered (if any): Solving problems using Excel; Emphasis on p-values

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

* Session duration: 50 minutes

Sub. Code / Sub. Name: MA22451 / Intoduction to Biostatistics

Unit : V

Unit Syllabus: **STATISTICAL QUALITY CONTROL**

Control charts for measurements (X and R charts), Control charts for attributes (p, c and np charts), Tolerance limits, Acceptance sampling

Objective: To acquire knowledge in Statistical Quality Control and use it effectively in various models.

Session No *	Topics to be covered	Ref	Teaching Aids
49	Introduction to the Unit, Statistical Quality Control	T3, Ch 15, 486 - 488	LCD/BB
50	Control charts for measurements (X and R-charts)	T3, Ch 15, 488 - 491	LCD/BB
51	Problems		LCD/BB
52	Problems		LCD/BB
53	Control charts for attributes (p, c and np charts)	T3, Ch 15, 493 - 499	LCD/BB
54	Problems		LCD/BB
55	Problems		LCD/BB
56	Problems		LCD/BB
57	Problems		LCD/BB
58	Tolerance limits, Acceptance sampling	T3, Ch 15, 499 - 501	LCD/BB
59	Problems		LCD/BB
60	Revision		LCD/BB
	CAT III		

Content beyond syllabus covered (if any):

* Session duration: 50 minutes

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TEXTBOOKS:

1. Spiegel M R, david P Lindstrom, Schaums Easy Outline Of Statistics, McGraw Hill India, 2020.
2. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand, 11th edition, 2005
3. Richard A J, Irwin Miller, John Freund, Miller and Freund's - Probability and Statistics for Engineers, Pearson Education, Asia, 9th Edition, 2020.

REFERENCES:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2012.
2. Johnson. R.A. and Gupta. C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th Edition, 2007.
3. Spiegel M R, Schiller J and Srinivasan R A, Schaum Outline of Theory and Problems of Probability and Statistics, Tata McGraw Hill Edition, 2004.

WEB LINK:

1. https://towardsdatascience.com/intro-to-descriptive-statistics-and-probability-for-data-science-8effec826488
2. https://online.stat.psu.edu/statprogram/reviews/statistical-concepts/hypothesis-testing

	Prepared by	Approved by
Signature		
Name	Dr. B Thilaka	Dr. R. Muthucumaraswamy
Designation	Professor	Professor and Head
Date	03/01/2024	03/01/2024
Remarks *:		
Remarks *:		