



CHAITANYA DEGREE & PG COLLEGE FOR WOMEN

AFFILIATED TO ANDHRA UNIVERSITY

CHAITANYA NAGAR, OLD GAJUWAKA, VISAKHAPATNAM-530026



DEPARTMENT OF STATISTICS

B.Sc Teaching Plan – 2023-2024

COURSE: B.Sc	YEAR- I	SEMESTER- I			
Subject	DESCRIPTIVE STATISTICS				
Units	<ul style="list-style-type: none"> • Introduction To Statistics • Measures of Dispersion • Curve fitting • Correlation • Regression • Attributes 				
Duration	60hours				
Learning Objectives	<p>Students will acquire</p> <ol style="list-style-type: none"> 1) ability to distinguish between random and non-random experiments, 2) knowledge to conceptualize the probabilities of events including frequents and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bays' Theorem, 3) knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments, 				
Units	U1	U2	U3	U4	U5
Hours Split: 60 Total: 75	12	12	12	12	12
Internal valuation:25 marks	5	5	5	5	5

Resource Material:

StudyMaterial(Handouts)

<https://www.andhrauniversity.edu.in/student-corner/ug-syllabus.html>

Text Book :

Descriptive statistics by Dr.M .Jagan mohan rao, published by Telugu academy .

Reference Books :

1. Gupta, S.P. Statistical Methods. Sultan Chand Sons: New Delhi. 2. Gupta, S.C., & Kapoor, V.K. Fundamentals of Applied Statistics. New Delhi: Sultan Chand and Sons. 3. Garret, H.E., & Woodworth, R.S. Statistics in Psychology and Education. Bombay: Vakila, Feffex and Simens Ltd. 4. Mood, A.M., and Graybill, F.A and Boes, D.C. Introduction to Theory of I. Academic-Pedagogical-Evaluation :Unit-wise Pedagogy Statistics. 3rd Edition Paperback – International Edition. 5. Mukhopadhyay,P. Mathematical Statistics. New central Book Agency (P) Ltd: Calcutta.

YOU TUBE LINKS:

<https://youtu.be/oPP9VJMvDpE>

<https://youtu.be/ljwGFAWoL2M>

I. Academic-pedagogy -Evaluation :Unit-wise pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	<p>Introduction to Statistics:</p> <p>Importance of Statistics. Scope of Statistics in different fields. Concepts of primary and secondary data. Diagrammatic and graphical representation of data: Histogram, frequency polygon, Ogives, Pie. Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean. Median and Mode through graph.</p>	P1,P2,P3	PQ,P6,PT
II	<p>Measures of Dispersion:</p> <p>Range, Quartile Deviation, Mean Deviation and Standard Deviation, Variance. Central and Non-Central moments and their interrelationship. Sheppard's correction for moments. Skewness and kurtosis.</p>	P1,P2,P3,P5	P6,PT
III	<p>Curve fitting:</p> <p>Bi- variate data, Principle of least squares, fitting of degree polynomial. Fitting of straight line, Fitting of Second degree polynomial or parabola, Fitting of power curve and exponential curves.</p> <p>Correlation:</p> <p>Meaning, Types of Correlation, Measures of Correlation: Scatter diagram, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient (with and without ties), Bi-variate frequency distribution, correlation coefficient for bi-variate data and simple problems. Concept of multiple and partial correlation coefficients (three variables only) and properties</p>	P1,P2,P3,P5	P Q , PT

IV	<p>Regression : Concept of Regression, Linear Regression: Regression lines, Regression coefficients and it's properties, Regressions lines for bi-variate data and simple problems. Correlation vs regression</p>	P1,P2,P4	PQ,P6,PT
V	<p>Attributes : Notations, Class, Order of class frequencies, Ultimate class frequencies, Consistency of data, Conditions for consistency of data for 2 and 3 attributes only , Independence of attributes , Association of attributes and its measures, Relationship between association and colligation of attributes, Contingencytable: Square contingency, Mean square contingency, Coefficient of mean square contingency, Tschuprow's coefficient of contingency.</p>	PQ,P6,PT,P8	PQ,PT

Course: B.SC	Year:I	Semester:II			
Subject	PROBABILITY AND DISTRIBUTIONS				
Units	<ul style="list-style-type: none"> • Introduction to probability • Random variables • Mathematical expectation • DiscreteDistribution • Continuous distribution 				
Duration	60hours				
LearningObjectives	<p>1) ability to distinguish between random and non-random experiments, 2)knowledge to conceptualize the probabilities of events including frequentist and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem, 3)knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments, 4)knowledge of important discrete and continuous distributions such as Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric, normal, uniform, exponential, beta and gamma distributions,</p>				
Units	U1	U2	U3	U4	U5
Hours Split:Total: 60	12	12	12	12	12
Internal valuation:40marks	8	8	8	8	8

ResourceMaterial:	<p>StudyMaterial(Handouts): https://www.andhrauniversity.edu.in/student-corner/ug-syllabus.html</p> <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Willam Feller: Introduction to Probability theory and its applications. Volume –I,Wiley 2. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd.,Kolakota. 3. Hoel P.G: Introduction to mathematical statistics, Asia Publishinghouse. 4. M. JaganMohan Rao and Papa Rao: A Text book of StatisticsPaper-I. 5. Sanjay Arora and Bansilal: New Mathematical Statistics: Satya Prakashan , NewDelhi 6. Hogg Tanis Rao: Probability and Statistical Inference. 7thedition.Pearson.
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YouTube Links:

<https://youtu.be/ENZpe8yJT64>

QuestionBank:

<https://www.andhrauniversity.edu.in/student-corner/ug-syllabus.html>

I Academic-Pedagogical-Evaluation:Unit-wisePedagogy

UNIT	DESCRIPTION	PEDAGOGOG Y	INTERNAL EVALUATION
I	<p>Introduction to Probability: Basic Concepts of Probability, random experiments, trial, outcome, sample space, event, mutually exclusive and exhaustive events, equally likely and favourable outcomes. Mathematical, Statistical, axiomatic definitions of probability. Conditional Probability and independence of events, Addition and multiplication theorems of probability for 2 and for n events. Boole's inequality and Baye's theorem and its applications in real life problems.</p>	P1,P2,P3	PQ,P6,PT
II	<p>Random variable: Definition of random variable, discrete and continuous random variables, functions of random variable. Probability mass function. Probability density function, Distribution function and its properties. For given pmf, pdf calculation of moments, coefficient of skewness and kurtosis. Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables and simple problems.</p>	P1,P2,P3,P5	P6,PT
III	<p>Random variable: Definition of random variable, discrete and continuous random variables, functions of random variable. Probability mass function. Probability density function, Distribution function and its properties. For given</p>	P1,P2,P3,P5	PQ,PT

	<p>pmf, pdf calculation of moments, coefficient of skewness and kurtosis. Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables and simple problems.</p>		
IV	<p>Discrete Distributions: Binomial, Poisson, Negative Binomial, Geometric distributions: Definitions, means, variances, M.G.F, C.F, C.G.F, P.G.F, additive property if exists. Poisson approximation to Binomial distribution. Hyper-geometric distribution: Definition, mean and variance.</p>	P1,P2,P4	PQ,P6,PT
V	<p>Continuous Distributions: Rectangular, Exponential, Gamma, Beta Distributions: mean, variance, M.G.F, C.G.F, C.F. Normal Distribution: Definition, Importance, Properties, M.G.F, CF, additive property.</p>	PQ,P6,PT,P8	PQ,PT



Course: B.SC	Year:II	Semester:III			
Subject	Statistical Inference				
Units	<ul style="list-style-type: none"> • Theory of estimation • Testing of hypothesis • Large sample test • Small sample test • Non-parametric test 				
Duration	60hours				
LearningObjectives	<p>The students will acquire</p> <ol style="list-style-type: none"> 1) Concept of law large numbers and their uses 2) Concept of central limit theorem and its uses in statistics 3) concept of random sample from a distribution, sampling distribution of a statistic, standard error of important estimates such as mean and proportions, 4) knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts, 5) knowledge about inferences from Binomial, Poisson and Normal distributions as illustrations, 6) concept about non-parametric method and some important non-parametric tests. 				
Units	U1	U2	U3	U4	U5
Hours Split:Total: 60	12	12	12	12	12
Internal valuation:40marks	8	8	8	8	8

ResourceMaterial:

StudyMaterial(Handouts):

<https://www.andhrauniversity.edu.in/student-corner/ug-syllabus.html>

Reference Books:

1. Fundamentals of Mathematics statistics : VK Kapoor and SCGuptha.
2. Outlines of statistics, Vol II : Goon Guptha, M.K.Guptha, Das GupthaB.
3. Introduction to Mathematical Statistics :HoelP.G.
4. Hogg Tanis Rao: Probability and Statistical Inference. 7thedition.Pearson.

YouTube Links:

<https://youtu.be/3nXQwwKRKCU>

QuestionBank:

<https://www.andhrauniversity.edu.in/student-corner/ug-syllabus.html>

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	<p>Concepts:</p> <p>Population, Sample, Parameter, statistic, Sampling distribution, Standard error. convergence in probability and convergence in distribution, law of large numbers, central limit theorem (statements only). Student's t- distribution, F – Distribution, χ^2-Distribution: Definitions, properties and their applications.</p>	P1,P2,P3	PQ,P6,PT

II	<p><u>Theory of estimation:</u> Estimation of a parameter, criteria of a good estimator – unbiasedness, consistency, efficiency, & sufficiency and. Statement of Neyman's factorization theorem. Estimation of parameters by the method of moments and maximum likelihood (M.L), properties of MLE's. Binomial, Poisson & Normal Population parameters estimate by MLE method. Confidence Intervals.</p>	P1,P2,P4,P5	P6,PT
III	<p><u>Testing of Hypothesis:</u> Concepts of statistical hypotheses, null and alternative hypothesis, critical region, two types of errors, level of significance and power of a test. One and two tailed tests. Neyman-Pearson's lemma. Examples in case of Binomial, Poisson, Exponential and Normal distributions.</p>	S1,S2,S3	SQ,ST
IV	<p><u>Large sample Tests:</u> large sample test for single mean and difference of two means, confidence intervals for mean(s). Large sample test for single proportion, difference of proportions. standard deviation(s) and correlation coefficient(s). <u>Small Sample tests:</u>- test for single mean, difference of means and paired t-test. χ^2-test for goodness of fit and independence of attributes. F-test for equality of variances</p>	P1,P2,P4,P5	PQ,P6,PT
V	<p><u>Non-parametric tests-</u> their advantages and disadvantages, comparison with parametric tests. Measurement scale- nominal, ordinal, interval and ratio. One sample runs test, sign test and Wilcoxon-signed rank tests (single and paired samples). Two independent sample tests: Median test, Wilcoxon –Mann-Whitney U test, Wald Wolfowitz's runs test.</p>	PQ,P6,PT	PQ,PT

Course: B.SC	Year: II	Semester: IV			
Subject	Sampling techniques and Designs of Experiments				
Units	<ul style="list-style-type: none"> • Simple random sampling • Stratified random sampling • Systematic random sampling • Analysis of variance • Designs of experiments • Randomized block designs • Factorial experiments 				
Duration	60hours				
Learning Objectives	<p>The students shall get</p> <ol style="list-style-type: none"> 1) Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling. 2) an idea of conducting the sample surveys and selecting appropriate sampling techniques, 3) Knowledge about comparing various sampling techniques. 4) carry out one way and two way Analysis of Variance, 5) understand the basic terms used in design of experiments, 6) use appropriate experimental designs to analyze the experimental data. 				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	10	12	14	10	14
Internal valuation: 40marks	8	8	8	8	8

Resource Material:	<p>Study Material (Handouts): https://www.andhrauniversity.edu.in/student-corner/ug-syllabus.html</p> <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Fundamentals of applied statistics : VK Kapoor and SC Gupta. 2. Indian Official statistics - MR Saluja. 3. Anuvarthita Sankhyaka Sastram - Telugu Academy. <p>YouTube Links: https://youtu.be/qXZH6MPgdn0.</p>
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QuestionBank:<https://www.ugpapers.com/2020/02/au-degree-4th-sem-maths-2019.html>

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	<p>Simple Random Sampling (with and without replacement):</p> <p>Notations and terminology, various probabilities of selection. Random numbers tables and its uses. Methods of selecting simple random sample, lottery method, method based on random numbers. Estimates of population total, mean and their variances and standard errors, determination of sample size, simple random sampling of attributes</p>	P1,P2,P3,P4	PQ,PT

<p>II</p>	<p>Stratified random sampling:</p> <p>Stratified random sampling, Advantages and Disadvantages of Stratified Random sampling, Estimation of population mean, and its variance. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.</p> <p>Systematic sampling:</p> <p>Systematic sampling definition when $N = nk$ and merits and demerits of systematic sampling - estimate of mean and its variance. Comparison of systematic sampling with Stratified and SRSWOR.</p>	<p>P1,P2,P4,P5</p>	<p>P6,PT</p>
<p>III</p>	<p>Analysis of variance :Analysis of variance(ANOVA) –Definition and assumptions. One-way with equal and unequal classification, Two way classification.</p> <p>Design of Experiments: Definition, Principles of design of experiments, CRD: Layout, advantages and disadvantage and Statistical analysis of Completely Randomized Design(C.R.D).</p>	<p>P1,P2,P3,P4</p>	<p>PQ,PT,P8</p>
<p>IV</p>	<p>Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) with their layouts and Analysis, Missing plot technique in RBD and LSD. Efficiency RBD over CRD, Efficiency of LSD over RBD and CRD.</p>	<p>P1,P2,P5</p>	<p>PQ,P6,PT</p>
<p>V</p>	<p>Factorial experiments –</p> <p>Main effects and interaction effects of 2^2 and 2^3 factorial experiments and their Statistical analysis. Yates procedure to find factorial effect totals.</p>	<p>P1,P2,P6</p>	<p>PQ,PT,P5</p>

Course: B.SC	Year: II		Semester: IV		
Subject	Applied statistics				
Units	<ul style="list-style-type: none"> • Time series • Seasonal components • Growth curves • Index numbers • Vital statistics 				
Duration	60hours				
LearningObjectives	<p>After completion of this course, the students will know about</p> <ol style="list-style-type: none"> 1) time series data, its applications to various fields and components of time series, 2) fitting and plotting of various growth curves such as modified exponential, Gompertz and logistic curve, 3) fitting of trend by Moving Average method, 4) measurement of Seasonal Indices by Ratio-to-Trend , Ratio-to-Moving Average and Link Relative methods, <p>Applications to real data by means of laboratory assignments</p>				
Units	U1	U2	U3	U4	U5
Hours Split:Total: 60	10	12	14	10	14
Internal valuation:40marks	8	8	8	8	8

Resource Material:

Study Material (Handouts):

<https://www.andhrauniversity.edu.in/student-corner/ug-syllabus.html>

Reference Books:

1. Fundamentals of applied statistics : VK Kapoor and SC Gupta.

1. BA/BSc III year paper - III Statistics - applied statistics - Telugu academy by prof.K.Srinivasa Rao, Dr D.Giri. Dr A.Anand, Dr V.Papaiah Sastry.

YouTube Links:

<https://youtu.be/1XIT3Y2oyAU?list=PLU6SqDYcYsfJOGZdxUpDk3w9o-w94-RoG>

https://youtu.be/_6oRqxY6O5w?list=PLdM-WZokR4tYxOsDe1s9QSWsVQBHfemd0

Question Bank:

<https://www.ugpapers.com/2020/12/au-degree-5th-sem-maths-paper-vi-2019.html>

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Time Series: Time Series and its components with illustrations, additive, multiplicative models. Trend: Estimation of trend by free hand curve method, method of semi averages. Determination of trend by least squares (Linear trend, parabolic trend only), moving averages method.	P1,PQ,P5,P7	P6,PT,PQ

<p>II</p>	<p>Seasonal Component: Determination of seasonal indices by simple averages method, ratio to moving average, Ratio to trend and Link relative methods, Deseasonalization.</p>	<p>P1,P3,P5,P7</p>	<p>PQ,PT</p>
<p>III</p>	<p>Growth curves: Modified exponential curve, Logistic curve and Grompertz curve, fitting of growth curves by the method of three selected points and partial sums. Detrending. Effect of elimination of trend on other components of the time series</p>	<p>P1,P5,P3,P2</p>	<p>PQ,P6,PT</p>
<p>IV</p>	<p>Index numbers: Concept, construction, problems involved in the construction of index numbers, uses and limitations. Simple and weighted index numbers. Laspayer's, Paasche's and Fisher's index numbers, Criterion of a good index number, Fisher's ideal index numbers. Cost of living index number and wholesale price index number.</p>	<p>PQ,PT,P8,P7</p>	<p>P6,PT</p>

v	<p>Vital Statistics:Introduction, definition and uses of vital statistics, sources of vital statistics.</p> <p>Measures of different Mortality and Fertility rates, Measurement of population growth. Life tables: construction and uses of life tables.</p>	P1,P2,P5,P6	PQ, PT
Course: B.SC	Year: III	Semester: V	
Subject	Operational research-1		
Units	<ul style="list-style-type: none"> • North west • corner rule • Matrix minimum method • VAM • UV method • Hungarian method • Assignment method • Transportation method • Johnsons method • Optimum sequence • Mixed method 		
Duration	60hours		
LearningObjectives	<p>After learning this course, the student will be able</p> <ol style="list-style-type: none"> 1. To know the scope of Operations Research 2. To link the OR techniques with business environment and life sciences 3. To convert real life problems into mathematical models 4. To find a solution to the problem in different cases 5. To inculcate logical thinking to find a solution to the problem UNIT-I 		

Units	U1	U2	U3	U4	U5
HoursSplit:Total: 60	15	15	15	15	15
Internal valuation:40marks	8	8	8	8	8

ResourceMaterial:

StudyMaterial(Handouts): <https://www.andhrauniversity.edu.in/student-corner/ug-syllabus.html>

Reference Books:

S.D. Sharma, Operations Research, Kedar Nath Ram Nath & Co, Meerut. 2. Kanti Swarup, P.K.Gupta, Manmohn, Operations Research, Sultan Chand and sons, New Delhi. 3. J.K. Sharma, Operations Research and Application, Mc.Millan and Company, New Delhi. 4. GassS.I: Linear Programming. Mc Graw Hill. 5. HadlyG :Linear programming. Addison-Wesley. 6. Taha H.M: Operations Research: An Introduction : Mac Millan.

YouTube Links:

<https://youtu.be/rWvTk9eubKM?list=PLU6SqDYcYsfLrTna7UuaVfGZYkNo0cpVC>

Power Point Presentations:

QuestionBank:

<https://www.ugpapers.com/2020/03/au-degree-6th-sem-maths-2019-cluster-2.html>

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Introduction of OR – Origin and development of OR – Nature and features of OR –Scientific Method in OR – Modeling in OR – Advantages and limitations of Models-General Solution methods of OR models – Applications of Operation Research. Linear programming problem (LPP) -Mathematical formulation of the problem - illustrations on Mathematical formulation of Linear programming of problem. Graphical solution of linear	P1,P2,P3	PQ,P6,PT

	programming problems. Some exceptional cases - Alternative solutions, Unbounded solutions, non-existing feasible solutions by Graphical method.		
II	General linear programming Problem(GLP) – Definition and Matrix form of GLP problem, Slack variable, Surplus variable, unrestricted Variable, Standard form of LPP and Canonical form of LPP. Definitions of Solution, Basic Solution, Degenerate Solution, Basic feasible Solution and Optimum Basic Feasible Solution. Introduction to Simplex method and Computational procedure of simplex algorithm. Solving LPP by Simplex method (Maximization case and Minimization case).	P1,P2,P3,P5	P6,PT
III	Artificial variable technique - Big-M method and Two-phase simplex method, Degeneracy in LPP and method to resolve degeneracy. Alternative solution, Unbounded solution, Non existing feasible solution and Solution of simultaneous equations by Simplex method.	P1,P2,P3,P5	PQ,PT
IV	Duality in Linear Programming – Concept of duality -Definition of Primal and Dual Problems, General rules for converting any primal into its Dual, Economic interpretation of duality, Relation between the solution of Primal and Dual problem(statements only). Using duality to solve primal problem. Dual Simplex Method.	P1,P2,P4	PQ,P6,PT

V	Post Optimal Analysis- Changes in cost Vector C, Changes in the Requirement Vector band changes in the Coefficient Matrix A. Structural Changes in a LPP.	PQ,P6,PT,P8	PQ,PT		
Course:B.SC	Year:III	Semester:V			
Subject	Operational research-2				
Units	<ul style="list-style-type: none"> • Scope of OR • Define LPP • Simplex method • Bigger method • Two face method • Dual of dual method • Post optimum analysis 				
Duration	60hours				
LearningObjectives	<p>After learning this course, the student will be able</p> <ol style="list-style-type: none"> 1. To define 'quality' in a scientific way 2. To differentiate between process control and product control 3. To speak about quality awareness in industry 4. To pave a path to an industry to meet the standards 5. To effectively implement various plans to control the quality standards at various stages of an industry. 				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	14	12	10	14	10
Internal valuation:40marks	8	8	8	8	8

Resource Material:	<p>StudyMaterial(Handouts):</p> <p>Reference Books:</p> <ol style="list-style-type: none"> 1. R.C. Gupta: Statistical Quality Control. 2. Duncan A.J. (1974): Quality Control and Industrial Statistics, fourth edition D.B. Taraporewala Sons and Co. Pvt. Ltd., Mumbai. 3. Grant, E. L. and Leavenworth (1980): Statistical Quality Control, fifth edition, McGraw Hill, New Delhi. <p>YouTube Links: https://youtu.be/kCVBxXQYADK</p> <p>QuestionBank:</p> <ol style="list-style-type: none"> 1. Montgomery, D. C. (2008): Statistical Quality Control, 6thEdn., John Wiley, New York. 2. Parimal Mukhopadhyay: Applied Statistics, New Central Book Agency. 3. Goon A.M., Gupta M.K. and Das Gupta B. (1986): Fundamentals of Statistics, Vol. II, World Press, Calcutta. 4. S.C. Gupta and V.K. Kapoor: Fundamentals of Applied Statistics – Chand publications
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UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Meaning of quality, concept of total quality management (TQM) and six-sigma, ISO, comparison between TQM and Six Sigma, Meaning and purpose of Statistical Quality Control (SQC), Seven Process Control Tools of Statistical Quality Control (SQC) (i) Histogram (ii) Check Sheet, (iii) Pareto Diagram (iv) Cause and effect diagram (CED), (v) Defect concentration diagram (vi) Scatter Diagram (vii) Control chart. (Only introduction of 7 tools is expected)..	P1,P2,P3	PQ,P6,PT
II	Statistical basis of Shewhart control charts, use of control charts. Interpretation of control charts, Control limits, Natural tolerance limits and specification	P1,P2,P3,P5	P6,PT

	limits. Chance causes and assignable causes of variation, justification for the use of 3-sigma limits for normal distribution, Criteria for detecting lack of control situations: (i) At least one point outside the control limits (ii) A run of seven or more points above or below central line..		
III	Control charts for Variables: Introduction and Construction of \bar{X} and R chart and Standard Deviation Chart when standards are specified and unspecified, corrective action if the process is out of statistical control. Control charts for Attributes: Introduction and Construction of p chart, np chart, C Chart and U charts when standards are specified and unspecified, corrective action if the process is out of statistical control.	P1,P2,P3,P5	PQ,PT
IV	Acceptance Sampling for Attributes: Introduction, Concept of sampling inspection plan, Comparison between 100% inspection and sampling inspection. Procedures of acceptance sampling with rectification, Single sampling plan and double sampling plan. Producer's risk and Consumer's risk, Operating characteristic (OC) curve, Acceptable Quality Level (AQL), Lot Tolerance Fraction Defective (LTFD) and Lot Tolerance Percent Defective (LTPD), Average Outgoing Quality (AOQ) and Average Outgoing Quality Limit (AOQL), AOQ curve, Average Sample Number (ASN), Average Total Inspection (ATI).	P1,P2,P4	PQ,P6,PT

V	Single Sampling Plan: Computation of probability of acceptance using Binomial and Poisson approximation, of AOQ and ATI. Graphical determination of AOQL, Determination of a single sampling plan by: a) lot quality approach b) average quality approach. Double Sampling Plan: Evaluation of probability of acceptance using Poisson distribution, Structure of OC Curve, Derivation of AOQ, ASN and ATI (with complete inspection of second sample), Graphical determination of AOQL, Comparison of single sampling plan and double sample plan.	PQ,P6,PT,P8	PQ,PT
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