



Re-Accredited B++ 2.86 CGPA by NAAC

VEER NARMAD SOUTH GUJARAT UNIVERSITY

University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.

વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી

યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.

Tel. +91 - 261 - 2227141 to 2227146, Toll Free : 1800 2333 011. Digital Helpline No. - 0261 2388888
E-mail : info@vnsgu.ac.in. Website : www.vnsgu.ac.in

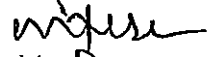
-:પરિપત્ર:-

યુનિવર્સિટીના વાણિજ્ય વિદ્યાશાખા હેઠળના તમામ શૈક્ષણિક વિભાગોના વડાશ્રીઓ અને યુનિવર્સિટી સંલગ્ન વાણિજ્ય વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, NEP-2020 અંતર્ગત શૈક્ષણિક વર્ષ ૨૦૨૬-૨૭ થી અમલમાં આવનાર B.Com.Statistics (Honours) Sem.-7 & 8 Major નો આંકડાશાસ્ત્ર વિષયની અભ્યાસ સમિતિની તા.૧૮/૦૮/૨૦૨૫ની સભાના ઠરાવ ક્રમાંક:૦૪થી નિમણૂક કરેલ પેટાસમિતિ દ્વારા તૈયાર કરવામાં આવેલ અભ્યાસક્રમ આંકડાશાસ્ત્ર વિષયની અભ્યાસ સમિતિના ચેરમેનશ્રીએ અભ્યાસ સમિતિવતી મંજૂર કરી વાણિજ્ય વિદ્યાશાખાને કરેલ ભલામણ વાણિજ્ય વિદ્યાશાખાની તા.૦૮/૦૬/૨૦૨૬ ની સભાના ઠરાવ ક્રમાંક:૦૫ થી મંજૂર કરવા એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૧૮/૦૬/૨૦૨૬ ની સભાના ઠરાવ ક્રમાંક : ૩૧ થી મંજૂર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

બિડાણ: ઉપર મુજબ

ક્રમાંક:ઓથો./પરિપત્ર/૧૩૭૨૬/૨૦૨૬

તા.૨૩/૦૬/૨૦૨૬


કુલસચિવ

પ્રતિ,

(૧) યુનિવર્સિટીના વાણિજ્ય વિદ્યાશાખા હેઠળના તમામ શૈક્ષણિક વિભાગોના વડાશ્રીઓ.

(૨) યુનિવર્સિટી સંલગ્ન વાણિજ્ય વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓ.

... આપશ્રીના વિભાગ/કોલેજના સંબંધિત શિક્ષકો/વિદ્યાર્થીઓને જાણ કરી અમલ કરવા સારું.

(૩) અધ્યક્ષશ્રી, વાણિજ્ય વિદ્યાશાખા.

(૪) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....તરફ જાણ તેમજ અમલ સારું.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT



B.COM. HONOURS SYLLABUS

Sem -VII and Sem-VIII

DEPARTMENT OF STATISTICS

PROGRAM TITLE	Bachelor of Commerce (Honours)
Name of Program	B. Com (Honours) – Advanced Statistics
Program Abbreviation	B. Com (Hons.)
Duration	4 Year
Eligibility Criteria	12 th pass
Pre-requisite	Pre-requisite for this Learning Program ➤ Students should possess a basic understanding of Statistics and Mathematics at the higher secondary (HSC) or undergraduate level. ➤ Familiarity with fundamental statistical concepts such as averages, dispersion, probability, and simple data interpretation is recommended. ➤ Ability to understand and work with numerical data, graphs, and basic algebraic expressions. ➤ Basic knowledge of computer applications, especially spreadsheets (Excel), is desirable for statistical analysis. ➤ An inclination toward analytical thinking, logical reasoning, and quantitative problem-solving will support learning effectiveness.
Medium of Instruction	English / Gujarati (as per institutional provision)
Objective of Program	➤ To develop strong theoretical foundations in probability, statistical distributions, design of experiments, actuarial science, forecasting methods, and operations research, enabling students to understand and analyze complex quantitative problems. ➤ To build analytical and computational skills using modern statistical tools, software, and mathematical models, preparing students to handle real-life data in business, finance, economics, agriculture, and industry. ➤ To promote data-driven decision-making by training students to collect, organize, analyze, interpret, and communicate quantitative data with accuracy, clarity, and ethical responsibility. ➤ To enhance research capabilities through exposure to statistical modeling, hypothesis testing, experimental designs, simulation techniques, and advanced analytical methods relevant for higher studies and professional careers. ➤ To prepare competent professionals who can apply statistical reasoning and problem-solving skills in various fields such as banking, insurance, analytics, operations management, policymaking, and academic research.
Program Outcome (PO)	After completion of the B. Com (Honours) – Advanced Statistics program, students will be able to: PO1: Disciplinary Knowledge Acquire comprehensive knowledge of statistical concepts, mathematical methods, business applications, operations research, actuarial science, experimental design, and economic analysis. PO2: Critical Thinking and Analytical Reasoning Develop the ability to think logically, critically, and analytically for solving quantitative, statistical, and business-related problems. PO3: Problem Solving Ability Apply statistical tools, models, and techniques to formulate, analyze, and solve real-life problems in commerce, economics, industry, research, and public administration. PO4: Statistical and Computational Skills Use statistical methods, mathematical reasoning, and appropriate computational tools for data analysis, interpretation, forecasting, optimization, and decision-making. PO5: Research Aptitude Develop the ability to design studies, collect data, analyze results, interpret findings, and prepare reports for academic, social, industrial, and business research. PO6: Communication Skills

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
Structure of Program (Semester-wise)

Name of Programme : B. Com. (Honours) – Advanced Statistics (As Per NEP – 2020)

About Programme : Semester – 7 (Major/Minor)

Teaching and Evaluation Scheme : As Per NEP – 2020

Structure of Program (Semester-wise)

Course Category	Course Code	Course Title	Marksheet Title in English	Level of Course	Teaching Hours/Week		Exam Duration		Credit		Internal Marks		External Marks		Total Marks	
					TH	PR	TH	PR	TH	PR	TH	PR	TH	PR	TH	PR
MAJOR	MJSTC 709	Advanced Statistics – I : Design of Experiments	Advanced Statistics – I : Design of Experiments	400	4		2		4		50		50		100	
MAJOR	MJSTC 710	Advanced Statistics – II : Actuarial Statistics	Advanced Statistics – II : Actuarial Statistics	400	4		2		4		50		50		100	
MAJOR	MJSTC 711	Advanced Statistics – III : Univariate Distributions - 1	Advanced Statistics – III : Univariate Distributions - 1	400	4		2		4		50		50		100	
MAJOR*	MJSTC 712	Advanced Statistics – IV : Operations Research – 1	Advanced Statistics – IV : Operations Research – 1	400	4		2		4		50		50		100	
MDC																
AEC																
SEC																
VAC																
Total									16							

* For Student who do not opt OJT (With out OJT)

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
Structure of Program (Semester-wise)

Name of Programme : B. Com. (Honours) – Advanced Statistics (As Per NEP – 2020) (with and without OJT)

About Programme : Semester – 8 (Major/Minor)

Teaching and Evaluation Scheme : As Per NEP – 2020

Course Category	Course Code	Course Title	Marksheet Title in English	Level of Course	Teaching Hours/Week		Exam Duration		Credit		Internal Marks		External Marks		Total Marks	
					TH	PR	TH	PR	TH	PR	TH	PR	TH	PR	TH	PR
MAJOR	MJSTC 813	Advanced Statistics – V : Statistics for Economics	Advanced Statistics – V : Statistics for Economics	400	4		2		4		50		50		100	
MAJOR	MJSTC 814	Advanced Statistics – VI : Business Forecasting & Testing of Hypothesis Methods	Advanced Statistics – VI : Business Forecasting & Testing of Hypothesis Methods	400	4		2		4		50		50		100	
MAJOR	MJSTC 815	Advanced Statistics – VII : Univariate Distributions & Sampling Distributions - 2	Advanced Statistics – VII : Univariate Distributions & Sampling Distributions - 2	400	4		2		4		50		50		100	
MAJOR*	MJSTC 816	Advanced Statistics – VIII: Operations Research – 2	Advanced Statistics – VIII: Operations Research – 2	400	4		2		4		50		50		100	
MDC																
AEC																
SEC																
VAC																
Total									16							

* For Student who do not opt OJT (With out OJT)

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**B.COM (Honours)****Semester -VII****Advanced Statistics – I : Design of Experiments (Major Paper – I) – Credit 4****As per NEP 2020****To be implemented from the Academic year 2026-27**

Program Name	B. Com (Honours) – Advanced Statistics						
Semester	7						
NCrF Credit Level	6.0						
Course Type	Major						
Course Subtype							
Subject Type	Discipline Specific						
Course Code	MJSTC 709						
Course Level	400						
Course Title	Advanced Statistics – I : Design of Experiments						
Credit	Theory:	4	Practical:		Total:	4	
Effective From	Academic Year : 2026-27						
Course Outcomes	On completion of the course, the students will be able to: CO1: Understand the fundamental concepts, principles, and importance of design of experiments in statistical analysis. CO2: Analyze Completely Randomized Design (CRD) and perform ANOVA for testing treatment effects. CO3: Apply Randomized Block Design (RBD) and Latin Square Design (LSD), including handling missing observations. CO4: Understand factorial experiments, main effects, interaction effects, and apply Yates’ method. CO5: Apply experimental design techniques in agriculture, industry, and research problems.						
Mapping between Cos and PSOs	COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1	✓	✓	✓			✓
	CO2	✓	✓	✓			✓
	CO3	✓	✓	✓			✓
	CO4	✓	✓	✓			✓
	CO5	✓	✓	✓		✓	✓
Course Content	Content					Weightage	Marks
	Unit-I : Introduction to Experimental Designs - Meaning, role, and purpose of experimental designs - Historical perspective of agricultural experiments - Terminology used in DOE - Experimental error and its control - Basic principles of experimentation - Uniformity trials - Fertility contour maps - Choice of size & shape of plots and blocks					20%	10

	Unit – 2 : Completely Randomized Design (CRD) • Basic idea, assumptions, and layout • Mathematical model for CRD • ANOVA for CRD • Testing equality of treatment means • Advantages and limitations of CRD • Illustrative numerical examples	30%	15																		
	Unit – 3: Randomized Block Design (RBD) and Latin Square Design (LSD) Randomized Block Design (RBD) • Layout, model, and ANOVA • Relative efficiency • Missing plot technique (one missing observation) Latin Square Design (LSD) • Layout, model, and ANOVA • Relative efficiency • Missing observation technique (one missing cell)	30%	15																		
	Unit – 4: Factorial Experiments • Meaning and advantages • Notations: $2^2, 2^3, \dots, 2^n$ • Main effects and interaction effects • Yates’ algorithm (if applicable) • Analysis of 2^n factorial experiments • Numerical illustrations	20%	10																		
Reference Books	<table><tr><th>Sr. No.</th><th>Book Title & Author</th><th>Publisher / Edition</th></tr><tr><td>1</td><td><i>Experimental Design</i> — Cochran, W. G. & Cox, G. M. (1959)</td><td>Asia Publishing House</td></tr><tr><td>2</td><td><i>Design and Analysis of Experiments</i> — Das, M. N. & Giri, N. C. (1986)</td><td>Wiley Eastern Ltd.</td></tr><tr><td>3</td><td><i>Fundamentals of Statistics, Vol. II</i> — Goon, A. M.; Gupta, M. K.; Dasgupta, B. (2005)</td><td>World Press, Kolkata</td></tr><tr><td>4</td><td><i>The Design and Analysis of Experiments</i> — Kempthorne, O. (1965)</td><td>John Wiley</td></tr><tr><td>5</td><td><i>Design and Analysis of Experiments</i> — Montgomery, D. C. (2008)</td><td>John Wiley</td></tr></table>	Sr. No.	Book Title & Author	Publisher / Edition	1	<i>Experimental Design</i> — Cochran, W. G. & Cox, G. M. (1959)	Asia Publishing House	2	<i>Design and Analysis of Experiments</i> — Das, M. N. & Giri, N. C. (1986)	Wiley Eastern Ltd.	3	<i>Fundamentals of Statistics, Vol. II</i> — Goon, A. M.; Gupta, M. K.; Dasgupta, B. (2005)	World Press, Kolkata	4	<i>The Design and Analysis of Experiments</i> — Kempthorne, O. (1965)	John Wiley	5	<i>Design and Analysis of Experiments</i> — Montgomery, D. C. (2008)	John Wiley		
Sr. No.	Book Title & Author	Publisher / Edition																			
1	<i>Experimental Design</i> — Cochran, W. G. & Cox, G. M. (1959)	Asia Publishing House																			
2	<i>Design and Analysis of Experiments</i> — Das, M. N. & Giri, N. C. (1986)	Wiley Eastern Ltd.																			
3	<i>Fundamentals of Statistics, Vol. II</i> — Goon, A. M.; Gupta, M. K.; Dasgupta, B. (2005)	World Press, Kolkata																			
4	<i>The Design and Analysis of Experiments</i> — Kempthorne, O. (1965)	John Wiley																			
5	<i>Design and Analysis of Experiments</i> — Montgomery, D. C. (2008)	John Wiley																			
Teaching Methodology	Hybrid (Interactive Lectures, Lecture-cum-Demonstration, Group Discussions, Problem-based Learning, and Self-Study Assignments)																				
Evaluation Method	Internal Assessment : 50 Marks External Assessment : 50 Marks																				

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
B.COM (Honours)
Semester -VII

Advanced Statistics – II : Actuarial Statistics (Major Paper – II) – Credit 4
As per NEP 2020
To be implemented from the Academic year 2026-27

Program Name	B. Com (Honours) – Advanced Statistics						
Semester	7						
NCrF Credit Level	6.0						
Course Type	Major						
Course Subtype							
Subject Type	Discipline Specific						
Course Code	MJSTC 710						
Course Level	400						
Course Title	Advanced Statistics – II : Actuarial Statistics						
Credit	Theory:	4	Practical:		Total:	4	
Effective From	Academic Year : 2026-27						
Course Outcomes	On completion of the course, the students will be able to: CO1: Understand the basic concepts of actuarial statistics and its applications in insurance and risk analysis. CO2: Apply probability distributions and utility theory in insurance decision-making. CO3: Understand premium calculation principles and individual risk models. CO4: Analyze survival distributions, life tables, and mortality functions. CO5: Apply actuarial models in life insurance and annuity calculations.						
Mapping between Cos and PSOs	COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1	✓			✓		✓
	CO2				✓		✓
	CO3	✓			✓	✓	✓
	CO4				✓	✓	✓
	CO5				✓		✓
Course Content	Content					Weightage	Marks
	Unit – 1: Introductory Statistics and Its Application in Insurance • Discrete, Continuous, and Mixed Probability Distributions • Insurance Applications • Distribution of Sum of Random Variables • Utility Theory: Utility function, expected utility criterion, types of utility functions, insurance, and utility theory					20%	10
	Unit – 2: Principles of Premium Calculation: • Properties of Premium Principles • Examples of Premium Principles					20%	10

	• Individual Risk Models: Models for individual claims, the sum of independent claims, approximations, and their application		
	Unit – 3: Survival Distribution and Life Tables • Uncertainty of Age at Death • Survival Function • Time-Until-Death for a Person • Curate Future Lifetime • Force of Mortality • Life Tables with Examples • Deterministic Survivorship Group • Life Table Characteristics • Assumptions for Fractional Age • Some Analytical Laws of Mortality		
	Unit – 4: Life Insurance • Models for Insurance Payable at the Moment of Death • Insurance Payable at the End of the Year of Death and Their Relationship Life Annuities: • Continuous Life Annuities, Discrete Life Annuities, Life Annuities with Periodic Payments Payments: • Continuous and Discrete Premiums		
Reference Books	Sr. No.	Book Title & Author	Publisher / Edition
	1	<i>Actuarial Mathematics</i> — Bowers, N. L. et al.	Society of Actuaries, Illinois
	2	<i>Life Contingencies</i> — Neill, A.	Butterworth-Heinemann
	3	<i>Actuarial Mathematics for Life Contingent Risks</i> — Dickson, D. C. M., Hardy, M. R., Waters, H. R.	Cambridge University Press
	4	<i>Fundamentals of Mathematical Statistics</i> — Gupta, S. C. & Kapoor, V. K.	Sultan Chand & Sons
	5	<i>Life Contingencies</i> — Spurgeon, E. T.	Cambridge University Press
	6	<i>Actuarial Mathematics and Life Tables</i> — Panjer, H. H.	Wiley
Teaching Methodology	Hybrid (Interactive Lectures, Lecture-cum-Demonstration, Group Discussions, Problem-based Learning, and Self-Study Assignments)		
Evaluation Method	Internal Assessment : 50 Marks External Assessment : 50 Marks		

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
B.COM (Honours)
Semester -VII

Advanced Statistics – III : Univariate Distributions - 1 (Major Paper – III) – Credit 4
As per NEP 2020
To be implemented from the Academic year 2026-27

Program Name	B. Com (Honours) – Advanced Statistics						
Semester	7						
NCrF Credit Level	6.0						
Course Type	Major						
Course Subtype							
Subject Type	Discipline Specific						
Course Code	MJSTC 711						
Course Level	400						
Course Title	Advanced Statistics – III : Univariate Distributions - 1						
Credit	Theory:	4	Practical:		Total:	4	
Effective From	Academic Year : 2026-27						
Course Outcomes	On completion of the course, the students will be able to: CO1: Understand the concepts of random variables, probability functions, expectation, moments, and M.G.F. CO2: Derive and apply Binomial and Poisson distributions with their properties and applications. CO3: Understand and apply Negative Binomial distribution in discrete probability modeling. CO4: Analyze Normal distribution, standard normal distribution, and approximation methods. CO5: Apply univariate distributions in statistics, business, economics, and research problems.						
Mapping between Cos and PSOs	COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1	✓	✓				✓
	CO2	✓	✓			✓	✓
	CO3	✓	✓				✓
	CO4	✓	✓			✓	✓
	CO5	✓	✓	✓		✓	✓
Course Content	Content				Weightage	Marks	
	Unit – 1: Introduction to Univariate Distributions - Random variable: discrete and continuous - Probability mass function and probability density function - Distribution function - Mathematical expectation - Moments				20%	10	

	• Moment generating function (M.G.F.) • Cumulants (basic idea) • Applications of probability distributions				
	Unit – 2: Discrete Univariate Distributions – I Binomial Distribution • Definition and assumptions • Probability mass function • Derivation of Mean and variance • Moment and M.G.F. • Important Properties • Applications Poisson Distribution • Definition and assumptions • Probability mass function • Derivation of Mean and variance • Moment and M.G.F. • Important Properties • Applications • Poisson approximation to Binomial			30%	15
	Unit – 3 : Discrete Univariate Distributions – II Negative Binomial Distribution • Definition • Probability function • Derivation of Mean and variance • M.G.F. • Applications			20%	10
	Unit – 4: Continuous Distributions Normal Distribution • Definition and properties • Probability density function • Derivation of Mean and variance • Standard Normal Distribution • Areas under the normal curve • Importance and applications • Normal approximation to Binomial and Poisson distributions			30%	15
Reference Books	Sr. No.	Book Title & Author	Publisher / Edition		
	1	<i>Probability and Statistics</i> — S. C. Gupta	—		
	2	<i>Probability and Statistics</i> — V. K. Rohatgi & A. K. Md. Ehsanes Saleh	—		
	3	<i>Probability Measures</i> — K. R. Parthasarathy	—		
	4	<i>Probability and Statistics</i> — S. M. Ross (Indian Print Edition)	Pearson India		
	5	<i>Statistical Distributions</i> — Mahajan	—		
	6	<i>Fundamentals of Statistics</i> (Complete Set, Latest Reprints) — Goon, Gupta & Dasgupta	World Press		

	7	<i>Comprehensive Statistical Methods</i> — P. N. Arora & S. Arora	—
	8	<i>Introductory Probability Theory</i> — Rao & Rao	—
	9	<i>Mathematical Statistics</i> — Mukhopadhyay, Parimal	—
	10	<i>Distributions in Statistics</i> — Johnson, N. L. & Kotz, S. (1977)	John Wiley
	11	<i>Mathematical Statistics</i> — Ferguson, T. (1967)	Academic Press
	12	<i>Statistical Distributions</i> — Jaiswal, M. C. (1973)	Gujarat University Book Publication Board, Ahmedabad
	13	<i>Introduction to Probability Theory and Mathematical Statistics</i> — Rohatgi, V. K. (1984)	Wiley Eastern
Teaching Methodology	Hybrid (Interactive Lectures, Lecture-cum-Demonstration, Group Discussions, Problem-based Learning, and Self-Study Assignments)		
Evaluation Method	Internal Assessment : 50 Marks External Assessment : 50 Marks		

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
B.COM (Honours)
Semester -VII

Advanced Statistics – IV : Operations Research – 1 (Major Paper – IV) – Credit 4
As per NEP 2020
To be implemented from the Academic year 2026-27

Program Name	B. Com (Honours) – Advanced Statistics						
Semester	7						
NCrF Credit Level	6.0						
Course Type	Major						
Course Subtype							
Subject Type	Discipline Specific						
Course Code	MJSTC 712						
Course Level	400						
Course Title	Advanced Statistics – IV : Operations Research – 1						
Credit	Theory:	4	Practical:		Total:	4	
Effective From	Academic Year : 2026-27						
Course Outcomes	On completion of the course, the students will be able to: CO1: Formulate and solve Linear Programming Problems using simplex, Big-M, and two-phase methods. CO2: Understand and analyze game theory concepts including payoff matrix, saddle point, and optimal strategies. CO3: Solve games using mixed strategies and apply sequencing models for optimal scheduling. CO4: Understand optimization principles in ancient Indian economic systems and their relevance. CO5: Apply operations research techniques for business, management, and industrial decision-making.						
Mapping between Cos and PSOs	COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1	✓	✓		✓	✓	✓
	CO2	✓	✓		✓	✓	✓
	CO3	✓	✓		✓	✓	✓
	CO4	✓			✓	✓	✓
	CO5	✓	✓		✓	✓	✓
Course Content	Content				Weightage	Marks	
	Unit – 1: Linear Programming & Simplex Methods • Introduction to Linear Programming Problem (LPP) • Formulation of LPP • Simplex Method – Basic Solution, Feasible Region • Simplex Table Format • Big–M Method • Two–Phase Method				20%	10	

	• Applications of Simplex Method to: ○ Maximization Problems ○ Minimization Problems ○ Constraints with Mixed Types			
	Unit – 2: Introduction to Game Theory (25%) • Introduction to Operations Research and Competitive Games • Two–Person Zero–Sum Games • Payoff Matrix • Maximin and Minimax Principle • Saddle Point and Value of the Game (Pure Strategies) • Fundamental Theorem of Game Theory • Dominance Rule • Graphical Method for solving ○ $m \times 2$ games ○ $2 \times n$ games		30%	15
	Unit – 3: Mixed Strategies and Sequencing Problems Part A – Mixed Strategies • Games without a Saddle Point • Solution using Mixed Strategies • Algebraic and Graphical Techniques • Expected Value of a Game Part B – Sequencing Problems • Introduction and Assumptions • Processing n Jobs through: ○ Two Machines (Johnson’s Rule) ○ Three Machines ○ m Machines (Two Jobs) ○ General Sequencing for n Jobs on m Machines		30%	15
	Unit – 4: Optimization Methods in Ancient India Ancient Indian texts show clear evidence of optimization , a core concept of O.R. ➤ Chanakya’s Arthashastra as the earliest treatise on resource optimization ➤ Maximizing state revenue with minimum tax burden ➤ Optimal allocation of land, labor, and treasury ➤ Price stabilization strategies through optimal decision-making ➤ Minimizing transportation losses in trade routes		20%	10
Reference Books	Sr. No.	Book Title & Author	Publisher / Edition	
	1	<i>Operations Research: Optimization Techniques</i> — S. D. Sharma	—	
	2	<i>Operations Research</i> — Kanti Swarup, P. K. Gupta & Manmohan	Sultan Chand	

	3	<i>Operations Research: An Introduction</i> — H. A. Taha	PHI
	4	<i>Linear Programming and Applications</i> — S. I. Gass	McGraw Hill
	5	<i>Introduction to Operations Research</i> — Hillier & Lieberman	McGraw Hill
	6	<i>Operations Research: Applications and Algorithms</i> — Winston, Wayne L.	—
	7	<i>Linear Programming</i> — Hadley, G.	Addison-Wesley
Teaching Methodology	Hybrid (Interactive Lectures, Lecture-cum-Demonstration, Group Discussions, Problem-based Learning, and Self-Study Assignments)		
Evaluation Method	Internal Assessment : 50 Marks External Assessment : 50 Marks		

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
B.COM (Honours)
Semester -VIII

Advanced Statistics – V : Statistics for Economics (Major Paper – V) Credit: 4
As per NEP 2020
To be implemented from the Academic year 2026-27

Program Name	B. Com (Honours) – Advanced Statistics						
Semester	8						
NCrF Credit Level	6.0						
Course Type	Major						
Course Subtype							
Subject Type	Discipline Specific						
Course Code	MJSTC 813						
Course Level	400						
Course Title	Advanced Statistics – V : Statistics for Economics						
Credit	Theory:	4	Practical:		Total:	4	
Effective From	Academic Year : 2026-27						
Course Outcomes	On completion of the course, students will be able to: CO1: Understand the concepts and components of time series analysis and forecasting techniques. CO2: Construct and analyze index numbers and evaluate their properties. CO3: Apply statistical methods in demand and supply analysis using various economic models. CO4: Understand and apply growth models such as Harrod-Domar and Solow models. CO5: Use statistical tools for economic analysis, planning, and real-life decision-making.						
Mapping between Cos and PSOs	COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1	✓	✓			✓	✓
	CO2	✓	✓			✓	✓
	CO3	✓	✓	✓		✓	✓
	CO4	✓	✓			✓	✓
	CO5	✓	✓	✓	✓	✓	✓
Course Content	Content				Weightage	Marks	
	Unit – 1: Analysis of Time Series ➤ Meaning and importance of Time Series ➤ Components of Time Series ➤ Introduction to Stationary Time Series ➤ Box–Jenkins methodology (concept only) ➤ Autoregressive (AR) Models ➤ Moving Average (MA) Models ➤ Mixed ARMA Models				20%	10	

	➤ ARIMA Models ➤ Properties of AR, MA, ARMA & ARIMA Models ➤ Forecasting techniques based on time series models				
	Unit – 2: Index Numbers ➤ Meaning, importance, and uses of Index Numbers ➤ Methods of constructing index numbers: ○ Ratio of Simple Aggregate ○ Ratio of Weighted Aggregate ○ Unweighted Average of Price Relatives ➤ Choice of base period ➤ Tests of a good index number: Time Reversal, Factor Reversal, Circular Test ➤ Cost of Living Index Numbers ➤ Various official index numbers in India ➤ Human Development Index (HDI): Concept and computation			20%	10
	Unit – 3: Demand and Supply Analysis ➤ Basic concepts of Demand and Supply ➤ Price elasticity of Demand and Supply ➤ Determination of Demand and Supply curves using: ○ Cross-sectional data ○ Time series data ➤ Leontief's Method ➤ Pigou's Method ➤ Engel's Curves ➤ Pareto Law of Income Distribution Growth Models ➤ Concept of Multiplier ➤ Concept of Accelerator ➤ Hicks–Samuelson Model ➤ Harrod–Domar Growth Model ➤ Solow's Growth Model ➤ Applications of growth models in economic analysis			40%	20
	Unit – 4: Statistical Thinking in Ancient Indian Economic & Administrative Systems ➤ Statistical record-keeping in <i>Kautilya's Arthashastra</i> ➤ Taxation, revenue records, land measurement ➤ Early population statistics ➤ Agriculture and rainfall records in ancient India ➤ Application of sampling-like methods in ancient surveys			20%	10
Reference Books	Sr. No.	Book Title & Author	Publisher / Edition		
	1	<i>Applied General Statistics</i> — Croxton, E. F.; Cowden, D. J.; Klein, S. (1967)	3rd Edition, Prentice-Hall, Englewood Cliffs (N.J.)		

	2	<i>Applied Statistics for Economics</i> — Karmel, P. H. (1963)	2nd Edition, Pitman, Melbourne
	3	<i>Time Series</i> — Kendall, M. (1976)	2nd Edition, Charles Griffin & Co.
	4	<i>Analysis of Time Series: Theory and Practice</i> — Chatfield, C. (1975)	Chapman & Hall, London
	5	<i>The Analysis of Time Series: An Introduction</i> — Chatfield, Chris (2003)	6th Edition, Chapman & Hall/CRC, ISBN-13: 9781584883173
	6	<i>Growth Economics</i> — Sen, A. K. (1970)	Penguin's Modern Economic Readings Edition
	7	<i>Economics & Business Statistics</i> — Pillai, S. (1973)	Progressive Corporation Pvt. Ltd.
	8	<i>Applied Statistics</i> — Mukhopadhyay, P. (2009)	Books & Allied (P) Ltd., ISBN: 8187134380 / 9788187134381
	9	<i>Fundamentals of Applied Statistics</i> — Gupta, S. C.; Kapoor, V. K. (2006)	Sultan Chand & Sons, ISBN: 8170141516 / 9788170141518
Teaching Methodology	Hybrid (Interactive Lectures, Lecture-cum-Demonstration, Group Discussions, Problem-based Learning, and Self-Study Assignments)		
Evaluation Method	Internal Assessment : 50 Marks External Assessment : 50 Marks		

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

B.COM (Honours)

Semester -VIII

Advanced Statistics – VI : Business Forecasting & Testing of Hypothesis Methods

(Major Paper – VI) – Credit 4

As per NEP 2020

To be implemented from the Academic year 2026-27

Program Name	B. Com (Honours) – Advanced Statistics						
Semester	8						
NCrF Credit Level	6.0						
Course Type	Major						
Course Subtype							
Subject Type	Discipline Specific						
Course Code	MJSTC 814						
Course Level	400						
Course Title	Advanced Statistics – VI : Business Forecasting & Testing of Hypothesis Methods						
Credit	Theory:	4	Practical:		Total:	4	
Effective From	Academic Year : 2026-27						
Course Outcomes	On completion of the course, students will be able to: CO1: Understand the concept, importance, and types of business forecasting. CO2: Apply forecasting models including exponential and power models. CO3: Understand statistical hypothesis testing, types of errors, and level of significance. CO4: Apply Neyman–Pearson Lemma and construct most powerful tests. CO5: Use statistical distributions for decision-making in business and economics. CO6: Apply forecasting and hypothesis testing techniques to real-life problems.						
Mapping between Cos and PSOs	COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1	✓	✓			✓	✓
	CO2	✓	✓			✓	✓
	CO3	✓	✓	✓			✓
	CO4	✓	✓	✓			✓
	CO5	✓	✓			✓	✓
Course Content	Content				Weightage		Marks
	Unit – 1: Introduction to Business Forecasting - Meaning and Concept of Forecasting - Importance and Need of Forecasting - Types of Forecasting - Steps / General Approach to Forecasting				20%		10
	Unit – 2: Methods of Business Forecasting - Mathematical Models of Forecasting - Exponential Model: $y = ae^{bx}$ - Power Model: $y = ab^x$ - Forecasting Demand				30%		15

	- Industry vs Company Sales Forecasting (Theory) - Factors Affecting Company Sales (Theory)			
	Unit – 3: Fundamentals of Hypothesis Testing - Definition of Statistical Hypothesis - Simple & Composite Hypothesis - Critical Region - Type I and Type II Errors - Level of Significance - Power of a Test		20%	10
	Unit – 4: Most Powerful Tests & Applications - Neyman–Pearson Lemma (without proof) - Most Powerful Tests for: - Binomial Distribution - Poisson Distribution - Normal Distribution - Exponential Distribution - Most powerful test of a simple hypothesis vs simple alternative		30%	15
Reference Books	Sr. No.	Book Title & Author	Publisher / Edition	
	1	<i>Distributions in Statistics</i> — Johnson, N. L. & Kotz, S. (1977)	John Wiley	
	2	<i>Mathematical Statistics</i> — Ferguson, T. (1967)	Academic Press	
	3	<i>Statistical Distributions</i> — Jaiswal, M. C. (1973)	Gujarat University Book Publication Board, Ahmedabad	
	4	<i>Introduction to Probability Theory and Mathematical Statistics</i> — Rohatgi, V. K. (1984)	Wiley Eastern	
	5	<i>Business Forecasting</i> — Hanke, J. E. & Reitsch, A.	Pearson Education	
	6	<i>Forecasting: Methods and Applications</i> — Makridakis, S.; Wheelwright, S. C.; Hyndman, R.	Wiley	
	7	<i>Fundamentals of Mathematical Statistics</i> — Gupta, S. C. & Kapoor, V. K.	Sultan Chand	
	8	<i>Introduction to the Theory of Statistics</i> — Mood, Graybill & Boes	McGraw-Hill	
	9	<i>Fundamentals of Statistics</i> — Goon, Gupta & Dasgupta	World Press	
	10	<i>Theory and Problems of Statistics</i> — Spiegel, M. R.	Schaum's Series	
	11	<i>Business Forecasting</i> — Allen, G.	McGraw-Hill	
	12	<i>Introduction to Mathematical Statistics</i> — Hoel, P. G.	Wiley	
	13	<i>Optimization Technique</i> — S. D. Sharma	—	
	14	<i>Operations Research</i> — Swarupkanti, Gupta P. K. & Manmohan (2007)	13th Edition, Sultan Chand & Sons	
	15	<i>Operations Research: An Introduction</i> — Taha, H. A. (2007)	8th Edition, Prentice Hall of India	

	16	<i>Linear Programming and Applications</i> — Gass, S. I. (1975)	McGraw-Hill
Teaching Methodology	Hybrid (Interactive Lectures, Lecture-cum-Demonstration, Group Discussions, Problem-based Learning, and Self-Study Assignments)		
Evaluation Method	Internal Assessment : 50 Marks External Assessment : 50 Marks		

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

B.COM (Honours)

Semester -VIII

Advanced Statistics – VII : Univariate Distributions & Sampling Distributions – 2 (Major Paper – VII) – Credit 4

As per NEP 2020

To be implemented from the Academic year 2026-27

Program Name	B. Com (Honours) – Advanced Statistics						
Semester	8						
NCrF Credit Level	6.0						
Course Type	Major						
Course Subtype							
Subject Type	Discipline Specific						
Course Code	MJSTC 815						
Course Level	400						
Course Title	Advanced Statistics – VII : Univariate Distributions & Sampling Distributions – 2						
Credit	Theory:	4	Practical:		Total:	4	
Effective From	Academic Year : 2026-27						
Course Outcomes	On completion of the course, the students will be able to: CO1: Understand Gamma distribution and derive its mean and variance using M.G.F. CO2: Analyze Beta Type–I and Beta Type–II distributions with properties and applications. CO3: Understand Cauchy distribution and its applications in economics and physics. CO4: Derive and analyze sampling distributions such as t, F, and χ^2 distributions. CO5: Apply advanced distributions in statistical inference and research.						
Mapping between Cos and PSOs	COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1	✓	✓				✓
	CO2	✓	✓				✓
	CO3	✓	✓			✓	✓
	CO4	✓	✓	✓			✓
	CO5	✓	✓	✓		✓	✓
Course Content	Content				Weightage		Marks
	Unit – 1: Univariate Distributions – Gamma Distribution • Introduction • Derivation of Mean & Variance using M.G.F. • Important Properties • Applications in real-life				20%		10
	Unit – 2: Univariate Distributions – Beta Type–1 & Beta Type–2 Beta Type–1 Distribution • Introduction • Derivation of Mean & Variance (using M.G.F.)				30%		15

	• Properties • Applications Beta Type–2 Distribution • Introduction • Derivation of Mean & Variance (using M.G.F.) • Properties • Applications		
	Unit – 3: Cauchy Distribution • Introduction • Derivation of Mean & Variance (using M.G.F.) • Important Properties • Applications in economics & physics	20%	10
	Unit – 4: Exact Sampling Distributions • Derivation t–distribution: formula, properties, applications • Derivation F–distribution: formula, properties, applications • Relation between t, F, χ^2 distributions • Derivation of χ^2 distribution	30%	15
Reference Books	Sr. No.	Book Title & Author	Publisher / Edition
	1	<i>Probability and Statistics</i> — S. C. Gupta	—
	2	<i>Probability and Statistics</i> — V. K. Rohatgi & A. K. Md. Ehsanes Saleh	—
	3	<i>Probability Measures</i> — K. R. Parthasarathy	—
	4	<i>Probability and Statistics</i> — S. M. Ross (Indian Print Edition)	Pearson India
	5	<i>Statistical Distributions</i> — Mahajan	—
	6	<i>Fundamentals of Statistics</i> (Complete Set, Latest Reprints) — Goon, Gupta & Dasgupta	World Press
	7	<i>Comprehensive Statistical Methods</i> — P. N. Arora & S. Arora	—
	8	<i>Introductory Probability Theory</i> — Rao & Rao	—
	9	<i>Mathematical Statistics</i> — Mukhopadhyay, Parimal	—
	10	<i>Distributions in Statistics</i> — Johnson, N. L. & Kotz, S. (1977)	John Wiley
	11	<i>Mathematical Statistics</i> — Ferguson, T. (1967)	Academic Press
	12	<i>Statistical Distributions</i> — Jaiswal, M. C. (1973)	Gujarat University Book Publication Board, Ahmedabad
	13	<i>Introduction to Probability Theory and Mathematical Statistics</i> — Rohatgi, V. K. (1984)	Wiley Eastern
Teaching Methodology	Hybrid (Interactive Lectures, Lecture-cum-Demonstration, Group Discussions, Problem-based Learning, and Self-Study Assignments)		
Evaluation Method	Internal Assessment : 50 Marks External Assessment : 50 Marks		

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
B.COM (Honours)
Semester -VIII

Advanced Statistics – VIII: Operations Research – 2 (Major Paper–VIII) – Credit 4
As per NEP 2020
To be implemented from the Academic year 2026-27

Program Name	B. Com (Honours) – Advanced Statistics						
Semester	8						
NCrF Credit Level	6.0						
Course Type	Major						
Course Subtype	Core Major						
Subject Type	Discipline Specific						
Course Code	MJSTC 816						
Course Level	400						
Course Title	Advanced Statistics -VIII : Operations Research-2						
Credit	Theory:	4	Practical:		Total:	4	
Effective From	Academic Year : 2026-27						
Course Outcomes	On completion of the course, the students will be able to: CO1: Understand inventory concepts, costs, and objectives of inventory control systems. CO2: Apply deterministic inventory models including EOQ, shortages, and quantity discounts. CO3: Understand the structure and characteristics of queuing systems and models. CO4: Analyze single-channel and multi-channel queuing models using performance measures. CO5: Apply inventory and queuing techniques in business, banking, hospitals, and service systems.						
Mapping between Cos and PSOs	COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1	✓	✓		✓	✓	✓
	CO2	✓	✓		✓	✓	✓
	CO3	✓	✓		✓		✓
	CO4	✓	✓		✓		✓
	CO5	✓	✓	✓	✓	✓	✓
Course Content	Content				Weightage		Marks
	Unit – 1: Introduction to Inventory Models - Meaning and importance of inventory - Types of inventory - Objectives of inventory control - Inventory costs: - Ordering cost - Carrying / Holding cost - Shortage cost				20%		10

	○ Purchase cost • Deterministic and probabilistic inventory models • Assumptions of inventory models • Inventory control techniques				
	Unit – 2: Deterministic Inventory Models • Economic Order Quantity (EOQ) Model • EOQ with finite replenishment rate • EOQ with shortages allowed • EOQ with quantity discounts • Reorder level and lead time • Selective inventory control techniques: ○ ABC Analysis ○ VED Analysis ○ HML Analysis • Numerical applications			30%	15
	Unit – 3: Introduction to Queuing Theory • Meaning and importance of queuing theory • Elements of a queuing system: ○ Calling population ○ Arrival pattern ○ Service mechanism ○ Queue discipline • Characteristics of waiting line models • Kendall's notation • Probability distributions in queuing theory: ○ Poisson distribution ○ Exponential distribution • Applications in banking, transport, hospitals, and service centers			30%	15
	Unit – 4: Queuing Models • Single-channel queuing model ($M/M/1$) • Multi-channel queuing model ($M/M/C$)– basic concept • Measures of effectiveness: ○ Average number in queue ○ Average number in system ○ Average waiting time in queue ○ Average waiting time in system ○ Probability of idle system • Applications and numerical problems • Business applications of waiting line models			20%	10
Reference Books	Sr. No.	Book Title & Author			Publisher / Edition
	1	<i>Operations Research: Optimization Techniques</i> — S. D. Sharma			—
	2	<i>Operations Research</i> — Kanti Swarup, P. K. Gupta & Manmohan			Sultan Chand
	3	<i>Operations Research: An Introduction</i> — H. A. Taha			PHI
	4	<i>Linear Programming and Applications</i> — S. I. Gass			McGraw Hill
	5	<i>Introduction to Operations Research</i> — Hillier & Lieberman			McGraw Hill

	6	<i>Operations Research: Applications and Algorithms</i> — Winston, Wayne L.	—
	7	<i>Linear Programming</i> — Hadley, G.	Addison-Wesley
Teaching Methodology	Hybrid (Interactive Lectures, Lecture-cum-Demonstration, Group Discussions, Problem-based Learning, and Self-Study Assignments)		
Evaluation Method	Internal Assessment : 50 Marks External Assessment : 50 Marks		