UG ALLIED PAPERS	
B. Com. / B.Com. (B &I)	
Semester III: UABMA24 - Business Mathematics and Statistics	
Semester IV: UABOR24 - Operations Research	
B.Sc. Chemistry / B. Sc. Physics	
Semester I: UAMAA24 - Allied Mathematics – I	
Semester II: UAMAB24 - Allied Mathematics – II	
B. Sc. Computer Science	
Semester I: UAMAC24 - Statistical Methods and their Applications – I	
Semester II: UAMAD24 - Statistical Methods and their Applications – I	
Semester III: UAMAE24 -Numerical Methods – I	
Semester IV: UAMAF24 -Numerical Methods – II	
BCA	
Semester III: UACAA24 - Mathematical Foundations	
Semester IV: UACAB24 - Statistical Methods	
B. Sc. Micro Biology	
Semester III: UABSA24 - Biostatistics – I	
Semester IV: UABSB24 - Biostatistics – II	
BBA	
Semester III: UABAC24 - Business Statistics	
Semester IV: UABAD24 – Operations Research	
Semester VI: UPBA24 **-** Quantitative Aptitude	
BHA	
Semester I: UAHAA24 - Medical Statistics	
Semester II: UAHAB24 - Operations Research	
B.Sc. Phycology	
UAPYC24 - Statistics for Behavioral Science	
Assessment Methods	

<table>
<tr><td>Title of the Course</td><td colspan="7">BUSINESS MATHEMATICS AND STATISTICS</td></tr>
<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">UABMA24</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">• To provide an opportunity to master mathematical applications in Economics, Finance, Commerce and Management.
• To develop the ability of students to deal with numerical and quantitative issues in business and to have a strong understanding of Statistical applications in Economics and Management</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I: (15 hours) (K1, K2, K3 & K4)
Ratio and Proportion
1.1 Introduction
1.2 Ratio
1.3 Proportion and Variations
1.4 Proportion and Variations (Continued)
1.5 Indices and Logarithms
1.6 Indices and Logarithms (Continued)</td></tr>
<tr><td></td><td colspan="7">Unit II: (15 hours) (K1, K2, K3 & K4)
Interest and Annuity
2.1 Banker’s Discount
2.2 Simple and Compound Interest
2.3 Arithmetic Progression
2.4 Geometric Progression
2.5 Annuity - Meaning
2.6 Types of Annuity - Applications</td></tr>
<tr><td></td><td colspan="7">UNIT III: (15 hours) (K1, K2, K3 & K4)
Measures of Central Tendency and Measures of Dispersion

3.1 Arithmetic Mean and Geometric Mean
3.2 Median
3.3 Mode
3.4 Measures of Dispersion – Range
3.5 Quartile Deviation and Co-efficient of Variation
3.6 Standard Deviation and Variance</td></tr>
</table>

	UNIT IV: (15 hours) (K1, K2, K3 & K4) **Correlation and Regression** 4.1 Correlation 4.2 Karl Pearson's Coefficient of Correlation 4.3 Karl Pearson's Coefficient of Correlation (Continued) 4.4 Spearman's Rank Correlation 4.5 Regression Lines 4.6 Regression Coefficients
	UNIT V: (15 hours) (K1, K2, K3 & K4) **Time Series Analysis and Index Numbers** 5.1 Time Series Analysis : Secular Trend 5.2 Seasonal Variation and Cyclical variations 5.3 Index Numbers 5.4 Aggregative Index Numbers 5.5 Relative Index Numbers 5.6 Cost of Living Index
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. P. A. Navnitham - Business Mathematics and Statistics - Jai Publishers - Trichy 2007. 2. R. S. N. Pillai and Bagavathi - Statistics, 17th Edition, S. Chand and Company, New Delhi,1984.
ReferenceBooks	1. Francis, Andy - Business mathematics and statistics. Cengage Learning EMEA, 2004. 2. Agarwal, B. M. - Business Mathematics & Statistics. Ane Books Pvt Ltd, 2009. 3. Asim Kumar Manna - Business Mathematics & Statistics. McGraw Hill Education (India) Pvt. Ltd., 2018
Website and e-learning source	1. https://www.britannica.com/biography/Henry-Briggs 2. https://corporatefinanceinstitute.com/resources/data-science/central-tendency/ 3. https://www.expressanalytics.com/blog/time-series-analysis/

Course Outcomes:

On completion of the course, the students should be able to

CO1: Learn the basics of ratio, proportion, indices and logarithm

CO2: Familiarize with calculations of simple and compound interest and arithmetic, geometric and harmonic progressions

CO3: Determine the various measures of central tendency

CO4: Calculate the correlation and regression co-efficient

CO5: Assess problems on time series analysis and Index Numbers

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	L	L	M	H
CO2	H	H	M	L	M	H
CO3	H	H	M	L	M	H
CO4	H	H	M	L	M	H
CO5	H	H	M	L	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	H	L
CO2	H	M	H	M	H	L
CO3	H	M	H	H	H	L
CO4	H	H	H	H	H	L
CO5	H	H	H	H	H	L

<table>
<tr><td>Title of the Course</td><td colspan="8">OPERATIONS RESEARCH</td></tr>
<tr><td>Paper No.</td><td colspan="8"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td>Credits</td><td>3</td><td>Course Code</td><td colspan="2">UABOR24</td></tr>
<tr><td>Semester</td><td>IV</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="3">-</td><td colspan="3">4</td></tr>
<tr><td>Prerequisites</td><td colspan="8">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">• To introduce the use of quantitative methods and techniques for effective decision making and to provide a detailed knowledge about mathematical, transportation and assignment models.
• To improve knowledge in Sequencing Problems, Queuing theory and Network Analysis.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT I: (12 hours) (K1, K2, K3 & K4)
Introduction to Operations Research and Linear Programming Problem

1.1 Operations research, Origin and development
1.2 Role in decision making and Phases and approaches to OR
1.3 Linear programming problem, Applications and limitations
1.4 Formulation of LPP
1.5 Simplex Method
1.6 Simplex Method (Continued)</td></tr>
<tr><td></td><td colspan="8">Unit II: (12 hours) (K1, K2, K3 & K4)
Transportation and Assignment problems

2.1 Transportation Problem- North West corner method
2.2 Least cost method
2.3 Vogel’s approximation method
2.4 Vogel’s approximation method (Continued)
2.5 Assignment problem
2.6 Assignment problem (Continued)</td></tr>
<tr><td></td><td colspan="8">UNIT III: (12 hours) (K1, K2, K3 & K4)
Game Theory and Simulation

3.1 Game Theory - different strategies followed by the players in a game
3.2 Optimal strategies of a game using maxi-min criterion
3.3 Game theory without Saddle point
3.4 Dominance property
3.5 Graphical method
3.6 Simulation - Introduction & Event Type Simulation</td></tr>
</table>

	UNIT IV: (12 hours) (K1, K2, K3 & K4) **Inventory Management** 4.1 Introduction to inventory systems 4.2 Inventory classification-Economic order quantity (EOQ) model 4.3 Single period probabilistic inventory models with discrete demand 4.4 Single period probabilistic inventory models with continuous demand 4.5 Basic concepts of Just-in-Time (JIT) 4.6 Material Requirement Planning (MRP)
	UNIT V: (12 hours) (K1, K2, K3 & K4) **Network Analysis** 5.1 Introduction 5.2 Network Diagram Representation 5.3 Time Calculations and Critical Path in Network Analysis 5.4 Critical Path Method (CPM) 5.5 Critical Path Method (CPM) (Continued) 5.6 Program Evaluation and Review Technique (PERT)
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. P.K. Gupta and D.S. Hira – Problems in Operations Research, 1st Edition – Chand and Company Ltd., (Reprint 2001). 2. S. Kalavathy – Operations Research, 2nd Edition – Vikas Publications Ltd., 2002.
Reference Books	1. S. J. Venkatesan – Operations Research, 3rd Edition – J S Publication, Printed by Udayam Offsets, Chennai, 1999. 2. V.K. Kapoor – Operations Research, 5th Edition – Sultan Chand and Sons, Educational Publishers New Delhi, Revised Reprint, 1996. 3. V. Sundaresan, K.S. Ganapathy Subramanian and K. Ganesan, "Resource Management Techniques" A.R. Publications, 2009
Website and e-learning source	1. www.orsi.in 2. www.learnaboutor.co.uk 3. www.theorsociety.com 4. https://books.google.co.in/books?id=6khDDAAAQBAJ&lpg=PP1&pg=PA21#v=onepage&q&f=false 5. https://books.google.co.in/books?id=5p8bEAAAQBAJ&lpg=PA1&pg=PA3#v=onepage&q&f=false

Course Outcomes:

On completion of the course, the students should be able to

CO1: Frame a linear programming problem for quantitative decisions in business planning

CO2: Optimise economic factors by applying transportation and assignment problems

CO3: Apply the concept of game theory and simulation for optimal decision making

CO4: Analyse and manage inventories to meet the changes in market demand

CO5: Construct networks including PERT, CPM for strategic management of business projects

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	L	L	M	H
CO2	H	H	M	L	M	H
CO3	H	H	M	L	M	H
CO4	H	H	M	L	M	H
CO5	H	H	M	L	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	H	L
CO2	H	M	H	M	H	L
CO3	H	M	H	H	H	L
CO4	H	H	H	H	H	L
CO5	H	H	H	H	H	L

<table>
<tr><td>Title of the Course</td><td colspan="7">ALLIED MATHEMATICS I</td></tr>
<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2"></td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">UAMAA24</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="3">-</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">• To introduce the basic concepts of matrices
• To improve problem solving skills in Trigonometry
• To introduce various methods to solve equations
• To introduce differential and integral calculus</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (18 hours) (K1, K2, K3 & K4)
Matrices

1.1 Symmetric and Skew symmetric matrices
1.2 Hermitian and Skew Hermitian matrices
1.3 Orthogonal and Unitary matriices
1.4 Eigen values and Eigen vectors
1.5 Cayley-Hamilton Theorem (without proof)
1.6 Diagonalisation of a matrix</td></tr>
<tr><td></td><td colspan="7">Unit II (18 hours) (K1, K2, K3 & K4)
Theory of Equations

2.1 Polynomial equations
2.2 Irrational roots and Complex roots
2.3 Reciprocal equations
2.4 Descarte’s Rule of signs
2.5 Approximation roots of polynomial equation by Newton’s method
2.6 Horner’s method</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (18 hours) (K1, K2, K3 & K4)
Trigonometric Functions

3.1 Expansions of sin nθ, cos nθ
3.2 Expansions tan nθ
3.3 Expansion of $\sin^n\theta$, $\cos^n\theta$
3.4 Expansions of sin θ, cos θ in terms of θ
3.5 Expansions of tan θ in terms of θ
3.6 Logarithm of a complex number</td></tr>
</table>

	UNIT-IV: (18 hours) (K1, K2, K3 & K4) **Differential Calculus** 4.1 Curvature 4.2 Curvature (Continued) 4.3 Radius of curvature in Cartesian Coordinates 4.4 Radius of curvature in Cartesian Coordinates (Continued) 4.5 Evolutes 4.6 Involutes
	UNIT-V: (18 hours) (K1, K2, K3 & K4) **Integration** 5.1 Integration-Introduction 5.2 Integration by parts 5.3 Bernoulli's formula 5.4 Reduction formulae $\sin^n x$ 5.5 Reduction formulae $\cos^n x$ 5.6 Reduction formulae $\tan^n x$

Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)

Recommended Text	S. Narayanan and others – Ancillary Mathematics – Volumes I, II, III and IV-S.Viswanathan Printers and Publishers Private Limited, 2007
ReferenceBooks	1. T.K.ManikavachogamPillay and others – Algebra – Volume II – S. Viswanathan Printers and Publishers Private Limited, 2006 2. T.K.ManikavachogamPillay and others – Differential Calculus - S.Viswanathan Printers and Publishers Private Limited – Volume I, 2007 3. T.K.ManikavachagomPillay and others – Integral Calculus - S.Viswanathan Printers and Publishers Private Limited - Volume II, 2007 4. P.R. Vittal - Allied Mathematics – Margham Publications - Third Edition, 2002
Website and e-learning source	1. https://nptel.ac.in/ 2. www.coursera.org 3. https://swayam.gov.in

Course Outcomes:

On completion of the course, the students should be able to

CO1: Understand the basic concepts of matrices

CO2: Apply the theory of equations and find roots using Newton's and Horner's method

CO3: Acquire problem solving skills in trigonometry.

CO4: Compute radius of curvature, centre of curvature, evolutes and involutes.
CO5: Apply the techniques of integral calculus.

CO	PO					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	H	H	H	H	H	L
CO2	H	H	H	H	M	L
CO3	H	H	H	H	L	L
CO4	H	H	H	H	H	L
CO5	H	H	H	H	L	L

CO	PSO					
	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	H	H	H	H	H	L
CO2	H	H	H	H	M	L
CO3	H	H	H	H	L	L
CO4	H	H	H	H	H	L
CO5	H	H	H	H	L	L

<table>
<tr><td>Title of the Course</td><td colspan="7">ALLIED MATHEMATICS II</td></tr>
<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2"></td><td>Year</td><td>I</td><td>Credits</td><td>5</td><td>Course Code</td><td>UAMAB24</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="3">-</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">• To introduce concepts of vector calculus
• To teach methods of solving partial differential equations
• To introduce Laplace transforms and Fourier Series</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (18 hours) (K1, K2, K3 & K4)
Differentiation of vectors

1.1 Scalar and vector point functions
1.2 Differentiation of vectors
1.3 Differential operators
1.4 Directional derivatives
1.5 Gradient
1.6 Divergence and Curl</td></tr>
<tr><td></td><td colspan="7">Unit II (18 hours) (K1, K2, K3 & K4)
Integration of vectors

2.1 Line Integral
2.2 Surface Integral
2.3 Volume Integral
2.4 Green’s theorem and application
2.5 Gauss’s theorem and application
2.6 Stoke’s theorem and application</td></tr>
<tr><td></td><td colspan="7">UNIT III: (18 hours) (K1, K2, K3 & K4)
Partial Differential Equations (PDE)

3.1 Formation of PDE by eliminating arbitrary constants
3.2 Formation of PDE by eliminating arbitrary functions
3.3 Solutions of standard types of first order differential equations: f(p, q) = 0
3.4 Solution of f(x, p, q) = 0; f(y, p, q) = 0; f(z, p, q) = 0
3.5 Solution of f1(x, p) = f_2(y, q)
3.6 Solution of z = px + qy + f(p, q)</td></tr>
</table>

	UNIT IV: (18 hours) (K1, K2, K3 & K4) **Laplace Transformations** 4.1 Definition of Laplace transforms 4.2 Laplace transforms of standard functions 4.3 Laplace transforms – problems 4.4 Laplace transforms – problems (Continued) 4.5 Inverse Laplace Transforms 4.6 Solving ordinary differential equations of second order with constant coefficients using Laplace transforms (Simple problems)
	UNIT V: (18 hours) (K1, K2, K3 & K4) **Fourier Series** 5.1 Definition of Fourier series 5.2 Problems on Fourier series 5.3 Problems on Fourier series (Continued) 5.4 Fourier series of Odd functions 5.5 Fourier series of Even function 5.6 Half range series
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. S.Narayanan and others – Ancillary Mathematics – Volumes I, II, III and IV, S.Viswanathan Printers and Publishers Private Limited, 2007.
ReferenceBooks	1. P.R. Vittal - Allied Mathematics – Margham Publications - Third Edition, 2002 2. T.K.ManikavachagomPillay and others – Ancillary Mathematics Volume I and Volume II - S.Viswanathan Printers and Publishers Private Limited, 2004 3. P.Kandasamy and K.Thilagavathi - Allied Mathematics Volume I and Volume II - S.Chand and Co, New Delhi, 2004.
Website and e-learning source	1. https://nptel.ac.in/ 2. www.coursera.org 3. https://swayam.gov.in
Course Outcomes: **On completion of the course, the students should be able to** **CO1:** Understand the use of vector calculus in science and engineering.	

CO2: Understand the applications of Green's, Gauss divergence and Stoke's Theorems.
CO3: Find the complete, singular and general integral of partial differential equations.
CO4: Understand the basic concepts of Laplace Transforms.
CO5: Determine the nature of the Fourier series and find its coefficients

CO	PO					
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO1	H	H	H	H	H	L
CO2	H	H	H	H	M	L
CO3	H	H	H	H	L	L
CO4	H	H	H	H	H	L
CO5	H	H	H	H	L	L

CO	PSO					
	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	H	H	H	H	H	L
CO2	H	H	H	H	H	L
CO3	H	H	H	H	M	L
CO4	H	H	H	H	M	L
CO5	H	H	H	H	H	L

<table>
<tr><td>Title of the Course</td><td colspan="7">STATISTICAL METHODS AND THEIR APPLICATIONS-I</td></tr>
<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">UAMAC24</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="3">-</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">1. Apply statistical and graphical techniques wherever relevant.
2. To interpret statistical results effectively in real life problems.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT-I: (18 hours) (K1, K2, K3 & K4)
Classification and Diagrammatic Representation of statistical data

1.1 Classification and its types
1.2 Frequency distribution- individual observations
1.3 Discrete frequency distribution
1.4 Continuous frequency distribution
1.5 Histogram
1.6 Frequency polygon and Frequency curve</td></tr>
<tr><td></td><td colspan="7">UNIT-II: (18 hours) (K1, K2, K3 & K4)
Measures of Central Tendency

2.1 Basic definitions of Measures of Central Tendency
2.2 Arithmetic mean.
2.3 Median (Individual observations and discrete series)
2.4 Median (Continuous series))
2.5 Mode (Individual observations and discrete series)
2.6 Mode (Continuous series)</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (18 hours) (K1, K2, K3 & K4)
Measures of Dispersion

3.1 Basic definitions of Measures of Dispersion
3.2 Range
3.3 Quartile deviation
3.4 Mean deviation
3.5 Standard deviation and variance
3.6 Coefficient of Variance</td></tr>
</table>

	UNIT IV: (18 hours) (K1, K2, K3 & K4) **Probability and Algebra** 4.1 Probability (Definition and axioms) 4.2 Problems on Probability 4.3 Permutations 4.4 Combinations 4.5 Combinatorial arguments 4.6 Boolean algebra
	UNIT V: (18 hours) (K1, K2, K3 & K4) **Index Numbers** 5.1 Index Number (Definition and types) 5.2 Construction of weighted index numbers 5.3 Construction of unweighted index numbers 5.4 Test of consistency of index numbers-Time reversal test 5.5 Factor reversal test 5.6 Chain base and fixed base index numbers
Extended Professional Component (isa part of internal component only, not to be included in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Statistical Methods, Dr. S.P. Gupta, Sultan Chand & Sons. 2. P. R. Vittal, Mathematical Foundations, Margham Publications, Chennai, 2nd Edition- 2003.
ReferenceBooks	1. P. A. Navnitham, Business Mathematics and Statistics, Jai Publishers, Trichy-2007. 2. R. S. N. Pillai and Bagavathi, Statistics, 17th Edition, S. Chand and Company, New Delhi- 1984. 3. Fundamental of Mathematical Statistics, S.C. Gupta & V.K. Kapoor, Sultan Chand.
Website and e-learning source	1. https://nptel.ac.in/ 2. https://swayam.gov.in/nc_details/NPTEL 3. https://www.coursera.org/
Course Outcomes: **On completion of the course, the students should be able to** **CO1:** Frame a relevant frequency distribution for a given biological data. **CO2:** Determine mean, median, mode for biological data. **CO3:** Provide an overall description of a set of data using measures of dispersion. **CO4:** Assess real-life simple problems with permutation, combination, and probability. **CO5:** Interpret numerical information that forms the basis of index numbers.	

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	H	H	H	M	L
CO2	S	S	H	H	M	L
CO3	S	H	H	H	M	L
CO4	S	S	H	H	M	L
CO5	S	H	H	H	M	L

CO	PO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	L
CO2	H	H	H	H	M	L
CO3	H	H	H	S	L	L
CO4	H	H	H	S	L	L
CO5	H	H	H	S	L	L

<table>
<tr><td>Title of the Course</td><td colspan="7">STATISTICAL METHODS AND THEIR APPLICATIONS-II</td></tr>
<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td>Credits</td><td>5</td><td>Course Code</td><td>UAMAD24</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="3">-</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">1. To understand and interpret statistical properties of data.
2. To interpret statistical results effectively in real life problems.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I: (18 hours) (K1, K2, K3 & K4)
Correlation and Regression

1.1Correlation
1.2 Karl Pearson’s Coefficient of Correlation
1.3 Karl Pearson’s Coefficient of Correlation (Continued)
1.4 Spearman’s Rank Correlation
1.5 Regression Lines
1.6 Regression Coefficients</td></tr>
<tr><td></td><td colspan="7">Unit-II: (18 hours) (K1, K2, K3 & K4)
Tests of Hypothesis

2.1 Basic definitions
2.2 Procedure of testing of hypothesis
2.3 Large Sample - Test for a single Mean
2.4 Large sample - Test for the equality of two means
2.5 Large Sample - Test for a single Proportion
2.6 Large Sample - Test for equality of two Proportions</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (18 hours) (K1, K2, K3 & K4)
Tests of Hypothesis (Continued)
3.1 t-test (Procedure and uses)
3.2 Properties of the sampling distribution of t
3.3 Small sample -Test for single mean
3.4 Small sample -Test for single mean (Continued)
3.5 Small sample -Test for difference between means
3.6 Paired t-test</td></tr>
</table>

	UNIT-IV: (18 hours) (K1, K2, K3 & K4) **Chi-Square Test** 4.1 Definitions of Chi-Square test 4.2 Uses of Chi-Square test 4.3 Contingency table 4.4 Chi-Square test for goodness of fit (Binomial distribution) 4.5 Chi-Square test for goodness of fit (Poison distribution) 4.6 Test for Independence of Attributes
	UNIT-V: (18 hours) (K1, K2, K3 & K4) **Analysis of Variance** 5.1 Introduction - Basic principle of Design of Experiments 5.2 One-way classification - Completely Randomized Design. 5.3 Two-way classification - Randomized Block Design. 5.4 Two-way classification - Randomized Block Design (Continued) 5.5 Three-way classification - Latin Square Design. 5.6 Three-way classification - Latin Square Design (Continued)
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. S. P. Gupta - Statistical Methods - Sultan Chand & Sons, New Delhi, 2nd Edition, 2020.
ReferenceBooks	1. R. S. N. Pillai and Bagavathi, Statistics, 17th Edition, S. Chand and Company, New Delhi- 1984. 2. Fundamental of Mathematical Statistics, S.C. Gupta & V.K. Kapoor, Sultan Chand. 3. Statistical Methods, Dr. S.P. Gupta, Sultan Chand & Sons.
Website and e-learning source	1. https://nptel.ac.in/ 2. https://swayam.gov.in/nc_details/NPTEL 3. https://www.coursera.org/

Course Outcomes:

On completion of the course, the students should be able to

CO1: Comprehend critical thinking and problem solving skills in correlation and regression.
CO2: Explain the Testing of hypothesis for large samples.
CO3: Execute the test of hypothesis for small samples drawn from a normal population
CO4: Apply the Chi-square test for independence as well as goodness of fit.
CO5: Carry out analysis of variance using F test.

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	H	H	H	M	L
CO2	S	S	H	H	M	L
CO3	S	H	H	H	M	L
CO4	S	S	H	H	M	L
CO5	S	H	H	H	M	L

CO	PO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	L
CO2	H	H	H	H	M	L
CO3	H	H	H	H	L	L
CO4	H	H	H	H	L	L
CO5	H	H	H	H	L	L

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<tr><td>Title of the Course</td><td colspan="8">NUMERICAL METHODS - I</td></tr>
<tr><td>Paper No.</td><td colspan="8"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2"></td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">UAMAE24</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="3">-</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="8">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">1. To introduce concepts of Numerical Analysis.
2. To provide suitable and effective methods called numerical methods, for obtaining approximate representative numerical results of problems.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT I (18 hours) (K1, K2, K3 & K4)
Finite Differences

1.1 Introduction- Basic definitions
1.2 Forward difference table
1.3 Backward difference table
1.4 Central difference table
1.5 Reciprocal Factorial and Polynomial in Factorial Notation
1.6 Reciprocal Factorial and Polynomial in Factorial Notation (Continued)
Chapter 5: Sections 5.1 – 5.9</td></tr>
<tr><td></td><td colspan="8">Unit II (18 hours) (K1, K2, K3 & K4)
Interpolation

2.1 Newton’s Forward interpolation
2.2 Newton’s Forward interpolation (Continued)
2.3 Newton’s Forward interpolation (Continued)
2.4 Newton’s backward interpolation
2.5 Newton’s backward interpolation (Continued)
2.6 Equidistant terms with one or more missing terms.
Chapter 6: Sections 6.1-6.3, 6.5 (Omit 6.4)</td></tr>
<tr><td></td><td colspan="8">UNIT-III: (18 hours) (K1, K2, K3 & K4)
Interpolation (Continued)

3.1 Gauss Forward Interpolation
3.2 Gauss Forward Interpolation (Continued)
3.3 Gauss Backward Interpolation
3.4 Gauss Backward Interpolation (Continued)
3.5 Stirling’s Interpolation
3.6 Stirling’s Interpolation (Continued)
Chapter 7: Sections 7.1 – 7.4</td></tr>
</table>

	UNIT-IV: (18 hours) (K1, K2, K3 & K4) **Interpolation (Continued)** 4.1 Bessel's Interpolation 4.2 Bessel's Interpolation (Continued) 4.3 Bessel's Interpolation (Continued) 4.4 Laplace – Everett's formula 4.5 Laplace – Everett's Interpolation (Continued) 4.6 Relation between Bessel's and Laplace – Everett's formulae **Chapter 7: Sections 7.5 – 7.7**
	UNIT-V: (18 hours) (K1, K2, K3 & K4) **Interpolation with Unequal intervals** 5.1 Properties of divided differences 5.2 Newton's divided difference interpolation 5.3 Newton's divided difference interpolation (Continued) 5.4 Lagrange's interpolation 5.5 Lagrange's interpolation (Continued) 5.6 Lagrange's interpolation (Continued) **Chapter 8: Sections 8.2-8.7**
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Dr. V. N. Vedamurthy, Dr. N.Ch. S. N. Iyengar – Numerical Methods, Vikas Publishing House Pvt. Ltd., New Delhi, 1998, Reprint 2011.
ReferenceBooks	1. S. Kalavathy- Numerical Methods – Thomson Learning – 5, Sheton Way, Singapore, 2004. 2. Dr. A. Singravelu – Numerical Methods – Meenakshi Agency – 120, Pushpa Nagar, Medavakkam, Chennai, Revised Edition, Dec 2007. 3. S. Arumugam, A. Thangapandi Isaac, A.Somasundaram – Numerical Methods, 2nd edition – SciTech Publishing Pvt. Ltd., Chennai – Reprint Sep 2005. 4. R. Gupta – Numerical Analysis, Revised Edition – Laxmi Publishing Ltd., New Delhi, 2001. 5. S. G. Venkatachalapathy – Calculus of Finite Differences and Numerical Analysis, 1st Edition, Margham Publications, 2003.
Website and e-learning source	1. https://powersystemfreebooks.blogspot.com/2019/09/pdf-complete-book-numerical-methods-by.html 2. https://pdf.wecabrio.com/numerical-methods-by-p-kandaswamy.pdf 3. https://efaidnbmnnnibpcajpcglclefindmkaj/https://gdcboysang.ac.in/About/Droid/uploads/Numerical%20Methods.pdf 4. https://nptel.ac.in/ 5. https://swayam.gov.in/nc_details/NPTEL 6. https://www.coursera.org/

Course Outcomes:

On completion of the course, the students should be able to

CO1: Form a forward and backward difference table to understand the operations and their properties.
CO2: Execute interpolation methods using forward and backward differences when the data is equally distributed.
CO3: Exhibit interpolation procedures using central differences when the data is equally distributed.
CO4: Use various types of central difference methods to solve different problems.
CO5: Use divided differences for interpolation when the data is unequally distributed.

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	H	L	H
CO2	H	M	H	H	L	H
CO3	H	M	H	H	L	H
CO4	H	M	H	H	L	H
CO5	H	M	H	H	L	H

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	M	H	H
CO2	H	M	L	M	H	H
CO3	H	M	L	M	H	H
CO4	H	M	L	M	H	H
CO5	H	M	L	M	H	H

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<tr><td>Paper No.</td><td colspan="8"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2"></td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">6</td><td rowspan="2">Course Code</td><td rowspan="2">UAMAF24</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="3">-</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="8">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="8">1. To familiarize the students with finding the root of equations, solving systems of linear algebraic equations, numerical integration, and differentiation.
2. To solve differential equations with initial value problems.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT I (18 hours) (K1, K2, K3 & K4)
Solutions of Algebraic and Transcendental Equations

1.1 Introduction- Basic definitions
1.2 Newton Raphson Method
1.3 Newton Raphson Method (Continued)
1.4 Method of false position.
1.5 Regula Falsi Method
1.6 Horner’s method.
Chapter 3: Sections 3.1, 3.4-3.5, 3.8-3.9</td></tr>
<tr><td></td><td colspan="8">UNIT II (18 hours) (K1, K2, K3 & K4)
Solutions of Simultaneous Linear Algebraic Equations

2.1 Gauss Elimination Method
2.2 Gauss Elimination Method (Continued)
2.3 Gauss – Jordan Method
2.4 Jacobi Method
2.5 Gauss- Seidel Method
2.6 Gauss- Seidel Method (Continued)
Chapter 4: Sections 4.1-4.3 and 4.9-4.10</td></tr>
<tr><td></td><td colspan="8">UNIT-III: (18 hours) (K1, K2, K3 & K4)
Numerical Differentiation

3.1 Introduction- Preliminaries
3.2 Derivatives using Newton’s forward difference formula
3.3 Derivatives using Newton’s forward difference formula (Continued)
3.4 Derivatives using Newton’s backward difference formula
3.3 Derivatives using Stirling’s formula
3.4 Derivatives using Stirling’s Formula (Continued)
Chapter 9: Sections 9.1 – 9.4</td></tr>
</table>

	UNIT-IV: (18 hours) (K1, K2, K3 & K4) **Numerical Integration** 4.1 Introduction- Preliminaries 4.2 Integration using Trapezoidal Rule 4.3 Integration using Simpson's One-Third Rule 4.4 Integration using Simpson's Three-Eight Rule 4.5 Integration using Weddle's Rule 4.6 Integration using Romberg Method **Chapter 9: Sections 9.6 – 9.11**
	UNIT-V: (18 hours) (K1, K2, K3 & K4) **Numerical Solution of Ordinary Differential Equations** 5.1 Runge – Kutta for solving first-order differential equations 5.2 Runge - Kutta for solving first-order differential equations (Continued) 5.3 Milne's predictor method 5.4 Milne's corrector method 5.5 Adams – Bashforth predictor method 5.6 Adams – Bashforth corrector method **Chapter 11: Sections 11.13-11.15 and 11.18-11.20**
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Dr. V. N. Vedamurthy, Dr. N.Ch. S. N. Iyengar – Numerical Methods, Vikas Publishing House Pvt. Ltd., New Delhi, 1998, Reprint 2011.
ReferenceBooks	1. S. Kalavathy- Numerical Methods – Thomson Learning – 5, Shenton Way, Singapore, 2004. 2. Dr. A. Singravelu – Numerical Methods – Meenakshi Agency – 120, Pushpa Nagar, Medavakkam, Chennai, Revised Edition, Dec 2007. 3. S. Arumugam, A. Thangapandi Isaac, A.Somasundaram – Numerical Methods, 2nd edition – SciTech Publishing Pvt. Ltd., Chennai – Reprint Sep 2005. 4. R. Gupta – Numerical Analysis, Revised Edition – Laxmi Publishing Ltd., New Delhi, 2001. 5. S. G. Venkatachalapathy – Calculus of Finite Differences and Numerical Analysis, 1st Edition, Margham Publications, 2003.
Website and e-learning source	1. https://powersystemfreebooks.blogspot.com/2019/09/pdf-complete-book-numerical-methods-by.html 2. https://pdf.wecabrio.com/numerical-methods-by-p-kandaswamy.pdf 3. https://efaidnbmnnnibpcajpcglclefindmkaj/https://gdcboysang.ac.in/About/Droid/uploads/Numerical%20Methods.pdf 4. https://nptel.ac.in/ 5. https://swayam.gov.in/nc_details/NPTEL 6. https://www.coursera.org/

Course Outcomes:

On completion of the course, the students should be able to

CO1: Obtain numerical solutions of algebraic and transcendental equations.
CO2: Find numerical solutions of the system of linear equations.
CO3: Use numerical methods to do differentiation.
CO4: Use numerical methods to do integration.
CO5: Solve ordinary differential equations using numerical methods.

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	H	L	H
CO2	H	M	H	H	L	H
CO3	H	M	H	H	L	H
CO4	H	M	H	H	L	H
CO5	H	M	H	H	L	H

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	M	H	H
CO2	H	M	L	M	H	H
CO3	H	M	L	M	H	H
CO4	H	M	L	M	H	H
CO5	H	M	L	M	H	H

<table>
<tr><td>Title of the Course</td><td colspan="7">MATHEMATICAL FOUNDATIONS</td></tr>
<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2"></td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">UACAA24</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• To provide basic mathematical concepts required for computer applications.
• To introduce the notion of relations and functions
• To learn simple methods in algebra</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (12 hours) (K1, K2, K3 & K4)
Symbolic logic

1.1 Introduction- symbolic logic
1.2 Logical operator
1.3 Conditional and bi-conditional operators
1.4 Converse, Inverse, Contrapositive
1.5 Tautology
1.6 Contradiction</td></tr>
<tr><td></td><td colspan="7">UNIT II (12 hours) (K1, K2, K3 & K4)
Relations and functions

2.1Relation
2.2 Equivalence relation
2.3 Partition, relation
2.4 Partial order relation
2.5 Functions, Inverse
2.6 Composition of functions</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (12 hours) (K1, K2, K3 & K4)
Probability & Algebra

3.1 Probability
3.2 Probability (Continued)
3.3 Permutations
3.4 Combinations
3.5 Combination (Continued)
3.6 Boolean algebra</td></tr>
</table>

	UNIT IV: (12 hours) (K1, K2, K3 & K4) **Matrices** 4.1 Introduction-Matrix operations 4.2 Symmetric and skew-symmetric matrices 4.3 Hermitian and skew-Hermitian matrices 4.4 Orthogonal and unitary matrices 4.5 Rank of a matrix 4.6 Cramer's rule
	UNIT V: (12 hours) (K1, K2, K3 & K4) **Differentiation** 5.1 Differentiation of standard function x^n 5.2 Differentiation of standard function e^x 5.3 Differentiation of standard function logx 5.4 Differentiation of standard functions sinx and cosx, 5.5 Differentiation of standard function tanx 5.6 Successive differentiation (up to second derivative)
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Shahnaz Bathul -Matheematical foundations of computer science-PHI learning private limited –New Delhi-2010 2. PA. Navanitham -Business Statistics-jai publishers, Trichy-21.october 2020
ReferenceBooks	1.Agarwal, B. M. - Business Mathematics & Statistics. Ane Books Pvt Ltd, 2009. 2.P.R. Vittal - Allied Mathematics – Margham Publications - Third Edition, 2002 3. M.K.Venkataraman - Engineering Mathematics, Volumes I and II - The National Publication Co., Madras, 1992 and 1993.
Website and e-learning source	1. https://nptel.ac.in/ 2. www.coursera.org 3. https://swayam.gov.in/

Course Outcomes:

On completion of the course, the students should be able to

CO1: Understand the concepts of Mathematical logic and compute the operators of Symbolic logic.
CO2: Acquire knowledge about relations and functions.
CO3: Assess real-life simple problems with permutation, combination, and probability.
CO4: Know about matrices and their types.
CO5: Differentiate standard functions.

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	M	L	M
CO2	H	H	H	M	L	M
CO3	H	H	M	M	L	H
CO4	H	H	H	M	L	M
CO5	H	H	H	M	L	M

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	L	H	H
CO2	H	H	H	M	L	H
CO3	M	L	H	H	H	H
CO4	M	L	H	H	H	H
CO5	H	H	M	H	H	L

<table>
<tr><td>Title of the Course</td><td colspan="7">STATISTICAL METHODS</td></tr>
<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2"></td><td>Year</td><td>II</td><td>Credits</td><td>4</td><td>Course Code</td><td>UACAB24</td></tr>
<tr><td>Semester</td><td>IV</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">• To enrich the knowledge of students on statistical methods which play a major role in computer applications
• To demonstrate sampling techniques and to employ statistical methods of analysis to make inference</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (12 hours) (K1, K2, K3 & K4)
Introduction of Statistics

1.1 Definition of Statistics
1.2 Classification and Tabulation
1.3 Graphical representation of statistical data
1.4 Problems based on statistical data
1.5 One way frequency distributions
1.6 Two way frequency distributions</td></tr>
<tr><td></td><td colspan="7">UNIT II (12 hours) (K1, K2, K3 & K4)
Measures of Central Tendency

2.1 Basic definitions of Measures of Central Tendency
2.2 Arithmetic mean
2.3 Median (Individual observations and discrete series)
2.4 Median (Continuous series))
2.5 Mode (Individual observations and discrete series)
2.6 Mode (Continuous series)</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (12 hours) (K1, K2, K3 & K4)
Measures of Dispersion

3.1 Basic Definitions of Measures of dispersion
3.2 Range
3.3 Quartile deviation
3.4 Mean deviation
3.5 Standard deviation and variance
3.6 Co-efficient of variation</td></tr>
</table>

	UNIT-IV: (12 hours) (K1, K2, K3 & K4) **Correlation and Regression** 4.1 Correlation 4.2 Karl Pearson's Coefficient of Correlation 4.3 Karl Pearson's Coefficient of Correlation (Continued) 4.4 Spearman's Rank Correlation 4.5 Regression Lines 4.6 Regression Coefficients
	UNIT-V: (12 hours) (K1, K2, K3 & K4) **Tests of Hypothesis** 5.1 Basic definitions of testing of hypothesis 5.2 Small sample-Test for single mean 5.3 Small samples-Test for difference between means 5.4 Large sample –Test for single mean 5.5 Large samples-Test for difference between means 5.6 Chi-Square test for independence of attributes
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. S.P. Gupta, Statistical Methods, Sultan Chand &Sons, New Delhi, 2020. 2. S. C. Gupta and V. K. Kappor - Fundamentals of Mathematical Statistics, 3rd Edition, Sultan Chand and Sons, 2004.
ReferenceBooks	1.P. R. Vittal-Mathematical Statistics, 1st Edition-Margham Publications, 2002. 2.P. R. Vittal and V. Malini - Statistical and Numerical Methods, 1st Edition - Margham Publications, 2007 3. P. Kandasamy and K. Thilagavathy - Calculus of Finite Differences and Numerical Analysis, 1st Edition - Margam Publications, 2003.
Website and e-learning source	1. www.coursera.org 2. https://swayam.gov.in/ 3. https://nptel.ac.in/

Course Outcomes:

On completion of the course, the students should be able to

CO1: Analyze the statistical data using measures of central tendency and graphs.
CO2: Provide an overall description of a set of data using measures of dispersion.
CO3: Apply the concept of regression and correlation in business problems.
CO4: Make decisions using hypothesis testing.
CO5: Apply the Chi-square test for independence as well as goodness of fit.

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	M	L	H
CO2	H	H	M	L	M	H
CO3	H	H	H	H	L	M
CO4	H	H	M	L	L	H
CO5	H	H	H	M	L	H

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	H	H
CO2	H	H	M	L	H	H
CO3	M	L	H	H	H	H
CO4	M	H	H	H	H	L
CO5	H	H	H	M	L	H

<table>
<tr><td>Title of the Course</td><td colspan="7">BIOSTATISTICS I</td></tr>
<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>II</td><td>Credits</td><td>5</td><td>Course Code</td><td>UABSA24</td></tr>
<tr><td>Semester</td><td>III</td><td colspan="3"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="3">-</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">• To deepen the knowledge in various statistical concepts which play an important role in the field of biological sciences.
• Recognize the importance data collection and its role in determining scope of inference.
• To apply appropriate statistical methods for analyzing one or two variables</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (18 hours) (K1, K2, K3 & K4)
Frequency Distributions
1.1 Introduction
1.2 Frequency distribution
1.3 Univariate frequency distribution
1.4 Bivariate frequency distribution
1.5 Diagrams: Histogram
1.6 Frequency polygon, Frequency curve</td></tr>
<tr><td></td><td colspan="7">Unit II (18 hours) (K1, K2, K3 & K4)
Measures of Central Tendency

2.1 Basic definitions of Measures of Central Tendency
2.2 Arithmetic mean.
2.3 Median (Individual observations and discrete series)
2.4 Median (Continuous series))
2.5 Mode (Individual observations and discrete series)
2.6 Mode (Continuous series)</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (18 hours) (K1, K2, K3 & K4)
Measures of Dispersion

3.1 Basic definitions of Measures of Dispersion
3.2 Range
3.3 Quartile deviation
3.4 Mean deviation
3.5 Standard deviation and variance
3.6 Coefficient of Variance</td></tr>
</table>

	UNIT-IV: (18 hours) (K1, K2, K3 & K4) **Probability** 4.1 Basic definitions 4.2 Axioms 4.3 Addition law 4.4 Multiplication law 4.5 Problems on probability 4.6 Conditional probability
	UNIT-V: (18 hours) (K1, K2, K3 & K4) **Correlation and Regression** 5.1 Correlation 5.2 Karl Pearson's Coefficient of Correlation 5.3 Karl Pearson's Coefficient of Correlation (Continued) 5.4 Spearman's Rank Correlation 5.5 Regression Lines 5.6 Regression Coefficients
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. P.S.S. Sundar Rao, J. Richard – An Introduction to Bio Statistics, 3rd Edition – Prentice Hall of India Pvt. Ltd., 2001.
ReferenceBooks	1. N. Gurumani – An introduction to Biostatistics, Second Edition – MJP Publishers, 2015. 2. Wayne W. Daniel, Chad L.Cross – Biostatistics, 10th Edition – Wiley India Pvt. Ltd., 2017. 3. P.Mariappan – Biostatistics, 1st Edition – Dorling Kindersley Pvt. Ltd., 2013.
Website and e-learning source	1. https://nptel.ac.in 2. www.coursera.org 3. https://swayam.gov.in3.

Course Outcomes:
On completion of the course, the students should be able to
CO1: Frame a relevant frequency distribution for a given biological data
CO2: Determine mean, median, mode for biological data.
CO3: Compute measures of dispersion
CO4: Understand probability concepts
CO5: Gain knowledge of correlation and regression and its applications.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	M	H
CO2	H	H	H	L	M	H
CO3	H	H	H	L	L	H
CO4	H	H	H	L	M	H
CO5	H	H	H	L	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	L
CO2	H	H	H	H	H	L
CO3	H	H	H	H	M	L
CO4	H	H	H	H	M	L
CO5	H	H	H	H	M	L

<table>
<tr><td>Title of the Course</td><td colspan="7">BIOSTATISTICS II</td></tr>
<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>II</td><td>Credits</td><td>5</td><td>Course Code</td><td>UABSB24</td></tr>
<tr><td>Semester</td><td>IV</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="3">-</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">1. To deepen the knowledge in various statistical concepts which play an important role in the field of biological sciences.
2. To understand interval estimation and hypothesis testing.
3. To interpret statistical results effectively in real life problems</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (18 hours) (K1, K2, K3 & K4)
Probability Distributions
1.1 Introduction
1.2 Binomial distribution
1.3 Binomial distribution (Continued)
1.4 Poisson distribution
1.5 Poisson distribution (Continued)
1.6 Normal distribution</td></tr>
<tr><td></td><td colspan="7">Unit II (18 hours) (K1, K2, K3 & K4)
Sampling
2.1 Introduction-definitions
2.2 Types of Population
2.3 Sample, Sampling variation and Bias
2.4 Non-Probability Sampling Techniques
2.5 Probability Sampling Techniques
2.6 Listing of Population - Sample size</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (18 hours) (K1, K2, K3 & K4)
Tests of significance and Estimation
3.1 Introduction
3.2 Procedure for Large Samples
3.3 Problems based on large samples
3.4 Procedure for Small samples
3.5 Estimation for Large Samples
3.6 Estimation for Small Samples</td></tr>
</table>

	UNIT-IV: (18 hours) (K1, K2, K3 & K4) **The Chi Square Test** 4.1 Definitions of Chi-Square test 4.2 Uses of Chi-Square test 4.3 Contingency table 4.4 Chi-Square test for goodness of fit (Binomial distribution) 4.5 Chi-Square test for goodness of fit (Poison distribution) 4.6 Test for Independence of Attributes
	UNIT-V: (18 hours) (K1, K2, K3 & K4) **Analysis of Variance** 5.1 Snedecor's F-Distribution 5.2 Analysis of Variance 5.3 one way classification - Completely Randomised Design 5.4 Two way classification - Randomised Block Design 5.5 Latin Square Design 5.6 Merits and demerits of analysis of variance
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. P. S. S. Sundar Rao, J. Richard – An Introduction to Bio Statistics, 3rd Edition – Prentice Hall of India Pvt. Ltd., 2001. 2. P. Mariappan – Biostatistics, 1st Edition – Dorling Kindersley Pvt. Ltd., 2013
ReferenceBooks	1. N. Gurumani – An introduction to Biostatistics, Second Edition – MJP Publishers, 2015. 2. Wayne W. Daniel, Chad L. Cross – Biostatistics, 10th Edition – Wiley India Pvt. Ltd., 2017.
Website and e-learning source	1. https://nptel.ac.in 2. www.coursera.org 3. https://swayam.gov.in

Course Outcomes:

On completion of the course, the students should be able to

CO1: Apply probability distributions such as Binomial, Poisson and Normal to solve real life problems

CO2: Recognize the importance of data collection and its role in determining scope of inference

CO3: Execute the test of hypothesis for large and small samples drawn from a normal

population

CO4: Perform and apply Chi-square test

CO5: Carry out analysis of variance using F test

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	M	H
CO2	H	H	H	L	M	H
CO3	H	H	H	L	L	H
CO4	H	H	H	L	M	H
CO5	H	H	H	L	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	L
CO2	H	H	H	H	M	L
CO3	H	H	H	H	M	L
CO4	H	H	H	H	M	L
CO5	H	H	H	H	M	L

<table>
<tr><td>Title of the Course</td><td colspan="8">BUSINESS STATISTICS</td></tr>
<tr><td>Paper No.</td><td colspan="8"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">UABAC24</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="8">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">• To introduce mathematical applications in business management, thereby enhancing the students' logical thinking with regard to problem-solving.
• To train the students to apply statistical techniques in business management, thereby enhancing the decision-making skills of the students.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT- I (12 hours) (K1, K2, K3 & K4)
Classification and Measures of Central Tendency
1.1Introduction - Meaning and Definition of Statistics
1.2 Presentation of Statistical Data
1.3 Graphs and Diagrams
1.4 Measures of Central Tendency: Arithmetic Mean
1.5 Median
1.6 Mode</td></tr>
<tr><td></td><td colspan="8">UNIT-II (12 hours) (K1, K2, K3 & K4)
Measures of Dispersion
2.1 Basic definitions of Measures of Dispersion
2.2 Range
2.3 Quartile deviation
2.4 Mean deviation
2.5 Standard deviation and variance
2.6 Coefficient of Variance</td></tr>
<tr><td></td><td colspan="8">UNIT-III: (12 hours) (K1, K2, K3 & K4)
Time series
3.1 Definition
3.2 Analysis of Time Series
3.3 Components of Time Series
3.4 Methods of Measuring Trend
3.5 Measures of Seasonal Variations
3.6 Simple Average Method</td></tr>
</table>

	UNIT-IV: (12 hours) (K1, K2, K3 & K4) **Index Numbers** 4.1 Index Number (Definition and types) 4.2 Construction of weighted index numbers 4.3 Construction of unweighted index numbers 4.4 Test of consistency of index numbers-Time reversal test 4.5 Factor reversal test 4.6 Chain base and fixed base index numbers
	UNIT-V: (12 hours) (K1, K2, K3 & K4) **Test of hypothesis** 5.1 Introduction- Testing of hypothesis 5.2 z-Test for single mean 5.3 z- Test for difference between two means 5.4 t- test for single mean 5.5 t- test for difference between two means & paired t-test 5.6 Chi Square test for independence of attributes
ExtendedProfessionalComponent(isapartofinternalcomponentonly,nottobeincludedintheexternalexamination Question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/JAM/TNPSCandotherstobesolved (To be discussed during the Tutorial hours)
Recommended Text	S. P. Gupta - Statistical Methods - Sultan Chand & Sons, New Delhi, 2nd Edition, 2020.
Reference Books	1. S.P. Gupta, Elements of Business Statistics, Sultan Chand & Sons, New Delhi, 2007. 2. J.K. Sharma, Business Statistics, Pearson Education, New Delhi, 2007. 3. Dr. S. P. Rajagopalan , Business Statistics & OR -, Tata McGraw-Hill, 3rd Edition, 2014. 4. P.R. Vittal, Business Mathematics and Statistics, Margham Publications, Chennai, 2004.
Website and e-learning source	**1.** https://theintactone.com/2019/09/01/ccsubba-204-business-statistics/ **2.** https://ug.its.edu.in/sites/default/files/Business%20Statistics.pdf **3.** http://www.statisticshowto.com **4.** https://statisticsbyjim.com/basics/measures-central-tendency-mean-median-mode/ **5.** https://www.toppr.com/guides/business-mathematics-and-statistics/index-numbers/

Course Outcomes:

On completion of the course, the students should be able to

CO1: Apply the Measures of Central Tendency in business.
CO2: Understanding the Measures of Variation
CO3: Analyze of Time Series
CO4: Understand Index Numbers and Statistical quality control
CO5: Testing of hypothesis

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	M	L	M
CO2	H	H	H	M	L	M
CO3	H	H	H	M	L	M
CO4	H	H	H	M	L	M
CO5	H	H	H	M	L	M

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	L	M
CO2	H	H	M	M	L	M
CO3	H	H	M	L	L	H
CO4	H	H	H	M	L	H
CO5	H	H	M	L	L	M

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<tr><td>Title of the Course</td><td colspan="7">OPERATIONS RESEARCH</td></tr>
<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>I</td><td>Credits</td><td>3</td><td>Course Code</td><td>UABAD24</td></tr>
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<tr><td>4</td><td>1</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">1. To apply problem-solving skills to real-life situations.
2. To develop logical and analytical skills.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (15 hours) (K1, K2, K3 & K4)

Linear Programming Problem(LPP)

1.1 Operations research- Definition – Scope
1.2 Characteristics
1.3 Linear programming problem
1.4 Formulation of LPP
1.5 Graphical method – Simple Problems
1.6 Regular simplex method -Simple Problems</td></tr>
<tr><td></td><td colspan="7">Unit II (15 hours) (K1, K2, K3 & K4)

Transportation Model
2.1 Transportation Problem – Introduction
2.2 Initial basic feasible solution (North West Corner Method)
2.3 Initial basic feasible solution (Least Cost Method)
2.4 Initial basic feasible solution (VAM)
2.5 Unbalanced Transportation problem
2.6 Maximization problem</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (15 hours) (K1, K2, K3 & K4)

Assignment Model
3.1 Assignment problem – Introduction
3.2 Minimal assignment problem - Balanced
3.3 Minimal assignment problem - Unbalanced
3.4 Restricted Assignment problem
3.5 Maximization problem – Balanced
3.6 Maximization problem – Unbalanced</td></tr>
</table>

	UNIT-IV: (15 hours) (K1, K2, K3 & K4) **Network Analysis** 4.1 Introduction 4.2 Network Diagram Representation 4.3 Time Calculations and Critical Path in Network Analysis 4.4 Critical Path Method (CPM) 4.5 Critical Path Method (CPM) (Continued) 4.6 Program Evaluation and Review Technique (PERT)
	UNIT-V: (15 hours) (K1, K2, K3 & K4) **Game Theory** 5.1 Game theory – Meaning – Saddle point 5.2 Pure Strategy 5.3 Mixed Strategy 5.4 Dominance property 5.5 Solving 2 x m game using graphical method (excluding L.P.P) 5.6 Solving n x 2 game using graphical method (excluding L.P.P)
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. P.K. Gupta and D.S. Hira – Problems in Operations Research, 1st Edition – Chand and Company Ltd., (Reprint 2001). 2. S. Kalavathy – Operations Research, 2nd Edition – Vikas Publications Ltd., 2002.
Reference Books	1. P.R. Vittal& V. Malini, Operative Research – Margham Publications, 1st Edition, 1999. 2. V.K. Kapoor – Operations Research, 5th Edition – Sultan Chand and Sons, Educational Publishers New Delhi, Revised Reprint, 1996. 3. R.Paneerselvam - Operation Research, PHI Learning Pvt. Ltd., 2nd Edition 2006
Website and e-learning source	1. https://books.google.co.in/books?id=6khDDAAAQBAJ&lpg=PP1&pg=PA21#v=onepage&q&f=false 2. Operational Research | Research.com 3. chromeextension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.rccmindore.com/wp-content/uploads/2021/04/Operations-Research.pdf 4. https://www.onlinemathlearning.com › linear-programming-example

Course Outcomes:

On completion of the course, the students should be able to

CO1: Understand the concepts of Operations Research and Essential features of LPP

CO2: Formulate the Transportation problem and finding an initial basic feasible solution.

CO3: Handle assignment problem which deals with the allocation of various resources to various activities on one-one basis and Sequencing Problem

CO4: Perform Network Analysis (PERT & CPM) which helps to control, monitor the Business process and its work flow

CO5: Use Game Theory and Decision Theory which resolves the situation of conflict in Business.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	L	L	M	H
CO2	H	H	M	L	M	H
CO3	H	H	M	L	M	H
CO4	H	H	M	L	M	H
CO5	H	H	M	L	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	H	L
CO2	H	M	H	M	H	L
CO3	H	M	H	H	H	L
CO4	H	H	H	H	H	L
CO5	H	H	H	H	H	L

<table>
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<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>III</td><td>Credits</td><td>2</td><td>Course Code</td><td>UPBA24</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>2</td><td>-</td><td colspan="3">-</td><td colspan="2">2</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• To categorize, apply and use thought process to distinguish between concepts of Quantitative methods.
• To categorize, apply and use thought process to distinguish between concepts of reasoning</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT- I (6 hours) (K1, K2, K3 & K4)

Arithmetic Ability
1.1 Numbers
1.2 Numbers (Continued)
1.3 Simplification
1.4 Averages
1.5 Percentage
1.6 Percentage (Continued)</td></tr>
<tr><td></td><td colspan="7">Unit-II (6 hours) (K1, K2, K3 & K4)

Arithmetic Ability (Continued)
2.1 Ratio & Proportion
2.2 Ratio & Proportion (Continued)
2.3 Time and work
2.4 Time and work (Continued)
2.5 Time and Distance
2.6 Time Distance (Continued)</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (6 hours) (K1, K2, K3 & K4)

Arithmetic Ability (Continued)
3.1 Profit, Loss and Discount
3.2 Profit, Loss and Discount (Continued)
3.3 Simple interest
3.4 Simple interest (Continued)
3.5 Compound Interest
3.6 Compound Interest (Continued)</td></tr>
</table>

	UNIT-IV: (6 hours) (K1, K2, K3 & K4) **Arithmetic Ability (Continued)** 4.1 Permutations 4.2 Permutations (Continued) 4.3 Combinations 4.4 Combinations (Continued) 4.5 Probability 4.6 Probability (Continued)
	UNIT-V: (6 hours) (K1, K2, K3 & K4) **Verbal Reasoning** 5.1 Series 5.2 Series (Continued) 5.3 Classification 5.4 Classification (Continued) 5.5 Seating arrangements 5.6 Puzzles
ExtendedProfessionalComponent(isapartofinternalcomponentonly,nottobeincludedintheexternalexamination Question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/JAM/TNPSCandotherstobesolved (To be discussed during the Tutorial hours)
Recommended Text	1. Dr. R. S. Aggarwal – Quantitative Aptitude – Seventh Edition – S. Chand and Co., 2019 2. Dr. R. S. Aggarwal – A Modern Approach to Verbal and Non-Verbal Reasoning –Revised Edition – 2019 – S. Chand and Co.
Reference Books	1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, McGraw Education Series, 5th Edition 2019 2. Dinesh Khattar, Quantitative Aptitude for Competitive Examinations, Pearson India, Edition 2019. 3. Sarvesh K. Verma, Quantitative Aptitude Quantum CAT 2018, Arihant publication, Edition 2018.
Websiteande-learningsource	**1.** www.m4maths.com **2.** www.Indiabix.com 3. https://www.boookart.com/products/schand-quantitative-aptitude-by-dr-rs-aggarwal 4. https://nritihas.com/rs-aggarwal-quantitative-aptitude-pdf-free-download/ 5. https://books.google.com/books/about/Quantitative_Aptitude_Data_Interpretatio.html?id=vqaODwAAQBAJ

Course Outcomes:

On completion of the course, the students should be able to

CO1: Use their logical thinking and analytical abilities to solve reasoning questions.

CO2: Solve questions related to time and distance and time and work.

CO3: Apply concept of percentages, Profit and loss, discount, simple and compound interest.

CO4: Use their logical thinking and analytical abilities to solve reasoning questions.

CO5: Solve questions related to combinations.

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	M	L	M
CO2	H	H	H	M	L	M
CO3	H	H	H	M	L	M
CO4	H	H	H	M	L	M
CO5	H	H	H	M	L	M

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	L	M
CO2	H	H	M	M	L	M
CO3	H	H	M	L	L	H
CO4	H	H	H	M	L	H
CO5	H	H	M	L	L	M

<table>
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<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2"></td><td>Year</td><td>I</td><td>Credits</td><td>4</td><td>Course Code</td><td>UAHAA24</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
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<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">• To introduce the basic concepts of statistics.
• To make decisions based on statistical representation related to hospital administration</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (15 hours) (K1, K2, K3 & K4)

Matrices
1.1 Definition - Types of matrices
1.2 Matrix operations
1.3 Determinant of a matrix
1.4 Cramer’s rule
1.5 Inverse of a matrix
1.6 Rank of a matrix</td></tr>
<tr><td></td><td colspan="7">Unit II (15 hours) (K1, K2, K3 & K4)

Differentiation
2.1 Derivatives of standard functions x^n, e^x, log x, constant (without proof)
2.2 Rules of differentiation (Addition, difference)
2.3 Rules of differentiation(product, quotient)
2.4 Chain rule
2.5 Successive differentiation
2.6 Maxima and minima</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (15 hours) (K1, K2, K3 & K4)

Classification
3.1 Classification - meaning - chief characteristics
3.2 Classification-objects - rules
3.3 Frequency distributions
3.4 Cumulative frequency distribution
3.5 Graph of frequency distribution - histogram
3.6 frequency polygon - frequency curve</td></tr>
</table>

	UNIT-IV: (15 hours) (K1, K2, K3 & K4) **Measures of Central Tendency** 4.1 Basic definitions of Measures of Central Tendency 4.2 Arithmetic mean. 4.3 Median (Individual observations and discrete series) 4.4 Median (Continuous series)) 4.5 Mode (Individual observations and discrete series) 4.6 Mode (Continuous series)
	UNIT-V: (15 hours) (K1, K2, K3 & K4) **Measures of Dispersion** 5.1 Basic definitions of Measures of Dispersion 5.2 Range 5.3 Quartile deviation 5.4 Mean deviation 5.5 Standard deviation and variance 5.6 Coefficient of Variance
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. S. P. Gupta - Statistical Methods - Sultan Chand & Sons, New Delhi, 2nd Edition, 2020. 2. P.A. Navnitham - Business Mathematics and Statistics, Jai Publishers, Trichy, 2023.
ReferenceBooks	1. Asim Kumar Manna - Business Mathematics & Statistics. McGraw Hill Education (India) Pvt. Ltd., 2018. 2. R.S.N. Pillai and Bagavathi – Statistics, S. Chand and Company, New Delhi, 17th Edition 3. Francis, Andy - Business mathematics and statistics. Cengage Learning EMEA, 2004. 4. Agarwal, B. M. - Business Mathematics & Statistics. Ane Books Pvt Ltd, 2009. 5. Dr. P.R. Vittal - Mathematical Statistics, Margam Publications, 2015.

Website and e-learning source	1. www.coursera.org/ 2. https://nptel.ac.in/ 3. https://swayam.gov.in/

Course Outcomes:

On completion of the course, the students should be able to

CO1: Solve basic mathematical problems using matrices

CO2: Use various differentiation techniques

CO3: Give graphical representation of statistical data

CO4: Understand the concepts related to statistics

CO5: Analyze problems related to statistical measures

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	H	L
CO2	H	M	H	H	H	L
CO3	H	H	H	M	H	H
CO4	H	M	H	H	H	L
CO5	H	H	M	H	L	H

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	M	H	L
CO2	H	H	H	H	H	L
CO3	H	H	H	M	H	H
CO4	H	M	H	H	H	L
CO5	H	H	M	H	L	H

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<tr><td>Title of the Course</td><td colspan="7">OPERATIONS RESEARCH</td></tr>
<tr><td>Paper No.</td><td colspan="7">ALLIED II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2"></td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">UAHAB24</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">• To introduce the techniques of solving problems in the field of industry, marketing and finance
• To create awareness about optimization in the utility of resources</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (15 hours) (K1, K2, K3 & K4)

Linear Programming Problem (LPP)
1.1 Operations research- Definition – Scope
1.2 Characteristics
1.3 Linear programming problem
1.4 Formulation of LPP
1.5 Graphical Method – Simple Problems
1.6 Regular simplex method (Simple Problems)</td></tr>
<tr><td></td><td colspan="7">Unit II (15 hours) (K1, K2, K3 & K4)

Transportation Model
2.1 Transportation Problem – Introduction
2.2 Initial basic feasible solution (North West Corner Method)
2.3 Initial basic feasible solution (Least Cost Method)
2.4 Initial basic feasible solution (VAM)
2.5 Unbalanced Transportation problem
2.5 Maximization problem</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (15 hours) (K1, K2, K3 & K4)

Assignment Model
3.1 Assignment problem – Introduction
3.2 Minimal assignment problem - Balanced
3.3 Minimal assignment problem - Unbalanced
3.4 Restricted Assignment problem
3.5 Maximization problem – Balanced
3.6 Maximization problem – Unbalanced</td></tr>
</table>

	UNIT-IV: (15 hours) (K1, K2, K3 & K4) **Network Analysis** 4.1 Introduction 4.2 Network Diagram Representation 4.3 Time Calculations and Critical Path in Network Analysis 4.4 Critical Path Method (CPM) 4.5 Critical Path Method (CPM) (Continued) 4.6 Program Evaluation and Review Technique (PERT)
	UNIT-V: (15 hours) (K1, K2, K3 & K4) **Game Theory** 5.1 Game theory – Meaning – Saddle point 5.2 Pure Strategy 5.3 Mixed Strategy 5.4 Dominance property 5.5 Solving 2 x m game using graphical method (excluding L.P.P) 5.6 Solving n x 2 game using graphical method (excluding L.P.P)
Extended Professional Component (isa part of internal component only, not to be included in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Premkumar Gupta and Hira D.S. - Introduction to Operations Research, 1st Edition – S.Chand Company Ltd., 2022. 2. V. Sundaresan, K.S. Ganapathy Subramanian and K. Ganesan, "Resource Management Techniques" A.R. Publications, 2009.
ReferenceBooks	**Text Books:** 1. Vittal P.R - Introduction to Operations Research, 1st Edition - Margham Publishers – 1999. 2. Kalavathy. S - Operations Research, 4th Edition, Vikas Publishing Ltd., 2013 3. K. Pandian, C.Kayalvizhi - Applied Operations Research for Management, 2nd Edition, Thirumalaa Publications, 2004 4. R.Paneerselvam - Operation Research, PHI Learning Pvt. Ltd., 2nd Edition 2006.

Website and e-learning source	1. www.coursera.org/ 2. https://nptel.ac.in/ 3. https://swayam.gov.in/

Course Outcomes:

On completion of the course, the students should be able to

CO1: Understand the basic operations research concepts and solve linear programming problems.

CO2: Analyze real-life situation using transportation models.

CO3: Assign jobs to different machines using assignment models.

CO4: Use knowledge of Network Analysis in Hospital Administration.

CO5: Acquire wide knowledge in Game Theory.

CO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	L	H	H
CO2	H	H	H	M	L	H
CO3	M	L	H	H	H	H
CO4	M	L	H	H	H	H
CO5	H	H	M	H	H	L

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	L	M	H
CO2	H	H	H	M	L	H
CO3	M	L	H	M	L	H
CO4	M	L	H	L	M	H
CO5	H	H	M	M	L	H

<table>
<tr><td>Title of the Course</td><td colspan="7">STATISTICS FOR BEHAVIORAL SCIENCE</td></tr>
<tr><td>Paper No.</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>II</td><td>Credits</td><td>3</td><td>Course Code</td><td>UAPYC24</td></tr>
<tr><td>Semester</td><td>III</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher Secondary Mathematics</td></tr>
<tr><td>Objectives ofthe course</td><td colspan="7">• To understand and interpret statistical properties of data.
• To interpret statistical results effectively in real life problems.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (15 hours) (K1, K2, K3 & K4)
Classification and Diagrammatic Representation of statistical data

1.6 Classification and its types
1.7 Frequency distribution- individual observations
1.8 Discrete frequency distribution
1.9 Continuous frequency distribution
1.10 Histogram
1.11 Frequency polygon and Frequency curve</td></tr>
<tr><td></td><td colspan="7">Unit II (15 hours) (K1, K2, K3 & K4)
Measures of Central Tendency
2.1 Basic definitions of Measures of Central Tendency
2.2 Arithmetic mean.
2.3 Median (Individual observations and discrete series)
2.4 Median (Continuous series))
2.5 Mode (Individual observations and discrete series)
2.6 Mode (Continuous series)</td></tr>
<tr><td></td><td colspan="7">UNIT-III: (15 hours) (K1, K2, K3 & K4)
Measures of Dispersion
3.1 Basic definitions of Measures of Dispersion
3.2 Range
3.3 Quartile deviation
3.4 Mean deviation
3.5 Standard deviation and variance
3.6 Coefficient of Variance</td></tr>
</table>

	UNIT-IV: (15 hours) (K1, K2, K3 & K4) **Tests of Hypothesis** 4.1 Basic definitions 4.2 z-test for a single Mean 4.3 z-test for the equality of two means 4.4 t-test (for single mean and for two means) 4.5 F-test for variance 4.6 Chi-square test for independence of attributes
	UNIT-V: (15 hours) (K1, K2, K3 & K4) **Analysis of Variance** 5.1 Introduction - Basic principle of Design of Experiments 5.2 One-way classification - Completely Randomized Design. 5.3 Two-way classification - Randomized Block Design. 5.4 Two-way classification - Randomized Block Design (Continued) 5.5 Three-way classification - Latin Square Design. 5.6 Three-way classification - Latin Square Design (Continued)
Extended Professional Component (isa part of internal component only, not to be included in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	S. P. Gupta - Statistical Methods - Sultan Chand & Sons, New Delhi, 2nd Edition, 2020.
ReferenceBooks	1. Hogg R.V. and Craig, A.T.- Introduction to Mathematical Statistics – Macmillan, 4th Edition 1998. 2. Mood, A.M., Graybill, F.A. and Boes, D.G.- Introduction to Theory of Statistics - McGraw Hill Publication,3rd Edition 1974. 3. Snedecor G.W., Cochran W.G. - Statistical Methods - Oxford and IBH -6th Edition 1967. 4. Hoel P.G. - Introduction to Mathematical Statistics – Wiley, 4th Edition 1971. 5. Wilks S.S. - Elementary Statistical Analysis - Oxford and IBH. Reprint 1971.

Website and e-learning source	1. www.coursera.org/ 2. https://nptel.ac.in/ 3. https://swayam.gov.in/

Course Outcomes:

On completion of the course, the students should be able to

CO1: Frame a relevant frequency distribution for a given biological data.

CO2: Determine mean, median, mode for biological data.

CO3: Provide an overall description of a set of data using measures of dispersion.

CO4: Execute the test of hypothesis for small samples and large samples drawn from a normal population

CO5: Carry out analysis of variance using F test.

CO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	H	H	H	M	L
CO2	S	S	H	H	M	L
CO3	S	H	H	H	M	L
CO4	S	S	H	H	M	L
CO5	S	H	H	H	M	L

CO	PO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	L
CO2	H	H	H	H	M	L
CO3	H	H	H	H	L	L
CO4	H	H	H	H	L	L
CO5	H	H	H	H	L	L