DEPARTMENT OFMATHEMATICS

ACADEMIC YEAR 2020-2021

B.SC. (MATHEMATICS WITH COMPUTER APPLICATIONS)

CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)

B.Sc. Mathematics with Computer Applications

Vision:

The Vision of the department is

- **To promote and support a comprehensive, innovative and dynamic learning environment**
- **To assist students in acquiring a conceptual understanding of the nature and structure of mathematics, its processes and applications.**

Mission:

The mission of the department is

M01: **To establish an atmosphere of creative endeavour that supports interdisciplinary collaborations, innovative projects, significant research, and informal discussions that mutually benefit students, faculty and the community at large.**

M02: **To provide graduate students an opportunity to develop a deep understanding and enjoyment of mathematics.**

M03: **To carry out original research, to become effective teachers and communicators, and to prepare themselves for their future careers.**

PROGRAMME EDUCATION OUTCOME B.Sc. (Mathematics with CA)

The B.Sc. (Mathematics with Computer Applications) program aims to achieve the following objectives:

PEO1: Will be capable of making a positive contribution in teaching Mathematics in School, as a programmer and system analysts in IT industries and as an efficient performer in the field of Banking.

PEO2: Will be able to pursue research in their chosen field of Applied Mathematics or Pure Mathematics.

PEO3: Will be able to demonstrate team spirits, skills and values and continue to learn and adapt to change throughout their professional career.

Mapping

	PEO1	PEO2	PEO3
MO1	**S**	**S**	**S**
MO2	**H**	**S**	**H**
MO3	**H**	**S**	**H**

S – Strong **H – High** **M – Medium** **L – Low**

Program Outcomes (PO)-B.Sc.(Mathematics with Computer Applications)

1. **Professionalism:** Apply the knowledge of Mathematics to develop logical thinking and pattern matching skills.
2. **Problem Analysis:** Identify the problems in real life situations and develop Mathematical models which paves the way to obtain solutions.
3. **Design/Development of Solutions:** Develop a deep understanding in mathematical concepts and design a new set of rules based on the need without affecting the basic rules of Mathematics.
4. **Conducting investigation of complex problems:** Apply Mathematics tools to analyze and interpret data to provide valid conclusions.
5. **Modern tool usage: S**elect and apply appropriate techniques, resources and modern statistical tools to cope up with recent trends.
6. **Mathematicians and society:** Inculcate the corporate responsibilities.
7. **Environment and sustainability:** Understand the impact of modern applied mathematics in societal and environmental contexts and to demonstrate the knowledge and need for sustainable development.
8. **Ethics:** Apply ethical principles and to commit professional ethics and responsibilities in accordance with the norms of practices.
9. **Individual and team work:** Function effectively as an individual and as a member or leader in team.
10. **Life-long learning:** Recognize the need for preparation and the ability to engage in life-long learning in the context of technological change.

MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PEO1	**S**	**H**	**S**	**H**	**S**	**S**	**H**	**S**	**S**	**S**
PEO2	**S**	**S**	**S**	**H**	**H**	**H**	**S**	**H**	**S**	**H**
PEO3	**H**	**H**	**H**	**H**	**H**	**H**	**S**	**H**	**H**	**S**

S – Strong **H – High** **M – Medium** **L – Low**

PROGRAM SPECIFIC OUTCOMES

PSO1	**Develop logical reasoning and thinking capacity.**
PSO2	**Carry out mathematical computations, both analytical and numerical, to a reasonably good level.**
PSO3	**Identify the different approaches and mathematical techniques/ methods of proofs adopted in a wide range of mathematical areas.**
PSO4	**Explain abstract mathematical ideas and able to write simple proofs.**
PSO5	**Apply concepts to solve simple problems.**
PSO6	**Make appropriate use of computer technology.**
PSO7	**Able to develop a code in C, C ++, Java and Visual Basic for simple problems.**

D.G. VAISHNAV COLLEGE (AUTONOMOUS)
CHENNAI – 600 106
Program Name: B.Sc. Mathematics with Computer Applications

Curriculum and Scheme of Examination under CBCS

(Applicable to the students admitted during the Academic Year 2019-2020 Onwards)

Semester	Title of the Paper	Instruction hours/cycle	Examination Marks			Duration of Exam (Hours)	Credits
			CIA	ESE	TOTAL		
I	Language – I	4	40	60	100	3	3
	English - I	4	40	60	100	3	3
	Core Paper I Classical Algebra	6	40	60	100	3	4
	Core Paper II Differential Calculus	6	40	60	100	3	4
	Allied I Programming in C Theory	4	40	60	100	3	3
	Practical I – Programming in C	2	40	60	100	3	2
	Soft Skills I	2	50	50	100	3	3
	Non Major Elective-I / Basic Tamil-I	23	40	60	100	3	2
	Total	30	-	-	800	-	24
II	Language – II	4	40	60	100	3	3
	English - II	4	40	60	100	3	3
	Core Paper III Trigonometry	6	40	60	100	3	4
	Core Paper IV Integral Calculus	6	40	60	100	3	4
	Allied II Object oriented programming with C++ Theory	4	40	60	100	3	3
	Practical II Object Oriented programming with C++	2	40	60	100	3	2
	Soft Skills II	2	50	50	100	3	3
	Non Major Elective-II / Basic Tamil-II	2	40	60	100	3	2
	Total	30	-	-	800	-	24
	Core Paper V Differential Equations	6	40	60	100	3	4

	Core Paper VI Mathematical Statistics	6	40	60	100	3	4
	Core Paper VII Multimedia Theory	6	40	60	100	3	3
	Allied – III Numerical methods I	7	40	60	100	3	5
	Practical III Multimedia	3	40	60	100	3	2
	Soft Skills III	2	50	50	100	3	3
	Total	30	-	-	600	-	21
IV	Core Paper VIII Vector Calculus, Analytical Geometry of Three Dimensions	5	40	60	100	3	4
	Core Paper IX Transforms and Fourier Series	5	40	60	100	3	4
	Core Paper X Programming in Java theory	6	40	60	100	3	3
	Allied – IV Numerical methods 2	7	40	60	100	3	5
	Practical IV Programming in Java	3	40	60	100	3	2
	Soft Skills IV	2	50	50	100	3	3
	Environmental Science	2	40	60	100	3	2
	Total	30	-	-	700	-	23
V	Core Paper XI Algebraic Structures	5	40	60	100	3	4
	Core Paper XII Real Analysis	5	40	60	100	3	4
	Elective I Discrete Mathematics	5	40	60	100	3	5
	Elective II Operations Research I	5	40	60	100	3	5
	Core Paper XIII Web Technology Theory	5	40	60	100	3	3
	Practical V Web Technology	3	40	60	100	3	2

	Value Education	2	40	60	100	3	2
	Total	30	-	-	700	-	25
VI	Core Paper XIV Linear Algebra	5	40	60	100	3	4
	Core Paper XV Complex Analysis	5	40	60	100	3	4
	Core Paper XVI Mechanics	5	40	60	100	3	4
	Elective III Operations Research II	6	40	60	100	3	5
	Core paper XVII DOT NET Programming Theory	5	40	60	100	3	3
	Practical VI DOT NET Programming	3	40	60	100	3	2
	Extension Activity	1	40	60	100	3	1
	Total	30	-	-	700	-	23
	Grand Total	180	-	-	4300	-	140

Note:

CBCS – Choice Based Credit System
CIA – Continuous Internal Assessment
ESE- End of Semester Examinations

Elective Papers:

1. Discrete Mathematics
2. Operations Research – I
3. Operations Research – II

Tally Table:

Subject	No. of Subjects	Total Marks	credits
Core – Theory Papers	17	1700	76
Elective Papers	3	300	15
Allied Papers	4	400	10
Allied Practical	6	600	12
Language	2	200	12
English	2	200	12
Soft skills	4	400	12
Non Major electives/ Basic Tamil	2	200	4
Environmental Science	1	100	2
Value Education	1	100	2
Extension Activity	1	100	1
Grand Total	43	4300	140

- 40 % CIA is applicable to all subjects except JOC, COP and SWAYAM courses which are considered as extra creditcourses.
- The students are advised to complete a **SWAYAM-MOOC** before the completion of the 3rd semester and the course completed certificate should be submitted to the HOD. Two credits will be given to the candidates who have successfullycompleted.
- A **Field Trip** preferably relevant to the course should be undertaken everyyear.

Components of Continuous Internal Assessment

Components		**Marks**	**Total**
Theory			
CIA I	50	(50+50 = 100/4)	40
CIA II	50	25	
Generic Activity		10	
Attendance		5	

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating

Theory Examination

Time: 1 hour and 30 minutes

CIA I&II: 50 Marks Each

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	Section A Answer any7Questions out of 10 Questions	7 x 2 = 14	Short Answer Questions	50
K2 Q11 to 15	Section B Answer any 3 Questions out of 5 Questions	3 x 7 = 21	Long Answer Questions	
K3 & K4 Q16 to 18	Section C Answer any 1 Questions out of 2 Questions	1 x 15 =15	Descriptive / Detailed	

Time: 3 hours

ESE: 100 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 12	Section A Answer any 10 Questions out of 12 Questions	10 x 2 = 20	Short Answer Questions	100
K2 Q13 to 19	Section B Answer any 5 Questions out of 7 Questions	5 x 7 = 35	Long Answer Questions	
K3 & K4 Q20 to 24	Section C Answer any 3 Questions out of 5 Questions	3 x 15 = 45	Descriptive / Detailed	

END SEMESTER THEORY EXAMINATION QUESTION PAPER PATTERN

B.SC Mathematics with Computer Applications

Pattern

Time : 3 hours Max Marks : 100

Section A Answer any 10 Questions out of 12 Questions	10x2 = 20 Marks
Section B Answer any 5 Questions out of 7 Questions	5x7 =35Marks
Section C Answer any 3 Questions out of 5 Questions	3x15 = 45 Marks
Total	**100 Marks**

Distribution of Marks for CIA

CIA Tests (2)	25 Marks
Generic Activity	10 Marks
Attendance	5 Marks
Total	**40 Marks**

Course Title: Classical Algebra

Course	B Sc(Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course Objectives

- **To develop the ability to use binomial, exponential and logarithmic series.**
- **To know about various methods to find the roots of the polynomial equations.**
- **To develop the skills of the students in the area of matrices**
- **To learn methods and techniques used in number theory**

Course Outcomes: At the end of the course, the Student will be able to

CO1	• Explain the concept of binomial, exponential and logarithmic series • Discuss other forms of binomial expansion • Find summation of series using binomial, exponential and logarithmic series
CO2	• Describe theory of equations • Explain the relation between the roots and coefficients of an equation • Discuss symmetric functions of roots of an equation • Find the sum of the powers of the given equation
CO3	• Solve reciprocal equation • Use diminishing of roots to transform the equaion • Discuss Descarte's rule of signs • Discuss Newton's and Horner's method
CO4	• Classify different types of matrices and their properties • Find the eigen values and eigen vectors of a matrix • Compute inverse of the matrix using Cayley Hamilton theorem
CO5	• Use Fermat's, Euler's theorems to solve congruence equation • Find the sum, number of all divisors of N • Define congruence and describe their properties

COs	CONTENTS OF MODULE	
CO1	**UNIT – I : Summation of Series :** Binomial, exponential and logarithmic series (*)– simple problems on summation -limits and approximation.	**K1,K2**
CO2	**UNIT-II : Theory of Equations :** Polynomial equations- Imaginary and irrational roots- Relation between roots and Coefficients-Symmetric functions of roots in terms of coefficients.	**K1,K2**
CO3	**UNIT– III: Transformations of equations**- Reciprocal equations-Formation of	**K2,K3**

	Equations-Transformations in general-Descartes' rule of signs -Approximate solutions of roots of polynomials by Newton-Raphson method – Horner's method.	
CO4	**UNIT-IV: Matrices** :-Symmetric; Skew Symmetric; Hermitian; Skew Hermitian; Orthogonal and Unitary Matrices - Cayley Hamilton Theorem (*)-verification -Computation of inverse matrix using Cayley – Hamilton theorem-Eigen values- Eigen Vectors - Diagonalization of a matrix.	**K1,K3**
CO5	**UNIT-V: Number theory:-**Prime number; Composite number; decomposition of a composite number as a product of primes uniquely (*) divisors of a positive integer n; congruence modulo *n*; Euler function (*); highest power of a prime number p contained in n!;Fermat's and Wilson's theorems – simple problems.	**K1,K3**

Note : (*)- Statement only

Recommended Text Book :

*T. Natarajan, K S Ganapathy, T K ManicavachagomPillay,*Algebra I and II,S. Viswanathan publications

Reference Books:

1. *Dr.P.R.Vittal,*Algebra and TrigonometryMargham Publishers
2. *P.Kandasamy,* Mathematics for first semester.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**M**	**S**	**H**	**M**	**S**	**M**	**M**
CO2	**M**	**M**	**H**	**H**	**S**	**M**	**M**
CO3	**M**	**H**	**S**	**M**	**S**	**M**	**M**
CO4	**M**	**H**	**H**	**S**	**S**	**H**	**M**
CO5	**H**	**S**	**H**	**M**	**S**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Differential Calculus

Course Code	B Sc(Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course Objectives

- **To obtain problem solving skills in derivatives and its application.**
- **To gain logical thinking and use of appropriate methods to solve the problems.**
- **To find the higher order derivatives for multiplication of two functions.**
- **To examine the maxima and minima for function of two variables with real life applications.**
- **To identify the bending of curve in both Cartesian and polar coordinates with application.**
- **To attain knowledge of curvature and its uses.**
- **To understand the behavior of the family of curves.**
- **To identify the asymptotes of rational algebraic functions without finding derivatives**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Retrieve the concept of differentiation and perceive the idea of finding nth derivative using Leibnitz theorem. • Find the derivatives of nested functions –chain rule. • Choose the chain rule to find the derivatives of implicit function and total differentiation.
CO2	• Determine the derivative for a function of several variables in partial forms– Jacobian matrix • Examine the maxima and minima for the function of two variables • Implement the idea of maxima and minima for functions subject to the constraints (Lagrange Multipliers)
CO3	• Attaining the knowledge of finding the angle between radius vector and tangent to the curve. • Infers the bending of the curve by finding the radius of curvature in both Cartesian and polar form. • Extend the idea of tangent to a curve to find the radius of curvature for pedal curve
CO4	• Recall the concept of radius of curvature and tangent to find the centre of curvature. • Examine the locus of centre of curvature to calculate the evolute • Survey the family of curves to find an envelope.
CO5	• Identify the asymptote of a rational algebraic curve by various methods • Estimate the possible number of asymptote by analyzing the given curve.

COs	CONTENTS OF MODULE	
CO1	**UNIT I:Successive differentiation**- Leibnitz's theorem(*) and its applications; Partial Differentiation – Chain rule, implicit function, total differentials –Simple problems	**K1,K2,K3**
CO2	**UNIT II :Jacobians –** Maxima and minima of f(x, y)- Lagrange's method of multipliers for f(x,y) (*) – Simpleproblems on these concepts.	**K2,K3,K4**
CO3	**UNIT III:**Angle between radius vector and tangent, angle of intersection of two curves,Radius of curvature in Cartesian form-radius of curvature in polar form-radius of curvature for pedal curve.	**K2,K3,K4,K5**
CO4	**UNIT IV :**Centre of curvature, Evolutes, Envelopes.	**K1,K4,K5**
CO5	**UNIT V:** Methods (without derivation) of finding asymptotes of rational algebraic curves with special cases.	**K4,K5**

NOTE : (*) – Statement only

Recommended Text Book:

T.K. Manickavachagam Pillai, S.Narayanan, Calculus Volume I S. Viswanathan Publications

Reference Books:

1. *Dr.P.R.Vittal*, Calculus Margham Publishers
2. *P.Kandasamy*, Mathematics for first semester, S.Chand& Company

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**M**	**S**	**M**	**H**	**M**	**H**	**M**
CO2	**M**	**S**	**S**	**M**	**S**	**M**	**M**
CO3	**S**	**M**	**S**	**M**	**S**	**M**	**M**
CO4	**M**	**M**	**S**	**S**	**S**	**M**	**M**
CO5	**S**	**S**	**S**	**M**	**S**	**M**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Programming in C

Course Code	B Sc(Maths with CA)
Exam Hours	03

Credits	03
CIA Marks	40
ESE Marks	60

Course Objectives

- **To enhance some knowledge in C Programming**
- **To be familiar with pointers and structures in C Programming.**

Course Outcomes: After completion of this course, students will be able to

CO1	• Understand the basic elements of C language • Do simple programs in C • Get familiar with I/O Statements
CO2	• Learn control statements and its importance • Learn Looping statements and its significance • Understand difference between Conditional and Unconditional statements
CO3	• Know the importance of Arrays and Strings • Do programs on arrays and strings • Learn about functions and its types
CO4	• Understand the Structure/Union/Pointer concepts • To do programs in Pointers as well as Structures. • Difference between Structures and Union • Difference between Arrays and Pointer
CO5	• Understand the various File Handling Techniques in C • Learn about different operations on Files in C • Do programs on Files in C

COs	CONTENTS OF MODULE	
CO1	**Unit I:** Basic structure of C program - Constants - Variables - Data Types - Operators - Expressions - Managing Input and Output Statements.	**K1,K2**
CO2	**Unit II:** Decision Making and Branching Statements - Simple if, If.....Else, Nesting of IF....Else - Else If ladder - Switch Statements - Ternary (?:) Operator - GOTO - Decision and Looping Statements - While, Do....While and For - Jumps in loops.	**K2,K3, K4**
CO3	**Unit III:** Arrays - Handling of Character Strings - User defined Functions	**K2, K3**
CO4	**Unit IV:** Structures - Unions - Pointers	**K3,K4**
CO5	**Unit V:** File Management - Defining and Opening a File - Closing a File - Input and Output operations on File - Error Handling during I/O operation - Random Access Files	**K2, K4**

Recommended Text Book:
*E. Balaguruswamy,*Programming in ANSI C Tata McGrawHill Publishing Company.

Reference Books:

1. *Venugopal,*Programming with C, Tata McGrawHill Publishing Company.
2. *Ashok N Kamthane,*Programming with C, Pearson Publishing Company.

On-Line Resources:

1.www. w3resource.com/c-program
2.www.beginnersbook.com

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**H**	**S**	**S**	**M**	**H**	**S**	**S**
CO2	**S**	**S**	**S**	**H**	**S**	**S**	**S**
CO3	**H**	**H**	**H**	**M**	**S**	**S**	**S**
CO4	**H**	**H**	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**H**	**S**	**H**	**S**	**S**	**S**

S - Strong H – High M – Medium L – Low

Course Title: Programming in C Practical

Course	B Sc(Maths with CA)
Exam Hours	03

Credits	02
CIA Marks	40
ESE Marks	60

1. Program to find Simple Interest.
2. Program to calculate area of rectangle, square and triangle.
3. Program to find odd or even of a given number.
4. Program to find biggest of three numbers.
5. Program to find sum of digits of a given number.
6. Program to print all possible roots for a given quadratic equation.
7. Program to sort a set of numbers.
8. Program to sort the given set of names.
9. Program to generate Fibonacci number.
10. Program to swap the two numbers using pointers.
11. Program to perform matrix addition.
12. Program to check the given string is palindrome or not.
13. Program to check whether a given number is prime or not.
14. Program to count the number of vowels, consonants, white spaces, digits, lines and words in the given sentence.
15. Program to manipulate simple file operations.

NME –OFFERED TO OTHER DEPARTMENTS

Course Title: Statistical Methods (NME-Paper I)

Course	ALL UG Courses
Exam Hours	03

Credits	02
CIA Marks	40
ESE Marks	60

Course objectives

- Distinguish between regression and correlation analysis.
- To explain the situations in which weighted and unweighted index numbers are useful.
- To analyze the main purpose of computing index numbers.
- Explain the meaning of the term index number, get accustomed to use of some widely used index numbers.

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Explain the basic concepts of measures of central tendency. • Estimate the mean, mode, median for the given data.
CO2	• Estimate variation for distributions using quartile deviations. • Compare the variability of two or more series using coefficient of variation. • Explain the various measures of dispersion.
CO3	• Demonstrate correlation and regression relations between the data. • Estimate the unknown values using regression equations. • Evaluate the correlation coefficient with the help of regression coefficients.
CO4	• Prepare the Index Numbers for the given data. • Explain the various reversibility tests to be satisfied by a good index number.
CO5	• Use the past observations to estimate the future values using time series. • Appraise the trend values using different methods. • Explain mathematical and statistical literatures of various types, including survey articles.

Cos	CONTENTS OF MODULE	
CO1	**Unit I :**Measure of Central Tendency: Arithmetic Mean- Combined Mean-Median-Mode-Simple Problems.	**K1, K3, K4**
CO2	**Unit II :**Measures of Dispersion: Range – Quartile Deviation – Mean Deviation – Standard deviation – Combined Standard deviation- simple problems.	**K1, K3**
CO3	**Unit III :**Correlation Analysis – Karl Pearson's Coefficient of correlation – Spearman's Rank correlation coefficient – Regression Analysis – Simple Problems.	**K2, K4, K5**

CO4	**Unit IV :** Index Number: Methods of constructing Index Numbers – Unweighted Index numbers – Simple aggregate Index Numbers – Simple average of price relative – Weighted Index Numbers – Weighted Aggregate – Laspeyre's method – Paasche's method – Fisher's method – Bowley's method – Marshall &Edgeworth method – Test of consistency of Index numbers – Time reversal test – Factor reversal test – simple problems.	**K2, K3, K5**
CO5	**Unit V :** Time series – Components of time series – measurement of Secular trend – moving average method- method of least squares -Measurement of seasonal variation – methods of simple average – ratio to trend method.	**K2, K3**

Recommended Text Book:

S.P. Gupta, Statistical Methods, Sultan Chand, 2005.

Reference Books:

1. *Dr. S. P. Rajagopalan, Dr. R. Sattanathan,*Business Statistics and Operations Research, Tata McGraw Hill.
2. *R.S.N. Pillai and Bagavathi*, Statistics Theory and Practice, S. Chand.
3. *D.C. Sancheti and V.K. Kapoor*,Statistics, Sultan Chand.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PS06**	**PS07**
CO1	**H**	**S**	**S**	**H**	**S**	**M**	**M**
CO2	**S**	**S**	**H**	**M**	**S**	**M**	**H**
CO3	**H**	**H**	**M**	**H**	**S**	**M**	**M**
CO4	**H**	**S**	**M**	**H**	**S**	**M**	**M**
CO5	**S**	**S**	**M**	**H**	**S**	**M**	**M**

S - Strong H – High M – Medium L - Low

Course Title: Trigonometry

Course	B Sc(Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course Objectives

- **To acquire the basic knowledge of circular and hyperbolic trigonometric functions**
- **To understand how to separate a complex function into its real and imaginary parts and also various methods for the summation of series**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Use Demoivre theorem to expand sinn$\boldsymbol{\theta}$, cosn$\boldsymbol{\theta}$ • Express $\sin^n\boldsymbol{\theta}$, $\cos^n\boldsymbol{\theta}$ in multiples of $\boldsymbol{\theta}$ • Express sin$\boldsymbol{\theta}$, cos$\boldsymbol{\theta}$ and tan$\boldsymbol{\theta}$ in terms of $\boldsymbol{\theta}$
CO2	• Express hyperbolic functions in terms of exponential functions and obtain hyperbolic identities • Manipulate expressions involving hyperbolic functions • Classify relation between circular and hyperbolic functions
CO3	• Express inverse trigonometric functions in terms of logarithmic functions • Differentiate hyperbolic, inverse – hyperbolic trigonometric functions • Separate the real and imaginary parts of trigonometric functions of complex variable
CO4	• Recognize the concept of logarithmic of complex numbers • Estimate sum of series of sines and cosines of n terms in A.P
CO5	• Manipulate any forms of summation of series such as binomial, logarithmic, geometric and Gregory's series • Recognize the concept of C+iS method

COs	CONTENTS OF MODULE	
CO1	**UNIT-I :**Expansion of $\cos n\theta$, $\sin n\theta$ (n is a positive integer) - Expansion of $\cos n\theta$ and $\sin n\theta$ in a series of sines, cosines of multiples of θ. Expansion of $\cos\theta$, $\sin\theta$ and $\tan\theta$ in terms of θ (θ given in radians) – Simple problems.	**K2,K3**
CO2	**UNIT-II :**Hyperbolic Functions – Euler formula for $e^{i\theta}$ - definition of hyperbolic Functions – Relation between circular and hyperbolic functions –Formula involving hyperbolic functions –Expansions of Sinh x and Cosh x in powers of *x*.	**K2,K3**
CO3	**UNIT-III:** Inverse hyperbolic functions – inverse hyperbolic functions in terms of logarithmic function-separation into real and imaginary parts of*sin(x+iy), cos(x+iy), tan(x+iy), sinh(x+iy), Cosh(x+iy), tanh(x+iy), Simple problems.*	**K2,K4**
CO4	**UNIT-IV:** Logarithms of Complex numbers-Definition-Principal Value-Gregory's series for $\tan^{-1}x$. Summation of series -Sums of sines of n angles which are in A.P and cosines of n angles which are in A.P.	**K1,K2**

CO5	**UNIT-V:** Summation of trigonometric series using telescopic method, $C + iS$method in the following series - Binomial, exponential, logarithmic, Geometric and Gregory's series.	**K1,K3**

Recommended Text Book :
S.Narayanan,T.K.ManicavachagomPillay, Trigonometry, S. Viswanathan publishers.

Reference Books:

1. *Dr.P.R.Vittal,* Algebra and Trigonometry,Margham Publishers.
2. *P.Kandasamy,*Mathematics for first semester

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**M**	**H**	**M**	**M**	**S**	**M**	**M**
CO2	**M**	**S**	**H**	**M**	**S**	**M**	**H**
CO3	**M**	**H**	**H**	**M**	**S**	**M**	**H**
CO4	**M**	**M**	**H**	**H**	**S**	**M**	**M**
CO5	**H**	**M**	**M**	**M**	**S**	**M**	**M**

S - Strong **H – High** **M – Medium** **L – Low**

Course Title: Integral Calculus

Course	B Sc(Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course Objectives

- **To recognize and use the properties of Definite Integrals, and special functions like Beta and Gamma functions to evaluate integrals**
- **To recognize the appropriate tools of Calculus to solve applied problems.**
- **To understand the application of definite integral to derive important quantities like arc length, Area and Volume.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Identify the various techniques of integration and apply them to integrate rational and irrational functions
CO2	• List the Properties of definite Integrals and evaluate definite integrals using these properties easily. • Apply the technique of integration by parts and integrate.
CO3	• Summarize Bernoulli's formula and Evaluate Integrals using the same. • Prove the reduction formulae for Standard functions and use the same to solve problems on standard integrals. • Analyze Definite integral as area under the curve using summation and limits.
CO4	• Classify double and triple integrals and evaluate them. • Solve double integrals by changing order of Integration • Use Polar coordinate system to solve Calculus application problems • Evaluate the area of plane surfaces and Volume of Solids using double and triple Integrals.
CO5	• Define Beta and Gamma Functions, summarize their properties and Use them to integrate complex functions. • Derive the recurrence formula For Gamma functions, and Relation between Beta and Gamma functions.

COs	CONTENTS OF MODULE	
CO1	**UNIT 1:** Methods of Integration – Integration of rational and irrational functions - $\int \frac{dx}{a+bcosx}$, $\int \frac{dx}{a+bsinx}$, $\int \frac{dx}{acosx+bsinx}$– Simple problems	**K1, K3**
CO2	**UNIT II:** Properties of Definite Integral -Integration by Parts – Simple problems.	**K1, K3, K4**
CO3	**UNIT III:** Bernoulli's formula - Reduction formulae –Integration as summation - Simple problems.	**K2, K4, K5**
CO4	**UNIT IV:** Double integrals-changing the order of integration-triple integrals-Applications of area and Volume.	**K3, K5**
CO5	**UNIT V**:Beta and Gamma functions-properties –Recurrence formula for gamma function, Relation between beta and gamma functions - simple problems.	**K1, K2, K5**

Recommended Text Book:

T.K. ManickavachagamPillai,S. Narayanan, Calculus Vol II, S. Viswanathan publishers.

Reference Books:

1. *Dr. P.R.Vittal,* Calculus, Margham Publishers.
2. *P. Kandasamy,* Mathematics for I& II semester, S.Chand& Company.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**H**	**H**	**H**	**H**	**S**	**M**	**H**
CO2	**H**	**S**	**H**	**H**	**S**	**M**	**H**
CO3	**H**	**S**	**S**	**S**	**S**	**H**	**H**
CO4	**H**	**S**	**S**	**H**	**S**	**H**	**M**
CO5	**H**	**S**	**S**	**S**	**S**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Object Oriented Programming with C++ Theory

Course Code	B Sc(Maths with CA)
Exam Hours	03

Credits	03
CIA Marks	40
ESE Marks	60

Course Objectives

- **To familiarize the usage of arrays and strings in C++**
- **To enhance the concept of constructors and its types.**
- **To construct programs in C++**
- **To master file handling techniques in C++**

Course Outcomes: After completion of this course, students will be able to

CO1	• Demonstrate the basic elements of C++ language • Discuss and analyze the concept of Object Oriented Programming • Prepare simple programs in C++ • Get familiar with I/O Statements in C++
CO2	• Explain control statements and its importance • Explain Looping statements and its significance • Prepare programs on arrays and strings in C++ • Demonstrate arrays and functions in C++
CO3	• Know the importance Classes and Objects • Learn about Constructor and its types
CO4	• Demonstrate the concept of Operator Overloading and its types • Learn the concept of Inheritance and its different types • Analyze the concept of reusability in OOP(Object Oriented Programming) • Prepare programs on Inheritance
CO5	• Learn the Importance of Pointers in C++ • Prepare programs using Pointers in OOPs concept • Demonstrate the various File Handling Techniques in C++ • Learn about different operations on Files in C++ • Prepare programs on Files in C++

COs	CONTENTS OF MODULE	
CO1	**Unit I:** Basic concepts of OOP- I/O statements - Data types – Operators - Control Structures:Decision making statements - Looping Statements.	**K1,K2,K3**
CO2	**Unit II:** Functions - Function declarations and definitions - Passing arguments - Inline functions –Function overloading-Arrays –one dimensional and two dimensional arrays - Passing arrays to functions.	**K3,K4**

CO3	**Unit III:** Classes&Objects : Class - Defining member functions , Static Data Members - Passing objects to function - Returning objects - Friend function - Default Arguments. Constructor - Types of Constructors - Destructors.	**K2, K3,K4**
CO4	**Unit IV:** Operator Overloading - Rules for overloading operators - Overloading of unary and binary operators. Inheritance - Types of inheritance - Virtual base classes.	**K2,K3,K4**
CO5	**Unit V:** Pointers- this pointer – Pointer to an Object - Virtual functions. Working with files - Classes for file stream operations - Opening and closing a file - Detecting EOF - File modes for opening.	**K2, K3,K4**

Recommended Text Books:

E.Balaguruswamy, Object Oriented Programming in C++, Sixth Edition, 2012, TMH.

Reference Books:

1. *H. Schildt,* The Complete Reference C++, Fourth Edition, 2002, TMH
2. *KanetkarY,*Let us C++, Third Edition, 1999, BPB Publishers.
3. *John R Hubbard,* Programming with C++, Third Edition, 2009, TMH.

E-References:

1. http://en.highscore.de/cpp/boost/
2. http://bookboon.com/en/structural-programming-with-c-plus-plus-ebook

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**H**	**S**	**S**	**M**	**H**	**S**	**S**
CO2	**S**	**S**	**S**	**H**	**S**	**S**	**S**
CO3	**H**	**H**	**H**	**M**	**S**	**S**	**S**
CO4	**H**	**H**	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**H**	**S**	**H**	**S**	**S**	**S**

S - Strong H – High M – Medium L – Low

Course Title: Object Oriented Programming with C++ Practicals

Course	B Sc(Maths with CA)
Exam Hours	03

Credits	02
CIA Marks	40
ESE Marks	60

1. Define a class to represent a bank account. Include the following members:Data members : Name of the depositor, Account number, Type of accountBalance amount in the accountMember functions : To assign initial values, To deposit an amount, To withdrawan amount after checking the balance, To display the name and balance.Write a main program to invoke the member functions.
2. Program to find the largest of three numbers using inline function.
3. Program to find mean of 'N' numbers using friend function.
4. Program to find volume of cube, cylinder and rectangular box using functionoverloading.
5. Program to add two times in hours and minutes format using objects as functionarguments.
6. Program to illustrate the use of arrays of objects.
7. Program to add two complex numbers using overloaded constructors.
8. Program to subtract two complex numbers using operator overloading.
9. Program to read the derived class data members such as name, roll number, sex,height and weight from the keyboard and display the contents of a class on thescreen. Write a program to demonstrate a single inheritance.
10. Program to do simple file operations.
11. Program to illustrate Virtual Functions.

NME –OFFERED TO OTHER DEPARTMENTS

Course Title: Discrete Mathematics (NME - Paper II)

Course	ALL UG COURSES
Exam Hours	03

Credits	02
CIA Marks	40
ESE Marks	60

Course Objectives:

- **Acquire basic knowledge in Boolean algebra and its application.**
- **Develop mathematical skills to solve the problems.**
- **Enhance the idea of Boolean expression for designing and simplification of circuits.**
- **Infers different gates and its uses. Solve recurrence relations.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Define Boolean algebra • Ability to identify whether the given set is a Boolean algebra or not with reasons. • Illustrate the properties of Boolean algebra • Define two element Boolean algebra • Interpret the equality of Boolean expressions
CO2	• Analyze Boolean expression • Estimate the min terms and max terms in Boolean expressions • Obtaining the canonical form of Boolean logic (disjunctive normal form and conjunctive normal form)
CO3	• Define and describe the basic ideas in circuits • Application of Boolean logic for simplification of circuits. • Application of Boolean logic for designing of switching circuits.
CO4	• Associate the Boolean operation with logic gates • Draw circuits from Boolean expression and vice versa. • Determine the equivalency in logic circuits
CO5	• Recall sequence and define recurrence relation • Solve recurrence relation by iteration method • Solve linear difference equations with constant coefficients.

COs	CONTENTS OF MODULE	
CO1	**UNIT- I: Boolean algebra and its Applications :** Boolean algebra – Two element Boolean algebra – Simple problems –(chapter 5 : 5.3 , 5.2)(only application of theorems)	**K1, K2,K3**
CO2	**UNIT-II: Boolean algebra and its Applications :** Disjunctive normal form – Conjunctive normal form – Simple problems.(chapter 5: 5.3. 5.4)	K**2**,**K3,**

CO3	**UNIT-III: Boolean algebra and its Applications :** Applications – Simplification circuits – Designing of Switching circuits – Simple problems(chapter 5 ; 5.5)	**K2, K3,K4**
CO4	**UNIT-IV : Boolean algebra and its Applications :** Logical gates and combinatorial circuits – And gate - OR gate – NOR gate – NAND gate – NOR gate – simple problems (chapter 5 : 5.6)	**K2,K3,K4**
CO5	**UNIT-V: Recurrence relations :** Sequence and Recurrence relations by iteration method – Linear difference equations recurrence relations with constant coefficients – simple problems – (chapter 6: 6.1,6.2)(only applications of theorem)	**K2,K3**

Recommended Text Book:

*S.Narayanan, R.Hanumantha Rao, T.K.ManicavachagamPiilai,*Ancillary Mathematics volume I & II,S.Viswanathan Pvt. Ltd, Reprint.

Unit I	**VolI Chapter 2 – Sections 2.1 to 2.4 ; pages 59 -83.**
Unit II	**VolI Chapter 4 - Sections 4.1 to 4.3 ; pages 183 – 214.**
Unit III	**Vol II Chapter 6 - Sections 1 to 3 pages 262 - 273**
Unit IV	**Vol II Chapter 8 -Sections 15 to 20 pages335 – 351**
Unit V	**Vol II Chapter 8 -Sections 1 to 2 pages 363 – 414**

[*Derivations are not included and only applications are to be expected from the students]

Reference Books:

1. *P. Duraipandian, Dr.S.Udaybakaran,*Allied Mathematics Volumes I & II, Muhil publishers
2. *P.Kandasamy, K.Thilagavathy,* Allied Mathematics Volumes I & II, S.Chand& company
3. *Dr.S.P.Rajagopalan and Dr.R.Sattanathan,* Allied Mathematics Tata Mcgraw hill publishers.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**S**	**S**	**S**	**L**	**M**	**L**	**L**
CO2	**S**	**S**	**S**	**L**	**M**	**L**	**L**
CO3	**S**	**S**	**S**	**M**	**M**	**L**	**L**
CO4	**S**	**S**	**M**	**M**	**M**	**L**	**L**
CO5	**S**	**S**	**M**	**M**	**S**	**L**	**L**

S - Strong **H – High** **M – Medium** **L - Low**

Course Title: Differential Equations

Course	B Sc(Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course Objectives

- **Identify the type of a given differential equations**
- **Apply the appropriate analytical technique for finding the solution of first order and selected higher order ordinary differential equation.**
- **Evaluate first order differential equation including separate, homogeneous, exact and linear.**

Course Outcome: After completing the course, the students will be able to

CO1	• Discuss the differential equation of first order and higher degree of the form $f(x,y,p)=0$ • Define the necessary and sufficient condition for exact equation • Convert differential equation which are not exact into exact equation
CO2	• Estimate solution to second order linear homogeneous Differential Equations with constant coefficient. • Illustrate the basic knowledge of complementary function and particular integral
CO3	• Estimate solution to second order Differential Equation with variable coefficient. • Use the method "Variation of parameter" to find the solution of higher order D.E with variable coefficient
CO4	• Discuss the solution for PDE of standard type $f(p,q)=0, f(x,p,q)=0, f(y,p,q)=0, f(x,p)=f(y,q)=0$ and by eliminating the arbitrary constant and arbitrary function, complete integral, singular integral and general integral. • Create the solution of Clairaut's form and linear partial differential equations
CO5	• Define homogeneous equation • Solve the homogeneous linear partial differential equation with particular integrals $e^{ax+by}, \sin(mx+ny), \cos(mx+ny), x^m y^n$

COs	CONTENTS OF MODULE	
CO1	**UNIT – I :**First order but of higher degree equations – solvable for p – solvable for x – solvable for y – Clairauts's form of differential equation – exact differential equations – simple problems	**K1,K2**

CO2	**UNIT-II :**Second order differential equations with constant coefficients, particular integrals for $e^{ax}, \sin ax, \cos ax, x^m, e^{ax}\ sinax, e^{ax}\ cosax, e^{ax}x^m$– simple problems	**K3, K5**
CO3	**UNIT– III:** Second order differential equations with variable coefficients - Total differential equation – method of variation of parameters —simple problems	**K3, K5**
CO4	**UNIT-IV :** Partial differential equations – formation of P.D.E. by eliminating arbitrary constants and arbitrary functions – complete Integral – singular Integral – general Integral – Standard types – $f(p,q) = 0, f(x,p,q) = 0, f(y,p,q) = 0, f(z,p,q) = 0, f(x,p) = f(y,q) = 0$ – Clairaut's form – Lagrange's equation $Pp + Qq = R$ – simple problems.	**K2**
CO5	**UNIT-V:** Partial differential equations -Solution of homogenous linear partial differential equation with particular integrals e^{ax+by} , $sin(mx + ny)$, $cos(mx + ny)$, $x^m y^n$.	**K1, K3**

Recommended Text Book

1. *S Narayanan, T.K.ManicavachagomPillai*, Calculus Vol III , S.Viswanathan, Publications (For Units I to III).
2. *A.Singaravelu*, Engineering Mathematics.

REFERENCE BOOKS:

1. *Dr.P.R.Vittal*, Differential Equations, Margham Publishers.
2. *Kandasamy*, Mathematics for third semester, S Chand & Company.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**H**	**S**	**S**	**H**	**S**	**H**	**M**
CO2	**S**	**H**	**H**	**S**	**H**	**S**	**H**
CO3	**S**	**S**	**S**	**S**	**H**	**H**	**M**
CO4	**H**	**S**	**M**	**H**	**S**	**S**	**M**
CO5	**H**	**H**	**S**	**S**	**S**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Mathematical Statistics

Course	B Sc(Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course Objectives

- **Demonstrate knowledge of probability and standard statistical distribution**
- **Demonstrate knowledge of small sample and large sample statistical properties of points and interval estimation**
- **Demonstrate knowledge of the properties of parametric, semi parametric and non-parametric testing procedures**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Illustrate and describe sample spaces and events for random experiments. • Interpret and calculate probabilities of event in discrete sample spaces and conditional probabilities of events using Baye's theorem.
CO2	• Illustrate the concept of a probability distribution • Sketch the same to real world problems involving various distributions like Binomial, Poisson and Normal distribution
CO3	• Measure and analyse the strength of the relationship between two variable using a correlation analysis. • Predict the value of any independent variable to the value of dependent variable using linear regression analysis
CO4	• Categorize small and large samples • Produce a significant test of hypothesis concerning the value of population mean based on Normal distribution.
CO5	• Produce a significant test of hypothesis concerning the value of population mean based on t-distribution, F-test, χ^2-test. • Explain the concept of analysis of variance and use them to investigate factorial dependence • Discuss about goodness of fit for given data

COs	CONTENTS OF MODULE	
CO1	**UNIT-I :** Concept of sample space – Events – Definition of Probability (classical, Statistical & Axiomatic) – Addition and Multiplication laws of Probability for 2 events – Extension of Addition and Multiplication laws of events (Statement only) – Independence – Conditional Probability – Baye's theorem - Simple Problems	**K2,K3**
CO2	**UNIT- II :**Binomial, Poisson, Normal distributions – Simple Problems.	**K3**
CO3	**UNIT– III:** Correlation – Rank Correlation – Regression – Simple Problems.	**K4, K5**
CO4	**UNIT-IV :**Large samples – Z test – Test of significance of a single mean, difference of two means, Single proportion, and difference of proportions. Small samples – t test – Test for a single mean, difference of means, Paired t-test.	**K3, K4**
CO5	**UNIT-V:** Small samples- F test – Test for equality of Population variance – Analysis of Variance – One-way classification – Two-way Classification – Simple Problems. Chi-Square Test – Goodness of Fit – Independence of attributes -Simple Problems.	**K2, K3**

Recommended Text Book:

Dr. P.R. Vittal, Mathematical Statistics Margham publishers.

Units	Chapter
Unit I	1
Unit II	12,13,16
Unit III	8,9
Unit IV	24,25
Unit V	26,27

REFERENCE BOOKS:

1. *S.C. Gupta & V.K. Kapoor*, Elements of Mathematical Statistics, Sultan Chand & Sons, Third Edition.
2. *S.P. Gupta*, Statistical Methods, Sultan Chand & Sons.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**S**	**H**	**S**	**S**	**M**
CO2	**M**	**S**	**S**	**S**	**H**	**H**	**M**
CO3	**S**	**H**	**S**	**S**	**M**	**H**	**H**
CO4	**H**	**S**	**S**	**H**	**H**	**S**	**H**
CO5	**S**	**S**	**H**	**S**	**S**	**H**	**H**

S - Strong H – High M – Medium L – Low

Course Title: Multimedia Theory

Course Code	B Sc(Maths with CA)
Exam Hours	03

Credits	03
CIA Marks	40
ESE Marks	60

Course Objectives

- **Develop a comprehensive understanding of multimedia tools, technologies and techniques.**
- **Develop an understanding of the process of making multimedia by introducing the multimedia building blocks of text, images, sound , video and animation**
- **Foster the development of critical-thinking and communication skills in creating a multimedia project.**

Course Outcomes : At the end of the course,the Student will be able to

CO1	• Define the common multimedia terms and qualify its characteristics in terms of linear and non-linear content. • Categorize the applications of Multimedia in several different environments that provide the benefit over other forms of information presentation. • Demonstrate the importance of text and the ways in which the text can be leveraged in multimedia presentation.
CO2	• Differentiate the use of MIDI and Digital Audio in multimedia production. • Differentiate among bitmap, vector and 3D images by describing their capabilities and limitations. • Point out the considerations involved in managing audio file and integrating them into multimedia project.
CO3	• Define Animation and demonstrate the principle and uses of animation in multimedia. • Classify the types of Animation Techniques and create a computer generated scene from multiple still images. • Judge and classify on selecting the best video recording formats for multimedia project.
CO4	• Demonstrate the intangible elements needed to make good multimedia. • Point out the importance of selecting and managing a team in order to produce successful multimedia projects. • Develop a multimedia project by choosing the appropriate software program, hardware and authoring system.
CO5	• Design the structure needed for a successful multimedia project by working with clients on a timely manner. • Organize the schedule, tasks and estimate the cost, timeline required to complete a multimedia project. • Plan to identify the benefits,drawbacks of various sources of project of content and determine the copyright,licensing for ownership of the project.

COs	CONTENTS OF MODULE	
CO1	**UNIT-I:** Multimedia Definition-Use of Multimedia-Delivering Multimedia.Text: About Font and faces-Using Text in Multimedia-Computers and Text-Font editing and Design Tools-Hypermedia and Hypertext.	**K1,K2**
CO2	**UNIT – II:** Images: Plan approach-Organize Tools-Configure Computer Workspace-Making Still Images – Color-Image File Formats.Sound:The Power of Sound-Digital Audio-MIDI Audio-MIDIVs.Digital Audio-Multimedia System Sounds-Audio File Formats-Vaughan'sLaw of Multimedia Minimums-Adding Sound to Multimedia Project.	**K2,K3**
CO3	**UNIT – III:** Animation: The Power of Motion-Principle of Animation-Animation by Computer-Making Animations that Work. Video: Using Video-Working with Video and Displays-Digital Video Containers-Obtaining Video Clips-Shooting and Editing Video.	**K3,K4,K5**
CO4	**UNIT-IV** Making Multimedia: The stage of Multimedia Project-The Intangible Needs-The Hardware Needs-The Software Needs-An Authoring System Needs. Multimedia Productions Team.	**K3,K4,K5**
CO5	**UNIT–V:** Planning and Costing: The Process of Making Multimedia-Scheduling and Estimating-RFPs and Bid Proposals. Designing and Producing-Content and Talent: Acquiring Content-Ownership of Content created for Project-Acquiring Talent	**K4,K5**

Recommended Text Books:

1. *Tay Vaughan***,** Multimedia :Making It Work, Eight Edition 2011, Tata McGraw-Hill.
2. *S.Gokul*,Multimedia Magic,Revised and Updated Second Edition,2008, BPB.

Reference Book:

1. *Ralf Steinmetz &KlaraNahrstedt*, Multimedia Computing, Communication &Applications, First Edition 2008,Pearson Education.
2. *Ranjan Parekh*, Principles of Multimedia,First Edition 2008,Tata McGraw Hill.
3. *Richard E.Mayer*, Multimedia Learning, Second Edition,2009,Cambridge,University Press.
4. *Glencoe*, Introduction to Multimedia, Student Edition, 2006, Tata McGraw-Hill.

Mapping Of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**H**	**S**	**M**	**H**	**S**	**S**
CO2	**S**	**S**	**S**	**H**	**H**	**H**	**S**
CO3	**S**	**M**	**M**	**M**	**H**	**H**	**S**
CO4	**S**	**S**	**M**	**S**	**H**	**M**	**S**
CO5	**S**	**M**	**S**	**M**	**S**	**S**	**S**

S-Strong H-High M-Medium L-Low

Course Title: Multimedia Lab

Course Code	B Sc(Maths with CA)
Exam Hours	03

Credits	02
CIA Marks	40
ESE Marks	60

List of Practical in FLASH

1. To Move an object, to move an object in the path.
2. Text flips, Text color change.
3. Creating a link using texts and objects, Change the color of the object.
4. Shape Tweening and using shape hints, Motion Tweening, Hybrid Tweening.
5. Character animation, object animation, drawing images.
6. An Application to show the Masking effect.
7. Slide shoe Presentation.

List of Practical in PHOTOSHOP

1. To creating a Greeting card, create background picture.
2. Text effects, photo effects.
3. Colors, Buttons.
4. Editing Images.
5. Designing Webpage.

List of Practical in DREAMWEAVER:

1. Text Management.
2. Tables – Layers.
3. Creating Menu bar.
4. Creating pages and Sites.
5. Animation in Images.

Course Title: Numerical Methods-I

Course	B Sc(Maths with CA)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objectives

- **To solve practical technical problems using various numerical method formulas,**
- **To identify the different types of polynomials**
- **To derive appropriate numerical methods to solve algebraic, transcendental equations and linear system of equations**
- **To approximate a function using various interpolation techniques and solve numerically linear system of equations.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Restate the principal of least curves • Solve the problems of fitting of straight lines, parabolas • Solve the problems of the different form of exponential curves
CO2	• Solve algebraic equations using various methods like Bisection method, Iteration method, RegulaFalsi method and Newton – Raphson method
CO3	• Estimate the solution of simultaneous linear equations using direct methods : Gauss-elimination method , Gauss –Jordan method and Crout's method • Estimate the solution of simultaneous linear equations using Iterative method :Gauss-Siedel
CO4	• Define basic concept of operators $\Delta, \nabla and E$. • Differentiate the factorial polynomial • Solving interpolation with equal intervals problems usingGregory Newton's forward formula and Newton's backward formula • Estimate the missing value for the equidistant terms
CO5	• Explain the operators $\mu, \delta$and relation with the operator • Estimate the solution of central difference formula using the methods Gauss's forward, backward formula, Stirling's formula, Bessel's formula and Laplace Everett formula.

COs	CONTENTS OF MODULE	
CO1	**UNIT I: Curve Fitting- Principle of Least curves –** Fitting of straight line, parabola, exponentialcurves of forms y = aebx , b y = ax , x y = ab .	**K2, K3**
CO2	**UNIT-II :Solutions of algebraic and transcendental equations** – Bisection method, Iterationmethod, Regulafalsi method and Newton-Raphson's method .	K2,**K3**
CO3	**UNIT-III: Solution of Simultaneous linear equations** – Direct methods -Gauss-elimination method, Gauss-Jordan method and Crout's method. Iterative method– Gauss Siedelmethod.	**K2, K3**
CO4	**UNIT-IV : Finite differences** – Operators D,Ñ and *E* - relation between them — factorial polynomials. **Interpolation with equal intervals** – Gregory-Newton forward and backward interpolation formulas. Equidistant terms with one or more missing values..	**K1,K3,K4**
CO5	**UNIT-V: Central differences formulae** – Operators μ, δ and relation with the other operators. Gauss forward and backward formulae, Stirling'sformula , Bessel's formula and Laplace Everett formula.	**K1,K3**

Recommended Text Book:
P. Kandasamy& K. Thilagavathy, Numerical Methods, S.Chand& Co.

Reference Books:
1.*M.K.Venkataraman,* Numerical Methods, National publishers.
2.*Arumugam,*Numerical Methods, Scitech publishers.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**H**	**M**	**S**	**H**	**H**
CO2	**S**	**S**	**M**	**M**	**H**	**H**	**M**
CO3	**S**	**S**	**M**	**M**	**H**	**H**	**M**
CO4	**H**	**H**	**S**	**S**	**H**	**H**	**H**
CO5	**S**	**S**	**S**	**S**	**H**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Vector Calculus, Analytical Geometry Of Three Dimensions

Course	B Sc(Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course Objectives

- To exhibit in depth the analytical and critical thinking
- To identify, formulate and solve real world problems.
- To demonstrate properties like gradient, divergence, curl associated with derivatives of vector point functions and integrals of vector point functions
- To develop the mathematical knowledge in evaluating multiple integrals and their usage also vector differential calculus and vector integral calculus.

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Restate Gradient, Curl and Divergent • Solve the problems of directional derivatives • Solve the problems of unit normal to the surface
CO2	• Define line ,surface and volume • Estimate the integration using Gauss, Stoke's, Green's theorems
CO3	• Restate general equation of plane • Estimate the equation of a plane passing through three points • Solve the problem of intercept form and normal form • Explain angle between two planes • Distinguish between condition of perpendicularityand parallelism • Demonstrate the equations from perpendicular distance form a point to a give plane, equation of plane pausing through the line of interchange of two planes. • Solve problems on ratio in which the plane divides the line joining the two points.
CO4	• Define general equation of the straight line, Symmetric, transformation. • Explain angle between plane and line. • Identify conditions of a line • Solve problems on parallel to the plane and two lie a plane • Classify coplanar lines, intersection of two given, skew lines and short distance between the lines.
CO5	• Define equation of the sphere, section of the sphere by a plane. • Demonstrate an equation of a circle, equation of a sphere passing through a given circle. • Explain intersection of two sphere, Orthogonal sphere and Identify condition for Orthogonality • Distinguish equation of the tangent two spheres, length of a tangent.

COs	CONTENTS OF MODULE	
CO1	**UNIT I:Vector differentiation** – gradient – divergence – curl – directional derivative – unit normal to the surface – simple problems.	**K2, K3**
CO2	**Unit II: Vector Integration** – Line, surface, volume Integrals – Verification of Gauss, Stoke'sand Green's theorems (without poof) – simple problems.	K**2**,**K3**
CO3	**Unit III: Plane** – General equation of a plane – equation of a plane passing through three points –coplanar plane – intercept form – normal form – angle between two planes – condition ofperpendicularity and parallelism – perpendicular distance form a point to a given plane –equation of a plane passing through the line of intersection of two planes – ratio in whichthe plane divides the line joining the two points – simple problems.	**K2, K3**
CO4	**Unit IV: Straight line** – General equation of a straight line – symmetric form – transformation –angle between a plane and a line – conditions of a line – parallel to a plane and to lie in aplane – coplanar lines – Intersection of two given lines – skew lines – shortest distancebetween the lines – simple problems	**K3,K4**
CO5	**Unit V:Sphere** – Equation of a sphere – section of a sphere by a plane – equation of a circle –equation of a sphere passing through a given circle – Intersection of two spheres – equation of the tangent to a sphere – length of a tangent – orthogonal spheres – conditionfororthogonality – simple problems.	**K1,K3**

Recommended Textbook :

1. *P. Duraipandian, LaxmiDuraipandian,* Vector Analysis,EmeraldPublishers,Chennai.(Units I & II)
2. *P. Duraipandian, LaxmiDuraipandian D. Muhilan,* Analytical Geometry 3 Dimensions,Emerald Publishers, Chennai.(Unit III,IV,V)

Reference Books:

1. *Dr. P.R.Vittal,*Vector Calculus and Coordinate geometry, Margham Publishers.
2.*M.K.Venkataraman,* Vector Calculus and Coordinate geometry, National publishers.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**M**	**M**	**S**	**H**	**H**	**H**
CO2	**S**	**S**	**M**	**M**	**H**	**H**	**H**
CO3	**S**	**S**	**S**	**S**	**H**	**H**	**M**
CO4	**H**	**S**	**S**	**S**	**H**	**H**	**M**
CO5	**S**	**M**	**S**	**S**	**H**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Transforms and Fourier series

Course Code	B Sc(Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course objectives

- **To demonstrate the application of Fourier series and transforms in various fields.**
- **To develop the proficiency in problem solving.**
- **To have an insight into Fourier series, Inverse Laplace transform, Laplace transforms and Inverse Fourier transforms.**

Course outcomes: At the end of the course, the student will be able to

CO1	• Use Laplace transform and Inverse Laplace transform in solving differential equations with constant coefficients. • Differentiate between Laplace transform and Inverse Laplace transform • Demonstrate the concept of Laplace transform and Inverse Laplace transform by giving examples and classify it
CO2	• Demonstrate the Fourier series to study the behaviour of Periodic functions and their applications. • Evaluate the problems in Fourier series using periodic functions.
CO3	• Categorize Even and odd functions and Classify half range Fourier series.
CO4	• Understand Fourier Integral theorem and evaluate problems under Integrals using the theorem.
CO5	• Analyze and understand infinite Fourier transforms and its inversion properties using convolution and Parsevals identity for Fourier transforms. • Evaluate integrals using sine and cosine transforms.

COs	CONTENTS OF MODULE	
CO1	**Unit1**: **Laplace transforms:** Laplace transforms of standard functions- Laplace transform of $e^{-at}f(t)$, $tf(t)$, $\frac{f(t)}{t}$, $\int_0^t f(x)dx$ - Inverse Laplace transform-Solving first and second order linear differential equations with constant coefficients.	K2,K3,K4
CO2	**Unit2: Fourier series:**Expansion of function of period 2π in Fourier series in the intervals$(0, 2\pi)$:$(-\pi, \pi)$.	K3,K5
CO3	**Unit3: Fourier series:**Expansion of even and odd functions in Fourier series in the interval$(-\pi, \pi)$:half range series in $(0,\pi)$.	K2,K4
CO4	**Unit4: Fourier Integral :**Fourier Integral theorem (Statement only). Fourier Integral, Sine and Cosine Integral and application and evaluation of Integrals using them.	K2,K5

CO5	**Unit5: FourierTransform: Infinite Fourier Transform** (Complex form) and its inversion, properties, convolution theorem andParseval's identity for fourier transforms. Sine and Cosine transforms and evaluation of Integrals using it.	K1,K4 ,K5

Recommended Text Book:

M.K.Venkataraman, Engineering Mathematics Volume3A, 3B, NationalPublishing Company.

Reference Books:

1.*P.Kandasamy*, Engineering Mathematics II and III, S Chand and Co.

2. *A.Singaravelu,* Engineering Mathematics II and III, Meenakshi Agency.

Mapping of course outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**S**	**S**	**S**	**S**	**S**
CO2	**M**	**H**	**H**	**M**	**S**	**M**	**M**
CO3	**S**	**M**	**S**	**H**	**M**	**S**	**H**
CO4	**H**	**H**	**S**	**H**	**S**	**H**	**M**
CO5	**S**	**H**	**M**	**M**	**H**	**S**	**H**

S-Strong H-High M-Medium L-Low

Course Title: Programming in Java Theory

Course Code	B Sc(Maths with CA)
Exam Hours	03

Credits	03
CIA Marks	40
ESE Marks	60

Course Objectives

- **To get in-depth Knowledge about the evolution of java and its Features**
- **Bring out the difference and similarities between C,C++ and java.**
- **Develop programmers in Java with its special Features.**
- **Implementing the code in internet using Applet with AWT controls**

Course outcomes: At the end of course,the student will be able to

CO1	• Explain the reason about the evolution of Java its development. • Recall the basic of Java and to develop code. • Summarize the importance of Java comparing the other language.
CO2	• Develop program using fields, methods and its types. • Categorize different types of decision making and branching. • Explain different types of looping.
CO3	• Explain the concept of interface, threads. • Sketch the concept Exception handling in various application. • Judge the significance of exception handling. • Define Life cycle of thread.Recall the definition of inheritance and Writing programme related to it.
CO4	• Usage of Java in internet • Definition of Applet and Developing code to connect to internet. • Demonstrate Life Build Applet code using AWT controls.
CO5	• Explain I/O streams. • Create file using Byte Stream and character Stream classes.

COs	CONTENT OF MODULE	
CO1	**UNIT – I :** Introduction to Java Programming - Features of Java – Java Support Systems – Java Environment – Java Program Structure - Java Tokens –Java Statements – Java Virtual Machine (JVM) – Constants - Variables - Data Types.	**K1, K2**
CO2	**UNIT – II:** Operators and Expressions – Decision making and branching – Decision making and looping. Classes and Objects – Defining a class – Fields and Methods Declaration – Member accessing - Method Overloading.	**K2, K4**
CO3	**UNIT – II:** Inheritance: Extending a class – Overriding methods – Final variables and methods – Final Class – Finalizer methods – Abstract methods and classes. Interfaces – Defining and	**K1, K2, K3, K5**

	extending interfaces – Threads – Life cycle of a thread – Creating threads – Using thread methods – Synchronization. Exception Handling – Types of errors and exceptions – Catch and Finally statements.	
CO4	**UNIT – IV:** Applets – Applet life cycle – Building Applet Code - The HTML Applet tag – Passing parameters to Applets. Graphics Programming–Graphics Class – Drawing Various shapes – Introduction to AWT Controls.	**K1, K3**
CO5	**UNIT – V:**Concept of Streams - Stream classes – Using Streams – Using File class –Creation of file – Reading or writing characters and bytes.	**K2**

Recommended Text Book:
E. Balagurusamy, Programming with Java – A Primer, TMH Publications.

Reference Book:
Herb Schildts, Java Programming, Cookbook.

Mapping of Course Outcomes to Program SpecificOutcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**M**	**M**	**M**	**M**	**S**	**S**	**S**
CO2	**M**	**M**	**M**	**M**	**S**	**S**	**S**
CO3	**H**	**M**	**M**	**H**	**S**	**S**	**S**
CO4	**H**	**M**	**M**	**M**	**S**	**S**	**S**
CO5	**M**	**M**	**M**	**M**	**S**	**S**	**S**

S-Strong H-High M-Medium L-Low

Course Title: Programming In Java Practicals

Course	B Sc(Maths with CA)
Exam Hours	03

Credits	02
CIA Marks	40
ESE Marks	60

1. Write a Java Program to perform all the arithmetic operations using switch statement.
2. Define a class Circle and find out the area and circumference of a circle.[Use overloaded Constructors and static constant value of PI]
3. Write a Java Applications to extract a portion of a character string and print theextracted string.
4. Write a Java Program to arrange the set of names in Alphabetical order using StringHandling Functions.
5. Write a Java Program to implement the concept of multiple inheritance usingInterfaces.
6. Write Java Program to handle the following Exceptions:
   i. DivideByZeroException
   ii. ArrayIndexOutOfBoundsException
   iii. NumberFormatException
7. Write a Java Program for Multithreading:
   a. Create a Thread using Thread class
   b. Create a Thread using Runnable Interface
8. Create an applet containing three buttons labeled red, green and blue. Depending onthe button pressed, the background color of the applet should be changed.
9. Write a Java Program to draw basic shapes.
10. Write a Java Program to copy the characters from one file in to another File.
11. Write a Java Program to create an applet with three text fields for name, age andqualification and a text field for multiple lines for address.

Course Title: Numerical Methods-II

Course Code	B Sc(Maths with CA)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course objectives

- **To increase the span of attention of concepts**
- **To link concepts related to one unit with other units**
- **Give clarity on the intended learning outcomes of the unit.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Define interpolation and extrapolation. • Use the Newton's divided difference formula and Lagrange's formulas for interpolation. • Construct a polynomial passing through the (n+1) points.
CO2	• Explain the definitions of Newton's forwards, backward, divided difference and Stirling's formula for numerical differentiation. • Prepare the first order second order derivatives from a set of tabulated values. • Point out the extreme values of model real time problems.
CO3	• Demonstrate a definite integral numerically. • Summarize the concept of Trapezoidal, Simpson's (1/3), Simpson's (3/8) and Weddle's rules. • Compute definite integral from a set of tabulated values by varies numerical integration methods.
CO4	• Identify linear homogeneous and non-homogeneous difference equations. • Distinguish difference equation and differential equation. • Formulate first and second order difference equations. • Solve first and second order difference equations.
CO5	• Explain Taylor's series, Euler's method, Modified Euler's method Runge-Kutta method. • Solve first order differential equation by various numerical methods. • Point out the importance of Milne's and Adams-Bashforth Predictor-corrector methods.

COs	CONTENTS OF MODULE	
CO1	**Unit I: Interpolation with Unequal intervals** – Divided differences and Newton's divided differences formula for interpolation and Lagrange's formula for interpolation – Inverse interpolation – Lagrange's method.	**K1, K3**
CO2	**UNIT-II: Numerical differentiation –** Derivatives using Newton's forward	**K2, K3, K4**

	and backward difference formulae, Derivatives using Stirling's formula, Derivative using divided difference formula, Maxima and Minima using the above formulae.	
CO3	**UNIT-III:Numerical integration –** General quadrature formula, Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Weddle's rule.	**K3, K2, K3**
CO4	**UNIT-IV:Difference equations –** Linear homogenous and non-homogeneous difference equation with constant coefficients, particular integrals for a^x, x^m, sin kx, coskx, $a^x x^m$.	**K1, K4, K3**
CO5	**UNIT-V:Numerical solution of ordinary differential equation (first order only),** Taylor's series method, Euler's method, Modified Euler's method Runge-Kutta method fourth order only. Predictor-corrector method – Milne's method and Adams-Bashforth method.	**K2, K3, K4**

Recommended Text Book:

P. Kandasamy& K. Thilagavathy, Numerical Methods, S. Chand & Co.

Chapter 1	**Sections 1.1 to 1.77**
Chapter 2	**Sections 2.1 to 2.83**
Chapter 3	**Sections 3.1 to 3.55**
Chapter 4	**Sections 4.1 to 4.72**
Chapter 5	**Section 5.1 to 5.101**

Reference Books:

1. *M.K. Venkataraman,* Numerical Methods, National Publishers.
2. *Arumugam*, Numerical Methods, SciTech Publishers.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**H**	**S**	**S**	**H**	**M**	**H**	**H**
CO2	**M**	**S**	**S**	**M**	**M**	**M**	**M**
CO3	**M**	**H**	**H**	**M**	**H**	**H**	**M**
CO4	**M**	**S**	**H**	**M**	**M**	**H**	**H**
CO5	**H**	**S**	**H**	**M**	**M**	**M**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Algebraic Structures

Course	B Sc(Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course Objectives

- **To demonstrate understanding of the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.**
- **To produce rigorous proofs of propositions arising in the context of abstract algebra**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Summarize the structure of Group, Subgroups. • Demonstrate operations satisfying various properties in group structure • Explain Lagrange's Theorem and its consequences.
CO2	• Classify and demonstrate examples of subgroups, normal subgroups and quotient groups • Summarize thepropertiesof cyclic subgroups of a group. • Explain Isomorphism and homomorphism of Groups.
CO3	• Explain the notion of permutations and operations on them • Summarize Cayley's theorem • ClassifyInnerautomorphism and their properties
CO4	• Define Rings, Integral Domains, Fields and Divisors of Zero. • Classify Quotient Rings, Ideals and their existence with examples • Demonstrate the characteristics of a ring, quotient rings and ideals • Explain Homomorphism and Isomorphism of Rings
CO5	• Classify the different types of Ideals and their properties. • Illustrate Imbedding of Integral domain over Field • Identify Euclidean Rings and investigate their properties.

COs	CONTENTS OF MODULE	
CO1	**UNIT 1:Groups** – Definition and examples of Groups – Some Preliminaries Lemmas – Subgroups– Lagrange's theorem.	**K2, K3**
CO2	**UNIT II:** A counting Principle, Normal Subgroups and Quotient Groups, Homomorphism (Omit applications 1 & 2)	**K2, K3**
CO3	**UNIT III:** Automorphism, Cayley's theorem, Permutation Groups.	**K2, K3**
CO4	**UNIT IV:** Ring Theory: Definition and examples of rings – Some special classes of rings - Homomorphism of rings – Ideals and Quotient rings.	**K1, K3**
CO5	**UNIT V** : More Ideals and Quotient rings – The field of Quotient of an Integral Domain – Euclidean rings – A particular Euclidean rings	**K1,K2, K3 K4**

Recommended Text Book:

I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd.

UNITS	CHAPTERS
I	Chapter 2 Section 2.1 to 2.4
II	Chapter 2 Section 2.5 to 2.7
III	Chapter 2 Section2.8 to 2.10
IV	Chapter 3 Section3.1 to 3.4
V	Chapter 3 Section3.5 to 3.8

Reference Books:

1. *A.R.Vasishtha*, Modern Algebra, KrishnaPrakashanMandir, Meerut.
2. *S. Arumugam and A.ThangapandiIssac*, Modern Algebra, New Gamma Publishing.
3. *Surjeet Singh and QaziZameeruddin*, Modern Algebra, Vikas Publishing House

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	H	H	S	H	S	S
CO2	H	H	H	S	H	M	H
CO3	H	M	H	H	H	M	M
CO4	H	H	H	S	M	H	M
CO5	H	H	H	S	M	M	H

S - Strong H – High M – Medium L – Low

Course Title: Real Analysis

Course	B Sc (Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course Objective

- **To make the students capable of analyzing any given sequence and series.**
- **To calculate limit superior, limit inferior and the limit of a sequence.**
- **To learn certain proof techniques and write precise proof of theorems**
- **To recognise alternating, conditionally convergent and absolutely convergent series.**

Course Outcomes: After completion of this course, students will be able to

CO1	• Describe the fundamental properties of the real numbers that lead to the formal development of real analysis. • Define and recognize the basic properties of the field of real numbers. • Identify the cardinality of a sets.
CO2	• Demonstrate an understanding of limits and how that are used in sequences. • Explain the basic principles of the convergence of a sequence. • List the condition(s) of convergent and divergent of a sequence.
CO3	• Identify the limit superior and limit inferior of a sequence. • Recall the Cauchy definition of a sequence.
CO4	• Construct rigorous mathematical proofs of convergence test of a sequence. • Distinguish between conditional convergence and absolute convergence.
CO5	• Define the Euclidian distance function and explain the geometric meaning of each of the metric space properties. • Demonstrate whether a given distance function is a metric. • Point out the value of a limit of a function at a point using definition

COs	CONTENTS OF MODULE	
CO1	**Unit I:** Sets and Functions: Functions, real valued functions, equivalence, countability, real Numbers, least upper bounds.	**K2, K3**
CO2	**Unit II :**Sequences of Real numbers: Sequence and subsequence- definition, limit of a Sequence, convergent sequences, bounded sequences and monotone sequences. Operations on convergent sequences.	**K2, K4**
CO3	**Unit III:** Sequences and Series of real numbers: Limit Superior and Limit Inferior, Cauchy sequences, convergence and divergence of a series of real numbers, series with non- negative terms.	**K2, K3**

CO4	**Unit IV :**Series of Real Numbers: Alternating series, conditional convergence and absolute convergence and test for absolute convergence. Series whose terms form a non-increasing sequence.	**K4, K5**
CO5	**Unit V:** Continuous functions and metric spaces: Limit of a function on the real line, metric spaces ($l^2$and l^∞ spaces to be omitted from example of a metric space) limits in metric spaces, functions continuous at a point on the real line, Reformulation	**K2, K4, K5**

Recommended Text Book:

Richard R. Goldberg, Methods of Real Analysis, Oxford and IBH Publishing Co.

Chapter 1	Sections – 1.3 to 1.7.
Chapter 2	Sections – 2.1 to 2.3, 2.5 to 2.7, 2.9 to 2.10
Chapter 3	Sections – 3.1 to 3.4, 3.6 to 3.7.
Chapter 4:	Sections - 4.1 to 4.3
Chapter 5:	Section 5.1 to 5.2

Reference Books:

1. *S.L. Gupta and Nisha Rani*, Principles of Real Analysis, Vikas Publishing House Pvt.Ltd. 1994.
2. *K. Chandrasekhara Rao and K.S. Narayanan,* Real Analysis, Volume I &II,*S.*ViswanathanPrinters& Publishers Pvt. Ltd. 2008.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**H**	**S**	**S**	**M**	**H**	**S**	**M**
CO2	**S**	**S**	**S**	**H**	**H**	**H**	**M**
CO3	**H**	**H**	**H**	**M**	**H**	**S**	**M**
CO4	**H**	**H**	**S**	**S**	**S**	**H**	**M**
CO5	**S**	**S**	**S**	**H**	**S**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Discrete Mathematics

Course	B Sc (Maths with CA)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objectives

- **To summarize the notion of mathematical thinking and algorithmic thinking.**
- **To write and evaluate a proof or outline the basic structure of and give examples.**
- **To define how graph serve as models for many standard problems by classifying as graphs, trees, Euler graph, cut set.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Explain the definition of Mathematical logic and analyze statements using truth tables • Differentiate between conjunction and disjunction, conditional and bi-conditional statements • Formulate an argument using logical notation and determine if the argument is or is not valid
CO2	• Distinguish between NAND, NOR and Normal forms. • Construct simple mathematical proofs and possess the ability to verify them.
CO3	• To solve recursive functions in a formal mathematical manner. • Classify the algorithm for solving finite order homogeneous and non-homogeneous finite linear relation. • Develop problem-solving skills using logical thinking.
CO4	• Solve problems on generating functions for recurrence relations • Illustrate different types of graphs and explain some definitions and basic theorems. • Indicate the concept of degree sequences, Graph isomorphism and operations on graphs.
CO5	• Apply graph theory based tools in solving practical problems. • Describe Kruskal's and Prim's algorithm in finding minimum weight spanning tree • Restate the definitions and simple examples of Eulerian and Hamiltonian graphs

COs	CONTENTS OF MODULE	
CO1	**UNIT I: Mathematical Logic:** Connectives-Conjunction-Disjunction-Negation-Conditional and Biconditional-Tautology and Contradiction	**K2, K4**

CO2	**UNIT-II :** NAND, NOR, Properties, Principal disjunctive normal form (PDNF)-Principle conjunctive normal form(PCNF)	**K4**
CO3	**UNIT-III: Recurrence relations –** Recursive definition of polynomial – solution of finite order homogeneous linear relations – Solution of non-homogeneous finite linear relation-simple problems	**K3, K4**
CO4	**UNIT-IV :Generating Functions –**solving generating functions for recurrence relations **Graph Theory:** Types of graph-sub graph-spanning and induced sub graph-Graph isomorphism-degree sequence	**K2,K3**
CO5	**UNIT-V: Connectedness –**Walk,trail,path, connectivity, cut vertex, bridge, block, Matrix representation of graphs, Dijkstra's algorithm. **Tree**- Tree, Kruskal's and Prim's algorithm for minimum weight spanning tree-**Eulerian and Hamiltonian graphs** –Definitions and examples.	**K1,K2, K3**

Recommended Text Book:

S.P. Rajagopalan, R. Sattanathan, Discrete Mathematics, MarghamPublicationsReprint 2011.

Units	**Chapter**
Unit1	**6(6.1 to 6.13)(6.33 to 6.40)**
Unit2	**6(6.19 to 6.31)**
Unit3	**3**
Unit4	**4,16**
Unit5	**17,18,19.**

Reference Books:

M.K. Venkataraman, N. Sridharan, N. Chandrasekaran, Discrete Mathematics– National Publishing company, Chennai

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**S**	**S**	**M**	**M**	**H**	**H**	**H**
CO2	**S**	**H**	**S**	**M**	**S**	**H**	**M**
CO3	**H**	**H**	**S**	**M**	**S**	**S**	**H**
CO4	**S**	**S**	**H**	**H**	**H**	**H**	**M**
CO5	**S**	**S**	**H**	**H**	**H**	**H**	**M**

S - Strong H – High M – Medium L - Low

Course Title: Operations Research –I

Course	B Sc (Maths with CA)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objectives

- **To improve capabilities in the students for understanding and analyzing different kind of situations in the real-world**
- **To involve limited resources and find the optimal solution within the constraints.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Formulate the linear programming model. • Express in Standard form and canonical form for given LPP • Identify the feasible solution and optimal solution by using Simplex Method and graphical Method. • Explain the application of linear programming.
CO2	• Define artificial variable. • Explain primal and dual variable. • Distinguish between primal and dual variable. • Express primal into dual and vice versa. • Apply dual simplex method to solve LPP.
CO3	• Explain transportation model. • Interpret the initial basic feasible solution such as row minima, column minima, Vogel's approximation method, least cost method, Northwest corner rule. • Describe the algorithm of getting optimal solution.
CO4	• Explain Assignment problem. • Define mathematical formulation. • Explain the procedure of getting optimal solution. • Solve the application of assignment model.
CO5	• Interpret Queuing Models. • Define and explain the concepts of queuing system. • Calculate the traffic intensity and utilization factor of queuing system. • Explain birth and death process, M/M/1 model, M/M/S model and apply this models.

COs	CONTENTS OF MODULE	
CO1	**Unit I: Linear programming** – Formulation – Graphical solution – Simplex method – Simpleapplications.	**K1,K3**
CO2	**Unit II: Linear programming** - Big-M method – Principle of Duality – Primal – Dual relation -Dual simplex method – Simple applications.	**K1,K2,K3,K5**
CO3	**Unit III:Transportation Problem**: Finding initial solution by North West Corner Rule – Vogel'sApproximation method and Matrix minimum method – Procedure for finding optimalsolution – Both minimisation and maximisation cases – Unbalanced and degeneratetransportation problems.	**K1,K2,K3,K4**
CO4	**Unit IV: Assignment Problem**: Formulation – Minimisation cases – procedure for gettingoptimum solution – Unbalanced problem – Maximisation problem – Problems withrestrictions.	**K1,K2,K3,K4**
CO5	**Unit V:Queueing Models**: Basic concepts – States of Queueing system – Steady state analysis of(M/M/1) : (_∞/FCFS) (Birth-death model), (M/M/1) : (∞_/FCFS) (General ErlangQueuingModel), (M/M/1) : (N/FCFS), (M/M/S) : (∞_/FCFS) Derivations only for the abovemodels and Simple applications.	**K2,K3**

Recommended Text Book:

P.K. Gupta and D. S. Hira, Operations Research, S. Chand & Co.

Reference Books:

1. *KanthiSwaroop, P.K. Gupta,Manmohan,*Operations Research –Sultan Chand & sons.
2. *H.A. Taha,* Operations Research Prentice Hall of India, New Delhi
3. *Sundaresan, Ganapathy Subramanian, Ganesan.*,Resource Management Technique – Meenakshi Agency.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**H**	**M**	**S**	**H**	**S**
CO2	**H**	**S**	**S**	**M**	**S**	**H**	**H**
CO3	**H**	**S**	**S**	**M**	**S**	**H**	**S**
CO4	**S**	**S**	**S**	**M**	**S**	**H**	**M**
CO5	**S**	**S**	**S**	**M**	**S**	**H**	**S**

S - Strong H – High M – Medium L – Low

Course Title: Web Technology Theory

Course	B Sc (Maths with CA)
Exam Hours	03

Credits	03
CIA Marks	40
ESE Marks	60

Course Objectives

- **Explain the history of World Wide Web and their related concepts that are vital in understanding Web development.**
- **Demonstrate the important HTML tags for designing web pages and separate design from content using Cascading Style Sheet.**
- **Design an Interactive website using JavaScript language by implementing their functions.**

Course Outcome: At the end of the course,the Student will be able to

CO1	• Define the common Web terms and qualify its characteristics in terms of design, writing and management. • Illustrate the concept of registering web pages. • Classify the different strategies for searching data on web and summarize their working. • Subdivide and explain the different types of Computer Viruses and the ways to prevent it.
CO2	• Demonstrate the concept of setting the document structure in HTML. • Differentiate the ways of formatting text using HTML tags. • Explain the process of creating hyperlinks and anchors. • Point out the considerations involved on applying Cascading style sheet in HTML script.
CO3	• Judge and classify on inserting Graphics and selecting different graphics format. • Organize the ways of creating navigational aids. • Explain the process of creating and formatting tables in HTML.
CO4	• Utilize the concept of JavaScript and their advantages. • Categorize the different types of Operators and Control Structures in JavaScript with examples. • Identify the characteristics of function and demonstrate the concept of recursion.
CO5	• Declare the concept of array and explain the process of passing arrays to functions. • Explain the process of sorting arrays and summarize the need of sorting. • Recognize and implement the different types of objects and outline their functions.

COs	CONTENTS OF MODULE	
CO1	**UNIT-I:** World Wide Web: Introduction the Web defined-Web Browser details-Web writing styles-Web presentation Outline, design and management-Registering Web pages. Searching the World Wide Web: Introduction- directories, Search engines and Meta-search engines. Search Fundamentals-Search strategies-how does a search engine works. Telnet and FTP:Introduction-Telnet and Remote login-File Transfer-Computer Viruses.	**K1,K2**
CO2	**UNIT-II:** HTML Basics:Understanding HTML-Setting up the Document Structure-Formatting Text by Using tags-Using Lists and Backgrounds-Creating Hyperlinks and Anchors. Style Sheets and Graphics: Introduction to Style Sheets.	**K2,K3**
CO3	**UNIT-III:**Graphics: Selecting a Graphics Format-Preparing Graphics for Web Use-Inserting Graphics-Arranging Elements on the Page-Controlling Image Size and Padding. Hyper linking from Graphics-Utilizing Thumbnail Graphics-Including Alternate Text for Graphics Navigation: Creating Text for Graphics-Navigation : Creating Navigational Aids-Creating Tables-Formatting Tables.	**K3,K4,K5**
CO4	**UNIT-IV:**JavaScript:Introduction to Scripting- Operators: Logical-Increment and Decrement operators-Control Structures-Functions: Definition-scope rules-Recursion.	**K3,K4,K5**
CO5	**UNIT V:**Arrays: Declaring Arrays-Passing Arrays to functions –Sorting Arrays-Object : Math Object-String Object-Date Object-Boolean Object and Number Object.	**K4,K5**

Recommended Text Book:

3. *FaitheWempen,*Microsoft Step by Step-HTML AND XH, Prentice Hall of India Private Limited, New Delhi,2006.
4. *C.Xavier*, World Wide Web Design with HTML, TMH 2007.
5. *Deitel, Nieto, Lin,Sadhu*, XML How to Program, Pearson Education,2001.

Mapping Of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**H**	**S**	**M**	**H**	**S**	**S**
CO2	**S**	**S**	**S**	**H**	**H**	**H**	**S**
CO3	**S**	**M**	**M**	**M**	**H**	**H**	**S**
CO4	**S**	**S**	**M**	**S**	**H**	**M**	**S**
CO5	**S**	**M**	**S**	**M**	**S**	**S**	**S**

S-Strong H-High M-MediumL-Low

Course Title: Web Technology Practical

Course	B Sc (Maths with CA)
Exam Hours	03

Credits	02
CIA Marks	40
ESE Marks	60

1. Create a simple page introducing yourself how old you are, what you do, what you like and dislike. Modify the introduction to include a bullet list of what you do and put list the 5 things you like most and dislike as numbered lists. Create another page about your favorite hobby and link it to (and from) your main page. Center something, and put a quote on one of your pages.

2. Put an existing image on a web page. Create a table, use a heading and at least one use of row span/col. span. Color a page and some text within the page. Link to another site.

3. Create a new file called index. html.

   - Put the normal HTML document structure tags in the file.
   - Give it a title.
   - At the bottom of the page (i.e. the last thing between the body tags) put the following:
     - A horizontal rule.
     - A Link to your e-mail Address (With your name between the tag); remember to put the link to your E- Mail address within address tags.
     - A line break.
     - The date. (I have this same structure at the bottom of this page).
     - Above this block (which is called the footer), put a title in heading tags.
     - Add some text describing yourself (you can split this into multiple headings and Paragraphs if you wish).

4. Write a script to create an array of 10 elements and display its contents.

5. Write a function in Java script that takes a string and looks at it character by character.

6. Create a simple calculator using form fields. Have two fields for number entry & one field for the result. Allow the user to be able to use plus, minus, multiply and divide.

7. Create a document and add a link to it. When the user moves the mouse over the link, it should load the linked document on it's own. (User is not required to click on the link).

8. Create a document, which opens a new window without a toolbar, address bar or a status bar that unloads itself after one minute.

Course Title: Linear Algebra

Course	B Sc (Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course Objectives

- **To demonstrate understanding of the relationships between abstract structures with familiar numbers systems such as the integers and real numbers.**
- **To produce rigorous proofs of propositions arising in the context of Linear algebra**
- **To recognise and use the properties of Polynomial Rings, Vector Spaces, Inner product spaces and Linear Transformations.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Define Polynomial rings over a field F[x]. Demonstrate that F[x] is a Euclidean Ring and is a PID. • Describe Polynomial Rings over Commutative Rings ie R[x], Relate the properties of R[x] with that of R and hence **Conclude** that if R is a UFD then so is R[x]. • Explain Eisenstein Criteria for irreducibility of Polynomials and apply the same to investigate the irreducibility of given polynomials.
CO2	• Quote an axiomatic description of an abstract vector space • Define the terms span, linear independence, basis, dimension, and Discuss their properties andapply these concepts to various vector spaces and subspaces • Compute Basis and Dimension of Vector Spaces in R^n.
CO3	• Summarize Vector Space Homomorphismsand Annihilator. Demonstrate that Hom (V, W) is the dual space for a given vector space V. • Define Norm andOrthogonality of vectors and Innner Product Space. • Discuss orthogonal and orthonormal basis • Explain the Gram-Schmidt Orthogonilization process, and **Construct** orthogonal and orthonormal basis for a given basis.
CO4	• Define Algebra over F. Indicate that Hom (V,V) is an Algebra over F. • **Outline** the properties of Invertible Linear transformations • Discuss the Kernel and Range of linear transformations andComputerank nullity of associated vector spaces. • Discuss Characteristic Roots and Characteristic Vectors of Linear Transformations in A(V).
CO5	• Associate Linear Transformations with matrices and represent them using matrix. • Demonstrate than F_n the set of all nxn matrices forms an Associative Algebra over F and hence concludethatA(V) and F_n are isomorphic as algebras over F. • Describe matrix of a transformation for a given basis and Demonstrate similarity transformation using Triangular forms.

COs	CONTENTS OF MODULE	
CO1	**UNIT 1 :**Polynomial Rings – Polynomial over the rational field, Polynomial rings over commutative rings.	**K1, K2, K3, K5**
CO2	**UNIT II:** Vector Spaces: Definition and examples, Linear dependence and independence – Basis.	**K1, K2, K3**
CO3	**UNIT III:** Dual spaces, Inner product spaces.	**K1, K2, K3,**
CO4	**UNIT IV:** Linear Transformations: Algebra of linear transformations, Characteristic roots.	**K1, K2, K3,K4**
CO5	**UNIT V** : Matrices of linear transformations, Canonical forms, triangular forms.	**K1, K2, K3, K5.**

Recommended Text Book:

I.N. Herstein, Topics In Algebra, Wiley Eastern Ltd.

UNITS	CHAPTERS
I	**Chapter 3 Section 3.9 to 3.11**
II	**Chapter 4 Section 4.1 to 4.2**
III	**Chapter 4 Section 4.3 to 4.4**
IV	**Chapter 6 Section 6.1 to 6.2**
V	**Chapter 6 Section 6.3 to 6.4**

Reference Books:

1. *A.R.Vasishtha,*Modern Algebra, KrishnaPrakashan,Mandir, Meerut.
2. *S. Arumugam and A.ThangapandiIssac* Modern Algebra, New Gamma Publishing.
3. *Surjeet Singh and QaziZameeruddin,*Modern Algebra, Vikas Publishing house

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**H**	**H**	**H**	**S**	**H**	**S**	**S**
CO2	**H**	**H**	**H**	**S**	**H**	**H**	**H**
CO3	**H**	**H**	**H**	**S**	**H**	**S**	**M**
CO4	**H**	**H**	**H**	**S**	**M**	**H**	**H**
CO5	**H**	**H**	**H**	**S**	**M**	**M**	**H**

S - Strong H – High M – Medium L - Low

Course Title: Complex Analysis

Course	B Sc (Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course Objectives

- **This course restates concept of analyticity, Cauchy Riemann relation and harmonic functions are then introduced.**
- **Cauchy's Integral theorem are used to evaluate the line integral.**
- **Explain derivatives of analytic function and few important theorem.**
- **Express a function as various series, classify poles and zeros of a function and use its residues to evaluate the improper real integrals.**
- **To describe mapping of linear and bilinear transformation create transformation and discuss transformation.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Judge Analytic function and harmonic function and its properties. • Design analytic function. • Derive Cauchy Riemann equation • Derive Cauchy Riemann equation in polar form.
CO2	• Illustrate Cauchy's Integral theorem. • Restate derivatives of analytical function. • Examine the values of the function using Cauchy's Goursat theorem. • Demonsrate Morera's theorem, Maximum moduli functions and Liouvilles theorem
CO3	• Derive various series for an analytic function. • Analyze poles and zeros and estimate the residue at poles. • Categorize the singularities
CO4	• Evaluates Improper real integrals.
CO5	• Judge and classify mappings by elementary functions • Classify fractional transformation. • Discuss various standard transformations.

COs	CONTENTS OF MODULE	
CO1	**UNIT-I**: **Analytic function -** Cauchy Riemann equations- Cauchy Riemann equations in polar form- properties of analytic and harmonic function.	**K2, K3,K4**

CO2	**UNIT-II: Integrals-** Line integrals – Cauchy's Goursat Theorem- Cauchy's Integral Formula-Derivatives of analytic functions-Moreras theorem. Maximum moduli functions- Liouvilles theorem and simple problems**.**	**K2**,**K3**
CO3	**UNIT-III:Taylor series-Laurent series-Examples- Residues –Residue theorem and simple problem.**	**K3, K5**
CO4	**UNIT-IV:Evaluation of improper Real in: Integral of the form (i)** $\int_{-\infty}^{\infty} \frac{p(x)}{q(x)} dx$ **(ii)** $\int_{-\infty}^{\infty} f(x) sinx dx$**or** $\int_{-\infty}^{\infty} f(x) cosx dx$**(iii)** $\int_{0}^{2\pi} f(sin\theta, cos\theta) d\theta$	**K3,K4**
CO5	**UNIT-V:Mapping by elementary functions- Linear fractional transformations- Cross ratios-fixed points-special linear fractional transformations. The transformation of function** $W = \frac{1}{z}$**,The function w=** z^2	**K5**

Recommended Text Book:

*TKManicavachagomPillay,S.P.RajagopalanandR.Sattanthan,*Complexanalysis,S.Viswanatha npvt Ltd.

Reference Books:

1. *RuelV.Churchill/JamesWard Brown,*Complexvariablesandapplications(FourthEdition)
2. *P.DuraipandianandLaxmiDuraipanidian,* Complexanalysis,Emeraldpublishers.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**S**	**S**	**H**	**H**	**M**	**M**	**M**
CO2	**H**	**S**	**S**	**S**	**S**	**M**	**M**
CO3	**H**	**S**	**S**	**S**	**H**	**M**	**M**
CO4	**S**	**S**	**S**	**S**	**M**	**L**	**M**
CO5	**S**	**S**	**S**	**S**	**M**	**M**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Mechanics

Course	B Sc (Maths with CA)
Exam Hours	03

Credits	04
CIA Marks	40
ESE Marks	60

Course objectives

- **To demonstrate the application of Mechanics in various fields.**
- **To develop the proficiency in problem solving.**
- **To have an insight into Types of forces, Moments,kinematics, projectiles and moment of Inertia.**

Course outcomes: At the end of the course,the student will be able to

CO1	• Understand the Vectorial and scalar representation of forces and moments. • Identify basic definitions and categorize Lami's theorem and its Applications.
CO2	• Explain Static equilibrium of particles and rigid bodies in two dimensions and also in three dimensions. • Distinguish problems under moments,parallel forces and couples.
CO3	• Illustrate the Laws of motion,Kinematics of motion and their Interrelationship. • Compare the relationship between Resultant,relative,angular and relative angular velocities.
CO4	• Recall concepts of projectiles • Differentiate time of flight,horizontal range and range in an inclined plane.
CO5	• Analyse the properties of surfaces and solids in relation to moment of Inertia. • Explain moment of Inertia of simple bodies and theorems of parallel and perpendicular axes. • Demonstrate various moments of Inertia of triangular and circular lamina as well as hollow and solid right sphere and cone.

COs	CONTENTS OF MODULE	
CO1	**Unit I**:**Types of forces:**Magnitude and resultant of the resultant of two forces acting on a particle, Lami'stheorem, resultant of several coplanar forces acting on a particle-simple problems.	K1,K2,K4
CO2	**UnitII:Forces on a rigid body**:Moment of a force,Parallelforce,Couple-Simple problems.	K2,K4
CO3	**Unit III :Kinematics**:Resultantvelocity,relativevelocity,Rectilinear motion with constant acceleration,angularvelocity,relative angular velocity-simple problems.	K2,K4
CO4	**Unit IV:Projectiles:**Time of flight,Horizontalrange, Range in an inclined plane-simple problems.	K1,K4
CO5	**Unit V:Moment of Inertia:Mo**ment of inertia simple bodies,theorems of parallel and perpendicular axes, **Mo**ment of inertia of triangular and circular lamina,circularring,Hollow and solid right circular cone,hollow and solid sphere-simple problems.	K2,K3,K4

Recommended Text Book:

P.Duraipandian, Mechanics, ,S.Chand& Co

Units	Chapter
UnitI	Chapter 2. Sections2.1.2 to2.2.2
UnitII	Chapter 4. Sections4.1,4,5,6,7,9(0mit 4.2,4.3,4.8)
UnitIII	Chapter 1. Sections1.1 to1.4
UnitIV	Chapter 13. Sections13.1,13.2 (0mit13.3)
UnitV	Chapter 17. Section17.1.1

Reference Books:

1.*M.KVenkataraman*, Statics and Dynamics Agasthiyar publishers.

2.*A.VDharmapadam*, Statics and Dynamics , S VishwanathanPvt.., Ltd

3. *K. ViswanathaNaik and M.S.Kasi*, Statics and Dynamics- Emerald publishers.

Mapping of Course Outcomes to Program SpecificOutcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	H	S	H	S	S	S
CO2	S	H	S	H	S	S	H
CO3	S	H	S	H	S	S	H
CO4	S	H	S	H	S	S	M
CO5	S	H	S	H	S	S	M

S-Strong H-High M-MediumL-Low

Course Title: Operations Research - II

Course	B Sc (Maths with CA)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objectives

- **To aim at improving capabilities of the students for understanding and analyzing different kind of situations in the real-world.**
- **To cover some analytical methods like sequencing,inventory methods, replacement models to help to make them better decisions.**

Course Outcomes: At the end of this Course, the Student will be able to

CO1	• Explain the rules for Network constructions. • Evaluate time calculation in PERT. • Describe PERT algorithm. • Distinguish between PERT and CPM.
CO2	• Explain basic concepts of EOQ models. • Apply the decision models to various real time problems. • Describe and analyze various models in EOQ.
CO3	• Discuss about models of replacement. • Apply and evaluate the replacement of an item whose maintenance cost increases with time and money value is not changed. • Apply and evaluate various models in replacement.
CO4	• Explain the concept of game theory. • Describe and solve the two person zero sum game with and without saddle point. • Explain and evaluate dominance rule. • Solve 2xn and mx2 game by using game theory.
CO5	• Discuss the concepts of sequencing problem. • Describe and solve n jobs -2 machines, n-jobs through 3 machines and n-jobs through n-machines. • Apply and solve problems by using graphical method.

COs	CONTENTS OF MODULE	
CO1	**Unit I :Networks**: Rules for network construction – Critical Path Method - Time calculationsin PERT – PERT algorithm (Crashing excluded) – Related problems.	**K2,K3,K4**

CO2	**Unit II : Inventory Models**: Basic concepts – EOQ Models: (a) Uniform demand rate infiniteproduction rate with no shortages (b) Uniform demand rate finite production rate with noshortages (c) Manufacturing Model with shortages (Uniform demand rate, finite production rate with shortages) – Classical Newspaper boy problem with discrete demandSimple applications.	**K1,K2,K3**
CO3	**Unit III: Replacement Models**: Model 1-Model-Replacement of an item whose maintenance costincreases with time and money value is not changed. Model 2- Replacement of an itemwhose maintenance cost increases with time and money value is changes with time.Model 3- Replacement of items due to sudden Failure. Model 4- Staff replacement.	**K1,K2,K3**
CO4	**Unit IV: Game Theory**: Two Person Zero-Sum game with saddle point – without saddle point –dominance rule – Solving 2 x n or m x 2 game by graphical method.	**K1,K3**
CO5	**Unit V:Sequencing Problem** – n jobs through 2 machines – n jobs through 3 machines – n jobsthrough m machines. Graphical method.	**K1,K3**

Recommended Text Book:

P.K. Gupta and D. S. Hira, Operations Research, S. Chand & Co.

Reference Books:

1. *KanthiSwaroop, P.K. Gupta,Manmohan,*Operations Research –Sultan Chand & sons.
2. *H.A. Taha*, Operations Research Prentice Hall of India, New Delhi
3. *Sundaresan, Ganapathy Subramanian, Ganesan.*,Resource Management Technique – Meenakshi Agency.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**S**	**S**	**S**	**H**	**S**	**H**	**H**
CO2	**H**	**S**	**S**	**M**	**S**	**H**	**,M**
CO3	**H**	**S**	**S**	**M**	**S**	**H**	**H**
CO4	**S**	**S**	**S**	**M**	**S**	**H**	**M**
CO5	**S**	**S**	**S**	**M**	**S**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Dot Net Programming

Course	B Sc (Maths with CA)
Exam Hours	03

Credits	03
CIA Marks	40
ESE Marks	60

Course Objectives

- **Explain the fundamentals of HTML and .NET programming**
- **Demonstrate the concept of ASP.NET and its validation controls**
- **Design an Interactive website using applications of VB.NET**

Course Outcomes: At the end of the course, the Student will be able to

CO1	• Demonstrate the concept of setting the document structure in HTML. • Differentiate the ways of formatting text using HTML tags. • Explain the process of creating hyperlinks and anchors. • Point out the considerations involved on applying Cascading style sheet in HTML script.
CO2	• Detailed framework for controls, menus and dialog boxes related to DOT.NET • Illustrate the concept of variables and operators • Subdivide and explain the different types of decision structures and the ways to trap and prevent errors.
CO3	• Recognize and implement the different types of graphics and animation that can be implemented in VB.net • Demonstrate the concept of setting the document modules and procedures
CO4	• Utilize the concept of Web Server Controls. • Foster the development of ASP.NET language structure. • Design and explain the concept of validation controls
CO5	• Explain the process of creating database and executing it • Demonstrate the process of managing cookies and objects associated with it.

COs	CONTENTS OF MODULE	
CO1	**UNIT-I :** Introduction– HTML Document Structure- Header Styles – Text Formatting –Types of List – HTML Table - Linking documents using Anchor tag - Forms – Basic controls in form – Image tag.	**K1,K2**
CO2	**UNIT II : VB.Net Basics**:.Net Framework Basics - Visual Studio Environment – Basic Controls — Variables, constants and Expressions – Decisions and Conditions - Loops - Arrays - Sub Procedures and Functions.	**K2,K3,K4**
CO3	**UNIT – III :VB.Net Advanced**: Graphics and Animation – The Graphics Environment – Simple Animation – Scroll Bar Controls. - Toolbars and Status Bars.	**K3,K4,K5**

CO4	**UNIT-IV :ASP.NET Basics**: ASP. NET Language Structure - Page Structure - Page event, Properties & Compiler Directives. **Basic Web server Controls**: Label, Textbox, Button, Image, Links, CheckBox, Radio button and Hyperlink. **Validation Controls**: RequiredValidator, CompareValidator and RegularExpressionValidator.	**K3,K4,K5**
CO5	**UNIT–V: ASP.NET Advanced:** Request and Response Objects, Cookies, Session Management. **Working with Data**: OLEDB Connection class, Command class - Program using database connectivity.	**K4,K5**

Recommended Text Books:

1. *Thomas A Powell*, The Complete Reference HTML, Third Edition, Tata McGraw Hill. (**Unit 1**)
2. *Julia Case Brandley, Anita C. Millspaugh*, Programming in Visual Basic.Net, 2003, Tata McGraw Hill. (**Unit 2,3**)
3. *G. Buczek*, ASP.NET Developers Guide, 2002, Tata McGraw Hill. (**Unit 4,5**)

Reference Books:

1. *C. Xavier*, World Wide Web Design with HTML, Tata McGraw-Hill Publishing.
2. *Platt S David*, Introducing Microsoft .Net, 2003, Prentice Hall of India, New Delhi.
3. *Crouch*, ASP.NET and VB.NET Web Programming, Pearson Education.
4. *HershBhasin*, Microsoft ASP.NET Professional Projects, Prentice Hall of India.
5. *Chris Ullman, John Kauffman*, Beginning ASP.NET 1.1 with VB.NET, 2003,Wrox Publications.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**H**	**S**	**M**	**H**	**S**	**S**
CO2	**S**	**S**	**S**	**H**	**H**	**H**	**S**
CO3	**S**	**M**	**M**	**M**	**H**	**H**	**S**
CO4	**S**	**S**	**M**	**S**	**H**	**M**	**H**
CO5	**S**	**M**	**S**	**M**	**S**	**S**	**H**

S - Strong H – High M – Medium L – Low

Course Title: Dot Net Programming Practical

Course	B Sc (Maths with CA)
Exam Hours	03

Credits	02
CIA Marks	40
ESE Marks	60

1. Creation of a personal web page (with multiple html documents and appropriate links)
2. Preparation of a bio data using various HTML Controls
3. Design a VB.Net form for Student manipulation.
4. Design a VB.Net form for Inventory control system.
5. Create an ASP.Net application form to apply for a new course in a college, fill the information and submit it (Use Basic webserver controls).
6. Design Sign Up form and validate the values: User Name (Minimum 8 character Maximum 15 and only characters and underscore), Password (Minimum 8 Characters) and Confirm Password (Both should be same), Phone No (Only digits), Email-id (should contain @ symbol) etc.
7. Demonstration of Request and Response Objects
8. Create an employee database and manipulate the records.
9. Demonstration of Cookies.
10. Create a web form for Online Library data entry using Session variables.

COURSES OFFERED TO OTHER DEPARTMENTS

Course Title: Allied -Mathematics paper - I

Course	B Sc (PCA)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objectives

- **To familiar with basic concepts in different topics in mathematics.**
- **To develop problem solving skills.**
- **To examine different types of matrix and to find the inverse of the matrix using cayley-hamilton theory.**
- **To familiarize with expansion of trigonometric functions.**
- **To gain wide knowledge in hyperbolic and inverse hyperbolic functions.**
- **To understand Laplace transform and its applications.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Recognize basic ideas about matrix • Distinguish and identify the type of matrix like symmetric, hermitian and so on. • Determine characteristic value and vector of the matrix • ExplainCayley-Hamilton theorem and its uses
CO2	• Recall binomial expansion and Demoive's theorem and apply it to understand the expansion of cosnx, sinnx . • Estimate the expansion of $\cos^n x$, $\sin^n x$ in terms of sines and cosines of multiples of x • Define hyperbolic functions • Distinguish the relations between trigonometric and hyperbolic functions
CO3	• List the identities in inverse hyperbolic functions • Enhance skills to separate real and imaginary parts of trigonometric functions of complex variables • Recall with proofs of certain integrals -$\int_0^{\frac{\pi}{2}} sin^n\, xdx$ and so on. • Infers the concept of Fourier series expansion and evaluate the problems for functions in $(0, 2\pi)$
CO4	• Determine the derivative for a function of several variables in partial forms– Jacobian matrix • Describe curvature and infers the bending of the curve by finding the radius of curvature in Cartesian coordinates • Investigate the maxima and minima for the function of two variables
CO5	• Define Laplace transform , the necessary and sufficient condition for a function to be Laplace transformed • Summarize the formula for standard functions of Laplace transform • Estimate the function from inverse Laplace transform • Evaluate the second order linear differential equation by using Laplace transform

COs	CONTENTS OF MODULE	
CO1	**UNIT- I:Matrices:**Symmetric, skew-symmetric, orthogonal and unitary matrices, eigen values and eigen – vectors (Diagonalization excluded), Cayley-Hamilton theorem(statement only) – verification of Cayley – Hamilton theorem-Computation of inverse matrix using Cayley – Hamilton theorem	**K2, K3,K4**
CO2	**UNIT-II: Trigonometry:** Expansion of cos nθ, sin nθ (where n is a positive integer) – Expansion of $\cos^n\theta$, $\sin^n\theta$ in a series of sines and cosines of multiples of θ – Hyperbolic functions – Relation between hyperbolic functions.	K**3**,**K4,K5**
CO3	**UNIT-III:Trigonometry :**Inverse Hyperbolic functions $\sinh^{-1}x$, $\cosh^{-1}x$ and $\tanh^{-1}x$ in terms of logarithmic functions – separation into real and imaginary parts of sin (x + iy), cos (x + iy) , tan (x + iy) and $\tan^{-1}$ (x+iy) – Simple problems Integral Calculus : Bernouli's formula, Reduction formula $-\int_0^{\pi/2} sin^n x dx$,$\int_0^{\pi/2} cos^n x dx$, $\int_0^{\pi/2} sin^n \cos^n x dx$ (m,n being positive integer) Fourier Series – Fourier series for functions in (0,2π);	**K3, K4, K5**
CO4	**UNIT-IV : Differential Calculus :**Jacobians, Curvature and radius of curvature in Cartesian co-ordinates, maxima and minima of functions of two variables – Simple problems.	**K2,K4,K5**
CO5	**UNIT-V: Laplace Transforms :**Laplace transforms of standard functions, Laplace transforms of e^{-at} f(t), tf (t), f(t)/t. Inverse Laplace transforms – Application to solution linear differential equations of second order with constant coefficients – simple problems.	**K2,K3, K4, K5**

Recommended Text Book:

*S.Narayanan, R.Hanumantha Rao, T.K.Manicavachagam Pillai,*Ancillary Mathematics Volume I & II, S.Viswanathan Pvt. Ltd, Reprint.

Unit I	**Vol I Chapter 3 –pages 121-124; 128-132;151-160**
Unit II	**VolI Chapter5 - Sections 5.1 and 5.2. ; pages220 – 232; Sec.5.4. – pages 242-247.**
Unit III	**Vol I Chapter 5– Section 5.4- pages 247– 253** **Vol II Chapter 1 – Section 13.3 – pages 75-82; Sec.15 – pages 93-94** **Vol II Chapter 2 - Section 1 to 5.5; pages 123-132**
Unit IV	**Vol I Chapter 6–Section 6.2,6.4,6.5 ;pages 282 – 285; 298-301;318-325**
Unit V	**Vol II Chapter 7 (Omit Solution of Simultaneous Differential Equations) pages 289 – 311**

[*Derivations are not included and only applications are to be expected from the students]

Reference Books:

4. *P. Duraipandian, Dr.S.Udaybakaran,* Allied Mathematics Volumes I & II, Muhil publishers.
5. *P.Kandasamy, K.Thilagavathy,*Allied Mathematics Volumes I & II, S.Chand& company.

6. *Dr.S.P.Rajagopalanand Dr.R.Sattanathan,* Allied Mathematics, Tata Mcgraw hill publishers.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**M**	**M**	**S**	**L**	**L**
CO2	**S**	**H**	**L**	**M**	**H**	**L**	**L**
CO3	**S**	**H**	**M**	**S**	**S**	**M**	**L**
CO4	**M**	**S**	**M**	**S**	**S**	**L**	**L**
CO5	**H**	**S**	**M**	**S**	**S**	**M**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Allied -Mathematics paper - II

Course	B Sc (PCA)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objectives

- **To enhance mathematical skills.**
- **To develop critical thinking to solve the problems.**
- **To understand the techniques to find the roots of polynomial equations.**
- **To estimate the numerical value of a function from a given set of values by using appropriate methods.**
- **To attain the basic knowledge in partial differentiation and the methods to solve PDE.**
- **To be well versed in the concept of vector differentiation and integration and also in its applications.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Acquire the basic ideas about algebraic equations. • Determine the roots of polynomial equations . Identify the symmetric functions of the root of the polynomial equation. • Transform the polynomial equations by either increasing or decreasing the roots by a constant.
CO2	• Estimate the intermediate value of a function whose table values are known at equal intervalsby Newton's forward and backward interpolation method. • Find the missing term in the table of values using binomial expansion. • Compute the intermediate value for a function whose table values are unequal intervals
CO3	• Recall the concept of partial differentiation • Explain the formation of Partial differential equation. Point out the different type of solutions of PDE. • Judge the solutions for different types of PDE. • Enhance the problem solving skills for any PDE and point out the method to be used for solving PDE
CO4	• Retrieve the idea of multiplication of vectors in two ways(dot andcross product)with its properties. • Interpret the derivative of a vector. • Manipulate differential operator to a vector in both dot and cross product. • Summarize the properties of differential operators when applied to vectors
CO5	• Recall the vector operators • Apply critical thinking and problem solving skills to evaluate line ,surface and volume integrals • Relate the line, surface and volume integrals by gauss, stokes and Greens theorem.

COs	CONTENTS OF MODULE	
CO1	**UNIT- I: Theory ofEquations:**Solving Polynomial equations with imaginary and irrational roots in A.P and G.P, Diminishing of roots, Reciprocal equations – simple problems.	**K2, K3,K4**
CO2	**UNIT-II: Interpolation :**Newton's forward and backward interpolation formula for equal intervals, Binomial method for missing termswith equal intervals, Lagrange's interpolation formula.	K3,**K4,K5**
CO3	**UNIT-III: Partial Differential Equations :** Formation , Complete integrals and general integrals , four standard types f(p,q) = 0, f(x,p,q) = 0, f(y,p,q)=0, f(z,p,q)=0,f(x,p) = f(y,q); Clairut's form and lagrange's equation Pp + Qq = R.	**K2, K3**
CO4	**UNIT-IV :Vector Differentiation :** levelsurfaces – the vector differential operator, gradient, divergence,curl,solenoidal and irrotational vectors.	**K3,K4,K5**
CO5	**UNIT-V:Vector Integration :** Line,surface and volume integrals ; Gauss, stokes's theorem (statement only)– Simple problems.	**K1,K2, K4**

Recommended Text Book:

S.Narayanan, R.Hanumantha Rao, T.K.ManicavachagamPiilai, Ancillary Mathematics Volume I & II, S.Viswanathan Pvt. Ltd, Reprint.

Unit I	**VolI Chapter 2 – Sections 2.1 to 2.4 ; pages 59 -83.**
Unit II	**VolI Chapter 4 - Sections 4.1 to 4.3 ; pages 183 – 214.**
Unit III	**Vol II Chapter 6 - Sections 1 to 3 pages 262 – 273**
Unit IV	**Vol II Chapter 8 -Sections 15 to 20 pages335 – 351**
Unit V	**Vol II Chapter 8 -Sections 1 to 2 pages 363 – 414**

[*Derivations are not included and only applications are to be expected from the students]

Reference Books:

7. *P. Duraipandian, Dr.S.Udaybakaran,* Allied Mathematics Volumes I & II, Muhil publishers
8. *P.Kandasamy, K.Thilagavathy,* Allied Mathematics Volumes I & II, S.Chand & company.
9. *Dr.S.P.Rajagopalanand Dr.R.Sattanathan,* Allied Mathematics, Tata Mcgraw hill publishers.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**M**	**L**	**M**	**L**	**M**
CO2	**S**	**S**	**M**	**L**	**S**	**M**	**M**
CO3	**S**	**S**	**S**	**M**	**S**	**M**	**M**
CO4	**S**	**S**	**M**	**L**	**S**	**M**	**M**
CO5	**S**	**S**	**M**	**M**	**S**	**M**	**M**

S - Strong **H – High** **M – Medium** **L – Low**

Course Title: Mathematics for Statistics-I

Course	B Sc (Statistics)
Exam Hours	03

Credits	05
CIA Marks	25
ESE Marks	75

Course objectives

- **To know about matrix applications.**
- **To enhance knowledge of differentiation and integration.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Explain different types of matrices and algebra of matrices. • Use elementary row and column operations to find rank of a matrix. • Differentiate Hermitian and Skew-Hermitian matrices.
CO2	• Judge and classify the characterization of matrices and determinants. • Use determinant to find the inverse of a non-singular matrix • Illustrate the Cramer's rule techniques in solving system of linear equations. • Classify the consistency of system of homogeneous and non-homogeneous linear equations.
CO3	• Summarize different methods of differentiation. • Point out the derivative as a process of measuring changes. • Identify the nature of curves like increasing or decreasing.
CO4	• Explain Leibnitz theorem and Partial Differentiation • Formulate successive derivatives. • Illustrate maximum and minimum values of a function.
CO5	• Demonstrate integral as a result of reversing the process ofdifferentiation. • Use properties of definite integrals. • Example of definite and indefinite integrals. • Point out the importance of Reduction formula and Bernoulli's formula.

COs	CONTENTS OF MODULE	
CO1	**UNIT I: Matrices:** Matrix theory-definition and type of matrices, scalar, Elementary, Symmetric, Skew Symmetric, Hermitian, Skew-Hermitian, independent and unitary matrices- algebraic operations on matrices and their properties-elementary transformation of matrices-determinant of matrix, definition of row matrix- column rank and rank of a matrix-determination of rank of a matrix.	**K2, K3, K4**
CO2	**UNIT-II: Solving System of Linear Equations :**Inverse of a square matrix-computation of the inverse of the square matrix-solution of linear equations-Homogeneous and non-homogeneous systems of equations-solutions space-consistency and general solutions Cramer's Rule and matrix method of solving	**K2, K3, K4, K5**

	system equations and numerical examples, characteristic equations-root and vectors of a square matrix-left and right eigen vectors-Cayley-Hamilton theorem-quadratic forms, definite, semi definite and indefinite quadratic forms.	
CO3	**UNIT-III: Differentiation:** Logarithmic differentiation-differentiation of one function with respect to another function-differentiation from parametric equations- differentiation of implicit functions-increasing and decreasing functions.	**K1, K2, K4**
CO4	**UNIT-IV: Applications of Derivatives:**Successive differentiation-Leibnitz theorem-Partial Differentiation-Maxima and Minima of functions of two variables.	**K2, K3**
CO5	**UNIT-V: Integration:** Integration-properties of definite integrals-Reduction formula-Bernoulli's formula.	**K1, K2, K3, K4**

Recommended Text Books:

1. *Narayanan and T. K. Manickavachagam Pillai* (1996): Calculus (Vol I& II) S. V. Publication.
2. *Shanti Narayanan,* Differential and Integral Calculus, Chand & co.

Narayanan and T. K. Manickavachagam Pillai (1996): Calculus (Vol I& II)	
Chapter 1	**Sections: 5 – 42**
Chapter 2	**Sections: 48 -103**
Chapter 3	**Sections: 108-146**
Chapter 4	**Sections: 153-184**
Chapter 5	**Sections: 188-235**
Chapter 6	**Sections: 242-274**

Reference Books:

S. Narayanan, Calculus, S. Viswanathan publications

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Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PS07**
CO1	**H**	**S**	**H**	**S**	**M**	**H**	**M**
CO2	**H**	**S**	**S**	**H**	**M**	**H**	**M**
CO3	**H**	**S**	**S**	**M**	**H**	**H**	**M**
CO4	**S**	**S**	**S**	**M**	**H**	**H**	**M**
CO5	**S**	**S**	**S**	**M**	**M**	**H**	**M**

S - Strong H – High M – Medium L - Low

Course Title: Mathematics for Statistics-II

Course	B Sc (Statistics)
Exam Hours	03

Credits	05
CIA Marks	25
ESE Marks	75

Course objectives

- **To study the concepts of real analysis.**
- **To learn mathematical proofs, writing skills and styles.**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• List and work with many properties of sets and operations on sets. • Explain the conceptsreal numbers bounds, supremum and infimum. • Example oflimits of real sequences. • Differentiate between limit inferior and limit superior.
CO2	• Summarize varies methods to test the convergence of real sequence. • Judge and classify the characterization convergence and divergence of series. • Categories an alternating is conditional convergent or absolute convergent.
CO3	• Explain the concept of limit and continuity through geometric process. • Formulate as series of a function by Taylor's series. • Illustrate sufficient conditions for Riemann integrability and Darboux theorem. • Point out the fundamental theorem of integral calculus and mean value theorem.
CO4	• Differentiate between proper and Improper Riemann integrals. • Point out the importance of Gamma and Beta integrals. • Summarize the transformation of variables to evaluate multiple integrals.
CO5	• Define Laplace Transforms and summarize existence of Laplace Transforms. • Compare the Laplace Transform and inverse Laplace Transform. • Demonstrate the impotence of Laplace Transforms.

COs	CONTENTS OF MODULE	
CO1	**UNIT I:** Sets, operations on sets-real valued functions-countability-real numbers bounds, supremum and infimum-sequence of real numbers-limit inferior and limit superior and limits of real sequences-limit theorems.	**K1, K2, K4**
CO2	**UNIT-II:**Convergence and divergence of series with non-negative terms-alternating series-conditional and absolute convergence-rearrangement of series-test for absolute convergence-summation by parts.	**K2, K4, K5**

CO3	**UNIT-III:**Continuity and derivative-the derivative of real functions-mean value theorems-Taylor's theorem-concept of limit and continuity-Riemann integrals, sufficient conditions for Riemann integrability, Darboux theorem, fundamental theorem of integral calculus-first mean value theorem.	**K2, K4**
CO4	**UNIT-IV:**Improper Riemann integral-Gamma and Beta integrals-multiple integrals-their evaluations using transformations of variables-simple example of multiple, integrals relevant to statistical methods.	**K2, K3, K4**
CO5	**UNIT-V:**Laplace Transformation (L.T)-definitions, L T of the functions t, e^at, cos at, sin at, e^at cos bt, e^at sin bt, transform of f'(t), f'' (t)-inverse L T relative to the standard function.	**K1, K3, K4**

Recommended Text Book:

3. *D. Somasundaram and B. Choudhary* (2002): A first course in mathematical analysis, Narosa Publishing house. (1970): Method of Real Analysis, Oxford and IBH.

Gold berg, R. R (1970): Method of Real Analysis, Oxford and IBH:

Chapter 1	**Sections: 1 – 38**
Chapter 2	**Sections: 43 -76**
Chapter 3	**Sections: 79-116**
Chapter 4	**Sections: 122-154**
Chapter 5	**Sections: 158-205**
Chapter 6	**Sections: 202-244**

REFERENCE BOOKS:

1. *Narayanan and T. K. Manickavachagam Pillai*, Ancillary Mathematics Book II
2. *Bartle, R. G & Shebert, D. R* (1982): Introduction to Real Analysis, Wiley Eastern & son.
3. *Bartle, R. G. Real* 1976. Analysis, John Wiley and sons Inc.,
4. I(1991). Mathematical Analysis, Wiley Eastern Limited, New Delhi.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PS07**
CO1	**S**	**H**	**S**	**M**	**M**	**H**	**M**
CO2	**H**	**M**	**S**	**H**	**M**	**H**	**M**
CO3	**H**	**M**	**S**	**M**	**H**	**H**	**M**
CO4	**M**	**M**	**S**	**M**	**H**	**H**	**M**
CO5	**M**	**H**	**S**	**M**	**M**	**H**	**M**

S - Strong H – High M – Medium L - Low

Course Title: Mathematical Foundations

Course	BCA
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objectives

- **To think analytically and have better reasoning abilities,**
- **To apply the logic theory to practical situation**
- **To analyze the statement using truth table.**
- **To recall the theory of matrices including elementary transformations, rank and its application in consistency of system of linear equations.**
- **To apply the concept of derivatives and integrals in determining different properties of a curve**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Identify basic properties and define Symmetric, Skew Symmetric, Hermitian, Skew Hermitian, Orthogonal, unitary matrices • Demonstrate inverse of a matrix and rank of a matrix • Solve system of linear equations by matrix method • Summarize the concepts of determinants and properties. • Solve problems using cramer's rules.
CO2	• Define Proposition • Summarize the concept of types of proposition, negation, disjunction, Conjunction, conditional, by conditional. • Prepare tautologies and contradictions • Explain logical equivalence • Summarize converse, inverse and contra positive propositions. • Judge arguments and validity of arguments
CO3	• Define operations on sets and Cartesian product of sets. • Prepare a Venn-diagram • Identify number of elements of sets • Summarize the concepts of domain, range, Equivalence relations, partially and totally ordered sets • List types of functions and Composition of function
CO4	• Discover the derivatives of simple function using sum, product, quotient rules, function of function rule, logarithmic differentiation, Implicit of functions, Parametric differentiation • Solve problems on successive differentiation
CO5	• List the rules of integration • Discover integration by substitution method, integration by parts, and Bernoulli's formula.

COs	CONTENTS OF MODULE	
CO1	**UNIT I:Matrices:** Introduction –Basic properties-Symmetric, Skew Symmetric –Hermitian, Skew Hermitian-Orthogonal-Unitary Matrices, Inverse of a Matrix-Rank of matrix-Solving system of linear equations by Matrix Method-Determinants-Properties-Carmer's rule.	**K1,K2, K3**
CO2	**Unit II: Mathematical Logic**– proposition-Definition- Types of Propositions-Negation-Disjunction-Conjunction-Conditional –Bi-condition-Tautologies and Contradictions-Logical equivalence-logical equivalence-algebra of propositions-converse, inverse and contra positive-arguments and validity of arguments	**K1,**K2,**K3, K5**
CO3	**Unit III:Sets**-operations on sets, Venn diagram, number of elements in a set, Cartesian product. Relations – domain and range of a relation, Equivalence relation, partially and totally ordered sets-simple problems. Functions – types of functions, compositions of functions-simple problems. (Theorems excluded)	**K1,K2, K3**
CO4	**Unit IV:Differentiation**- derivatives of simple functions using sum, product, quotient rules-function rule-logarithmic differentiation-differentiation of Implicit function-parametric differentiations-successive differentiation (upto 3rd derivatives) – simple problem	**K3,K4**
CO5	**Unit V:** Unit 5: **Integration:** Rules of integration-integration by substitution (using algebraic functions)- integration by parts-Bernoulli's formula.	**K1,K4**

Recommended Text Book:
P.R.Vittal, Mathematical Foundation

Reference book:

- *M.K Venkatraman,* Discrete mathematics, National Publishing Company
- *M.K Venkatraman,* Engineering mathematics, National Publishing Company.

Unit 1	Chapter 8 page 8.1 -8.71,8.130-8.140
Unit 2	Chapter1 page1.1-1.50
Unit 3	Chapter 2 page2.1-2.38,chapter 3 page 3.1-3.5,3.10 -3.23,chapter 4 page 4.1-4.35
Unit 4	Chapter 10 page 10.1-10.24,10.36-10.56,chapter 11page 11.1-11.10
Unit 5	Chapter17 page 17.1-17.31,17.38-17.45,chapter 18 page 18.1-18.4

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**H**	**M**	**H**	**S**	**H**
CO2	**S**	**S**	**S**	**H**	**M**	**H**	**M**
CO3	**S**	**S**	**M**	**M**	**H**	**H**	**M**
CO4	**H**	**H**	**M**	**M**	**H**	**H**	**M**
CO5	**S**	**M**	**S**	**S**	**H**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Statistical Methods

Course	BCA
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objective

- **To make the students familiar with concepts of mathematics emphasis on both analytical and logical ability.**
- **To develop computational skills needed in competitive examinations.**

Course Outcomes: At the end of theCourse, the Student will be able to

CO1	• Determine the value of the mean, median and the mode for the grouped and ungrouped data. • Distinguish between the mean, median and the mode of the data. • Explain the advantages and disadvantages of three measures
CO2	• Describe the purpose of measure of dispersion • Compute the range,the quartile deviation, standard deviation and the variance for the given data. • Evaluate the natue of skewness.
CO3	• Interpret the correlation between two variables and regression for a set of data. • Calculate the correlation between two variables and simple linear regression equation of given data.
CO4	• Define event,outcome,trial,sample space . • Solve applications implicating probabilities. • Apply probability to solve real world events
CO5	• Exhibit advanced understanding of the concepts of time series and their application in various area.

	Course content module	
CO1	**Unit I :Measures of central tendency**: Arithmetic mean, median, mode geometric mean and harmonic mean combined mean, weighted mean-Simple problems.	**K1,K2,K3**
CO2	**Unit II :Measures of dispersion:** Range, Quartile deviation, mean deviation, standard deviation, combined standard deviation, coefficient variation. Measures of skewness:Karlpearson's, Bowley's coefficient of skewness.Simple problems.	**K1,K2,K3,K5**
CO3	**Unit III :Correlation:** Karl pearson,spearsman's rank correlation method.**Regression:** Lines of regression.	**K1,K3,K5**

CO4	**Unit IV : Probability:**Sample space-Events-probability-Addition and multiplication theorem-Conditional probability-Baye'stheorem(statement only)-Simple problems.	**K1,K2,K3**
CO5	**Unit V**: **Time series**-Meaning –definitions-uses-Components of time series – Methods of measuring trends.	**K1,K2,K4**

Text book:

*DR-Dr.S.P.Rajagopalan, R.Sattanathan,*Business statistics and TATAMcgraw Hill.

Reference book:

Dr.P.R.Vittal, Business Statistics, Margham Publishers.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**S**	**S**	**H**	**M**	**S**	**H**	**M**
CO2	**H**	**S**	**S**	**M**	**S**	**H**	**M**
CO3	**H**	**S**	**S**	**M**	**S**	**H**	**M**
CO4	**S**	**S**	**S**	**M**	**S**	**H**	**M**
CO5	**S**	**S**	**S**	**M**	**S**	**H**	**M**

S - Strong H – High M – Medium L - Low

Course Title: Allied Mathematics I

Course	B Sc (C Sc)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objectives

- **To develop the skills of the students in the areas of matrices and trigonometry**
- **To impact the knowledge of Calculus ,Fourier and Laplace transforms.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• **Classify different types of matrices and their properties** • **Use characteristic polynomial to find Eigen values, vectors** • **Prove that the square matrix satisfies its characteristic polynomial** • **Compute inverse of the matrix using Cayley Hamilton theorem**
CO2	• **Use Demoivre's theorem to expand $\sin n\theta, \cos n\theta$** • **Express $\sin^n\theta, \cos^n\theta$ in multiples of θ** • **Express hyperbolic functions in terms of exponential functions and obtain hyperbolic identities** • **Manipulate expressions involving hyperbolic functions**
CO3	• **Express inverse trigonometric functions in terms of logarithmic functions** • **Separate the real and imaginary parts of trigonometric functions of complex variables** • **Integrate using Bernoulli's formula** • **Use reduction formula and evaluate the integral easily** • **Formulate fourier series of a given periodic function by evaluating the fourier coefficients**
CO4	• **Find partial derivatives of given function** • **Classify maxima and minima of the function of two variables** • **Calculate the determinant of the matrix of partial derivatives using Jacobian** • **Explain about curvature in Cartesian form and calculate the radius**
CO5	• **Explain about the Laplace transforms and inverse laplace transforms of standard functions** • **Solve second order differential equations using laplace transform and inverse laplace transform**

COs	CONTENTS OF MODULE	
CO1	**UNIT – I : MATRICES:** Symmetric, skew-symmetric ,orthogonal and unitary matrices, eigen values and eigen-vectors (Diagonalization excluded), Cayley-Hamilton theorem(statement only)- verification of Cayley-Hamilton theorem-computation if inverse matrix using Cayley- Hamilton theorem.	**K3,K5**
CO2	**UNIT-II : TRIGONOMMETRY:** Expansion of $\cos n\boldsymbol{\theta}$,$\sin n\boldsymbol{\theta}$ (where n is a positive integer) – Expansion of $\cos^n\boldsymbol{\theta}$, $\sin^n\boldsymbol{\theta}$ in a series of sines and cosines of multiples of $\boldsymbol{\theta}$, Hyperbolic functions- Relations between hyperbolic functions.	**K2,K3**
CO3	**UNIT– III: TRIGONOMETRY:** Inverse hyperbolic function $\sinh^{-1}x$, $\cosh^{-1}x$ and $\tanh^{-1}x$ in terms of logarithmic functions separation into real and imaginary parts of sin(x+iy), cos(x+iy), and $\tan^{-1}(x+iy)$, -simple problems. **INTEGRAL CALCULUS-** Bernoulli's formula, reduction formula - $\int_0^{\frac{\pi}{2}} \sin^n x dx \int_0^{\frac{\pi}{2}} \cos^n x dx \int_0^{\frac{\pi}{2}} \sin^m x \cos^n x dx$ (m,n being positive integer). **FOURIER SERIES –** Foruier series for functions in $(0, 2\pi)$	**K2,K3,K4**
CO4	**UNIT-IV : DIFFERENTIAL CALCULUS:** Jacobians, curvature and radius of curvature in Cartesian coordinates, maxima and minima of functions of two variables- Simple problems.	**K1,K2,K3**
CO5	**UNIT-V: LAPLACE TRANSFORMS:** Laplace transforms of standard functions. Laplace transform of e^{-at} f(t), tf(t), f(t)/t. Inverse laplace transforms-Application to solution linear differential equations of second order with constant coefficients- simple problems.	**K2,K3**

Recommended Text books:

S.Narayanan, R.Hanumantha Rao, T.K.Manickavachagam Pillay, Ancillary Mathematics Volume I & II, S.Viswanathan Pvt.Ltd, Reprint.

Unit I	**Vol I**	**Chapter 3 -Pages 121-124 ; Pages 128-132 ; Pages 151-160**
Unit II	**Vol I**	**Chapter 5 - §5.1 ,5.2 Pages 220-232 ; §5.4 Pages 242-247**
Unit III	**Vol II**	**Chapter 5 - § 5.4 Pages 247-253** **Chapter 1 - § 13.3 Pages 75-82 ; §15 Pages 93-94** **Chapter 2 - § 1 to §5.5 pages 123-132**
Unit IV	**Vol I**	**Chapter 6 - § 6.2,6.4,6.5 Pages 282-285; 298-301 ; 318-325**
Unit V	**Vol II**	**Chapter 7 – Pages 289-311 (Omit solution of simultaneous differential equations)**

Reference books:

1. *P.Duraipandian, Dr.S.Udhayabhaskaran,* Allied mathematics Volume I & II, Muhil publishers.
2. *P.Kandasamy, K.Thilagavathy,* Allied mathematics Volume I & II, S.Chand & Company.
3. *Dr.S.P.Rajagopalan, Dr.R.Sattanathan,* Allied mathematics, Tata Mcgrawhill publishers.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**S**	**M**	**S**	**H**	**H**
CO2	**M**	**M**	**S**	**H**	**S**	**L**	**L**
CO3	**M**	**M**	**S**	**S**	**H**	**H**	**M**
CO4	**M**	**S**	**H**	**M**	**H**	**L**	**L**
CO5	**M**	**S**	**H**	**M**	**S**	**M**	**M**

S - Strong **H – High** **M – Medium** **L – Low**

Course Title: Allied Mathematics II

Course	B Sc (C Sc)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objectives

- **To know about various methods to find the roots of the polynomial equations**
- **To provide the numerical methods of solving non-linear equations, interpolation, differentiation and integration.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Explain the relation between roots and coefficients • Solve the polynomial equations using imaginary and irrational roots • Generate equation using reciprocal roots • Use diminishing of roots to transform the equation
CO2	• Define least square method • Examine the best fit for a line or curve • Explain about interpolating the data • Calculate the dependent variable f(x) at any point of x • Solve problems using the interpolation methods for equal intervals
CO3	• Discuss about the concept of divided difference • Solve the problems with unequal intervals and interpolate the value • Use inverse interpolation to find the independent variable x for given values of f(x)
CO4	• Use numerical differentiation to find the value of derivative of a function • Discuss the various methods of numerical integration • Estimate the given function in an interval
CO5	• Define algebraic and transcendental equations • Explain about iteration method • Use various methods of solving algebraic and transcendental equations

COs	CONTENTS OF MODULE	
CO1	**UNIT – I :Theory of equations :** Relation between the roots and the coefficients of f(x)=0 , Solving polynomial equations with imaginary and irrational roots – To form equations whose roots are reciprocals-Reciprocal equations, Diminishing of roots – simple problems	**K2,K3,**
CO2	**UNIT-II : Curve Fitting :** By least squares method only – Fitting of straight line and parabolic curve **Interpolation :** Newton's forward and backward interpolation formula, Stirling's central difference formula	**K1,K2,K3,K4**

CO3	**UNIT– III: Interpolation with unequal intervals :** Divided differences, Newton's divided difference formula for interpolation and Lagrange's formula for interpolation, Inverse interpolation using Lagrange's method	**K2,K3**
CO4	**UNIT-IV :Numerical differentiation :** Derivatives using Newton's forward and backward difference formulae, Stirling's formula and Divided difference formula (Maxima and minima not included) **Numerical integration :** Trapezoidal formula , Simpson's one-third rule and three eighth rule (Romberg's method and applications are not included)	**K2,K3**
CO5	**UNIT-V: Solutions of Algebraic and Transcendental Equations :** Bisection method, Iteration method , Regular falsi method , Newton Raphson method (Convergence and rate of convergence not included) and Horner's method	**K1,K2,K3**

Recommended Text book:

*M.K.Venkatraman,*Numerical methods in Science and Engineering, The National publishing company, Fifth edition, 1999.

Unit I	**Chapter II - § 1 to §4 ; § 7 to §10 Pages 53-63,69-80**
Unit II	**Chapter I - § 1.7 and §1.8** **Chapter VI - § 1 to § 5** **Chapter VII - § 5 Pages 26-30,34-39,193-208,225-226**
Unit III	**Chapter VIII - § 1 to § 5 Pages 244-263**
Unit IV	**Chapter IX - § 1 to § 4 (Omit maxima and minima) § 8 to § 11 Pages 265-278, 281-293**
Unit V	**Chapter III - § 1 to § 6 Pages 81-112**

Reference books:

4. *P.Kandasamy , K.Thilagavathy & K.Gunavathy,* Numerical methods, S.Chand & Company.
5. *S.Arumugam, A.Thangapandi Isaac & A.Somasundaram,*Numerical methods, Scitech publications.
6. *T.Veerarajan and T.Ramachandran,* Numerical methods with programming in C, Tata Mcgraw hill publishers.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**M**	**S**	**S**	**H**	**H**	**H**	**M**
CO2	**S**	**H**	**S**	**H**	**S**	**H**	**H**
CO3	**S**	**S**	**S**	**H**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**H**	**H**	**H**	**S**
CO5	**M**	**H**	**S**	**H**	**H**	**M**	**H**

S - Strong H – High M – Medium L – Low

Course Title: Statistical Methods

Course	B Sc (C Sc)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objectives

- **To incur knowledge about the statistical distributions**
- **To develop the ability to perform complex data management and analysis.**
- **To get knowledge on large and small samples and perform testing procedures on hypothesis**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• **Explain about central tendency** • **Calculate the various measures of central tendency** • **Test the empirical relation** • **Explain how mean, median, mode are related in symmetric and skew symmetric distributions**
CO2	• **Explain about dispersion and calculate the various measures** • **Estimate the coefficient of variation using standard deviation** • **Investigate the uniformity or consistency of a data using coefficient of variation** • **Interpret the concept of Skewness and methods to calculate its coefficient**
CO3	• **Define correlation and its types** • **Conclude about the correlation between two variables** • **Use regression equations to estimate the values of unknown variable using the given data** • **Rank the given data and examine the rank correlation**
CO4	• **Categorize small and large samples** • **Test the hypothesis of the given population using t-test** • **Estimate confidence interval**
CO5	• **Test the equality of variances using F-test** • **Use Chi-square test for the independent attributes** • **Discuss about goodness of fit for given data** • **Compute and interpret the results of a bivariate data using ANOVA**

Cos	CONTENTS OF MODULE	
CO1	**UNIT – I : Measures of central tendency :** Arithmetic mean ,median, mode, Geometric mean, Harmonic mean, combined mean , weighted mean	**K2,K3,K5**
CO2	**UNIT-II : Measures of dispersion :** Range , Quartile deviation, Mean deviation, Standard deviation , coefficient of variation . **Measures of skewness** : Karl Pearson's , Bowley's coefficient of skewness – simple problems	**K2,K4**
CO3	**UNIT– III: Correlation :** Karl Pearson coefficient of correlation ,Spearman's rank correlation , Repeated ranks – simple problems **Regression** : Simple regression equations	**K1,K3,K4,K5**
CO4	**UNIT-IV : Testing of Hypothesis :** Large samples – test for specified mean , equality of means , test for specified proportion and equality of proportions Small samples – t-test for specified mean , equality of means – paired t-test	**K2,K4,K5**
CO5	**UNIT-V: Test for equality of variances –** F-test , Chi-square test – Test of independence of attributes , Test for goodness of fit **Analysis of variance –** One way , Two way classification	**K2,K3,K5**

Recommended Text book :

P.R.Vittal , Quantitative techniques, Margham publications.

Reference books :

1. *Dr.S.P.Gupta,* Statistical Methods.
2. *Dr.S.P.Rajagopalan , R.Sattanthan,* Business Statistics & OR

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**H**	**S**	**S**	**M**	**S**	**H**	**S**
CO2	**H**	**S**	**S**	**H**	**S**	**S**	**S**
CO3	**H**	**S**	**S**	**H**	**S**	**S**	**S**
CO4	**S**	**H**	**H**	**H**	**S**	**H**	**H**
CO5	**S**	**S**	**H**	**H**	**S**	**H**	**H**

S - Strong H – HighM – Medium L – Low

Course Title: Resource Management Technique

Course	B Sc (C Sc)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course Objectives

- **Introduce students to use quantitative methods and techniques for effective decision making**
- **Demonstrate the knowledge of applying linear programming to solve real life applications**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Explain the term LPP • Formulate and model a linear programming problem • Solve an LPP using graphical and simplex method • Identify a feasible solution and optimal solution using simplex method and Big M method
CO2	• Explain the Transportation problem and formulate it as LPP and solve the problem • Interpret the initial basic solution using various methods • Analyze the optimal solution using MODI method
CO3	• Explain Assignment problem • Determine that an assignment problem is a special case of LPP and evaluate using Hungarian Method
CO4	• Explain basic components of network analysis and critical path • Define CPM and PERT • Construct the network using CPM and PERT techniques to plan, schedule and control project activities
CO5	• Define various terms and rules used in the Theory of Games • Identify strategic situations and represent them as games • Compute general solution of m x n rectangular games • Calculate graphical solution for m x 2 and 2 x n games

COs	CONTENTS OF MODULE	
CO1	**UNIT – I :**Solving Linear Programming Problem using Graphical method, Simplex method, Big M method.	**K1, K2, K3**

CO2	**UNIT-II :**Transportation problem – Basic definitions, Finding an initial basic feasible solution – North-West corner rule, Least Cost entry method, Vogel's approximation method, MODI method, unbalanced and degenerate transportation problem	**K2,K4**
CO3	**UNIT– III:**Assignment problem – Hungarian method – Minimization and Maximization case, unbalanced assignment problem	**K2,K5**
CO4	**UNIT-IV :**Network Models – CPM and PERT – Difference between PERT and CPM – Constructing network – Critical path , various floats, three time estimates for PERT (crashing not included)	**K1,K2**
CO5	**UNIT-V:** Game theory – Pure strategy, Mixed strategy,Matrix oddment method, Dominance property – Graphical Method for solving 2xn and mx2 game	**K1,K3**

Recommended Text Book:

*Sundaresan, Ganapathy Subramanian, Ganesan,*Resource Management Techniques, A.R Publications

Reference Books:

1. *Dr.P.R.Vittal,* Operations Research, Margham publication
2. *P.K.Gupta and Manmohan,* Operations Research, S.Chand& Co
3. *Kanthi Swaroop, P.K Gupta, Manmohan,*Operations Research, Sultan Chand & Sons.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**H**	**H**	**S**	**L**	**S**	**H**	**M**
CO2	**M**	**M**	**S**	**L**	**S**	**M**	**M**
CO3	**M**	**M**	**S**	**L**	**S**	**M**	**M**
CO4	**M**	**M**	**S**	**L**	**S**	**M**	**M**
CO5	**M**	**M**	**S**	**L**	**S**	**M**	**M**

S – Strong **H – High** **M – Medium** **L – Low**

Course Title: Business Mathematics I
(For B.Com. (Gen)

Course	B Com.(General)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course objectives

- **To understand the set theory concepts.**
- **To demonstrate the applications of ratio, proportion and variance.**
- **To prepare business mathematics model for any given real life situation through survey.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Restate the definition of sets. • Differentiate the elements and sets. • Demonstrate relation and functions of sets.
CO2	• Distinguish between permutation and combination. • Solve the problem on binomial theorem. • Summarise the concepts of exponential and logarithmic series.
CO3	• Define the term ratio. • Demonstrate the importance of proportions.. • Solve the problems on ratios, proportion and variance.
CO4	• Define the term differentiation . • Explain the concept of maxima and minima of univariatefuntions. • Judge and classify the concepts of maxima and minima.
CO5	• Define the term interest. • Point out the important term of annuity and banker's discount.

COs	CONTENTS OF MODULE	
CO1	**UNIT I: Set theory**: Definition, Elements and types of sets, Operations on sets, Relations and functions of sets.	**K1, K3,K4**
CO2	**UNIT-II : Algebra :** Ratio, proportion and variance	K3,**K4,K5**
CO3	**UNIT-III: Permutation and combination:** permutation and combination, binomial theorem, exponential and lograthemic series.	**K2, K3**
CO4	**UNIT-IV :Differential calculus:**Differentiation- meaning, rules, maxima and minima of univariate functions, application of maxima and minima in business.	**K3,K4,K5**
CO5	**UNIT-V: Interest and annuity:** Interest and annuity , Banker's discount, binary number system.	**K1,K2, K4**

Recommended Text Book:
Dr.P.R. Vittal, Business Mathematics, Margham Publications

Reference Books:
Dr.S. P.Rajagopalan, Dr. R. Sattanathan, Business Mathematics, Tata McGraw-Hill, Chennai

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**H**	**H**	**M**	**H**	**H**
CO2	**H**	**S**	**S**	**M**	**M**	**H**	**H**
CO3	**H**	**S**	**S**	**S**	**H**	**H**	**M**
CO4	**S**	**S**	**S**	**S**	**M**	**H**	**M**
CO5	**S**	**S**	**S**	**S**	**M**	**H**	**M**

S - Strong **H – High** **M – Medium** **L – Low**

Course Title: Business Mathematics II

Course	B Com.(General)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course objectives

- **To understand the plane analytical geometry concepts.**
- **To demonstrate the applications of co-ordinate system.**
- **To prepare business mathematics model for any given real life situation through survey.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Restate the definition of plane analytical geometry. • Demonstrate the Cartesian co-ordinate system. • Demonstrate gradient of straight line.
CO2	• Distinguish between arithmetic mean and geometric mean. • Solve the problem on arithmetic mean and harmonic mean.
CO3	• Unsderstand the concept of integral calculus. • Demonstrate the meaning and rules of integration. • Solve the problems on integration by parts rule.
CO4	• Define the term interpolation . • Explain the concept of binomial method. • Judge and classify the concepts of Newton and lagrange interpolation method).
CO5	• Define the term matrix. • Point out the important term of matrix inversion, solution to linear equation.

COs	CONTENTS OF MODULE	
CO1	**UNIT I :Set theory** : **Plane analytical geometry** –Cartesian co-ordinate system, length of a line segment, section formula(ratio)-gradient of a straight line, equation of a straight line**.**	**K1, K3,K4**
CO2	**UNIT-II : Algebra :** Arithmetic, geometric and harmonic progressions.	K3,**K4,K5**
CO3	**UNIT-III: Integral calculus:** Integration, meaning and rules of integration, integration by substitution method, indefinite and definite integration, applications in business (Trigonometric functions to be excluded).	**K2, K3**
CO4	**UNIT-IV :Interpolation:** Binomial, Newton and Lagrange's method .	**K3,K4,K5**
CO5	**UNIT-V: Matrices:** Matrices- Meaning and operations, matrix inversion, solution to linear equation-payroll wages and commission.	**K1,K2, K4**

Recommended Text Book:
Dr.P.R. Vittal, Business Mathematics, Margham Publications

Reference Books:
Dr.S. P.Rajagopalan, Dr. R. Sattanathan, Business Mathematics, Tata McGraw-Hill, Chennai

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**H**	**H**	**M**	**H**	**H**
CO2	**H**	**S**	**S**	**M**	**M**	**H**	**M**
CO3	**H**	**S**	**S**	**S**	**H**	**H**	**M**
CO4	**S**	**S**	**S**	**S**	**M**	**H**	**M**
CO5	**S**	**S**	**S**	**S**	**M**	**H**	**M**

S - Strong **H – High** **M – Medium** **L – Low**

Course Title: Business Mathematics I

Course	**B Com.(A&F)**
Exam Hours	**03**

Credits	**05**
CIA Marks	**40**
ESE Marks	**60**

Course objectives

- **To understand the set theory concepts.**
- **To demonstrate the applications of ratio, proportion and variance.**
- **To prepare business mathematics model for any given real-life situation through survey.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Restate the definition of sets. • Differentiate the elements and sets. • Demonstrate relation and functions of sets.
CO2	• Define the term ratio. • Demonstrate the importance of proportions. • Solve the problems on ratios, proportion and variance.
CO3	• Distinguish between permutation and combination. • Solve the problems on binomial theorem. • Summarie the concepts of exponential and logarithmic series.
CO4	• Define the term interest. • Explain the difference between Simple interest and Compound interest. • Calculate the future and present values of Annuities. • Point out the important term of banker's discount.
CO5	• Distinguish between H.C.F & L.C.M of numbers. • Demonstrate the importance of Average and Percentage. • Solve real-life problems based on time & work.

COs	**CONTENTS OF MODULE**	
CO1	**UNIT I: Set theory**: Definition,Elements and types of sets, Operations on sets, Relations and functions of sets.	**K1, K3,K4**
CO2	**UNIT-II : Algebra :** Ratio, proportion and variance	K3**,K4,K5**
CO3	**UNIT-III: Permutation and combination:** permutation and combination, binomial theorem, exponential and logarithmic series.	**K2, K3, K4**
CO4	**UNIT-IV:Interest and annuity:**Simple interest, Compound interest and Annuities-Discount on bills-Payroll-Wages-commission.	**K3,K4,K5**
CO5	**UNIT-V: Quantitative Aptitude:** Operations on Numbers-H.C.F. & L.C.M. of Numbers- Average-Percentage-Time & Work- Time & Distance-Odd Man Out & Series.	**K1,K2, K3**

Recommended Text Book:

1. *Dr.P.R. Vittal,* Business Mathematics, Margham Publications.
2. *Dr. R. S. Aggarwal, (2017)* Quantitative Aptitude, S. Chand & Company Ltd., (Revised edition)

Reference Books:

1. *Dr.S. P. Rajagopalan, Dr. R. Sattanathan*, Business Mathematics, Vijay Nichole Imprints private limited.
2. *D. .C. Sanchetti, V.K. Kapoor*(2014), Business Mathematics, Sultan Chand & Sons.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**H**	**H**	**M**	**H**	**H**
CO2	**H**	**S**	**S**	**M**	**M**	**H**	**H**
CO3	**H**	**S**	**S**	**M**	**H**	**H**	**M**
CO4	**S**	**S**	**S**	**S**	**M**	**H**	**M**
CO5	**H**	**S**	**S**	**H**	**H**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Business Mathematics II

Course	B Com.(A&F)
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course objectives

- **To understand the plane analytical geometry concepts.**
- **To demonstrate the applications ofco-ordinate system.**
- **To prepare business mathematics model for any given real-life situation through survey.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Restate the definition of plane analytical geometry. • Demonstrate the Cartesian co-ordinate system. • Demonstrate gradient of straight line.
CO2	• Define the term Arithmetic, Geometric and Harmonic progressions. • Distinguish between arithmetic mean and geometric mean. • Solve the problem on arithmetic mean and harmonic mean.
CO3	• Define the term interpolation. • Explain the concept of binomial method. • Judge and classify the concepts of Newton and Lagrange interpolation method.
CO4	• Define the term matrix. • Point out the important term of matrix inversion. • Illustrate the technique in solving linear equations by Matrix inversion method.
CO5	• Understand the difference between rational and irrational numbers and perform operations with Surds and Indices. • Calculate the profit and loss of a real-life problem. • Find the ratio between two or more ingredients at their respective prices.

COs	CONTENTS OF MODULE	
CO1	**UNIT I: Geometry**: Plane analytical geometry –Cartesian co-ordinate system, length of a line segment, section formula(ratio)-gradient of a straight line, equation of a straight line**.**	**K1, K3,K4**
CO2	**UNIT-II: Algebra:** Arithmetic, geometric and harmonic progressions.	K**3**,**K4,K5**
CO3	**UNIT-III: Interpolation:** Binomial, Newton and Lagrange's method.	**K2, K3, K5**

CO4	**UNIT-IV:Matrices:** Matrices- Meaning and operations-Matrix inversion-Solution to linear equation.	**K1, K3,K5**
CO5	**UNIT-V: Quantitate Aptitude:** Surds & Indices-Profit&Loss-Pipes & Cistern-Alligation or Mixture-Calendar-Clocks.	**K1,K2, K4**

Recommended Text Book:

1. *Dr.P.R. Vittal,* Business Mathematics, Margham Publications.
2. *Dr. R. S. Aggarwal, (2017)* Quantitative Aptitude, S. Chand & Company Ltd., (Revised edition)

Reference Books:

1. *Dr.S. P. Rajagopalan, Dr. R. Sattanathan*, Business Mathematics, Vijay Nichole Imprints private limited.
2. *D. .C. Sanchetti, V.K. Kapoor*(2014), Business Mathematics, Sultan Chand & Sons.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**S**	**S**	**H**	**H**	**M**	**H**	**H**
CO2	**H**	**S**	**S**	**M**	**M**	**H**	**M**
CO3	**H**	**S**	**S**	**S**	**H**	**H**	**M**
CO4	**S**	**S**	**S**	**S**	**M**	**H**	**M**
CO5	**H**	**S**	**S**	**S**	**H**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Business Statistics and Operations Research – I
(For B.Com. (Gen) & B.Com.(A/F))

Course	**B Com.(Gen,A/F)**
Exam Hours	**03**

Credits	**05**
CIA Marks	**40**
ESE Marks	**60**

Course Objectives

- **Demonstrate knowledge of the statistical distributions.**
- **Demonstrate knowledge on applications of statistics in business operations**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Explain about classification and tabulation of statistical data • Plot the diagrammatic and graphical representation of data
CO2	• Explain about central tendency and calculate various measures • Explain how mean, median, mode are related in symmetric and skew symmetric distributions • Explain about dispersion and calculate various measures • Estimate the coefficient of variation using standard deviation • Investigate the uniformity or consistency of a data using coefficient of variation • Interpret the concept of skewness and methods to calculate its coefficient
CO3	• Define correlation and its types • Calculate and interpret correlation between two variables • Apply regression equations to estimate the values of unknown variable using the given data • Rank the given data and examine the rank correlation
CO4	• Define the nature and features of operations research • Explain the term LPP • Formulate and model a linear programming problem • Solve an LPP using graphical • and simplex method • Identify a feasible solution and optimal solution using simplex method
CO5	• Explain basic components of network analysis and critical path • Define CPM and PERT • Construct the network using CPM and PERT techniques to plan, schedule and control project activities

COs	CONTENTS OF MODULE	
CO1	**UNIT – I :**Introduction – Classification and Tabulation of statistical data – Diagrammatic and graphical representation of data	**K2,K3**
CO2	**UNIT-II :**Measures of central tendency : Arithmetic mean ,median, mode Measures of dispersion : Range , Quartile deviation, Mean deviation, Standard deviation , Measures of skewness – simple problems	**K2,K4**
CO3	**UNIT– III:** Correlation : Karl Pearson'scoefficient of correlation ,Spearman's rank correlation,Regression Lines and Coefficients	**K1,K2,K3,K5**
CO4	**UNIT-IV :**Introduction to OR – Linear Programming Formulation _ Graphical and Simplex method to solve LPP with all constraints less than or equal to type only (simple problems)	**K1,K2,K3**
CO5	**UNIT-V:** Network Analysis – PERT and CPM(no crashing)	**K1,K2**

Recommended Text Book:

Dr. P.R.Vittal,Business Statistics and Operations Research, Margham publications

Reference Books

1. *Dr.S.P.Rajagopalan ,R.Sattanthan*, Business Statistics & Operations Research, Margham Publications.
2. *Dr.S.P.Gupta*, Statistical Methods
3. *Gupta and Hira*, Operations Research, S.Chand.
4. *Handy and A.Taha*, Operations Research, Macmillan Publishers

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**M**	**M**	**S**	**M**	**S**	**S**	**S**
CO2	**M**	**H**	**H**	**M**	**M**	**S**	**H**
CO3	**M**	**M**	**M**	**M**	**S**	**H**	**H**
CO4	**L**	**H**	**H**	**H**	**S**	**H**	**M**
CO5	**L**	**M**	**H**	**M**	**H**	**S**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Business Statistics and Operations Research –II

(For B.Com. (Gen) & B.Com.(A/F))

Course	**B Com.(Gen,A/F)**
Exam Hours	**03**

Credits	**05**
CIA Marks	**40**
ESE Marks	**60**

Course Objectives

- **To demonstrate knowledge on applications of statistics in business operations**
- **Experience the use statistical tools to make scientific decisions in uncertain business environment.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Explain the term time series • Classify the various components of time series • Analyze the seasonal and cyclical pattern in series of time
CO2	• Interpret indices to identify trends in a data set • Construct simple and weighted price, quantity and value indices • Use the consumer price index to determine the purchasing power
CO3	• Explain basic probability axioms and rules • Calculate probabilities by using addition and multiplication law, with the terms independent and mutually exclusive events • Apply Baye's Theorem to solve real world events
CO4	• Explain the Transportation problem and formulate it as LPP and solve the problem • Determine that an assignment problem is a special case of LPP and evaluate using Hungarian Method
CO5	• Define various terms and rules used in the Theory of Games • Identify strategic situations and represent them as games • Compute general solution of m x n rectangular games • Demonstrate graphical solution for m x 2 and 2 x n games

COs	CONTENTS OF MODULE	
CO1	**UNIT – I :** Time series analysis – Trend – Seasonal Variation – Cyclical Variation	**K2,K4**
CO2	**UNIT-II :** Index numbers – Aggregate and Relative index – Chain and Fixed index - Wholesale index- Cost of living index	**K2**
CO3	**UNIT– III:** Probability – Addition and Multiplication theorem – Conditional probability – Baye's Theorem (without proof) – Simple problems	**K2,K3**
CO4	**UNIT-IV :** Assignment and Transportation problem	**K2,K5**
CO5	**UNIT-V:**Game theory – Games with saddle – Dominance – Graphical Method	**K1,K3**

Recommended Text Book:

Dr. P.R.Vittal, Business Statistics and Operations Research, Margham publications

Reference Books

1. *Dr.S.P.Rajagopalan ,R.Sattanthan,* Business Statistics & Operations Research, Margham Publications.
2. *Dr.S.P.Gupta,* Statistical Methods
3. *Gupta and Hira,* Operations Research, S.Chand.
4. *Handy and A.Taha,* Operations Research, Macmillan Publishers

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**M**	**S**	**H**	**S**	**S**	**S**
CO2	**H**	**M**	**H**	**L**	**S**	**S**	**H**
CO3	**M**	**M**	**H**	**M**	**M**	**S**	**M**
CO4	**M**	**M**	**H**	**M**	**S**	**H**	**M**
CO5	**M**	**M**	**H**	**M**	**S**	**S**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Business Mathematics

(For B.Com F&aT and B.Com. (Hons)

Course	**B.Com. F&T & B Com (Hons)**
Exam Hours	**03**

Credits	**04**
CIA Marks	**40**
ESE Marks	**60**

Course objectives

- **To recall the concepts of the sets, functions and relations.**
- **To explain the importance of the ratio, proportion, variations, permutation and combination in real time problems.**
- **To demonstrate the different types of series such as Binomial series, exponential series, logarithmic series with given examples.**
- **To summarize the arithmetic progression, Geometric progression and Harmonic progression with illustrations.**
- **To discuss the applications of differential calculus, matrices and interest calculation on real time situations through secondary data**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Restate the set notation, elementary set theory. • explain the connection between set operations and logic. • Classify the different types of functions and properties of injections, surjections, bijections, compositions and inverse functions. • Categorize the different types of relations.
CO2	• Demonstrate and solve certain real time business problems using ratios, proportion, variations, permutations and combinations.
CO3	• Explain the different types of series such as Binomial series, exponential series and logarithmic series and illustrate with examples. • Distinguish and solve the arithmetic progression, Geometric progression and Harmonic progression.
CO4	• Point outthe derivative of an algebraic, exponential and logarithmic function using theaddition rule, product rule, quotient rule and chain rule. • Point out the applications of differentiation to business situations. • Iidentify the extrema of a function and classify them as minima and maxima.
CO5	• Explain the meaning of simple interest, compound interest and annuity through secondary data. • Restate the matrix and explain the different types of matrices using examples. • Solve the system of linear and equations by matrix method.

Cos	CONTENTS OF MODULE	
CO1	**Unit –I:** Theory of Set- Set theory-definition-Elements and Types of Sets-Operations on Sets-Relation and Functions of Sets	**K1, K2, K4**
CO2	**Unit –II:** Ratios, Proportions and Variations- Permutations and Combinations.	**K3**
CO3	**Unit –III:**Binomial theorem, Exponential and Logarithmic series- Arithmetic, Geometric and Harmonic progressions	**K3, K4**
CO4	**Unit –IV :**(# Unit for Compulsory Question)Differential Calculus - Differentiation- Meaning and Rules- Maxima and Minima for Univariatefunctions - Applications of Maxima and Minima in Business.	**K1,K4**
CO5	**Unit –V :**(# Unit for Compulsory Question)Simple Interest, Compound Interest and Annuity - Matrices - Meaning and Operations -Matrix inversion - Solutions to linear equations.	**K1, K3**

Note: Question in section C - is practical question (Compulsory Question)

Reference Books:

1. *P.R. Vittal*, Business Mathematics, Margham Publications, Chennai.
2. *D.C.Sancheti & V.K.Kapoor*, Business Mathematics, Sultan Chand Publication, New Delhi.
3. *B.M Agarwal*, Business Mathematics, Kalyani Publishers.
4. *R.S.Soni*, Business Mathematics, Pitambar Publishing house.
5. *Singh .J.K.*, Business Mathematics, Himalaya Publishing house.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PS07
CO1	**S**	**S**	**H**	**H**	**M**	**H**	**M**
CO2	**H**	**S**	**S**	**M**	**M**	**H**	**M**
CO3	**H**	**S**	**S**	**S**	**H**	**H**	**M**
CO4	**S**	**S**	**S**	**S**	**M**	**H**	**M**
CO5	**S**	**S**	**S**	**S**	**M**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Business Statistics and Operations Research

(For B.Com F&aT and B.Com. (Hons)

Course	**B.Com. F&T & B Com (Hons)**
Exam Hours	**03**

Credits	**04**
CIA Marks	**40**
ESE Marks	**60**

Course objectives

- **To distinguish univariate and bivariate analysis in statistics,**
- **To point out the importance of testing the hypothesis of large and small samples through survey.**
- **To solve the real time industrial problems using Simplex method, transportation model and Assignment model.**

Course Outcomes: At the end of the Course, the Students will be able to

CO1	• Identify the strength and direction of a linear relationship between two variables by using correlation and regression analysis • Solve real time problems based on primary and secondary data.
CO2	• Explain the meaning of the terms namely hypothesis, Null & Alternative hypothesis, Type I and Type II error, one tail test, two tail test, level of significance, Number of degrees of freedom, accept region, reject region, small sample, large sample, non-parametric test. • Summarize the logic and framework of the inference of hypothesis testing. • Solve problems on large sample test for a specified mean,test for equality of two means, test for a single proportion and test for equality of two proportions.
CO3	• Demonstrate the various types of small samples tests viz. t test, F test, Chi square test and analysis of variance with given illustrations.
CO4	• Identify and explain the mathematical background of LPP to develop operational research models from the verbal description to the real system. • Explain basic concepts of optimization, modelling and linear modeling. • Distinguish the feasible solution, optimal solution and basic feasible solution. • Formulate a given simplified description of a suitable real-world problem as a linear programming model in general, standard and canonical forms. • Solve a two-dimensional linear programming problem graphically. • Explain the theory of Simplex Algorithm and approach. • Use the Simplex method to solve linear programming models for 2 decision variables and 3 decision variables.
CO5	• Identify the special features of the transportation balanced and unbalanced problems for minimization and maximization cases. • Demonstrating the optimal solution by Modified Distribution (MODI)

	Method. • Point out the importance of degeneracy situations in transportation model. Restate the Assignment mathematical model. • Explain the theory of assignment problem and UsesHungarian method for solving assignment problem. • Distinguish between a transportation and an assignment problem with suitable examples.

COs	**CONTENTS OF MODULE**	
CO1	**Unit –I :** Correlation - Meaning - Types - Karl Pearson's Co-efficient of Correlation - Rank Correlation -Concurrent deviation - Regression Analysis (Simple Problems)	**K1, K3**
CO2	**Unit –II :** Testing of Hypothesis - Large sample test - test for Specified Mean, equality of means, test for specified proportion and equality of proportions - Small samples - t-test for a Specified Mean, equality of means and paired deviations.	**K2,K3**
CO3	**Unit –III :** (# Unit for Compulsory Question)Test for equality of Variances - F-test- Chi square test - Test of attributes- test for goodness of fit -Analysis of Variance - One way,Two way classifications.	**K2, K3**
CO4	**Unit –IV:** Introduction to Operations Researcah (OR)- Meaning and scope - * characteristic - Models in OR - Linear Programming Problem - Formulation - Graphical Method - Simplex Method (Simple Problems)	**K1,K2,K3,K4**
CO5	**Unit –V:** (# Unit for Compulsory Question)Transportation Model - Balanced and Unbalanced transportation problems - Minimization and Maximization - basic feasible solutions - formulation, Solving transportation problem using North West corner rule - Least Cost Method - Vogel's approximation method - MODI method- Assignment problem -Balanced and Unbalanced - Minimization and Maximization - Hungarian Method.	**K1,K2,K3,K4**

Note: Question in section C - is practical question (Compulsory Question)

Reference Books:

1. *P.R. Vittal*, Business Mathematics & Statistics, Margham Publications, Chennai
2. *S.C.Gupta & V.K.Kapoor*, Business Statistics, S Chand & Co.
3. *Hardy A.Taha*, Operations Reasearch - An Introduction, Prentice Hall of India - NewDelhi
4. *P.K.Gupta & Man Mohan*, Problems in Operations Reasearch, Sultan Chand Publication, New Delhi.
5. *S.C.Gupta*, Statistical Methods, S Chand & Co.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	**S**	**S**	**H**	**H**	**M**	**H**	**S**
CO2	**H**	**S**	**S**	**M**	**M**	**H**	**S**
CO3	**H**	**S**	**S**	**S**	**H**	**H**	**S**
CO4	**S**	**S**	**S**	**S**	**M**	**H**	**S**
CO5	**S**	**S**	**S**	**S**	**M**	**H**	**S**

S - Strong **H – High** **M – Medium** **L – Low**

Course Title: Business Mathematics

Course	BBA
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course objectives

- **To summarize the concepts of mathematics for the business problems**
- **To apply the mathematics formulas to business problems**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Define the arithmetic progression and related problems • Summarize the geometric progression and related problems.
CO2	• Distinguish the various forms of equations of straight line • Solve the problems on area of triangle, intercepts of x-axis and y-axis and ratio of a point intersecting externally and internally.
CO3	• Solve the differentiation of polynomial functions • Explain the average cost, marginal cost, Marginal revenue, elasticity, Maxima and Minima, Point of inflexion using differentiation.
CO4	• Distinguish the various types of matrices. • Produce solution of a system of linear equations.
CO5	• Define simple interest, compound interest and annuities. • Compare the importance of free hold estate, leasehold estate, sinking fund, Amortization and Discount on Bills.

COs	CONTENTS OF MODULE	
CO1	**UNIT I: Progressions:** Arithmetic progression-n^{th} term of an AP, sum to n terms of an AP, Geometric progression-n^{th} term of a GP, sum to n terms of a GP	**K1, K2**
CO2	**UNIT-II : Plane Analytic Geometry:** Straight line-length of line segment, section formula, gradient or slope of a line, various forms of equation of straight line-simple problems	K**3**,**K4**
CO3	**UNIT-III: Differential Calculus:** Differentiation(involving polynomial function only)-product rule-quotient rule- Applications-Average cost, Marginal cost, Marginal Revenue, elasticity, Maxima and Minima, Point of inflexion	**K2, K3**
CO4	**UNIT-IV: Matrices:** Types of matrices, Addition Subtraction and multiplication of two matrices, transpose, matrix inversion and solution to system of linear equations.	**K4**
CO5	**UNIT-V: Mathematics of finance:** Simple interest and compound interest, Annuities- amount of an annuity, freehold estate and leasehold estate, sinking fund, Amortization, Discount.	**K1,K5**

Recommended Text Book:

P.R.Vittal, Business Mathematics, Margham Publications, Chennai.

Chapter 1	**Chapter 7 (Pages 118-172)**
Chapter 2	**Chapter 12(upto equations of straight lines)**
Chapter 3	**Chapter 13 (Pages 434 - 534)**
Chapter 4	**Chapter 14**
Chapter 5	**Chapter 17, Chapter 18, Chapter 19, Chapter 11**

Reference Book:

Dr.S.P.Rajagopalan, Business Mathematics, Tata Mcgrawhill, Chennai.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**S**	**M**	**H**	**H**	**M**	**H**	**S**
CO2	**H**	**S**	**S**	**M**	**M**	**H**	**H**
CO3	**H**	**S**	**M**	**S**	**H**	**H**	**H**
CO4	**S**	**M**	**S**	**S**	**M**	**H**	**M**
CO5	**S**	**S**	**S**	**M**	**M**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Operations Research

Course	BBA
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course objectives

- **To summarize the concepts of operations research**
- **To use the concepts of operations research for real life problems**
- **To produce solution for the operations research problems**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• List the concepts and scope of Operations Research • Formulate general mathematical model of Linear Programming problem • Solve the LPP of graphical method
CO2	• Summarize the transportation model • Distinguish initial basic feasible solution under the methods of northwest corner rule, row minima, column minima, least cost method and Vogel's approximation method. • Solve the transportation model using Vogel's approximation method.
CO3	• Distinguish the assignment problem of types balanced and unbalanced problem and also minimization and maximization problems. • Solve assignment problem under Hungarian method • Summarize the sequencing problem of processing of n jobs through m=2 or 3 machines.
CO4	• Judge the network problems. • Produce the solution for Critical Path Method and PERT computations
CO5	• Define the game theory problems. • Solve the problems based on pure and mixed strategies, dominance method and graphical method.

COs	CONTENTS OF MODULE	
CO1	**UnitI: Linear Programming problem-** Concept and scope of OR, general mathematical model of LPP, steps of LP model formulation, graphical method of the solution of LPP-Simple problems	**K1, K3**
CO2	**Unit II: Transportation Problem**- Basic definitions, formulation of transportation problem as LPP, Finding initial basic feasible solution-North west corner rule, the row minima, column minima, least cost method and Vogel's approximation methods-optimum solution	**K2, K3, K4**

CO3	**Unit III: Assignment problem**-Hungarian method – Minimization and maximization-unbalanced assignment problem **Sequencing problem:** Processing of n jobs through 2 machines-Processing of n jobs through 3 machines-Processing each of n jobs through m machines	**K2, K3, K4**
CO4	**Unit IV:** PERT and CPM-difference between PERT and CPM-constructing Network-Critical Path, various floats-PERT computations.	**K5**
CO5	**Unit V:** Game theory- Maximin-minmax criterion, saddle point, dominance property, graphical method for solving 2xn and mx2 game	**K1, K3**

Recommended Text Book:

P.R.Vittal & Malini, Operations Research, Margham Publications.2007

Chapter 1	**Chapter 2 & Chapter 3**
Chapter 2	**Chapter 10**
Chapter 3	**Chapter 11 & Chapter12**
Chapter 4	**Chapter 14**
Chapter 5	**Chapter 15**

REFERENCE BOOKS:

P. K. Gupta and Manmohan, Operations Research, S. Chand & Company

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**S**	**S**	**M**	**H**	**M**	**H**	**H**
CO2	**H**	**M**	**S**	**M**	**S**	**H**	**H**
CO3	**H**	**S**	**H**	**S**	**H**	**H**	**H**
CO4	**M**	**H**	**S**	**M**	**S**	**H**	**M**
CO5	**S**	**S**	**S**	**S**	**M**	**H**	**M**

S - Strong H – High M – Medium L – Low

Course Title: Business Statistics

Course	BBM
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course objectives

- **To introduce the basic tools in statistics.**
- **To find the relations and degree of relation between two data.**
- **To apply the concept of index number in data.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Recollect the basic concept of measures like measurement of central tendency.
CO2	• Demonstrate various measures of dispersion
CO3	• Introduce the new measures like skewness and kurtosis
CO4	• Quantify the strength of the relationship between the variables for the given set of data (correlation). • Express the relationship of two set of given data in an equation form (Regression).
CO5	• Construct an index number for changes in the value of a variable by Laspeyre's, Paasche's, Fisher's, Bowley's and Marshall Edgeworth methods. • Test the datas using time reversal and factor reversal test for the index.

COs	CONTENTS OF MODULE	
CO1	**UNIT I: Measures of averages:** Arithmetic mean – weighted mean – Combined mean – Median –Mode – Geometric mean – Harmonic mean – Simple problems.	**K1, K2,K3**
CO2	**UNIT-II : Measures of the Dispersion :** Range – Quartile deviation –Mean deviation – Standard deviation – Combined standard deviation – coefficient of variance – Simple problems. Regression	K**1**,**K2,K3**
CO3	**UNIT-III:Skewness :**Karl Pearson's coefficient of skewness – Bowley's oefficient of skewness –Kurtosis – simple problems.	K**1**,**K2,K3**
CO4	**UNIT-IV :Correlation:** Karl Pearson's coefficient of correlation: **Regression Analysis:** Regression Equations (Except Bivariate analysis) - simple problems.-spearman's rank correlation methods	**K2,K3,K4**
CO5	**UNIT-V: Index number:** Index numbers methods of constructing index numbers Laspeyre's method - paasche's method - Fisher's method- Bowley's method-Marshall & Edgeworth method. Unit test-Time reversal test- Factor reversal test-simple problems.	**K2,K3, K4, K5**

Reference Books:

1. *S.P. Gupta*, Statistical Methods, Sultan Chand, 2005.
2. *Dr. S.P. Rajagopalan*, Business statistics and Operation research.

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	S	S	H	S	S	S	H
CO2	H	M	M	H	M	H	S
CO3	S	H	M	H	M	H	H
CO4	S	H	M	H	M	M	M
CO5	H	S	M	M	M	M	M

S - Strong **H – High** **M – Medium** **L – Low**

Course Title: Operational Research

Course	BBM
Exam Hours	03

Credits	05
CIA Marks	40
ESE Marks	60

Course objectives

- **To introduce the concept of Linear Programming Problem.**
- **To experiment the real life LPP in the form of transportation, assigment, game, sequencing problems etc..**
- **To prepare a network for a given project and consume the critical path of the project.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Deal with history of operations research and introduce linear programming problem. • Determine theoptimality of the objective function of a linear programming problems
CO2	• Determine the schedule for transporting goods from source to destination in a way whichwill minimize the shipping cost while satisfying supply and demand constraints
CO3	• Assign a number of jobs to an equal number of machine so as to minimize the total time required for successful execution of all the jobs
CO4	• Demonstrate pure and mixed strategy and saddle point of a game. • Explain the concept of fair game. • Complete the job in maximum possible time, keeping the minimal idle time of the machine
CO5	• Schedule, organize and coordinate tasks within a particular project by using the activities of the project (PERT) • Determine the project completion time and the critical path of the project

COs	CONTENTS OF MODULE	
CO1	**UNIT I:** Operations Research Definition- Scope limitations Linear programmingproblem(LPP)- Formation of LPP-Graphical method-simple problems.	**K1, K2,K3**
CO2	**UNIT-II :** Transportation model-Balanced and Unbalanced Transportation problems – Initialbasic feasible solution- North west corner rule, the row minima ,column minima,least cost method and Vogel's approximation methods - Optimum solution-Modimethod.	**K3**,**K4,K5**
CO3	**UNIT-III:** Assignment Problem- Balanced and Unbalanced Maximization restricted assignment problem. (Excluding travelling salesman	**K3**,**K4,K5**

	Minimization andproblem).	
CO4	**UNIT-IV:Game Theory**- Pure & Mixed Strategies- Dominance-Graphical method. **Sequencing problem:** Processing of n jobs through 2 machines- Processing of njobs through 3 machines- Processing each of n jobs through m machines.(Excluding Processing 2 jobs through m machines)	**K2,K3,K4**
CO5	**UNIT-V:**.PERT- Project Network diagram- PERT computations.	**K4,K5**

Reference Books:

1. *Sundaresan, Ganapathy Subramanian, Ganesan,,* Resource Management Technique, A.R. Publications.
2. *P.RVittal & Malini,* 0perations Research,Margham Publications.2007

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	**S**	**M**	**H**	**S**	**H**	**H**	**H**
CO2	**S**	**H**	**M**	**H**	**M**	**H**	**H**
CO3	**S**	**H**	**S**	**H**	**M**	**H**	**H**
CO4	**S**	**S**	**H**	**H**	**M**	**M**	**M**
CO5	**S**	**S**	**S**	**S**	**M**	**M**	**H**

S - Strong H – High M – Medium L – Low

Course Title: Advanced Statistics

Course	M Com
Exam Hours	03

Credits	
CIA Marks	40
ESE Marks	60

Course objectives

- **Summarize the importance of probability and standard statistical distributions.**
- **Prepare a statistical model for any given real life situation through survey.**
- **Compute and interpret correlation and regression analysis.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Illustrate and describe sample spaces and events for random experiments • Calculate probabilities of events in discrete sample spaces and conditional Probabilities of events using Baye's theorem. • Sketch the concept of probability distribution to real world problems involving various distributions like Binomial, Poisson and Normal distributions.
CO2	• Describe the testing hypothesis for large samples • Produce a significant test of hypothesis concerning the value of population means and proportion based on Normal distribution
CO3	• Describe the testing hypothesis for small samples • Produce a significant test of hypothesis concerning the value of population mean based on t-distribution, F-test, χ^2-test. • Discuss about goodness of fit for given data
CO4	• Explain the concept of analysis of variance and use them to investigate factorial dependence • Demonstrate pay-off table, Maximin and Minimax principle and Baye's principle • Explore how problem solving and decision tree making interrelate.
CO5	• Measure and analyse the strength of the relationship between two or three variable using a correlation analysis. • Predict the value of any independent variable to the value of dependent variable using linear regression analysis

COs	CONTENTS OF MODULE	
CO1	**UNIT I: Probability and Theoretical Distribution** Probability-Definition-addition theorem-Multiplication theorem-conditional probability-Baye's theorem-simple problems. Theoretical Distributions- Binomial, Poisson and Normal distributions-simple problems.	**K2, K3**
CO2	**UNIT-II : Statistical Inference- Testing of Hypothesis for large samples** Testing of hypothesis-procedure-two types of error-one and two tailed tests-standard error-large sample-test for specified proportion-test for difference between proportions- test for specified mean- test for difference of mean of two samples.	**K2**,**K3**
CO3	**UNIT-III: Testing of Hypothesis for Small samples** Small samples: t-test: specified mean, equality of two means-paired t-test, F-test-equality of variances- Chi square test- independence of attributes and goodness of fit.	**K2, K3**
CO4	**UNIT-IV :Analysis of Variance and Decision Theory** Analysis of Variance -one way and two way classification-Pay off table-Maximin principle -Minimax principle- Baye's Principle- Decision Tree Analysis.	**K2,K3,K4**
CO5	**UNIT-V:Correlation and Regression** Correlation-types of correlation- Karl Pearsons coefficient of correlation-Rank Correlation coefficient- Regression- Regression equations-partial and mutiplecorrelation(upto three variables)-partial and mutiple regressions(upto three variables)	**K4,K5**

Recommended Text Book:

1. *S.P. Gupta*, Statistical Methods, Sultan Chand, 2005.

2. *P.R. Vittal*, Quantitative Techniques, Margham Publications.

Mapping of Course Outcomes to Program Specific Outcomes

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

S - Strong H – High M – Medium L - Low

Course Title: M.Com- Resource Management Techniques

Course	M Com
Exam Hours	03

Credits	
CIA Marks	40
ESE Marks	60

Course objectives

- **To summarize the concepts of resource management**
- **To use the resource management techniques to real life problems**
- **To produce solution for the resource management problems**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• summarize the transportation model • Distinguish initial basic feasible solution under the methods of northwest corner rule, row minima, column minima, least cost method and Vogel's approximation method. • Solve the transportation model using Modi method.
CO2	.Distinguish the assignment problem of types balanced and unbalanced problem and also minimization and maximization problems. • Solve restricted assignment problem and travelling salesman problem • Summarize the sequencing problem of processing of n jobs through m=2 or 3 machines.
CO3	• Define the game theory problems. • Solve the problems based on pure and mixed strategies, dominance method and graphical method.
CO4	• Distinguish the 4 models of replacement problems. • Produce the solution for replacement of an item whose maintenance cost increases with time and money value is not changed(Model-1) • Produce the solution for replacement of an item whose maintenance cost increases with time and money value is changed with time(Model-2). • Produce the solution of replacement of items due to sudden failure(Model-3) • Solve the staff replacement problem(Model-4)
CO5	• Judge the network problems. • Produce the solution for Critical Path Method and PERT computations

COs	CONTENTS OF MODULE	
CO1	**Unit I:** Transportation model- Balanced and unbalanced transportation problems-initial basic feasible solution-North west corner rule, the row minima, column minima, least cost method and Vogel's approximation methods-optimum solution-Modi method	**K2, K3, K4**
CO2	**Unit II:** Assignment problem-Balanced and unbalanced – Minimization and maximization-restricted assignment problem-travelling salesman problem. Sequencing problem: Processing of n jobs through 2 machines-Processing of n jobs through 3 machines-Processing each of n jobs through m machines-Processing 2 jobs through m machines	**K2, K3, K4**
CO3	**Unit III:** Game theory- Pure & Mixed strategies-Dominance-Graphical method	**K1, K3**
CO4	**Unit IV:** Replacement model 1- replacement of an item whose maintenance cost increases with time and money value is not changed-Model 2 - replacement of an item whose maintenance cost increases with time and money value is changed with time- Model 3- replacement of items due to sudden failure- Model 4- staff replacement	**K3, K4**
CO5	**Unit V:** PERT and CPM-Project Network diagram-Critical Path(Crashing Excluded)-PERT computations.	**K5**

Recommended Text Book:

P.R.Vittal& V. Malini, Operations Research, Margham Publications.2007

Chapter 1	**Chapter 10**
Chapter 2	**Chapter 11 & Chapter 12**
Chapter 3	**Chapter 15**
Chapter 4	**Chapter 16**
Chapter 5	**Chapter 14**

Reference Books:

*Sundaresan, Ganapathy Subramanian,*Resource Management Technique –A.R.Publications

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**S**	**S**	**H**	**H**	**M**	**H**
CO2	**H**	**H**	**S**	**M**	**M**	**H**
CO3	**H**	**S**	**H**	**S**	**H**	**H**
CO4	**S**	**H**	**S**	**M**	**S**	**H**
CO5	**S**	**S**	**S**	**S**	**M**	**H**

S - Strong H – High M – Medium L - Low