KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Re-accredited by NAAC with 'A+' Grade (4th Cycle)

College of Excellence awarded by UGC

29th Rank among Colleges in NIRF 2023

Coimbatore – 641 029

DEPARTMENT OF MATHEMATICS

COURSE OUTCOMES (CO)

B. Sc MATHEMATICS

For the students admitted

in the

Academic Year 2023-2024

Programme Code: 02		B.Sc Mathematics		
Course Code: 23UMA101		Core Paper 1 - Classical Algebra		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	4	60	4

Course Objectives

1. To get the knowledge of convergence and divergence of a series.
2. To find the summation of series.
3. To understand the nature of the roots of an algebraic equation.

Course Outcomes (CO)

K1 to K5	CO1	Finding the roots of a polynomial function.
	CO2	Classifying convergence and divergence of a series.
	CO3	Applying the Binomial theorem, Exponential theorem, logarithmic theorem to find summation of series.
	CO4	Analyzing the nature of the roots of the equation.
	CO5	Evaluating the problem by using Horner's method.

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA102		Core Paper 2 –CALCULUS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	5	75	4

Course Objectives

1. To give basic knowledge about Mathematical concepts in calculus.
2. To evaluate double and triple integrals.
3. To learn different methods of integration, Beta and Gamma integrals which form the basis for higher studies.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the formulas in differentiation and integration.
	CO2	Interpret the definite integral geometrically as the area under a curve.
	CO3	Apply the concept of definite integral to solve various kinds of problems.
	CO4	Analyze the values of the derivative at a point algebraically.
	CO5	Evaluating the integrals using the computational tool MATLAB.

Programme Code : 02		B.Sc Mathematics		
Course Code : 23UMA1I1		Allied Paper 1-STATISTICS – I		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	7	105	5

Course Objectives

1. To enable the students to acquire the knowledge of statistics.
2. To remember the properties of various statistical functions.
3. To understand the concepts of some statistical distributions.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concepts of probability and random variables
	CO2	Understanding the properties of some distributions.
	CO3	Solving mean, median, mode, moments and moment generating functions of Binomial, Poisson and Normal distributions.
	CO4	Analyzing how correlation is used to identify the relationships between variables and how regression analysis is used to predict outcomes.
	CO5	Determining the relationship between Binomial, Poisson and Normal distributions.

Programme Code: 02	B.Sc. Mathematics		
PART IV – ENVIRONMENTAL STUDIES			
Batch 2023-2026	**Hours / Week** 2	**Total Hours** 30	**Credits** 2

COURSE OBJECTIVES

1. The course will provide students with an understanding and appreciation of the complex interactions of man, health and the environment. It will expose students to the multi-disciplinary nature of environmental health sciences
2. To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
3. To shape students into good "Ecocitizens" thereby catering to global environmental needs.
4. This course is designed to study about the types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling and principles of environmental pollution such as air, water and soil
5. The course will address environmental stress and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 - K5	CO 1	Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities and ecosystems
	CO2	Develop an in depth knowledge on the interdisciplinary relationship of cultural, ethical and social aspects of global environmental issues
	CO3	Acquiring values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones
	CO4	To gain inherent knowledge on basic concepts of biodiversity in an ecological context and about the current threats of biodiversity
	CO5	To appraise the major concepts and terminology in the field of environmental pollutants, its interconnections and direct damage to the wildlife, in addition to human communities and ecosystems

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA203		Core Paper 3 - Differential Equations And Laplace Transforms		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	4	60	4

Course Objectives

1. To solve second-order linear differential equations with constant and variable coefficient.
2. To get the ability of solving first and second order ordinary differential equations and first order partial differential equations.
3. To get the knowledge about Laplace and inverse Laplace transforms.

Course Outcomes (CO)

K1 to K5	CO1	Recalling the concept of first order linear differential equations.
	CO2	Understanding the concept of first order higher degree ordinary differential equations
	CO3	Solving Linear partial differential equations by using the Lagrange's method.
	CO4	Analyzing the concepts of Laplace transforms and inverse Laplace transforms to solve ODE with constant coefficients.
	CO5	Evaluating the general and complete solutions of first order PDE's

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA204		Core Paper 4 - Trigonometry, Vector Calculus And Fourier Series		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	5	75	4

Course Objectives

1. To enable the students to get basic knowledge of trigonometry
2. To bring in the knowledge of vector calculus and its applications in theorems
3. To understand the expansions of Fourier series.

Course Outcomes (CO)

K1 to K5	CO1	Defining the expansion of trigonometric, hyperbolic and inverse hyperbolic functions.
	CO2	Illustrating the Fourier co-efficient for Periodic functions.
	CO3	Applying the differential operator to find Gradient, Divergence and Curl
	CO4	Examining the multiple integrals by applying Gauss divergence theorem, Stoke's theorem and Green's theorem.
	CO5	Evaluating the double and triple integral.

Programme Code : 02		B.Sc Mathematics		
Course Code : 23UMA2I2		Allied Paper 2-STATISTICS – II		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	7	105	5

Course Objectives

1. To enable the students to give inference on statistical population based on sample statistics.
2. To Understand the concepts of various estimators.
3. To study the concepts of analysis of variance.

Course Outcomes (CO)

K1 to K5	CO1	Finding the derivations of t, χ^2 and F distributions.
	CO2	Explaining the procedure for Testing of hypothesis and sampling of attributes.
	CO3	Applying the concepts of various distributions in real time situations.
	CO4	Analyzing one - way and two – way Classifications and design of experiments.
	CO5	Interpreting the analysis of data using various test using MATLAB.

Programme Code: 02	B.Sc. Mathematics		
MORAL AND ETHICS			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	2	30	2

Course Objectives

1. To impart Value Education in every walk of life.
2. To help the students to reach excellence and reap success.
3. To impart the right attitude by practicing self introspection.
4. To portray the life and messages of Great Leaders.
5. To insist the need for universal brotherhood, patience and tolerance.
6. To help the students to keep them fit.
7. To educate the importance of Yoga and Meditation.

Course Outcomes (CO)

After completing the course the students:

K1 - K5	CO1	will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice
	CO2	will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations
	CO3	can emulate the principled life of great warriors and take it forward as a message to self and the society
	CO4	will be able to Analyse the Practical outcome of practicing Moral values in real life situation
	CO5	could Evaluate and Rank the outcome of the pragmatic approach to further develop the skills

Programme Code : 02		**B.Sc Mathematics**		
Course Code: 23UMA305		Core Paper 5 - Analytical Geometry		
Batch 2023-2026	**Semester** III	**Hours / Week** 4	**Total Hours** 60	**Credits** 4

Course Objectives

1. To gain knowledge about coordinate geometry and also about geometrical aspects.
2. To know the concepts of cone and cylinder.
3. To determine coordinate axes and coordinate planes in the dimensional space.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the equation of a line that passes through a given point which is parallel or perpendicular to a given line.
	CO2	Understanding the results based on the properties of a sphere.
	CO3	Identifying conic sections.
	CO4	Analyzing the concepts of geometry.
	CO5	Evaluating geometric problems using MATLAB.

Programme Code : 02		**B.Sc Mathematics**		
Course Code: 23UMA306		Core Paper 6 –Statics		
Batch 2023-2026	**Semester** III	**Hours / Week** 3	**Total Hours** 45	**Credits** 3

Course Objectives

1. To enable the knowledge of Forces and Moments.
2. To understand the notions of Friction.
3. To solve problems under friction and equilibrium of strings**.**

Course Outcomes (CO)

K1 to K5	CO1	Remembering the notions of friction and equilibrium of strings and deploy them in solving the problems.
	CO2	Understanding the concepts of forces and moments.
	CO3	Applying the concepts of forces in finding the resultant of any number of forces and the resultant of force and moments.
	CO4	Analyzing the basics of coplanar forces and equilibrium of forces acting on a rigid body and solving the problems.
	CO5	Estimating the coefficient of friction and normal reaction of a body on a rough inclined plane under equilibrium condition.

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UGC3S1		Skill Based Subject 1 – Cyber Security		
Batch 2023-2026	Semester III	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. The course introduces the basic concepts of Cyber Security
2. To develop an ability to understand about various modes of Cyber Crimes and Preventive measures
3. To understand about the Cyber Legal laws and Punishments

Course Outcomes (CO)

K1 - K5	CO1	To Understand the Concepts of Cybercrime and Cyber Frauds
	CO2	To Know about Cyber Terrorism and its preventive measures
	CO3	To Analyze about the Internet, Mobile Phone and E-commerce security issues
	CO4	To Understand about E-mail and Social Media Issues
	CO5	To Describe about various legal responses to Cybercrime

Programme Code : 02	B.Sc Mathematics		
PART IV -NON MAJOR ELECTIVE –I HUMAN RIGHTS			
Batch 2023-2026	Hours / Week 2	Total Hours 30	Credits 2

Objectives

1. To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy
5. To appreciate the relationship between rights and duties
6. To foster respect for tolerance and compassion for all living creature.

Course Outcomes (CO)

K1 – K5	CO1	T o understand the hidden truth of Human Rights by studying various theories.
	CO2	To acquire overall knowledge regarding Human Rights given by United Nation Commission. (UNO)
	CO3	To gain knowledge about various organs responsible for Human Rights such as National Human Rights Commission and state Human Right commission (UNHCR)
	CO4	To get habits of how to treat aged person, others and positive social responsibilities
	CO5	To treat and confirm, child, refugees and minorities with positive social justice.

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA407		Core Paper 7 - Number Theory		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	IV	3	45	3

Course Objectives

1. To expose the basics of number theory to the students.
2. To enable the students to learn the usage of prime numbers and factors.
3. To solve linear congruences.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concepts of divisibility, congruence, GCD and prime numbers.
	CO2	Explaining various divisibility tests.
	CO3	Identifying the Euler number and solving the linear congruence.
	CO4	Analyzing the nature of numbers.
	CO5	Evaluating the greatest integer function, Euler function and the solution of the congruence equations.

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA408		Core Paper 8 –Dynamics		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	IV	4	60	4

Course Objectives

1. To enable the students to know the laws, principles and understand the concepts of motion of a particle and projectiles.
2. To provide the knowledge about the field of kinematics and impact between spheres.
3. To gain knowledge about simple harmonic motion and central orbits.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concepts of motion of a particle and projectile in different angles.
	CO2	Understanding the notions of impact between two smooth spheres in different ways.
	CO3	Applying the concept of simple harmonic motions in composition of two bodies in different directions.
	CO4	Distinguishing between the pedal equations of well known curves.
	CO5	Determining the force and the central orbits of the curves in two fold problems.

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA4S2		Skill Based Subject 2–Vedic Mathematics		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	IV	2	30	3

Course Objectives

1. To make the students to calculate faster.
2. To equip the students with skills to meet competitive examinations.
3. To train the students to solve complex problems efficiently.

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Course Outcomes (CO)

K1 to K5	CO1	Remembering various techniques in Vedic Mathematics
	CO2	Understanding the steps involved in each technique
	CO3	Solving general equations
	CO4	Analyzing the different methods available for effective calculation
	CO5	Exploring the Vedic sutras in arithmetic.

Programme Code: 02	**B.Sc Mathematics**		
Course Code:**23UWR4N2**	**Part IV -Non- Major Elective – II Women's Rights**		
Batch **2023-2026**	Hours / Week **2**	Total Hours **30**	Credits **2**

Objectives

1. To know about the laws enacted to protect Women against violence.
2. To impart awareness about the hurdles faced by Women.
3. To develop a knowledge about the status of all forms of Women to access to justice.
4. To create awareness about Women's rights.
5. To know about laws and norms pertaining to protection of Women.
6. To understand the articles which enables the Women's rights.
7. To understand the Special Women Welfare laws.
8. To realize how the violence against Women puts an undue burden on healthcare services.

Course Outcomes (CO)

K1toK5	CO1	Understand the importance of Women's Studies and incorporate Women's Studies with other fields.
	CO2	Analyze the realities of Women Empowerment, Portrayal of Women in Media, Development and Communication.
	CO3	Interpret the laws pertaining to violence against Women and legal consequences.
	CO4	Study the important elements in the Indian Constitution, Indian Laws for Protection of Women.
	CO5	To be Aware of Government Developmental schemes for women and to create Awareness on modernization and impact of technology on Women.

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA509		Core paper 9 - Real Analysis-I		
Batch 2023-2026	**Semester** V	**Hours / Week** 5	**Total Hours** 75	**Credits** 3

Course Objectives

1. To know about the basic notions of the real numbers system, set theory, relations and functions .
2. To enable to have knowledge about the basic topological properties and theorems based on point set topology.
3. To Study about the covering theorems, compactness, metric spaces and continuity of a function.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the basic properties in the field of real numbers.
	CO2	Understanding the concepts of continuity, convergent sequences and metric spaces.
	CO3	Applying the concept of point set topology in related theorems
	CO4	Analyzing the compactness and to classify the continuity of a function with its limits.
	CO5	Evaluating the limit of the function and limit of the sequences.

Programme Code: 02		B.Sc Mathematics		
Course Code: 23UMA510		Core Paper 10 - Complex Analysis – I		
Batch 2023-2026	**Semester** V	**Hours / Week** 6	**Total Hours** 90	**Credits** 4

Course Objectives

1. To recognize complex analysis as an essential part of mathematical background for engineers, physists and other scientists.
2. To introduce the students about the complex number system.
3. To Justify the need for a complex number system and explain how it is related to other existing number systems.

Course Outcomes (CO)

K1 to K5	CO1	Defining continuity, differentiability and analyticity of a complex valued function which helps the students to acquire deeper knowledge.
	CO2	Showing the condition(s) for a complex valued function to be analytic and/or harmonic.
	CO3	Developing the concept of sequences and series with respect to the complex numbers system.
	CO4	Analyzing complex integration, Cauchy's integral formulae and Cauchy's fundamental theorem and evaluation of complex integration.
	CO5	Determining the functions of complex variable in terms of continuity, differentiability and analyticity.

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA511		Core Paper 11 - Modern Algebra I		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	V	6	90	4

Course Objectives

1. To know the concepts of group theory and ring theory
2. To understand the concepts of Ideals and Quotient Rings
3. To enable the concepts of Cauchy's theorem for Abelian groups , Sylow's theorem for Abelian groups , Automorphisms , Inner automorphism and Cayley's theorem.

Course Outcomes (CO)

K1 to K5	CO1	Finding whether a given abstract structure is a group or a ring.
	CO2	Understanding the elementary concepts of rings and fields and compare the similarities and differences between these concepts and those of group theory.
	CO3	Applying the concepts of homomorphism and isomorphism for comparing the algebraic features of mathematical systems in groups, rings and fields
	CO4	Examining the results from group theory to study the properties of rings and fields and to possess the ability to work within their algebraic structures.
	CO5	Assessing the finite groups through sylow's theorem.

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA512		Core paper 12 - Programming in C Theory		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	V	4	60	3

Course Objectives

1. To understand the C programming language.
2. To learn the concept of control statements, one dimensional, two dimensional and multi-dimensional arrays.
3. To solve the mathematical problems using C programs.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the importance and functioning of C programming.
	CO2	Understanding the use of decision making statement and loop structures.
	CO3	Applying the operators and functions to solve mathematical problems.
	CO4	Distinguishing different types of arrays.
	CO5	Evaluating the solution for Mathematical problems using programs

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA5CL		Core Practical 1 - Programming in C Practical		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	V	2	30	2

Course Objectives

1. To provide practical experience for the students to understand the structure of a C program.
2. To enrich the knowledge in solving mathematical problems using C programs.
3. To train the students to construct C programs on their own.

Course Outcomes (CO)

K3 to K5	CO1	Remembering the basic concepts of C language to solve Mathematical problems
	CO2	Understanding the usage of strings and arrays.
	CO3	Applying the concepts of loops and control statements in C programs.
	CO4	Classify the various operators used to develop a solution for a mathematical problem
	CO5	Evaluating the mathematical and statistical problems using C programs.

Programme Code : 02	B.Sc Mathematics		
Major Elective Paper - Operations Research			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	6	90	5

Course Objectives

1. To introduce certain OR techniques such as LPP, Transportation problems, Assignment problems and network techniques.
2. To help the students to develop logical reasoning.
3. To apply mathematical tools to managerial and real life problems.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the rules to construct an LPP.
	CO2	Understanding the rules of artificial variables and summarizing the concept of replacement problems.
	CO3	Applying the notions of linear programming in solving transportation problems and Assignment Problem.
	CO4	Analyzing the concept of CPM & PERT
	CO5	Determining the solution for various real time decision making problems.

Extra Departmental Course (EDC)				
Course Code: 23UMA5X1		Fundamentals of Mathematics		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2023-2026	V	2	30	3

Course Objectives

1. To understand the basic concepts in Mathematics and Statistics.
2. To study the concepts related with banking using various Mathematical concepts.
3. To understand the application of these mathematical concepts in the real life problems.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the problems based on Time and work.
	CO2	Understanding the concepts based on Time and Distance.
	CO3	Applying basic mathematical concepts in business problems.
	CO4	Analyzing the different measures of central tendency.
	CO5	Evaluating the correlation and its types.

Programme Code : 02		**B.Sc Mathematics**		
Course Code: 23UMA613		Core Paper 13 - Real Analysis-II		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	VI	6	90	4

Course Objectives

1. To understand the concept of functions, Connectedness, uniform continuity, fixed point and related theorems.
2. To find the Derivatives and related theorems and Functions of bounded variations and related theorems.
3. To enable to know about the Reimann- Stieltjes integrals and its properties.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concept of derivatives, bounded variation.
	CO2	Understanding the concepts of connectedness
	CO3	Applying the differentiability of real functions in related theorems.
	CO4	Analyzing the Riemann Integrals.
	CO5	Determining the continuous function in terms of bounded variation.

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA614		Core paper 14 - Complex Analysis – II		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	VI	6	90	4

Course Objectives

1. To learn about Taylor's Series and Laurent's series.
2. To understand the concept of singularities and residues.
3. To study the concept of definite integrals.

Course Outcomes (CO)

K1 to K5	CO1	Recalling the fundamental theorem of algebra in complex number system.
	CO2	Illustrating the Taylor's and Laurent's expansions of simple functions.
	CO3	Applying Laurent's series for isolated singularities and determine residues.
	CO4	Analyzing the concepts of residues and residue theorem to compute real definite integrals using contours.
	CO5	Interpreting integrals along a path in the complex plane using Cauchy's theorem.

Programme Code : 02		B.Sc Mathematics		
Course Code: 23UMA615		Core Paper 15 - Modern Algebra II		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	VI	6	90	4

Course Objectives

1. To know the concepts of Hermitian and Skew-Hermitian Matrices , Orthogonal and Unitary Matrices ,Characteristic Roots and Characteristic Vectors of a Square Matrix.
2. To enable the concepts of linear independence, basis and dimension of a vector spaces.
3. To understand the concept of linear transformation and matrices which will enrich the knowledge of logical thinking.

Course Outcomes (CO)

K1 to K5	CO1	Recalling the basic concepts of matrices, rank of a Matrix
	CO2	Understanding the basic ideas of vector spaces and the concepts of linear span, linear independence, basis, dimension and to apply these concepts to vector spaces, subspaces and inner product spaces.
	CO3	Applying the principles of matrix algebra to linear transformations and compute their rank.
	CO4	Examining whether the given set of vector is linearly independent or linearly dependent .
	CO5	Evaluating the Eigen values and Eigen vectors of a matrix.

Programme Code: 02	**B.Sc Mathematics**		
Major Elective Paper- NUMERICAL METHODS			
Batch 2023-2026	**Hours / Week** 5	**Total Hours** 75	**Credits** 5

Course Objectives

1. To solve algebraic and transcendental equations for finding roots using numerical methods.
2. To solve simultaneous linear algebraic equations using various numerical methods
3. To know about finite differences and its uses to interpolate the values for equal and unequal intervals.

Course Outcomes (CO)

K1 to K5	CO1	Remembering various numerical methods for finding the solution of algebraic and transcendental equations.
	CO2	Demonstrating various numerical algorithms for solving simultaneous linear algebraic equations.
	CO3	Applying finite difference methods for interpolation.
	CO4	Analyzing the various methods of interpolation for equal and unequal intervals.
	CO5	Evaluating the solutions of the algebraic and transcendental equations using MATLAB.

Programme Code : 02	**B. Sc Mathematics**
Course code: 23UMA6Z1	Project
Batch 2023-2026	**Credits** :5

Course Objectives

1. To study the basic concepts related to the Project work.
2. To identify the field of research.
3. To know the concept of writing a dissertation in an effective way.

Course Outcomes (CO)

K3 toK5	CO1	Choosing the area of research
	CO2	Classifying their findings or the data collected
	CO3	Applying the relative notions in the respective areas and finding the results.
	CO4	Analyzing results with the existing results.
	CO5	Interpreting the results with suitable examples.

Programme Code : 02		**B.Sc Mathematics**		
Course Code:23UMA6SL		Skill Based Subject 3 Fundamentals of LaTeX-Practical		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	VI	3	45	3

Course Objectives

1. LaTeX is a typewriting system that is extremely useful for typing and formatting scientific documents.
2. Typing Mathematical equations is very intuitive and easy in LaTeX.
3. This practical subject is Job and Skill oriented for the students.

Course Outcomes (CO)

K3 to K5	CO1	Choosing LaTeX software to prepare letters, dissertation, curriculum vitae and other documents
	CO2	Illustrate model question papers, matrix, case statements and tables using LaTeX software
	CO3	Select LaTeX software for preparing research papers as per the journal's template.
	CO4	Construct molecular orbital diagrams for Homo and Hetro diatomic molecules by using MO diagram package in LaTeX software
	CO5	Recommending R software to merge the coding of R with the LaTeX documents

Programme Code : 02	**B.Sc Mathematics**		
Major Elective Paper- LINEAR ALGEBRA			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	5	75	5

Course Objectives

1. Represent mathematical information and communicate mathematical reasoning symbolically and verbally.
2. Apply mathematical methods involving arithmetic, algebra, geometry, and graphs to solve problems.
3. Interpret and analyze numerical data, mathematical concepts, and identify patterns to formulate and validate reasoning

Course Outcomes(CO)

K1 to K5	CO1	Remembering to write the system of linear equations in terms of matrix equations
	CO2	Understanding the systems of linear equations and matrix equations to determine linear dependency or independency.
	CO3	Solving problems that can be modeled by systems of linear equations.
	CO4	Examining the solution set of a system of linear equations
	CO5	Assessing bilinear symmetric forms.

Programme Code : 02	**B.Sc Mathematics**		
Major Elective Paper-ASTRONOMY			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	5	75	5

Course Objectives

1. To acquire the knowledge about the celestial objects and planets.
2. Develop skills to design observing projects with research telescopes and projects drawing upon data in the literature and in archives.
3. To be familiar with the appearance of a range of common astronomical objects, such as asteroids, comets, satellites, planets, stars, and galaxies.

Course Outcomes(CO)

K1 to K5	CO1	Defining about the observed properties of physical systems that comprise the known universe.
	CO2	Demonstrate their ability to read, understand, and critically analyze the astronomical/physical concepts
	CO3	Applying their physics and mathematical skills to problems in the areas of planetary science.
	CO4	Analyzing for valid scientific conclusions and communicate those conclusions in a clear and articulate manner.
	CO5	Demonstrating eclipse of moon

Programme Code : 02	**B.Sc Mathematics**		
Major Elective Paper **FUZZY MATHEMATICS**			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	5	75	5

Course Objectives

1. To know the basic definitions of fuzzy set theory.
2. To know the fundamentals of fuzzy Algebra.
3. To know the applications of fuzzy Technology.

Course Outcomes(CO)

K1 to K5	CO1	Remembering the basic concepts of Boolean algebra.
	CO2	Understanding the concepts of fuzzy sets.
	CO3	Identifying the concepts of Algebra of fuzzy relations and logic connectives.
	CO4	Analyzing fuzzy subgroup and Preimage of subgroupoid.
	CO5	Evaluating the fuzzy invariant for subgroup.

Programme Code : 02	**B.Sc Mathematics**		
Major Elective Paper **COMBINATORICS**			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	5	75	5

Course Objectives

1. To learn about recurrence relation.
2. To have knowledge about permutation.
3. To be familiar with assignment problems.

Course Outcomes(CO)

K1 to K5	CO1	Remembering the basic concepts of Fibonacci sequence.
	CO2	Understanding the concepts of Permutation and Fibonacci type relation.
	CO3	Identifying the concepts of counting simple electrical networks.
	CO4	Analyzing inclusion and Exclusion principle.
	CO5	Evaluating Fibonacci relation using generating function.

Programme Code : 02	**B.Sc Mathematics**		
Non- Major Elective – Consumer Affairs			
Batch	**Hours/Week**	**Total Hours**	**Credits**
2023-2026	2	30	2

Course Objectives

1. To familiarize the students with their rights and responsibilities as a consumer.
2. To understand the procedure of redress of consumer complaints.
3. To know more about decisions on Leading Cases by Consumer Protection Act.
4. To get more knowledge about Organizational set-up under the Consumer Protection Act
5. To impart awareness about the Role of Industry Regulators in Consumer Protection
6. To understand Contemporary Issues in Consumer Affairs

Course Outcomes (CO)

K1 to K5	CO1	Able to know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
	CO3	Applying the role of different agencies in establishing product and service standards.
	CO4	Analyse to handle the business firms' interface with consumers.
	CO5	Assess Quality and Standardization of consumer affairs

Programme Code: 03		B.Sc Physics		
Course Code:23UMA1A1		Allied Paper 1 - Mathematics I		
Batch 2023-2026	**Semester** I	**Hrs/Week** 7	**Total Hours** 105	**Credits** 5

Course Objectives

1.To provide the basic knowledge of Trigonometry and Matrices.
2.To get the ability of solving first and second order ordinary differential equations and first order partial differential equations
3.To give basic knowledge about Mathematical concepts in Calculus.

Course Outcomes (CO)

K1 to K5	CO1	Defining hyperbolic and inverse hyperbolic functions.
	CO2	Understanding the concept of Characteristic equations to find Eigen Values and Eigen Vector.
	CO3	Applying finite difference methods for interpolation.
	CO4	Analyzing the Laplace and inverse Laplace transforms and solve Ordinary differential equations.
	CO5	Evaluating the Eigen Values and Eigen Vectors of a Matrix

Programme Code:03		B.Sc Physics		
Course Code:23UMA2A1		Allied Paper 2 - Mathematics II		
Batch 2023-2026	**Semester** II	**Hrs/Week** 7	**Total Hours** 105	**Credits** 5

Course Objectives

1. To provide the basic knowledge of Probability.
2. To get the ability to solve Partial differential equations.
3. To Understand basic knowledge in Vector Calculus.

Course Outcomes (CO)

K1 to K5	CO1	Defining the multiple integrals using Green's Theorem.
	CO2	Illustrating the Fourier Coefficient for periodic Functions.
	CO3	Solving Partial Differential Equation by using the Lagrange's Method.
	CO4	Examining the concept of probability.
	CO5	Evaluating the General solution of Bessel's equations

Programme Code:04		B.Sc Chemistry		
Course Code:23UMA1A2		Allied Paper 1 - Mathematics I		
Batch	**Semester**	**Hrs/Week**	**Total Hours**	**Credits**
2023-2026	I	**7**	105	5

Course Objectives

1.To provide the basic knowledge of Trigonometry.
2.To get the ability of solving first and second order ordinary differential equations and first order partial differential equations
3.To know about finite differences and its uses to interpolate the values for equal and unequal intervals.

Course Outcomes (CO)

K1 to K5	CO1	Defining hyperbolic and inverse hyperbolic functions.
	CO2	Understanding the concept of first order higher degree ordinary differential equations.
	CO3	Applying finite difference methods for interpolation.
	CO4	Analyzing the Laplace and inverse Laplace transforms to solve the Ordinary differential equations.
	CO5	Evaluating the characteristic roots and characteristic vectors of a matrix.

Programme Code: 04		B.Sc Chemistry		
Course Code:23UMA2A2		Allied Paper 2 - Mathematics II		
Batch	**Semester**	**Hrs/Week**	**Total Hours**	**Credits**
2023-2026	II	**7**	105	5

Course Objectives

1. To give basic knowledge about Mathematical concepts in Calculus.
2. To understand the concepts of Evaluating Double and Triple integrals.
3. To get the ability of solving Partial differential equations .

Course Outcomes (CO)

K1 to K5	CO1	Remembering the formulas in Differentiation and Integration.
	CO2	Illustrating the Fourier Coefficient for periodic Functions.
	CO3	Solving Partial Differential Equation by using the Lagrange's Method.
	CO4	Analyzing the differential operator to find Gradient, Divergence and Curl
	CO5	Evaluating the Fourier series with different intervals.

Programme Code : 09		B.Sc Computer Science		
Course Code: 23UCS1A1		Allied 1 - DISCRETE MATHEMATICS AND STATISTICS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	6	90	5

Course Objectives

1. To understand the concepts of discrete structures, formal languages.
2. To use finite state machines to model computer operations.
3. To solve real time problems using various statistical techniques.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the fundamental ideas and notation of discrete mathematics with examples.
	CO2	Understanding the concept of measures of central tendency, measures of dispersion, Correlation, regression, probability distributions, hypothesis testing.
	CO3	Applying problem solving techniques to solve real world problems.
	CO4	Analyzing the experimental and observational data and draw appropriate conclusions.
	CO5	Interpreting the coefficient of correlation and regression.

Programme Code: 11		B.Sc Computer Technology		
Course Code: 23UCT1A1		Allied 1-Discrete Mathematics and Statistics		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	6	90	5

Course Objectives

1. To understand the concepts and principles of mathematical logic, formal languages
2. To classify Measures of central tendency and dispersion
3. To know the purpose of correlation and regression

Course Outcomes (CO)

K1 toK5	CO1	Remembering about the fundamental ideas and notation of discrete mathematics with examples
	CO2	Understanding the concepts of measures of central tendency and dispersion
	CO3	Applying Logic and Boolean algebra concepts in circuit construction
	CO4	Analyzing grammar in shortest path construction
	CO5	Evaluating the regression coefficient among the variables.

Programme Code: 10		BCA		
Course Code: 23UCA1A1		**COMPUTER ORIENTED NUMERICAL AND STATISTICAL METHODS**		
Batch 2023-2026	Semester I	Hours / Week 6	Total Hours 90	Credits 5

Course Objectives

1. To demonstrate the mathematical concepts underlying the numerical methods considered.
2. To understand the concepts in statistical techniques.
3. To motivate students an intrinsic interest in statistical thinking.

Course Outcomes (CO)

K1 to K5	CO1	Finding the unknown values in simultaneous linear equations using some methods in Numerical Techniques.
	CO2	Extending the idea of finding the integration of simple functions using Numerical Techniques.
	CO3	Choosing the concept of measures of central tendency and dispersion.
	CO4	Analyzing the concept of sampling and some of the Statistical Tests.
	CO5	Evaluating the statistical data by the concept of sampling techniques.

Programme Code : 08		**B.Sc Biotechnology**		
Course Code: 23UBT3A3		Fundamentals of Mathematics		
Batch 2023-2026	**Semester** III	**Hours / Week** 5	**Total Hours** 75	**Credits** 4

Course Objectives

1. To understand the fundamental knowledge on mathematics in biology.
2. To provide the necessary basic concepts of numerical methods and the problem solving techniques in scientific problems using Numerical methods.
3. To expose that the differential and integral equations are powerful tools in solving problems in biology and medicine.

Course Outcomes (CO)

K1 to K5	CO1	Remember the basic concepts in mathematics.
	CO2	Demonstrating various numerical algorithms for solving simultaneous linear algebraic equations.
	CO3	Applying the concepts of Differentiation and Integration in the field of Bio-technology.
	CO4	Analyzing the solutions of differential and integral equations by various numerical techniques.
	CO5	Evaluating numerical solutions for differentiation and integration using Numerical methods

Programme Code: 12		Information Technology		
Course Code: 23UIT1A1		Allied 1-Mathematical Foundation for Computer Science		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	6	90	5

Course Objectives

1.To understand the concepts and principles of mathematical logic
2.To classify Measures of central tendency and dispersion
3.To know the purpose of correlation and regression

Course Outcomes (CO)

K1 to K5	CO1	Remembering about the fundamental ideas and notation of discrete mathematics with examples
	CO2	Understanding the concepts of measures of central tendency and dispersion
	CO3	Applying Logic and Boolean algebra concepts in circuit construction
	CO4	Analyzing the results through the program outputs
	CO5	Evaluating the regression coefficient among the variables.

Programme Code :16		BBA		
Course Code : 23UBB1A1		MATHEMATICS FOR MANAGEMENT – I		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	6	90	5

Course Objectives

1. To Understand the concepts of Matrices, concepts related with banking and concepts of various statistical tools.
2. To study the concepts of statistics, Measures of dispersion and Analysis of time series. Also understand the applications of these concepts in real world problems.
3. To use mathematical knowledge to analyze and solve problems.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the basic concepts of mathematics in business analysis
	CO2	Understanding the problem-solving methods
	CO3	Applying basic mathematical calculations in business problems
	CO4	Analyzing mathematical techniques and applications
	CO5	Evaluating correlation and regression coefficient among the variables

Programme Code : 17		BBA CA		
Course Code : 23UBA1A1		MATHEMATICS FOR MANAGEMENT – I		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	6	90	5

Course Objectives

1. To Understand the concepts of Matrices, concepts related with banking and concepts of various statistical tools.
2. To study the concepts of statistics, Measures of dispersion and Analysis of time series. Also understand the applications of these concepts in real world problems.
3. To use mathematical knowledge to analyze and solve problems.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the basic concepts of mathematics in business analysis
	CO2	Understanding the problem-solving methods
	CO3	Applying basic mathematical calculations in business problems
	CO4	Analyzing mathematical techniques and applications
	CO5	Evaluating correlation and regression coefficient among the variables

Programme Code : 13		B.Com		
Course Code: 23UCM3A3		BUSINESS MATHEMATICS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	Credits
2023-2026	III	6	90	5

Course Objectives

1. To give basic knowledge about Mathematical concepts
2. To solve the modern business problems using various mathematical techniques.
3. To solve the various real life business problems.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the application of mathematics in business analysis
	CO2	Understanding the concepts of mathematics in finance
	CO3	Applying basic mathematical calculations in business problems
	CO4	Analyzing the business conditions using Effective rate of Interest.
	CO5	Evaluating the solution for business problems using Graphical and Simplex method

Programme Code : 15		B.Com PA		
Course Code: 23UPA1A1		MATHEMATICS FOR BUSINESS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	6	90	5

Course Objectives

1. On successful completion of this course, the student should have understood the basic concepts.
2. To use Mathematical Techniques to solve the modern business problems.
3. To enable the students to apply basic mathematical knowledge to solve the real life business problems.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the basic concepts of mathematics in business analysis
	CO2	Understanding the concepts of mathematics in finance
	CO3	Applying basic mathematical calculations in business problems
	CO4	Analyzing the business conditions using Differentiation and Integration
	CO5	Evaluating the solution for business problems using Graphical and Simplex Method.

Programme Code :14		B.Com CA		
Course Code: 23UCC1A1		BUSINESS MATHEMATICS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	6	90	5

Course Objectives

1. To give basic knowledge about Mathematical concepts
2. To solve the modern business problems using various mathematical techniques
3. To enable the students to apply basic mathematical knowledge to solve the real life business problems.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the basic concepts of mathematics in business analysis
	CO2	Understanding the concepts of mathematics in finance
	CO3	Applying basic mathematical calculations in business problems
	CO4	Analyzing the business conditions using Differentiation and Integration
	CO5	Evaluating Linear programming problem by using graphical and tabulation method.

Programme Code : 19		B.Com (Banking & Insurance)		
Course Code: 23UCB1A1		BUSINESS MATHEMATICS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	6	90	5

Course Objectives

1. On successful completion of this course, the student should have understood the basic concepts.
2. To use Mathematical Techniques to solve the modern business problems.
3. To enable the students to apply basic mathematical knowledge to solve the real life business problems.

Course Outcomes (CO)

K1 – K5	CO1	Remembering the basic concepts of mathematics in business analysis
	CO2	Understanding the concepts of mathematics in finance
	CO3	Applying basic mathematical calculations in business problems
	CO4	Analyzing the business conditions using Linear Programming problems.
	CO5	Evaluating the solution for business problems using Graphical and Simplex method

Programme Code : 21		B.Sc Psychology		
Course Code: 23UPS3A3		**ALLIED III: PSYCHOLOGICAL STATISTICS**		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	III	5	75	5

Course Objectives

1. To give basic knowledge about statistical concepts.
2. To solve the social problems using various statistical techniques.
3. To provide knowledge and skills to select and conduct appropriate statistical tests for psychological research.

Course Outcomes (CO)

K1 to K5	CO1	Remembering appropriate Statistical techniques for summarizing and displaying social science data.
	CO2	Understanding the concepts of measures of central tendency and formulate percentile by arranging the data from smallest to largest.
	CO3	Applying the statistical tools to solve sociological problems.
	CO4	Analyzing and interpret the variance form ANOVA output.
	CO5	Evaluating the correlation among the variables.

Programme Code : 20		B.Com (Accounting and Finance)		
Course Code: 23UAF3A3		BUSINESS MATHEMATICS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	Credits
2023-2026	III	6	90	5

Course Objectives

1. To give basic knowledge about Mathematical concepts
2. To solve the modern business problems using various mathematical techniques.
3. To solve the various real life business problems.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the application of mathematics in business analysis
	CO2	Understanding the concepts of mathematics in finance
	CO3	Applying basic mathematical calculations in business problems
	CO4	Analyzing the business conditions using Effective rate of Interest.
	CO5	Evaluate the solution for business problems using Graphical and Simplex method

Programme Code : 24		B.Sc Artificial Intelligence and Machine Learning		
Course Code : 23UAI1A1		**ALLIED 1:** Discrete Mathematics and Statistics		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	6	90	4

Course Objectives

1. To understand the techniques, algorithms, and reasoning processes involved in the study of discrete mathematical structures.
2. To understand the concepts and principles of mathematical logic, formal languages
3. To use finite state machines to model computer operations
4. To classify Measures of central tendency and dispersion
5. To know the purpose of correlation and regression

Course Outcomes (CO)

K1 to K5	CO1	Remember the basic concepts in mathematical logic and statistics.
	CO2	Analyze and construct mathematical arguments that relate to the study of discrete structures
	CO3	Apply the techniques of discrete structures and logical reasoning to solve a variety of problems and write an argument using logical notation
	CO4	Understanding the concepts of measures of central tendency and dispersion
	CO5	Analyze the correlation among the variables.

Programme Code : 23		B.Sc Computer Science with Data Analytics		
Course Code : 23UDA1A1		**ALLIED 1: Discrete Mathematics and Statistics**		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	6	90	4

Course Objectives

1.To understand the techniques, algorithms, and reasoning processes involved in the study of discrete mathematical structures.
2.To understand the concepts and principles of mathematical logic, formal languages
3.To use finite state machines to model computer operations
4.To classify Measures of central tendency and dispersion
5.To know the purpose of correlation and regression

Course Outcomes (CO)

K1 to K5	CO1	Remember the basic concepts in mathematical logic and statistics.
	CO2	Analyze and construct mathematical arguments that relate to the study of discrete structures
	CO3	Apply the techniques of discrete structures and logical reasoning to solve a variety of problems and write an argument using logical notation
	CO4	Understanding the concepts of measures of central tendency and dispersion
	CO5	Analyze the correlation among the variables.

Programme Code : **22**		B.Com IT		
Course Code: 23UCI1A1		ALLIED I- BUSINESS MATHEMATICS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	I	6	90	5

Course Objectives

1. To impart basic knowledge about Mathematical concepts
2. To solve the business problems using various mathematical techniques
3. To enable the students to apply basic mathematical knowledge to solve the real life business problems.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the applications of mathematics in business analysis
	CO2	Understanding the concepts of mathematics in finance
	CO3	Applying basic Mathematical concepts in business problems
	CO4	Analyzing the business conditions using Linear Programming Problems.
	CO5	Evaluating the solution for business problems using graphical method and Simplex method

Programme Code : 9		B.Sc Computer Science		
Course Code: 23UCS2A2		ALLIED 2 - OPERATIONS RESEARCH		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	6	90	5

Course Objectives

1. To understand the various mathematical applications in industries and decision making for real time environment.
2. To gain the knowledge about the principles and applications of operations research.
3. To develop skills necessary to effectively analyze and synthesize the inter-relationships inherent in complex socio-economic productive systems.

Course Outcomes (CO)

K1 to K5	CO1	Remembering mathematical formulation of the problem.
	CO2	Understanding the notions of linear programming in solving transportation problems and Assignment Problems.
	CO3	Applying the fundamental concept of inventory control and Queuing theory.
	CO4	Analyzing CPM and PERT techniques, to plan, schedule, and control project activities.
	CO5	Determine new simple models to improve decision making and develop critical thinking.

Programme Code :12		B.Sc. Information Technology		
Course Code : 23UIT2A2		Operations Research		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	6	90	5

Course Objectives

1. To understand the concept of Linear Programming Problem
2. To explain the various mathematical applications in industries
3. To show the optimization concepts in real time environment

Course Outcomes (CO)

K1 to K5	CO1	Remembering the replacement problem.
	CO2	Understanding the notions of Linear Programming in solving Transportation Problems and Assignment Problems.
	CO3	Applying the fundamental concept of inventory control.
	CO4	Knowing the application of CPM & PERT
	CO5	Evaluating the real life problems using the concept of Queuing theory.

Programme Code: 10		BCA		
Course Code: 23UCA2A2		**OPERATIONS RESEARCH**		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	6	90	5

Course Objectives

1. To identify and develop operational research models from the verbal description of the real system.
2. To understand the mathematical tools that are needed to solve optimization problems.
3. To develop a report that describes the model and the solving technique.

Course Outcomes (CO)

K1 to K5	CO1	Showing that the real time problems can be solved by using operations research techniques.
	CO2	Demonstrating the idea of finding the shortest path using transportation problem.
	CO3	Appling the concept of inventory control and replacement techniques in business.
	CO4	Examining the concept of traffic intensity in real life problems.
	CO5	Evaluating the real life problems using the concept of queuing theory.

Programme Code : 08		**B.Sc Biotechnology**		
Course Code: 23UBT4A4		Bio-Statistics		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	IV	4	60	4

Course Objectives

1. To provide the fundamental knowledge on statistics in biology.
2. Students can be able to know the level of significance after analysis of data and also applied in research work.
3. Acquire knowledge on sources for the biological data base and its storage and analysis

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concept of sampling techniques.
	CO2	Understanding the significant of biostatistics on biological sciences and also applied in research work.
	CO3	Applying the bio-statistical formula to solve the biological related problems.
	CO4	Analyzing one way and two way classification.
	CO5	Evaluating the correlation and regression coefficients among the variables.

Programme Code : 08		B.Sc Biotechnology		
Course Code: 23UBT4AL		Lab in Bio-Statistics		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	IV	2	30	2

Course Objectives

1. To provide practical experience for the students.
2. Students can be able to know the level of significance after analysis of data and also applied in research work.
3. To analyze the data by using varied statistical methods.

Course Outcomes (CO)

K3 to K5	CO1	Remembering the basic concepts of R Programming.
	CO2	Understanding the importance of R Programming in research problems
	CO3	Applying the concepts of average and statistical test in R programming
	CO4	Analyzing thr various features available in R programming
	CO5	Evaluating the mathematical problems using R programming

Programme Code : 13		B.Com		
Course Code: 23UCM4A4		BUSINESS STATISTICS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	IV	6	90	5

Course Objectives

1. To demonstrate understanding of basic concepts of probability and statistics embedded in their courses
2. Statistics in the social sciences involves the collection, analysis, interpretation, and Presentation of data to answer questions about the social world.
3. To Perform Correlation & Compute the equation of simple regression line from a sample data and the intercept of the equation

Course Outcomes (CO)

K1 to K5	CO1	Selecting appropriate Statistical techniques for summarizing and displaying business data.
	CO2	Understanding the measures of central tendency, symmetrical and asymmetrical distribution
	CO3	Identifying and carryout basic statistical analyses used in sociological inquiry.
	CO4	Analyzing and draw inferences from business data using appropriate statistical methods.
	CO5	Evaluating the trend lines from business data using business forecasting models

Programme Code :14		B.Com CA		
Course Code: 23UCC2A2		BUSINESS STATISTICS		
Batch 2023-2026	**Semester** II	**Hours / Week** 6	**Total Hours** 90	**Credits** 5

Course Objectives

1. To give basic knowledge about statistical concepts.
2. To solve the modern business problems using various statistical techniques
3. To estimate the mean and standard deviation of the marginal distribution of the response variable and use this information to inform a business decision

Course Outcomes (CO)

K1 to K5	CO1	Selecting appropriate Statistical techniques for summarizing and displaying business data
	CO2	Interpreting correlation coefficients and Formulate regression line by identifying dependent and independent variables.
	CO3	Identifying and carryout basic statistical analyses used in sociological inquiry.
	CO4	Analyzing and draw inferences from business data using appropriate statistical methods.
	CO5	Evaluating the trend lines from business data using business forecasting models

Programme Code : 15		B.Com PA		
Course Code: 23UPA2A2		STATISTICS FOR BUSINESS		
Batch 2023-2026	**Semester** II	**Hours / Week** 6	**Total Hours** 90	**Credits** 5

Course Objectives

1. To give basic knowledge about statistical concepts.
2. To solve the modern business problems using various statistical techniques
3. To estimate the mean and standard deviation of the marginal distribution of the response variable and use this information to inform a business decision

Course Outcomes (CO)

K1 to K5	CO1	Choosing a statistical method for solving practical problems.
	CO2	Understanding and use the basic measure of central tendency.
	CO3	Identifying different types of statistical data.
	CO4	Classifying the structure and characteristics of statistical data.
	CO5	Evaluating the trend lines from business data using business forecasting models

Programme Code :16		BBA		
Course Code : 23UBB2A2		MATHEMATICS FOR MANAGEMENT – II		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	6	90	5

Course Objectives

1. To understand various mathematical applications in industries.
2. To know the mathematical tools that are needed to solve optimization Problems.
3. To understand the Decision making for real time environment.

Course Outcomes (CO)

K1 to K5	CO1	Remembering to use the variables for formulating mathematical models in management.
	CO2	Understanding the concept of Transportation and Assignment models
	CO3	Applying the fundamental concept of Queuing theory.
	CO4	Analyzing CPM and PERT techniques, to plan, schedule, and control project activities.
	CO5	Evaluating the solution for business problems using Graphical and Simplex method

Programme Code :17		BBA CA		
Course Code : 23UBA2A2		MATHEMATICS FOR MANAGEMENT – II		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	6	90	5

Course Objectives

1. To understand various mathematical applications in industries.
2. To know the mathematical tools that are needed to solve optimization Problems.
3. To understand the Decision making for real time environment.

Course Outcomes (CO)

K1 – K5	CO1	Remembering to use the variables for formulating mathematical models in management.
	CO2	Understanding the concept of Transportation and Assignment models
	CO3	Applying the fundamental concept of Queuing theory.
	CO4	Analyzing CPM and PERT techniques, to plan, schedule, and control project activities.
	CO5	Evaluating the solution for business problems using Graphical and Simplex method

Programme Code :11		B.Sc. Computer Technology		
Course Code : 23UCT2A2		Operations Research		
Batch	**Semester**	**Hours / week**	**Total Hours**	**Credits**
2023-2026	II	6	90	5

Course Objectives

1. To understand the concept of Linear Programming Problem
2. To explain the various mathematical applications in industries
3. To show the optimization concepts in real time environment

Course Outcomes (CO)

K1 to K5	CO1	Remembering the replacement problem.
	CO2	Understanding the notions of Linear Programming in solving Transportation Problems and Assignment Problems.
	CO3	Applying the fundamental concept of inventory control.
	CO4	Knowing the application of CPM & PERT
	CO5	Evaluating the real life problems using the concept of Queuing theory.

Program Code :**19**		B.Com (Banking & Insurance)		
Course Code: 23UCB2A2		BUSINESS STATISTICS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	6	90	5

Course Objectives

1. To impart basic knowledge about statistical concepts.
2. To solve the business problems using various statistical techniques
3. To Understand the Correlation and Regression problems.

Course Outcomes (CO)

K1 - K5	CO1	Selecting appropriate Statistical techniques for summarizing and displaying business data
	CO2	Understanding to use the basic measure of central tendency.
	CO3	Identifying the statistical tool to solve sociological problems.
	CO4	Analyzing and drawing inferences from business data using appropriate statistical methods.
	CO5	Evaluating correlation and regression analysis among the variables.

Programme Code : 21		B.Sc Psychology		
Course Code: 23UPS4A4		**ALLIED IV: RESEARCH METHODOLOGY**		
Batch 2023-2026	**Semester** IV	**Hours / Week** 5	**Total Hours** 75	**Credits** 5

Course Objectives

1. To give basic knowledge about research and its methodologies.
2. To identify the concepts and procedures of sampling, data collection, analysis and Reporting.
3. To develop an understanding of various research designs and techniques.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the research problem and technique and defining a problem are developing a research Plan.
	CO2	Understanding the concepts of sampling, error and its degrees of freedom.
	CO3	Identifying various sources of information for data collection.
	CO4	Analyzing to prepare key elements of a research report.
	CO5	Interpreting the results of the data using statistical techniques.

Programme Code : 20		B.Com (Accounting and Finance)		
Course Code: 23UAF4A4		BUSINESS STATISTICS		
Batch 2023-2026	**Semester** IV	**Hours / Week** 6	**Total Hours** 90	**Credits** 5

Course Objectives

1. To demonstrate understanding of basic concepts of probability and statistics embedded in their courses
2. Statistics in the social sciences involves the collection, analysis, interpretation, and Presentation of data to answer questions about the social world.
3. To Perform Correlation & Compute the equation of simple regression line from a sample data and the intercept of the equation

Course Outcomes (CO)

K1 to K5	CO1	Selecting appropriate Statistical techniques for summarizing and displaying business data.
	CO2	Understanding the measures of central tendency, symmetrical and asymmetrical distribution
	CO3	Identifying the appropriate statistical tool to solve sociological problems.
	CO4	Analyzing and drawing inferences from business data using appropriate statistical methods.
	CO5	Evaluating the solution for business problems using Graphical and Simplex method

Programme Code : 24		B. Sc Artificial Intelligence and Machine Learning		
Course Code : 23UAI2A2		**ALLIED 2:**OPTIMIZATION TECHNIQUES AND LINEAR ALGEBRA		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	6	90	4

Course Objectives

1.To introduce certain OR techniques such as LPP, Transportation problems, Assignment problems and network techniques.

1. To help the students to develop logical reasoning.
2. To apply mathematical tools to managerial and real life problems.
3. Introduce students to prove mathematical statements by means of inductive reasoning

Course Outcomes (CO)

K1 to K5	**CO1**	Remembering the rules to construct an LPP and Remembering to write the system of linear equations in terms of matrix equations.
	CO2	Understanding the rules of artificial variables and summarizing the concept of simplex problems and Understanding the systems of linear equations and matrix equations to determine linear dependency or independency.
	CO3	Applying the notions of linear programming in solving transportation problems and Assignment Problem and Solving problems that can be modeled by systems of linear equations.
	CO4	Analyzing the concept of CPM & PERT and Examining the solution set of a system of linear equations.
	CO5	Determining the solution for various real time Travelling salesman problems and Assessing Gram-Schmidt forms.

Programme Code : 23		B. Sc Computer Science with Data Analytics		
Course Code : 23UDA2A2		ALLIED 2:OPTIMIZATION TECHNIQUES AND LINEAR ALGEBRA		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	6	90	4

Course Objectives

1.To introduce certain OR techniques such as LPP, Transportation problems, Assignment problems and network techniques.
2.To help the students to develop logical reasoning.
3.To apply mathematical tools to managerial and real life problems.
4.Introduce students to prove mathematical statements by means of inductive reasoning

Course Outcomes (CO)

K1 to K5	**CO1**	Remembering the rules to construct an LPP and Remembering to write the system of linear equations in terms of matrix equations.
	CO2	Understanding the rules of artificial variables and summarizing the concept of simplex problems and Understanding the systems of linear equations and matrix equations to determine linear dependency or independency.
	CO3	Applying the notions of linear programming in solving transportation problems and Assignment Problem and Solving problems that can be modeled by systems of linear equations.
	CO4	Analyzing the concept of CPM & PERT and Examining the solution set of a system of linear equations.
	CO5	Determining the solution for various real time Travelling salesman problems and Assessing Gram-Schmidt forms.

Programme Code : 22		B.COM IT		
Course Code: 23UCI2A2		ALLIED.II- STATISTICS FOR BUSINESS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2026	II	6	90	5

Course Objectives

1. To impart basic knowledge about statistical concepts.
2.To solve the business problems using statistical techniques
3.To develop the students ability in business by using the graphical and algebraic techniques.

Course Outcomes (CO)

K1 to K5	CO1	Choose a statistical method for solving practical problems.
	CO2	Understand and use the basic measure of central tendency.
	CO3	Identify different types of statistical data.
	CO4	Classify the structure and characteristics of statistical data.
	CO5	Evaluate the correlation coefficients and Formulate regression line by identifying dependent and independent variables.

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DEPARTMENT OF MATHEMATICS

COURSE OUTCOMES (CO)

M. Sc MATHEMATICS

For the students admitted in the

Academic Year 2023-2024

Programme Code : 02		M.Sc Mathematics		
Course Code : 23PMA101		**Core Paper 1 –**ALGEBRA		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	I	7	105	5

Course Objectives

1. To study groups, rings, fields and linear transformations which are widely used in many research fields and the concepts of mappings are applied in the subjects like analysisand topology.
2. To show the needs from which a modern mathematical attitude may grow and it is of great help in any further axiomatic study of mathematics.
3. To study the concept of linear transformations using matrices. Also, Contemporary mathematics and mathematical physics make extensive use of abstract algebra.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concept of rings, fields and extension fields.
	CO2	Understanding the difference between algebraic and transcendental extensions; be able to find the minimal polynomial for algebraic elements over a field and be able to prove whether a polynomial is irreducible over a given field.
	CO3	Applying Sylow's theorems to determine the structure of certain groups of small order and also Gauss lemma, Eisentein criterion for irreducibility of rationals.
	CO4	Analyzing Galois groups in simple cases and to apply the group theoretic information to deduce results about fields and polynomials.
	CO5	Evaluating linear transformation in Vector Space.

Programme Code : 02		**M.Sc Mathematics**		
Course Code : 23PMA102		**Core Paper 2 -** REAL ANALYSIS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	I	6	90	4

Course Objectives

1. To learn about advanced topics in Riemann's Stieltjes Integrals.
2. To study the mean value theorem for Riemann and Riemann's Stieltjes integrals.
3. To study directional derivatives, total derivatives, Jacobian determinant and their applications.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the upper and lower integrals and the Riemann conditions.
	CO2	Understanding the difference between necessary and sufficient conditions for Riemann's Stieltjes Integrals.
	CO3	Identifying the sufficient conditions for differentiability and mixed partial derivatives.
	CO4	Analyzing the Jacobian determinant to understand the Implicit and Inverse function theorems.
	CO5	Evaluating the complex integration and Labesgue integral.

Programme Code : 02		M. Sc Mathematics		
Course Code: 23PMA103		Core Paper 3 - Ordinary Differential Equations		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	I	7	105	5

Course Objectives

1. To understand the concepts of fundamental matrix and successive approximation for finding solution.
2. To enable the students to know the concepts of non-homogeneous linear systems with constant co-efficient and periodic co-efficient.
3. To gain knowledge in the area of linear oscillations and non-linear oscillations.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the different types of differential equations.
	CO2	Understanding the concept of linear oscillations and non-linear oscillations.
	CO3	Applying the notions of fundamental matrix and successive approximations in the system of differential equations.
	CO4	Analyzing the non-homogeneous linear systems with constant co-efficient and periodic co-efficient.
	CO5	Evaluating the solutions for homogeneous systems with linear and non-linear oscillations

Programme Code :02		M. Sc Mathematics		
Course Code: 23PMA104		**Core paper 4 -** NUMERICAL ANALYSIS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	I	6	90	4

Course Objectives

1. To solve the linear equations, non-linearequations and interpolating the values using numerical methods.
2. To obtain th e solution of Boundary Value Problems and Characteristic Value Problems using Numerical Methods.
3. To find the Solution of Ordinary Differential Equations and Partial Differential Equations using Numerical methods.

Course Outcomes (CO)

K1 to K5	CO1	Remembering various numerical methods for finding the solution of algebraic and transcendental equations.
	CO2	Demonstrating various numerical algorithms for solving simultaneous linear algebraic equations.
	CO3	Applying various numerical methods to solve differential equations.
	CO4	Analyzing the Boundary Value Problems and Characteristic Value Problems.
	CO5	Evaluating the Characteristic values using power method

Programme Code : 02		M. Sc Mathematics		
Course Code : 23PMA205		**Core Paper 5 -** COMPLEX ANALYSIS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	II	7	105	4

Course Objectives

1. To study Cauchy's theorem and applying it for a rectangle and a disk.
2. To know various types of singularities and evaluation of definite integrals using residues.
3. To understand the concept of power series expansions and canonical products.

Course Outcomes (CO)

K1 to K5	CO1	Recalling rectifiable arcs and line integrals as functions of arcs.
	CO2	Explaining the concepts of Local mapping theorem, Cauchy residue theorem and its applications.
	CO3	Applying the Residue theorem on definite integrals.
	CO4	Analyzing the concepts of Weirstras's theorem and Taylor series.
	CO5	Determining the genus of an Entire function.

Programme Code : 02		**M.Sc Mathematics**		
Course Code: 23PMA206		Core Paper 6 - Partial Differential Equations		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	II	6	90	4

Course Objectives

1. To study linear partial differential equations and non-linear partial differential equations.
2. To know the concept of partial differential equations and their role in modern mathematics.
3. To understand the concepts of wave equations and diffusion equations.

Course Outcomes (CO)

K1 to K5	CO1	Finding the solutions of nonlinear partial differential equations by using Charpit's and Jocobi methods
	CO2	Understanding the classification of PDE's and interpret the solutions using analytical methods.
	CO3	Applying the method of separation of variables and the method of integral transforms to solve the initial, boundary value problems.
	CO4	Analyzing the solutions of Laplace equations subject to the boundary conditions.
	CO5	Evaluating the elementary solutions of wave equations, diffusion equations using calculus of variations.

ProgrammeCode :02		M. Sc Mathematics		
Course Code: 23PMA207		Core Paper 7-MECHANICS		
Batch 2023-2025	**Semester** II	**Hours / Week** 6	**Total Hours** 90	**Credits** 4

Course Objectives

1. To know the basic concepts of the Mechanical system.
2. To understand about the constraints, differential forms and Generating functions
3. To acquire knowledge about mechanical concepts to solve various problems in Mechanics.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concepts of generalized co-ordinates and constraints.
	CO2	Explaining the derivation of Lagrange's and Hamilton equations.
	CO3	Applying Hamilton Principle for deriving Hamilton Jacobi Equation.
	CO4	Analyzing the Lagrange's and Poisson Brackets.
	CO5	Evaluating the transformation equations using generating functions

Programme Code : 02		**M.Sc. Mathematics**		
Course Code: 23PMA208		**Core Paper 8 –** PROGRAMMING IN PYTHON		
Batch 2023-2025	Semester II	Hours / Week 5	Total Hours 75	Credits 3

Course Objectives

1. To introduce the fundamentals of Python Programming.
2. To teach about the concept of Functions in Python.
3. To impart the knowledge of Lists, Tuples, Files and Directories.

Course Outcomes (CO)

K1 – K5	CO1	Remembering the concept of operators, data types, Loops and control statements in Python programming.
	CO2	Understanding the concepts of Input / Output operations in file.
	CO3	Applying the concept of functions and classes.
	CO4	Analyzing the structures of list, tuples and maintaining dictionaries.
	CO5	Justifying the usage of exception handling.

Programme Code : 02		**M.Sc. Mathematics**		
Course Code: 23PMA2CL		**Core Practical 1–** Programming in Python – Practical		
Batch 2023-2025	Semester II	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives

1. To gain knowledge about the concepts of Python programming.
2. To solve algebraic and non-linear ordinary differential equations using Python programs.
3. To enhance the students to develop the program writing skills for mathematical problems.

Course Outcomes (CO)

K3- K5	CO1	Finding the GCD of two integers using Python program
	CO2	Demonstration of Pascal's triangle with the help for loop in Python
	CO3	Utilizing Python program for finding the Numerical solutions of Algebraic and Transcendental Equations.
	CO4	Analyzing the GCD, interpolation values and File management using Python programs
	CO5	Applying, compiling and debugging programs with the help of Python.

Programme Code : 02		M. Sc Mathematics		
Course Code: 23PMA309		Core Paper 9 TOPOLOGY		
Batch 2023-2025	**Semester** III	**Hours / Week** 7	**Total Hours** 105	**Credits** 5

Course Objectives

1. To get basic knowledge in topology and topological spaces.
2. To study the concepts of Compactness and Connectedness.
3. To know the concept of countability axioms.

Course Outcomes (CO)

K1 to K5	CO1	Knowing the basic definitions and properties in topology.
	CO2	Classifying the ideas of product topology and metric topology.
	CO3	Applying countability and separation axioms in proving Urysohn lemma and UrysohnMetrization theorem.
	CO4	Analyzing the concepts of limit point compactness and local compactness.
	CO5	Deducing the properties of Regular, Normal and Hausdorff spaces.

ProgrammeCode : 02		M. Sc Mathematics		
Course Code: 23PMA310		Core Paper 10 FUNCTIONAL ANALYSIS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	III	7	105	5

Course Objectives

1. To know the concepts of Normed linear spaces, Banach spaces and Hilbert spaces.
2. To understand the ideas of Uniform boundedness principles, closed graph theorem and Open mapping theorem.
3. To comprehend the notions of spectral radius, the spectral theorem and Operators on Hilbert spaces.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concepts of semi norms and Quotient spaces.
	CO2	Understanding the operators on normed linear spaces.
	CO3	Applying Uniform boundedness principle on bounded operators.
	CO4	Analyzing the concepts of eigenspectrum on normed linear spaces and spectral radius on Banach spaces.
	CO5	Evaluating the results of Adjoint, Self-Adjoint, Normal and Unitary Operators defined on Hilbert spaces.

Programme Code : 02		M. Sc Mathematics		
Course Code: 23PMA311		Core Paper 11 MATHEMATICAL STATISTICS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	III	7	105	5

Course Objectives

1. To study the concepts of random variables and different types of distributions.
2. To determine the moments of the distribution function by using the characteristic functions.
3. To understand the Methods of finding estimates, Sample moments and their functions

Course Outcomes (CO)

K1 to K4	CO1	Remembering the random events and random variables of different distributions.
	CO2	Classifying the properties of characteristic functions of various distributions.
	CO3	Identifying the types of estimates for various probability distribution functions.
	CO4	Analyzing the functions by using various significance tests.
	CO5	Evaluating Characteristic function and moments of various distributions.

Extra Departmental Course (EDC)				
Course Code : **23PMA3X1**		RESEARCH METHODOLOGY: APPROACHES AND TECHNIQUES		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	III	2	30	2

Course Objectives

1. To know the basic concepts of research process and its methodologies.
2. To discuss the concepts and procedures of sampling, data collection, analysis and reporting.
3. To develop the skills involved in hypothesis testing and its significance.

Course Outcomes (CO)

K1 – K5	CO1	Remembering the research problem and technique and defining a problem are developing a research Plan.
	CO2	Classifying the census and sample survey and different types of sample designs
	CO3	Analyzing the Hypothesis by using various significance tests.
	CO4	Identifying the population variance, Chi – square as a Non- parametric Test.
	CO5	Interpreting the results of data using Statistical tools.

ProgrammeCode :02		M. Sc Mathematics		
Course Code: 23PMA412		Core Paper 12 MATHEMATICAL METHODS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	IV	8	120	5

Course Objectives

1. To study the concept of Fourier transforms .
2. To impart analytical ability in solving variational problemsand integral equations.
3. Touse calculus of variation to find theextremum of a functional.

Course Outcomes (CO)

K1 to K5	CO1	Finding the solution of Fredholm and Volterra Integral equations.
	CO2	Explaining the method to reduce the differential equations to Integral equations.
	CO3	Solving Maximum or minimum of a functional using Calculus of Variation Techniques.
	CO4	Analyzing the Euler's finite difference method, the Ritz method and Kantorovich's method.
	CO5	Evaluating Fourier sine and cosine transforms of given function and to solve PDE's by means of Fourier transforms.

Programme Code : 02		M. Sc Mathematics		
Course Code:23PMA413		Core Paper 13 CONTROL THEORY		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	IV	8	120	5

Course Objectives

1.To know the basic results of Differential Equations and Fixed Point Methods.
2. To study the basics of observability, controllability, stability, stabilizability, optimal Control of linear and nonlinear system.
3. To develop skills to review research papers in the field of Controllability Problems.

Course Outcomes (CO)

K1 to K5	CO1	Choosing ordinary differential equations through state-space representations towards analyzing and designing dynamical systems.
	CO2	Understanding mathematical techniques to formulate and solve control theory problems.
	CO3	Solving the stability of the given linear and nonlinear system using matrix theory.
	CO4	Analyzing various optimal control formulations and necessary conditions of optimal control.
	CO5	Evaluating the stabilization and optimal control via feedback control.

Programme Code:02		M. Sc Mathematics		
Course Code:23PMA414		Core Paper 14 OBJECT ORIENTED PROGRAMMING WITH C++ - THEORY		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	IV	5	75	4

Course Objectives

1. To enable the students to learn about the basic concepts of Object Oriented Programming Techniques, class structure, operators, functions in C++ and operators Overloading and Type Conversions.
2. To know the differences between object oriented programming and procedure oriented programming.
3. To apply object oriented techniques to solve the computing Problems.

Course Outcomes (CO)

K1 to K5	CO1	Finding solutions for problems in Mathematics, Engineering, Science and Technology using Object Oriented Programming.
	CO2	Classifying secured and unsecured data processing by applying Abstraction, Encapsulation and Information hiding.
	CO3	Constructing programmes using C++ features such as composition of objects, Inheritance and Polymorphism.
	CO4	Analyzing the concepts of Object Oriented Programming to solve real world problems.
	CO5	Evaluating the solutions of Mathematical problems using C++ Programs.

Programme Code : 02		M. Sc Mathematics		
Course Code:23PMA4CM		Core Practical 2 OBJECT ORIENTED PROGRAMMING WITH C++ - PRACTICAL		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2023-2025	IV	2	30	2

Course Objectives

1. To identify and formulate the techniques of software development using Object Oriented Programming concepts.
2. To find the solution of complex problems spanning the breadth of the C++ Programming language.
3. To write programs for problems in various domains like Mathematics, Science, Technology and real world problems.

Course Outcomes (CO)

K3 to K5	CO1	Remembering the syntax to write a program
	CO2	Understanding the concepts of object oriented programming.
	CO3	Applying the concepts of Object Oriented Program for building object based applications.
	CO4	Analyzing different logic with suitable validations for a given problem.
	CO5	Interpret and design the Exception Handling Techniques for resolving run-time errors using file I/O.

ProgrammeCode :02	M. Sc Mathematics
Course code: 23PMA4Z1	Project
Batch 2023-2025	**Credits**:2

Course Objectives

1.To study the basic concepts related to the Project work.
2.To know the respective research fields.
3. To know the concept of writing a dissertation in an effective way.

Course Outcomes (CO)

K3 to K5	CO1	Remembering the fundamental notions to undergo a project
	CO2	Understanding the necessary concepts in the respective area of research
	CO3	Applying the relative notions in the respective areas and finding the results.
	CO4	Analyzing results with the existing results.
	CO5	Interpreting the results with suitable examples.

Programme Code : 02	M. Sc Mathematics		
Major Elective Paper -FLUID DYNAMICS			
Batch 2023-2025	**Hours / Week** 7	**Total Hours** 105	**Credits** 5

Course Objectives

1.To have a good understanding of the fundamental equation of viscous compressible fluid.

2.To enable to Bernoulli equations, Momentum theorems and its applications.

3.To understand the motion of solid bodies in fluid and sound knowledge of boundary layer theory.

Course Outcomes (CO)

K1 to K5	CO1	Defining the fundamental aspects of fluid flow behavior.
	CO2	Classifying the flow patterns of a fluid (gas or liquid) depend on its characteristic.
	CO3	Utilizing the fluid dynamics to analyze the flow of air over the surface to calculate pressure, changes in velocity using the Blasius's equation.
	CO4	Analyzing the steady state kinetic energy equation for fluid flow systems and estimate pressure drop in fluid flow systems.
	CO5	Interpret the solution of boundary layer equation.

Programme Code : 02	M. Sc Mathematics		
Major Elective Paper - GRAPH THEORY			
Batch 2023-2025	**Hours / Week** 7	**Total Hours** 105	**Credits** 5

Course Objectives

1. It enables students to impart the different concepts of theory of graphs.
2. The study helps to modelling the real word problems to get solutions.
3. It motivates the students to pursue research.

Course Outcomes (CO)

K1 to K5	CO1	Remembering different types of graphs and their applications
	CO2	Understand various operations on graphs
	CO3	Analysing the applications of different parameters of a graph.
	CO4	Applying the concept of chromatic and domination numbers and its real life applications
	CO5	Determining mathematical modeling using graph theory concepts.

ProgrammeCode : 02	M. Sc Mathematics		
Major Elective Paper- FUNDAMENTALS OF ACTUARIAL MATHEMATICS			
Batch 2023-2025	**Hours / Week** 7	**Total Hours** 105	**Credits** 5

Course Objectives

1 To use standard techniques of mathematics to solve problems in actuarial science

2. To calculate the values of Annuity and Annuity dues .

3.To know the concepts of Life insurance premiums, Temporary assurance, Whole Life assurance and the values of policies.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concept of Insurance policies and its benefits.
	CO2	Understanding the consequences of events involving risk and uncertainity.
	CO3	Applying various modelling techniques to evaluate quantitative risk analysis.
	CO4	Analysing the appropriate Life insurance plans suitable for the individual or concern.
	CO5	Estimating the policy values and surrender values

ProgrammeCode : 02	M. Sc Mathematics		
Major Elective Paper - CRYPTOGRAPHY			
Batch 2023-2025	**Hours / Week** 7	**Total Hours** 105	**Credits** 5

Course Objectives

1. To enable the students to acquire the knowledge about Classical Cipher Systems**,** Shift Registers and Public Key systems.
2. To be familiar with information security awareness and a clear understanding of its importance.
3. To be exposed to the importance of integrating people, processes and technology.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the basic encryption techniques.
	CO2	Understanding the cryptographic theories, principles and technique used in security properties.
	CO3	Constructing a range of different cryptosystems from an applied view point.
	CO4	Analyzing the methods of Cryptography
	CO5	Explaining public key systems

Programme Code : 02	**M.Sc Mathematics**		
Major Elective Paper : **STOCHASTIC PROCESSES**			
Batch 2023-2025	**Hours / Week** 7	**Total Hours** 105	**Credits** 5

Course Objectives

1. To know the basic concepts of Laplace transforms.
2. To study the fundamentals of stochastic process.
3. To know the applications of queuing systems.

Course Outcomes(CO)

K1 to K5	CO1	Remembering the basic concepts of Difference equations.
	CO2	Understanding the concepts of Markov chains.
	CO3	Identifying the concepts of Poisson process and related distributions.
	CO4	Analyzing Stochastic process in queuing and reliability.
	CO5	Explaining the Birth and death process in queuing theory

Programme Code : 02	**M.Sc Mathematics**		
Major Elective – Mathematical Modeling			
Batch 2023-2025	**Hours / Week** 7	**Total Hours** 105	**Credits** 5

Course Objectives

1. To understand physical systems through Mathematical models.
2. To understand applications of differential equations, difference equations and graph theory in Mathematical modelling.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the basic concepts of differential equations.
	CO2	Understanding the properties Mathematical Models.
	CO3	Identifying difference equations through modeling.
	CO4	Analyzing the concepts of seven bridge problem.
	CO5	Evaluating the matrices associated with the directed graphs

ProgrammeCode : 02	M. Sc Mathematics		
Non Major Elective Paper - SYSTEMS ANALYSIS AND DESIGN			
Batch 2023-2025	**Hours / Week** 4	**Total Hours** 60	**Credits** 5

Course Objectives

1. To enable the learners to understand the concepts of Foundations for systems development, Structuring system requirements and Designing Data bases.
2. To explain the principles, methods and techniques of systems development.
3. To elaborate on the application areas for different types of methods.

Course Outcomes (CO)

K1 to K5	CO1	Defining and describe the phases of the system development life cycle.
	CO2	Demonstrating the forms and reports and designing interfaces.
	CO3	Building the system development alternatives.
	CO4	Examining the system analysis problems.
	CO5	Evaluating the developed system for implementation and maintenance

Programme Code: 02		M. Sc Mathematics		
Course Code: 23PGI2N2		**Non-Major Elective Paper :** INFORMATION SECURITY		
Batch 2023-2025	**Semester** II	**Hours/Week** 4	**Total Hours** 60	**Credits** 4

Course Objectives

1. Students will identify the core concepts of Information security.
2. To examine the concepts of Information Security.
3. To design and implement the security features for IT and Industrial sectors.

Course Outcomes(CO)

K1 - K5	CO1	To Learn the principles and fundamentals of information security.
	CO2	To Demonstrate the knowledge of Information security concepts
	CO3	To Understand about Information Security Architecture.
	CO4	To Analyze the various streams of security in IT and Industrial sector.
	CO5	To know about Cyber Laws and Regulations.

ProgrammeCode : 02	M. Sc Mathematics		
Non Major Elective Paper- **FUZZY LOGIC AND NEURAL NETWORKS**			
Batch 2023-2025	**Hours / Week** 4	**Total Hours** 60	**Credits** 5

Course Objectives

1. To understand the concepts of fuzzy sets, fuzzy operations and fuzzy logic.
2. To know the concepts of neural networks and neuro-modeling.
3. To study the basics of neural network architectures and some learning algorithms.

Course Outcomes (CO)

K1 to K5	CO1	Recalling the difference between crisp set theory and fuzzy set theory.
	CO2	Explaining the concepts of operations on fuzzy set.
	CO3	Applying the learning methods in neural network architectures.
	CO4	Examining the Back propagation learning algorithm.
	CO5	Demonstrating the fuzzy set theory and neural networks in real applications

ProgrammeCode : 02	M. Sc Mathematics		
Non Major Elective Paper -MEASURE AND INTEGRATION			
Batch 2023-2025	**Hours / Week** 4	**Total Hours** 60	**Credits** 5

Course Objectives

1. To understand the concepts of Measurable functions and Integrable functions.
2. To know about Lebesgue measure and Lebesgue integral.
3. To apply measurable functions in convergence theorems and The Radon – Nikodym theorem.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concepts of Measure and outer measure
	CO2	Classifying the difference between various measures
	CO3	Applying measure theory in theorems like monotone convergence theorem , bounded convergence theorem .
	CO4	Analyzing L^p spaces.
	CO5	Demonstrating the concepts of differentiation and integration in terms of Lebesgue

ProgrammeCode : 02	M. Sc Mathematics
Course code: 23PMA0D1	ALC 1 DISCRETE MATHEMATICS AND AUTOMATA THEORY
Batch 2023-2025	**Credits** 2

Course Objectives

1. To understand mathematical foundations to create mathematical arguments.
2. To enable to know how lattices and Boolean algebra are used as mathematical models of network systems.
3. To know about Automata Theory and its applications.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the concepts of Mathematical logic.
	CO2	Explaining the implication problems using truth table , replacement process and rules of inference.
	CO3	Solving normal forms of given logical expression.
	CO4	Analyzing Karnaugh map for simplifying the Boolean expression.
	CO5	Demonstrating the abstract models of DFA, NFA and Turing machine models.

ProgrammeCode :02	M. Sc Mathematics
Course code: 23PMA0D2	ALC 2 ASTRONOMY
Batch 2023-2025	**Credits** 2

Course Objectives

4. To acquire the knowledge about the celestial objects and planets.
5. Develop skills to design observing projects with research telescopes and projects drawing upon data in the literature and in archives.
6. To be familiar with the appearance of a range of common astronomical objects, such as asteroids, comets, satellites, planets, stars, and galaxies.

Course Outcomes(CO)

K1 to K5	CO1	Defining about the observed properties of physical systems that comprise the known universe.
	CO2	Demonstrate their ability to read, understand, and critically analyze the astronomical/physical concepts
	CO3	Applying their physics and mathematical skills to problems in the areas of planetary science.
	CO4	Analyze to draw valid scientific conclusions and communicate those conclusions in a clear and articulate manner.
	CO5	Determining the Eclipse of a moon

ProgrammeCode : 02	M. Sc Mathematics
Course code: 23PMA0D3	ALC 3 INTERNET AND JAVA PROGRAMMING
Batch 2023-2025	**Credits** 2

Course Objectives

1. To understand the difference between C, C++ and Java Programs.
2. To explore the Java Applications and to identify the variations between Stand alone java applications and Web based applications.
3. To provide the advanced concepts in java programming like Package, Multi Thread and Applet.

Course Outcomes (CO)

K1 to K5	CO1	Remembering the basic concepts of OOPs, Data Types, Control Statements and Tokens.
	CO2	Understanding about the java statements.
	CO3	Applying the concept of Package, Thread and Applet in program
	CO4	Inspect the java concepts and get the new innovative ideas.
	CO5	Evaluating the usage of AWT components in java frames.