KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

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

College of Excellence (UGC)

Coimbatore – 641 029

DEPARTMENT OF MATHEMATICS

COURSE OUTCOMES (CO)

M.SC. MATHEMATICS

For the students admitted
in the
Academic Year 2020-2021

Programme Code : 02		M.Sc Mathematics		
Course Code : 20PMA101		**Core Paper 1 –**ALGEBRA		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	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 K4	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.

Programme Code : 02		**M.Sc Mathematics**		
Course Code : 20PMA102		**Core Paper 2 -** REAL ANALYSIS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	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 Stieltjesintegrals.
3. To study directional derivatives, total derivatives, Jacobian determinant and their applications.

Course Outcomes (CO)

K1 to K4	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.

Programme Code : 02		M. Sc Mathematics		
Course Code: 20 PMA103		Core Paper 3 - Ordinary Differential Equations		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	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 K4	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.

Programme Code :02		M. Sc Mathematics		
Course Code:20PMA104		**Core paper 4 -** NUMERICAL METHODS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	I	6	90	4

Course Objectives

1. To solve thelinear equations, non-linearequations and interpolating the values using numerical methods.
2. To obtain the 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 K4	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.

Programme Code : 02		M. Sc Mathematics		
Course Code : 20PMA205		**Core Paper 5 -** COMPLEX ANALYSIS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	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 K4	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 Riemann mapping theorem and Schwarz – Christoffel formula.

Programme Code : 02		M.Sc Mathematics		
Course Code: 20PMA206		Core Paper 6 - Partial Differential Equations		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	II	6	90	4

Course Objectives

1. To studylinear 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 K4	CO1	Finding the solutions of the heat equation, wave equation and the Laplace equation subject to boundary conditions
	CO2	Understanding the method of separation of variables and the method of integral transforms.
	CO3	Applying calculus of variations in finding elementary solutions of diffusion equations.
	CO4	Analyzing the solutions of non-linear partial differential equations by using Charpit's and Jacobi's methods.

ProgrammeCode :02		M. Sc Mathematics		
Course Code: 20PMA207		Core Paper 7-MECHANICS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	II	6	90	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 K4	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.

Programme Code : 02		**M.Sc. Mathematics**		
Course Code: 20PMA208		**Core Paper 8 –** Programming in Python		
Batch 2020-2022	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 – K4	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 exception handling
	CO4	Analyzing the structures of list, tuples and maintaining dictionaries.

Programme Code : 02		**M.Sc. Mathematics**		
Course Code: 20PMA2CL		**Core Practical 1–** Programming in Python – Practical		
Batch 2020-2022	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	Utilizing Python program for finding the Numerical solutions of Algebraic and Transcendental Equations.
	CO2	Analyzing the GCD, interpolation values and File management using Python programs
	CO3	Applying, compiling and debugging programs with the help of Python.

Programme Code : 02		M. Sc Mathematics		
Course Code: 20PMA309		Core Paper 9 TOPOLOGY		
Batch 2020-2022	**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 K4	CO1	Recalling the concept of Basis for a 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.

ProgrammeCode : 02		M. Sc Mathematics		
Course Code: 20PMA310		Core Paper 10 FUNCTIONAL ANALYSIS		
Batch 2020-2022	**Semester** III	**Hours / Week** 7	**Total Hours** 105	**Credits** 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 K4	CO1	Remembering the concepts of semi norms and Quotient spaces.
	CO2	Understanding the ideas of Uniform boundedness principles.
	CO3	Applying the concepts of eigenspectrum on normed linear spaces and spectral radius on Banach spaces.
	CO4	Analyzing the results of Adjoint, Self-Adjoint, Normal and Unitary Operators defined on Hilbert spaces.

Programme Code : 02		M. Sc Mathematics		
Course Code: 20PMA311		Core Paper 11 MATHEMATICAL STATISTICS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	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.

Extra Departmental Course (EDC)				
Course Code : **20PMA3X1**		RESEARCH METHODOLOGY: APPROACHES AND TECHNIQUES		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	III	2	30	2

Course Objectives

1. To know the basic concepts of research process and its methodologies.

2. Todiscuss 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 – K4	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.

ProgrammeCode :02		M. Sc Mathematics		
Course Code: 20PMA412		Core Paper 12 MATHEMATICAL METHODS		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	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 K4	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.

Programme Code : 02		M. Sc Mathematics		
Course Code:20PMA413		Core Paper 13 CONTROL THEORY		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	IV	8	120	5

Course Objectives

1.Toknow 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 K4	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.

Programme Code:02		M. Sc Mathematics		
Course Code:20PMA414		Core Paper 14 OBJECT ORIENTED PROGRAMMING WITH C++ - THEORY		
Batch 2020-2022	**Semester** IV	**Hours / Week** 5	**Total Hours** 75	**Credits** 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 K4	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.

Programme Code : 02		M. Sc Mathematics		
Course Code:20PMA4CM		Core Practical 2 OBJECT ORIENTED PROGRAMMING WITH C++ - PRACTICAL		
Batch 2020-2022	**Semester** IV	**Hours / Week** 2	**Total Hours** 30	**Credits** 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)

o K5	CO1	Applying the concepts of Object Oriented Program for building object based applications.

	CO2	Analyzing different logic with suitable validations for a given problem.
	CO3	Interpret and design the Exception Handling Techniques for resolving run-time errors using file I/O.

ProgrammeCode :02	M. Sc Mathematics
Course code: 20PMA4Z1	Project
Batch2020-2022	**Credits**:4

CourseObjectives

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	Applying the relative notions in the respective areas and finding the results.
	CO2	Analyzing results with the existing results.
	CO3	Interpreting the results with suitable examples.

ProgrammeCode : 02	M. Sc Mathematics
Course code: 20PMA0D1	ALC 1 DISCRETE MATHEMATICS AND AUTOMATA THEORY
Batch2020-2022	**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 K4	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.

ProgrammeCode :02	M. Sc Mathematics
Course code: 20PMA0D2	ALC 2ASTRONOMY
Batch 2020-2022	**Credits** 2

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 K4	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.

ProgrammeCode : 02	M. Sc Mathematics
Course code: 20PMA0D3	ALC 3 INTERNET AND JAVA PROGRAMMING
Batch2020-2022	**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 K4	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.

ProgrammeCode : 02	M. Sc Mathematics		
Major Elective Paper -FLUID DYNAMICS			
Batch 2020-2022	**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 K4	CO1	Defining the fundamental aspects of fluid flow behaviour.
	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.

Programme Code : 02	M. Sc Mathematics		
Major Elective Paper - GRAPH THEORY			
Batch 2020-2022	**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 K4	CO1	Remembering different types of graphs and their applications
	CO2	Understand various operations on graphs
	CO3	Analysis the applications of different parameters of a graph.
	CO4	Applying the concept of chromatic and domination numbers and its real life applications

ProgrammeCode : 02	M. Sc Mathematics		
Major Elective Paper- FUNDAMENTALS OF ACTUARIAL MATHEMATICS			
Batch 2020-2022	**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 K4	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.

ProgrammeCode : 02	M. Sc Mathematics		
Major Elective Paper - CRYPTOGRAPHY			
Batch2020-2022	**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 K4	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

Programme Code : 02	**M.Sc Mathematics**		
Major Elective Paper : **STOCHASTIC PROCESSES**			
Batch 2020-2022	**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 K4	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.

Programme Code : 02	**M.Sc Mathematics**		
Major Elective – Mathematical Modeling			
Batch 2020-2022	**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 K4	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.

ProgrammeCode : 02	M. Sc Mathematics		
Non Major Elective Paper - SYSTEMS ANALYSIS AND DESIGN			
Batch2020-2022	**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 K4	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.

ProgrammeCode : 02	M. Sc Mathematics		
Non-Major Elective Paper - VISUAL BASIC AND ORACLE			
Batch 2020-2022	**Hours / Week** 4	**Total Hours** **60**	**Credits** 5

Course Objectives

1. To develop visual programming skills for modern software development.
2. To get the knowledge on Graphical User Interface.
3. To apply Visual Basic controls in data base managementsystem.

Course Outcomes (CO)

K1 to K4	CO1	Remembering the fundamentals of visual basic and procedures.
	CO2	Understanding the Visual Basic controls and command button properties.
	CO3	Making use of visual data manager and data bound control for the database programming with Visual Basic.
	CO4	Analyzing the connection between ORACLE and VB.

ProgrammeCode : 02	M. Sc Mathematics		
Non Major Elective Paper- FUZZY LOGIC AND NEURAL NETWORKS			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	4	60	5

Course Objectives

1. To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, 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 K4	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.

ProgrammeCode : 02	M. Sc Mathematics		
Non Major Elective Paper -MEASURE AND INTEGRATION			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2020-2022	4	60	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 convegencetheorems and The Radon – Nikodym theorem.

Course Outcomes (CO)

K1 to K4	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.