Mahilaratna Pushpatai Hiray Arts, Science & Commerce Mahila Mahavidyalaya, Malegaon Camp
Name of the Program: B. Sc. Mathematics

	Department of Mathematics
PO No.	**Program Outcomes:**
	After completing the program student will be able to :
PO1	Gain sound knowledge on fundamental principles and concepts of Mathematics and computing with their applications related to Industrial, Engineering, Biological and Ecological problems.
PO2	Exhibit in depth the analytical and critical thinking to identify, formulate and solve real world problems of science and engineering.
PO3	Get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.
PO4	A student should get adequate exposure to global and local concerns that explorethem many aspects of Mathematical Sciences.
PO5	Apply their skills and knowledge, that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.
PO6	Be capable of undertaking suitable experiments/research methods while solving the real-life problem and would arrive at valid conclusions based on appropriate interpretations of data and experimental results.
PO7	Develop written and oral communications skills in order to effectively communicatedesign, analysis and research results.
PO8	Demonstrate appropriate inter-personal skills to function effectively as an individual,as a member or as a leader of a team and in a multi-disciplinary setting.
PO9	Acquire competent position in industry and academia as well
PO10	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science stream

PSO No.	Program Specific Outcomes: (Mathematics)
	At the end program student will be able to:
PSO1	Give the students a sufficient knowledge of fundamental principles, methods and a clear perception of innumerous power of mathematical ideas and tools and know how to use them by modeling, solving and interpreting.
PSO2	To equip the students sufficiently in both analytical and computational skills inMathematical Sciences.
PSO3	To develop a competitive attitude for building a strong academic - industrial collaboration, with focus on continuous learning skills.
PSO4	Enhancing students overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
PSO5	Enabling students to develop a positive attitude towards mathematics as an interestingand valuable subject of study.
PSO6	Enabling students to Gauge the hypothesis, theories, techniques and proofsprovisionally.

Course Outcomes: B.Sc.(Mathematics)		
Sem / Class	**Course Title/ Course Code**	**COURSE OUTCOMES**
		At the end of the course student will able to:
F.Y. B.Sc. Sem I	**MT111 Algebra**	**CO1:** Study recalls basic knowledge about sets, relations and functions.
		CO2: Learn divisibility of integers.
		CO3: Learn primes and Congruence relations
		CO4: Study complex number and basic concept.
	MT112 Calculus I	**CO1:** Learn basic properties of real numbers and its subsets.
		CO2: Study concept of sequence, convergent, monotone, and divergent and Cauchy sequence.
		CO3: Study functions and its graph in detail which is a fundamental structure in all sciences.
		CO4: Check limit and continuity of a function.
F.Y. B.Sc. Sem II	**MT121 Analytical Geometry**	**CO1:** Learn concept of change of axis, translation, rotation and conic section.
		CO2: Solve the problems of lines in three dimension, planes,
		CO3: Learn equation of spheres and intersection of sphere
		CO4: Understand how geometry is related to algebra by using their algebraic equations.
	MT122 Calculus II	**CO1:** Apply notion of derivative in mean value theorem and also in higher order derivatives which arise in all applied sciences.
		CO2: Understand the techniques of differentiation of function with real variables.
		CO3: Apply the intermediate value theorem, Mean value theorem and L"Hospital''s rule
		CO4: Solve differential equations such as Exact, homogeneous
S.Y. B.Sc. Sem III	**MT 231 Calculus of several variables**	**CO1:** Study functions of several variables, graphs and level curves.
		CO2: Study the notion of Continuity and Differentiability of multivariate functions.
		CO3: Find extreme values of multivariable functions using derivatives.
		CO4: Learn Concept of double and triple integration and its application to area and volume.

	MT232(A) Numerical Analysis and its applications	**CO1:** Learn the various numerical techniques for solving real life problems.
		CO2: Fit curve to the data by using five different methods of interpolation
		CO3: Find approximate solutions to difficult differential equations occurring in engineering sciences.
		CO4: Develop theoretical, applied and computational skills.
	MT232(B) Graph theory	**CO1:** Study different types of graphs and operations on graphs.
		CO2: Study the concept of paths, circuits, connectivity & separability.
		CO3: Study the concept of trees in detail and algorithms to find special spanning trees.
		CO4: Study the properties of cut-sets and cut-sets in a graph.
S.Y. B.Sc. Sem IV	**MT341 Linear Algebra**	**CO1:** Learn basic matrix algebra and method to find solutions to system of linear equations and rank of a matrix. Also to learn eigen values and eigenvectors of matrix.
		CO2: Learn basic concepts of vector spaces, subspace, linear dependent and independent.
		CO3: Study of rank and nullity of matrix.
		CO4: Learn the importance of linear transformation in Physics, Engineering, Social sciences and various branches of Mathematics.
	MT342(A) Vector Calculus	**CO1:** Learn the concept of vector valued function and limit , continuity, derivatives and integrations of vector function.
		CO2: Study Arc length along space curve, unit tangent vector and speed on smooth curve.
		CO3: Learn evaluation line integral of vector function and Green's Theorem.
		CO4: Learn evaluation Surface integral and volume integral of vector function, Stoke's Theorem and Gauss Divergence Theorem.
T.Y.B. Sc. Sem V	**MT 351 Metric Spaces**	**CO1:** Understand the introductory concepts of metric spaces.
		CO2: Study convergent sequence, Cauchy sequence, Dense set, Bounded set and boundary of set.
		CO3: Learn continuous functions, topological properties, uniform continuity, open and closed map.

		CO4: Appreciate the abstractness of the concepts such as open balls, closed balls, compactness, connectedness etc. beyond their geometrical imagination
	MT 352 **Real Analysis I**	**CO1**: Learn basic concept of set theory, logical equivalence, Predicates, Quantifiers.
		CO2: Learn to define sequence in terms of functions from N to a subset of R and to understand several properties of sequence.
		CO3: Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.
		CO4: Use the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.
	MT353 **Group Theory**	**CO1:** Recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups, etc.
		CO2: Analyze consequences of Lagrange's theorem
		CO3: Learn about structure preserving maps between groups and their consequences.
		CO4: Explain the significance of the notion of cosets, normal subgroups, and factor groups.
	MT354 **Ordinary** **Differential** **Equations**	**CO1:** Understand the genesis of ordinary differential equations.
		CO2: Study principle of superposition and various methods of solving non homogeneous equations.
		CO3: Learn Series solution of linear second order equation and Eulers equation.
		CO4: Learn system of differential equations and basic theory of homogeneous linear system with constant coefficients.
	MT 355(A) **Operations** **Research**	**CO1:** Analyze and solve linear programming models of real-life situations.
		CO2: The graphical solution of LPP with only two variables, and illustrate the concept of convex set and extreme points. The theory of the simplex method is developed.
		CO3: The relationships between the primal and dual problems and their solutions.

		CO4: Apply solution of transportation and assignment problems in real life
	MT-356 (C) Laplace Transform and Fourier Series	**CO1:** Learn Laplace transform of some elementary and special function and evaluation of integral by using Laplace transformation.
		CO2: Learn various methods of finding inverse Laplace transformations, Beta function, Heaviside's expansion formula, Beta function
		CO3: Solve an initial value problem for an nth order ordinary differential equation using the Laplace transform.
		CO4: Find the Fourier series representation of a function of one variable.
	MT3510 Programming in Python –I	**CO1:** Explain basic principles of Python programming language.
		CO2: The student will implement object oriented concepts.
	MT3511 LaTeX for Scientific Writing	**CO1:** Write a simple LaTeX input document based on the article class.
		CO2: Turn the input document into pdf with the pdflatex program.
		CO3: Format Words, Lines, and Paragraphs.
		CO4: Understand how to present data using tables.
T.Y. B.Sc. Sem VI	**MT 361 Complex Analysis**	**CO1:** Understand the significance of differentiability of complex functions leading to the understanding of Cauchy-Riemann equations. Some elementary functions.
		CO2: Evaluate the contour integrals and understand the role of Cauchy-Goursat theorem and the Cauchy integral formula.
		CO3: Expand some simple functions as their Taylor and Laurent series.
		CO4: classify singularities and poles, find residues and evaluate complex integrals using the residue theorem
	MT 362 Real Analysis-II	**CO1:** Some of the families and properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.
		CO2: Learn improper integral on bounded and unbounded intervals, test of convergence of integral

		CO3: Recognize the difference between point wise and uniform convergence of a sequence of functions.
		CO4: Illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability, and integrability.
	MT363 **Ring Theory**	CO1: The fundamental concept of Rings, Fields, subrings, integral domains and the corresponding morphisms.
		CO2: Learn concept of ideal, prime and maximal ideal, zero divisors and apply division algorithm.
		CO3: Learn in detail about polynomial rings, fundamental properties of finite field extensions, and classification of finite fields.
		CO4: Appreciate the significance of unique factorization in rings and integral domains.
	MT 364 **Partial** **Differential** **Equations**	CO1: Solve simultaneous differential equation of first order and first degree. Formation of Pfaffian differential equation and finding its solution
		CO2 Solve linear partial differential equations using various methods and apply these methods in solving some physical problems.:
		CO3: Formulate, classify and transform partial differential equations into canonical form
		CO4: Solve Laplace equations, Wave equation, Heat equation, Periodic equation, using various analytical methods demonstrate uniqueness of solutions of certain kinds of these equations.
	MT 365 (C) **Financial** **Mathematics**	CO1: Describe and explain the fundamental features of a financial instruments.
		CO2: Demonstrate a clear understanding of financial research planning, methodology and implementation.
		CO3: Demonstrate understanding of basic concepts in linear algebra, relating to linearequations, matrices, and optimization.
		CO4: Demonstrate understanding of concepts relating to functions and annuities.
	MT 366(B) **Computational** **Geometry**	CO1: Construct algorithms for simple geometrical problems.
		CO2: Characterize invariance properties of Euclidean geometry by groups of transformations.

		CO3: Describe and construct basic geometric shapes and concepts by computational means
		CO4: Learn a parametric curves, Bezier curves
	MT3610 Programming in Python – II	**CO1:** Demonstrate the use of Python in Mathematics such as operations research and computational Geometry etc. **CO2:** Study graphics and design and implement a program to solve a real world problem.
		CO3: The students will implement the concepts of data with python and database connectivity.
	MT3611 Mathematics into LaTeX	**CO1:** Typeset mathematical formulas, use nested list, tabular and array environments.
		CO2: Import figures and pictures that are stored in external files.