BSC - MATHEMATICS			
Semester I/II/III/IV/V/VI	**All Subjects / Course**	**Objective of teaching the subject (Minimum 4)**	**OUTCOMES**
Sem I	**FYBSC Mathematics Paper 1 Calculus I**	1) Gain Knowledge of fundamental concepts of real numbers.	Students Gain Knowledge of fundamental concepts of calculus and are able to understand and apply various properties of calculus.
		2) Verify the value of the limit of a function at a point using epsilon-delta definition of limit.	
		3) learn to define sequences in terms of functions from N to $\mathbb{R}$.	
		4) learn to define differential and partial differential equations. Here we mainly focused on first order first degree differential equations and we learn to convert a second order differential into a first order differential equation.	
Sem I	**FYBSC Mathematics Paper 2 Algebra I**	1) Students will be able to understand the concept of an integer and divisibility. Students will also be able to solve the examples of integers and divisibility.	prepare the foundation of basic branches of mathematics like algebra and number theory.
		2) Students easily understand the concept of functions and equivalence relation.	
		3) Students learn and Identify the degree, leading coefficient, and leading term of a polynomial expression · Perform algebraic operations on polynomial expressions etc.	
		4) Students understand the concept of polynomial, statement and proof of the Division Algorithm for polynomials, and be able to solve related examples.	
Sem II	**FYBSC Mathematics Paper 1 Calculus II**	1) Learn to check function is continuous understand the consequences of the intermediate value theorem for continuous functions	This trains the student to learn the fundamental concept of calculus.
		2) understood the concept of differentiation and fundamental theorems in differentiation and various rules.	
		3) Geometrical representation and problem solving on Mean Value Theorems, Taylor series expansion at a specified point.	
		4) Find out extreme values of function and using concavity and point of inflection, we sketched the graph of functions.	

Sem II	**FYBSC** **Mathematics Paper 2** **Discrete Mathematics**	1) Understand the basic principles of sets and operations in sets.	students learn basic counting techniques and prepare a background for probability theory.
		2) Students understand and learn the concept of Counting Principles, Two way counting, Stirling numbers and Multinomial theorem.	
		3) Students formulate recurrence relations to solve problems involving an unknown sequence.	
		4) Students easily understand the concept of homogeneous and non-homogeneous recurrence relation, Fibonacci sequence and related problems solved easily.	
Sem III	**SYBSC** **Mathematics Paper 1** **Calculus III**	1) Understand many properties of the real line $\mathbb{R}$ and learn to define sequence in terms of functions from $\mathbb{R}$ to a subset of $\mathbb{R}$.	They learn the application of derivatives to other branches of sciences, especially physics and engineering.
		2) Learn and understand some of the properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.	
		3) Learn and apply properties of Improper integrals	
		4) After completion of this course, the students will be able to understand the concept of Sequence, limit, continuity, differentiability, Riemann Integration in detail.	
Sem III	**SYBSC** **Mathematics Paper 2** **Linear Algebra I**	Solve a system of linear equations.	Upon successful completion of this course students are able to
		Solve systems of linear equations using Gauss-Jordan elimination to reduce to echelon form	Solve systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion.
		Introduction to vector spaces and subspaces.	Carry out matrix operations, including inverses and determinants.
		Compute determinants of using Laplace expansions and properties of determinants	
Sem III	**SYBSC** **Mathematics Paper 3** **Ordinary Differential Equations**	1) To apply appropriate numerical methods to solve the problem with most accuracy.	students learn basic knowledge of differential equation which enables him/her to understand branches of physics such as fluid dynamics, mechanics, heat transfer,etc
		2) Using appropriate numerical methods determine approximate solution of ODE and system of linear equation.	
		3) Student will be able to find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.	
		4) Student will have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients.	

Sem IV	**SYBSC Mathematics Paper 1 Multivariable Calculus I**	1) Gain Knowledge of fundamental concepts of real numbers in n dimensions. Verify the value of the limit of a function at a point using the definition of the limit in R*R	Students learn basic knowledge of real numbers, limit of functions, mean value theorem, and maxima minima.
		2) Geometrical representation and problem solving MVT.	
		3) Students will have to understand differentiation and fundamental theorem in differentiation and various rules.	
		4) Find the extreme value in 2 dimensions.	
Sem IV	**SYBSC Mathematics Paper 2 Linear Algebra II**	Use matrix algebra and the related matrices to linear transformations.	Interpret a matrix as a linear transformation from R n to R m. Discuss the transformation's kernel and image in terms of nullity and rank of the matrix. Understand the relationship between a linear transformation and its matrix representation.
		Learn properties of inner product spaces and determine orthogonality in inner product spaces.	Define eigenvalues and eigenvectors geometrically. Use characteristic polynomials to compute eigenvalues and eigenvectors. Use eigenspaces of matrices, when possible, to diagonalize a matrix.
		Find eigenvalue and eigenvectors of a square matrix using the characteristic polynomial.	Use axioms for abstract vector spaces (over the real or complex fields) to discuss examples (and non-examples) of abstract vector spaces such as subspaces of the space of all polynomials.
		how to diagonalize a matrix is diagonalizable.	
Sem IV	**SYBSC Mathematics Paper 3 Numerical Methods**	1) Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems	It helps students to understand approximation theory and helps to solve differential equations.
		2) Apply numerical methods to obtain approximate solutions to mathematical problems.	
		3) Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations	
		4) Analyze and evaluate the accuracy of common numerical methods	

Sem V	**TYBSC Mathematics Paper 1 Calculus**	Define the double and triple integrals as a limit of Riemann sum and to see their interpretations as average value, volume under graph, volume of a solid, area of a region, total mass from density. Estimate multiple integrals in different coordinate systems including Cartesian, polar, cylindrical and spherical coordinates.	An understanding of line integrals for work and flux, surface integrals for flux, general surface integrals and volume integrals. Also, an understanding of the physical interpretation of these integrals.
		Use the most important theorems of vector calculus, such as the Fundamental Theorem of Line Integrals, Green's Theorem, the Divergence Theorem, and Stokes' Theorem, to simplify integration problems.	The ability to set up and compute multiple integrals in rectangular, polar, cylindrical and spherical coordinates.
		Define and evaluate line integrals using the Fundamental Theorem of Line Integrals and Green's Theorem	The ability to change variables in multiple integrals.
		Define and compute the curl and divergence of vector fields and apply Green's Theorem, Stokes's Theorem and the Divergence Theorem to evaluate line integrals, surface integrals and flux integrals.	An understanding of the major theorems (Green's, Stokes', Gauss') of the course and of some physical applications of these theorems
Sem V	**TYBSC Mathematics Paper II Linear Algebra**	1) This course will enable the students to: i) Understand the concepts of vector spaces, subspaces, bases, dimensions and their properties.	Use computational techniques and algebraic skills essential for the study of systems of Linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, Orthogonality and Diagonalization.
		2) Definition and examples, Algebra of linear transformations, Matrix of a linear transformation, Change of coordinates.	
		3) Learn and understand properties of eigenvalues and eigenvectors.	
		4) Students understand and apply all properties of this course.	
Sem V	**TYBSC Mathematics Paper 3 Topology Of Metric Spaces**	1)Isolate the three fundamental properties of distance and base all our deductions on these three properties alone in the treatment of the metric spaces.	understand and appreciate the concept of metric space and be able to recognize standard examples and it is the fundamental notion of distances.
		2) Distinguish between open and closed balls in a metric space.	
		3) Provide students with systematic proofs of theorems using the definitions of basic terms and properties of metrics.	
		4) Treat the various basic concepts of adherent points, convergent and Cauchy convergent sequences, complete spaces ; compactness and connectedness etc. to the students.	
Sem V	**TYBSC Mathematics Paper 4 Graph Theory**	1) learn some basics of graphs and understood the concept of shortest path problems.	this enables students to learn application to computer science includes sorting and algorithm which is extensively used in data science
		2) learn the definitions like cycles,bipartite graphs, complete graphs, connected graphs,etc.	
		3) learn the definition of Tree in a graph and its consequences, algorithms to find minimal spanning trees.	
		4) learn about Eulerian and Hamiltonian graphs.	

Sem V	**TYBSC Mathematics Paper 5 Computer Programming and System Analysis**	1) Learning SQL can not only enhance your skills, but it can also give you a better understanding of applications you work with on a daily basis	Join as database Administrator, web development.
		2)SQL is RDBMS which is used in all private and government sectors	
		3) Java teaches new coders how to think like a programmer, working through processes with logic and testing out ideas.	
		4) Learning and doing programming is an exercise for your brain that eventually improves your problem solving and logical ability.	
Sem VI	**TYBSC Mathematics Paper 1 Basic Complex Analysis**	Analyze limit, continuity and differentiation of functions of complex variables. Understand Cauchy- Riemann equations, analytic functions and various properties of analytic functions.Understand conformal mapping.	Demonstrate understanding of the basic concepts underlying complex analysis.
		Understand Cauchy theorem and Cauchy integral formulas and apply these to evaluate complex contour integrals.	Demonstrate familiarity with a range of examples of these concepts.
		Represent functions as Taylor and Laurent series; classify singularities and poles.	Prove basic results in complex analysis
		find residues and evaluate complex integrals using the residue theorem.	
Sem VI	**TYBSC Mathematics Paper II Algebra**	1) The course will enable the students to: i) Recognize the mathematical objects called groups. ii) Link the fundamental concepts of groups and symmetries of geometrical objects.	They learn the concept and application of group theory, ring theory and field theory.
		2) Students learn and understand Properties of cosets, Normal subgroups, Simple groups, Factor groups	
		3) Definition, examples and elementary properties of rings, Commutative rings, Integral domain,	
		4) Students understand the concept of Polynomial rings over commutative ring and their basic properties, The division algorithm; Polynomial rings over rational field, Gauss lemma and Eisenstein’s criterion, Euclidean domain, principal ideal domain, and unique factorization domain.	

Sem VI	**TYBSC Mathematics Paper 3 Topology Of Metric Spaces And Real Analysis**	1) Introduce the students to the definitions of basic terms and concepts of continuous function in metric space topology.	be familiar with the fundamental notion of continuity, convergence and compactness.
		2) Treat the various basic concepts of separated sets , disconnectedness, connectedness, path connected sets etc. to the students.	
		3) Understand and be able to apply basic definitions and concepts in set and function theory. Understand the nature of a logical argument and a mathematical proof and be able to produce examples of these.	
		4) Understand the definitions of limits and convergence in the context of sequences and series of real numbers. Be able to compute limits of sequences involving elementary functions. Be able to prove simple statements involving convergence arguments.	
Sem VI	**TYBSC Mathematics Paper 4 Graph Theory and Combinatorics**	1) learn to color the vertices and edges of graphs, connectivity and some standard results related to coloring.	This enables students to learn applications to network analysis.
		2) learn to identify planar graphs, some lemmas which help to identify planarity of a graph	
		3) learn to identify maximum flow and minimum cut in a network.	
		4) learn to relate marriage condition using matching in a graph and some parts of combinatorics.	
Sem VI	**TYBSC Mathematics Paper 5 Computer Programming and System Analysis**	1)Java can also be used to create a small application program based on applet, which is further used for web page.	Jobs in data science, AI, data analyst, Robotics, Web development.
		2) Python is highly versatile. You can use it for both small and complex tasks, and it is used across many different industries	
		3) Python is easier to read, write, and learn than most other major programming languages.	
		4) Python is used for algebraic calculations and plot the different graphs	