



DEPARTMENT OF B.SC MATHEMATICS

COURSE OUTCOMES

I B.Sc Mathematics

SEMESTER: I

Subject Name: THEORY OF EQUATIONS AND TRIGONOMETRY

Subject Code: U22MAC11/ U3MAC11

On completing this course, students can/are

Cos	CO Statements
CO1:	Capable of solving algebraic equations using the relations between the roots and coefficients.
CO2:	Get skills in transforming equations in one form into another.
CO3:	Capable of finding the solutions of numerical equations using Horner's method.
CO4:	Perform expansion of $\sin\theta$, $\cos\theta$, $\tan\theta$ and power of $\sin\theta$ and $\cos\theta$, in terms of functions of multiples of θ .
CO5:	Understand hyperbolic functions and logarithm of complex numbers.

Subject Name: CALCULUS

Subject Code: U22MAC12

On completing this course, students can/are

Cos	CO Statement
CO1:	Acquire knowledge about Differential Calculus, subfield of Calculus.
CO2:	Understand that the derivative of a function at a chosen input value describes the rate of change of the function near that input value.
CO3:	Learn about envelopes and evolutes and know that an evolute is the envelope of the normals to a curve.
CO4:	Find large number of industrial applications like the shape of cooling towers, mirrors used for long distance telescope.
CO5:	Get the skills of evaluating integrals by the method of substitution, integration of functions, integration of trigonometric functions, evaluation of definite integrals, reduction formula.
CO6:	Know the usage of special types of integrals namely Beta and Gamma integrals.



Subject Name: APPLICATIONS OF CALCULUS

Subject Code: U22MAS11

On completing this course, students can/are

Cos	CO Statement
CO1:	Able to apply the knowledge of differential calculus in finding the maximum/minimum values in the field of commerce, economics, science and engineering and other branches of arts.
CO2:	Understand the role of Jacobian in the context of integration
CO3:	Know the usefulness of series expansion in handling the functions by expanding the function in terms of series
CO4:	Much aware of how the concept of integration is very useful in getting the area and volume of the standard/random shapes which are essential in real life problems.

SEMESTER: II

Subject Name: DIFFERENTIAL EQUATIONS

Subject Code: U22MAC21

On completing this course, students can/are

Cos	CO Statement
CO1:	Get skill of solving the ordinary differential equations, particularly homogeneous and non homogeneous equations.
CO2:	Able to find particular integrals of ordinary differential equations.
CO3:	Get exposure to the concepts of Charpit's method.
CO4:	Acquire the knowledge of solving partial differential equations.
CO5:	Be familiar with Lagrange's equation.

Subject Name: Analytical Geometry 3D and Vector Calculus

Subject Code: U22MAC22/ U3MAC22

On completing this course, students can/are

Cos	CO Statement
CO1:	Know various forms of equations of a plane in three dimensional space.
CO2:	Study vector differentiation and vector integration.
CO3:	Find the shortest distance between two skew lines.
CO4:	Understand the concept of Gradient, Curl and Divergence.
CO5:	Be able to evaluate line integrals and Surface integrals.



Subject Name: APPLICATIONS OF VECTOR CALCULUS

Subject Code: U22MAS21

On completing this course, students can/are

Cos	CO Statement
CO1:	Able to compute the double integrals much easier way by using line integrals
CO2:	Much aware of link between the double integrals and triple integrals and use a proper (easier) dimension to resolve the given problem.
CO3:	Able to apply the knowledge of line integrals or vector integrals to most of the physical problem but not limited branch of physics.
CO4:	Much flexible or well equipped in finding value of the double, triple integrals

I B.Sc Mathematics (Physics | Chemistry)

Subject Name: ALGEBRA AND TRIGONOMETRY

Subject Code: U22MAAX11

In this course the students will

CO1:	Gain knowledge on various series like binomial series, logarithmic series, and trigonometric series.
CO2:	Develop the ability to solve equations and understand the nature of roots of higher order equations.
CO3:	Acquire knowledge on hyperbolic functions.

Subject Name: CALCULUS AND MATRICES

Subject Code: U22MAAX21/ U2MAA2X2

In this course the students will

CO1:	Apply the reduction formula to solve problems in integral calculus.
CO2:	Utilize the concept of vector differentiation to identify the curl, divergence of a given vector.
CO3:	Construct the evolute of any curve using differential calculus.
CO4:	Develop the skills of solving simultaneous equations by marking use of the rank of matrices.
CO5:	Find the eigen values, eigen vectors of a given matrix.



COURSE OUTCOME

SEMESTER III

DIFFERENTIAL EQUATIONS

Subject Code: U3MAC3

- To understand the basic terminologies in differential equations.
- To solve the differential equations of first order and higher degree.
- To facilitate a better understanding of some special methods of solving standard forms of partial differential equations

ALLIED – 3 ELECTRICITY & ELECTRONICS

Subject Code: U2PHA3X3

- To understand the fundamentals electrostatic parameters, Gauss's law and its application, Electric Potential, Capacitance and different types Capacitors.
- To learn about Kirchhoff's Laws and its applications, principle of potentiometer.
- To Study about the principle & working of galvanometer and LCR circuits.
- To Know about performance of transistor amplifiers and op-amps.
- To study the Study the principle of digital electronics and related concepts.

ALLIED – 3 General Chemistry - III

Subject Code: U2CHA3X3

- To know the basic requirements of chemical calculations.
- To acquire fundamental knowledge in bonding.
- To gain fundamental knowledge about adsorption, catalysis and co-ordination compounds.
- To study the principles water analysis.

ALLIED - 4 NUMERICAL METHODS

Subject Code: U3MAA3

- Understanding the distinction between accuracy and precision.
- Learning how to quantify error.
- Understanding how to write forward, backward and centered finite- difference approximations of first and second derivatives

SBE - APPLICATIONS OF DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

Subject Code :U3MAS3

- To solve the real life problems using differential equations
- To Understand and apply the Laplace transform techniques in solving differential equations.



SEMESTER IV

MODERN ALGEBRA

Subject Code: U3MAC4

- To know about the properties of groups, subgroups, normal subgroups.
- To know about homomorphism, isomorphism of groups.
- To learn about rings, sub rings, characteristic of a ring and ideals.

ALLIED - 5 OPTICS, SPECTROSCOPY & MODERN PHYSICS

Subject Code: U2PHA4X4

- To understand the basics of geometrical and physical optics.
- To Study about the different technique in spectroscopy and photoelectricity.
- To Get basic knowledge about quantum physics
- To Understand the concept of relativity

ALLIED - 5 General Chemistry - IV

Subject Code: U3CHA4X4

- To study the basics of chemical equilibrium.
- To acquire basic idea about drugs.
- To gain knowledge about the chromatographic techniques.
- To understand the role of bio-organic materials.

LAB: Organic Qualitative Analysis

Subject Code: U2CHA4PX

- To gain fundamental knowledge about organic analysis

ALLIED – 6 MECHANICS

Subject Code: U3MAA4

- To know the concepts of forces and resolution of forces and its applications
- To acquire knowledge in Dynamics

ALLIED – 6 NUMERICAL METHODS AND MECHANICS

Subject Code : U3MAA4P

- To develop the skills of the students to solve computationally large problems using electronic tools in Numerical Methods and Mechanics



COURSE OUTCOME

SEMESTER V

GRAPH THEORY AND ITS APPLICATIONS

Subject Code : U2MAC51

CO1: Gain the knowledge & the basic concepts of graph theory.

CO2: Master the ways & solving real life problems using graph models.

CO3: Develop the ability to apply various graph concepts in solving the challenging problems in real life.

CO4: Possess the Knowledge & various important conjectures and established theorems in graph theory.

LINEAR ALGEBRA AND MATRICES

Subject code : U2MAC52

CO1: Gain knowledge about the basic concepts of vector spaces and linear transformations.

CO2: Know the relationship between matrices and linear transformations.

CO3: Become familiar with the rank of the matrices.

CO4: Have thorough acquaintance with eigen values and eigen vectors.

REAL ANALYSIS

Subject Code : U3MAC53

CO1:	Able to identify the important properties of a non-empty subset of a metric space.
CO2:	Able to apply the concept of continuity in real life problems.
CO3:	Able to figure out similarities (in the sense of homeomorphism) among the metric
CO4:	Able to apply the theory to identify the complete metric spaces and make use of these spaces directly or indirectly to the real life problems.

SEQUENCES AND SERIES

Subject Code : U3MAA51

CO1:	Able to apply the important properties of order relation on \mathbb{R} .
CO2:	Capable of Solving problems pertaining to AM, GM and HM.
CO3:	Able to apply their skills in getting better approximation through the theory of
CO4:	Much aware about the concept of infinite series of numbers and their applications.
CO5:	Able to apply various tests of convergence of series to conclude the nature of series of positive terms.



LINEAR PROGRAMMING

Subject Code : U3MAE51

- CO1:** Getting the ability of converting the real life problems in to a LPP and apply the techniques of LPP to solve the problems.
- CO2:** Able to apply the methods of optimization, viz., simplex method, Big-m method to solve the real life problems.
- CO3:** Getting the idea of transporting the goods from source to destination at minimum
- CO4:** Able to assign the jobs optimally to more suitable persons/machines so as to reduce the total working hours which in turn yields a maximum profit.
- CO5:** Realize the mathematical background of each and every industry as a part of the industrial visit.

SBE- EMPLOYABILITY SKILLS

Subject Code: U1PS51

To enrich the Employability Skills by imparting Reason ing skills, Aptitude skills and General Knowledge.

Fundamentals of Mathematics

Subject code : U3MAN51

- CO1:** Classify different types of equations and solve them.
- CO2:** Be able to define sequence of numbers and understand progression as sequence.
- CO3:** Study different types of progressions and thereby study Arithmetic and Geometric means.
- CO4:** Understand the notion of set and describe different types of sets.
- CO5:** Possess the knowledge of Matrix and write down different types of matrices.
- CO6:** Perform algebra of Matrices.

SEMESTER VI COMPLEX ANALYSIS

Subject code : U2MAC61

- CO1:** Demonstrate the idea of the Complex number system and work with arithmetic of complex numbers.
- CO2:** Acquire a good knowledge of analytic functions in terms of power series approach, differentiability approach and the geometrical approach.
- CO3:** Identify many important applications of line integrals and curve integrals by recalling Green's theorem, Stoke's theorem and Gauss Divergence theorem from vector calculus.
- CO4:** Know the importance of improper integrals and the application of "Contour integration".
- CO5:** Understand main ideas behind the elementary transformations like translation, rotation, homothetic transformation and inversion in transforming regions in the complex plane.



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STATISTICS

Subject Code : U3MAC62

CO1:	Is capable of analyzing statistical data using measures of central tendency and
CO2:	Could use the concept of the law of large numbers to define a random variable and the corresponding probabilities for a particular industrial or any real life problem.
CO3:	Is able to calculate probabilities, and derive the marginal and conditional distributions of bivariate random variables.
CO4:	Is able to translate real-world problems into probabilistic models and critically evaluate the underlying assumptions of analysis tools.
CO5:	Can understand and discuss the issues/significance in the framed hypothesis based on the samples.

OPERATIONS RESEARCH

Subject Code : U2MAC63

CO1:	Identify and develop operations research models from the verbal description of the
CO2:	Understand the mathematical tools that are needed to solve optimization problems
CO3:	Apply the knowledge of game theory concepts to articulate real-world decision situations for identifying, analyzing, and practicing strategic decisions to counter
CO4:	Demonstrate solution methods including graphs and linear programming to analyze and solve the Two-person, zero-sum games
CO5:	Know the fundamental concepts of Operations Research.
CO6:	Develop mathematical models associated with network problems and find critical path analysis for an optimum solution

Project work

Subject Code : U1MA6PR

- Will get a little exposure to the field of research in mathematics.
- Able to convert a real life problem into a mathematical model and solve it by mathematical skills.
- Able to frame the hypothesis, derivations and conclusions of their mathematical model.
- Will familiarize about various applications of mathematics.

TRANSFORMATION TECHNIQUES

Subject Code : U3MAS61

CO1:	Understand and apply Z Transforms techniques.
CO2:	Solve the finite difference problems using Z transforms.
CO3:	Write the Fourier series of functions which arouse naturally in real world problems.
CO4:	Apply the techniques of Fourier transform to solve the differential equations.



RANDOM PROCESSES

Subject Code: U2MAS62

- CO1:** Demonstrate about mathematical basis of continuous-time Markov chains.
CO2: To formulate continuous-time Markov chain models for relevant practical systems.
CO3: To apply the theory developed to specific problems in signal communications.
CO4: Develop the attitude of the analyzing the role of random processes in system modeling.

NME 2 - STATISTICS AND OPERATIONS RESEARCH

Subject code : U2MAN61

CO1:	Able to apply mean, median and mode concepts in real life problems.
CO2:	Getting the ability of analyzing the economic problems using index numbers.
CO3:	Able to apply the optimization techniques in real life situations.
CO4:	Getting the ability of converting the real life problems in to a LPP and apply the techniques of LPP to solve the problems.
CO5:	Getting the idea of transporting the goods from source to destination at minimum



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COURSE OUTCOME

SELF LEARNING

ADVANCED PROGRAMMING TECHNIQUES

Subject code: U1MASL51

- To know various techniques of programming



DEPARTMENT OF B.SC MATHEMATICS

COURSE OUTCOMES

I M.Sc. Mathematics

SEMESTER: I

Subject Name: ABSTRACT ALGEBRA – I

Subject Code: P22MAC11

In this course the students will

Cos	CO Statements
CO1:	Learn the concept of group theory.
CO2:	Construct new groups from some groups already on hand.
CO3:	Learn the symmetry to analyse the object using group theoretic methods.
CO4:	Know about the concept of group, the algebraic structure such as rings, fields and modules.
CO5:	Use group theory as a powerful tool for research in robotics, computer vision, computer graphics and medical image analysis.

Subject Name: Real Analysis - I

Subject Code: P22MAC12

In this course the students will

CO1:	Know how to connect abstract statement with concrete examples.
CO2:	Get experience in reading and writing proofs.
CO3:	Acquire more ideas about Calculus and Linear Algebra.
CO4:	Analyse the technical proofs and intuitive ideas.
CO5:	Learn how the principles and theory of Real Analysis can be applied in a variety of fields.

Subject Name: Differential equations

Subject Code: P22MAC13/ P19MAC13

In this course the students will

CO1:	Understand the method of solving initial value problems.
CO2:	Acquire the knowledge of relationship between Wronstian and independent of solutions.
CO3:	Become familiar with Legendre, Euler and Bessel equations.
CO4:	Be able solve many types of partial differential equations.



Subject Name: PROBABILITY AND STATISTICS

Subject Code: P22MAC14/ P19MAC14

In this course the students will

CO1:	Apply the different statistical measures for any data.
CO2:	Understand Statistics facilitates comparison.
CO3:	Attain several skills to solve various problems in all statistical concepts.
CO5:	Be able to deal with all sciences such as Biology, Zoology, Education, Economics, Planning, industry, Medical sciences.

Subject Name: DIFFERENTIAL GEOMETRY

Subject Code: P22MAE11

On completing this course, students can/are

Cos	CO Statements
CO1:	Determine the Arc length, Curvature, Torsion and Osculating Plane for any curve in the Euclidean space.
CO2:	Analyze the behavior of a space curve and its contact with the surfaces.
CO3:	Find the moving triad of a point in the space curve to identify the Evolutes and Involutives of the curve.
CO4:	Parameterize a surface using the local intrinsic properties of a surface.
CO5:	Construct the first and second fundamental forms for any given surface.

Subject Name: Fuzzy sets and Logics

Subject Code: P22MAE12/ P19MAE12

In this course the students will

CO1:	Gain the main subject of fuzzy sets.
CO2:	Learn crisp and fuzzy set theory.
CO3:	Decide the difference between crisp set and fuzzy set theory.
CO4:	Make calculation on fuzzy set theory.
CO5:	Gain the methods of fuzzy logic.
CO6:	Recognize fuzzy logic membership function.
CO7:	Recognize fuzzy logic fuzzy inference systems.
CO8:	Make applications on Fuzzy logic membership function and fuzzy inference systems.



Subject Name: Java and Web Designing

Subject Code: P22MAE13/ P19MAE13

On completing this course, students can/are

COs	CO Statements
CO1:	Create Java programs that solve simple business problems.
CO2:	Understand the concept of exception handling and Input / Output operations. Construct a Java class based on a UML class diagram.
CO3:	Perform a test plan to validate a Java program.
CO4:	Document a Java program.
CO5:	Design the applications of Java & Java applet.
CO6:	Analyze & Design the concept of Event Handling and Abstract Window Toolkit.

SEMESTER: II

Subject Name: ABSTRACT ALGEBRA – II

Subject Code: P22MAC21/P19MAC21

On completing this course, students can/are

Cos	CO Statements
CO1:	Understand the concept of dual spaces, inner product space.
CO2:	Understand the concept of the types of linear transformation and algebra of transformation
CO3:	Know about main application of the algebra in cryptography area.
CO4:	Learn about the determinants and its properties

Subject Name: REAL ANALYSIS – II

Subject Code: P22MAC22/P19MAC22

On completing this course, students can/are

Cos	CO Statements
CO1:	Understand the analytic properties of functions, sequences, convergence, limit of sequences, continuity, linear transformation, differentiation, etc.,
CO2:	Become familiar with the concept of Riemann integrals.
CO3:	Analyse inverse operations such as integration and differentiation.
CO4:	Try to analyse the problems that arise when limit processes are interchanged.



Subject Name: Topology

Subject Code: P22MAC23/P19MAC23

On completing this course, students can/are

Cos	CO Statements
CO1:	Understand the terms and definitions of Topological Spaces, Accumulation Points, Interior, Closure, Boundary and exterior of sets, Coarser and Finer Topologies – Subspace and theorems related to topology.
CO2:	Be motivated to unify the basics like open set, closed sets, components, continuity, completeness and so on, that are learnt through one semester course on Real and complex analysis.
CO3:	Elaborate the knowledge of concepts such as connectedness and compactness.
CO4:	Recognize Bases and Subbases for topologies and write Topologies generated by classes of sets.
CO5:	Understand the importance of Metrizable topological spaces and know sufficient conditions for metrizability of a topological space.
CO6:	Use the concept of homeomorphism to identify the spaces that are having similar geometrical structures.

Subject Name: ADVANCED GRAPH THEORY

Subject Code: P22MAC24/P19MAC24

On completing this course, students can/are

Cos	CO Statements
CO1:	Know basic definitions in Graph theory.
CO2:	Use mathematical definitions to identify, construct examples and to distinguish the existence and non-existence of certain properties.
CO3:	Gather the graph theoretical knowledge and its applications through algorithm.
CO4:	Identify special graphs and know related theorems.
CO5:	Solve some real time problems using the concepts of Graph theory.
CO6:	Apply graph as models for many standard problems.

Subject Name: Number Theory and Cryptography

Subject Code: P22MAC25

On completing this course, students can/are

Cos	CO Statements
CO1:	Apply the concept of different number theoretic functions.
CO2:	Understand the application of congruences in solving number theoretic problems.
CO3:	Learn more things on arithmetic functions and primitive roots.
CO4:	Have introduction in cryptography.
CO5:	Be Enriched with the knowledge of doing research in number theory



Subject Name: Industrial Statistics (NME)

Subject Code: P22MAN21/ P19MAN21

On completing this course, students can/are

COs	CO Statements
CO1:	Understand the concept of statistical inference by testing hypothesis.
CO2:	Apply t-test for small samples.
CO3:	Understand the concept of control chart, types of control chart.
CO4:	Learn the construction of index numbers and uses of index numbers.
CO5:	Utilize the concept of time series to fit a given straight line and parabola.



COURSE OUTCOME

SEMESTER III FIELD THEORY

Subject Code : P19MAC31

- To enable the students to understand the concept of Field
- To enable the students to understand the concept of Galois theory
- To enable the students to understand the concept of chain conditions

Complex Analysis

Subject code: P19MAC32

- To lay the foundation for this subject, to develop clear thinking and analyzing capacity for further study.
- To learn about Cauchy's Theorem which leads to useful techniques for evaluating real integrals based on the 'calculus of residues'.
- To learn more about normal families in the context of families of analytic functions.

NUMERICAL METHODS

Subject code: P19MAC33

- To know about the direct and indirect methods for finding the roots of transcendental and polynomial equations
- To know various methods for finding eigen values and eigen vectors.
- To discuss the single step and multistep methods for solving first order initial value problems.
- To discuss several methods of differentiation
- To discuss several methods of integration

MEASURE THEORY

Subject Code: P19MAC34

- Enable the students to know about the concept of measure on the real line
- To get the knowledge about integration measurable functions
- Enable the students to know about the extension of measure and integration to more abstract spaces and their consequences.

ELECTIVE 2 (a) - INTEGRAL EQUATIONS

Subject Code : P19MAE31

- Develop the ability to solve the problems involving integral equations.
- To know the method of converting initial and boundary value problems into integral equations.
- To understand the Classical Fredholm theory in solving problems
- To practice the application of Green's function in the conversion of initial and boundary value problems.



CLASSICAL MECHANICS

Subject code: P19MAE32 / P19MAE41

- To enable the students to understand the concept of generalized co-ordinates and Lagrange's equation for holonomic system.
- To enable the students to understand the different variational principles.
- To derive the equation of motion.
- To enable the students to deal with the canonical transformation.

SEMESTER IV OPTIMIZATION TECHNIQUES

Subject Code: P19MAC41

- To know the techniques of network models and classical optimizations
- To give the tools of solving non-linear programming

FUNCTIONAL ANALYSIS

Subject code:P19MAC42

- Understand the basic concepts of Normed linear Spaces and continuity of linear maps
- Know the two important theorems on Banach spaces
- Understand the three fundamental theorems in functional analysis and how to use this theorems in problems

COMBINATORICS

Subject code: P19MAC43

- Understand the basic concepts of permutations and combinations
- Be familiar with generating functions and techniques
- Develop skills to obtain solutions of recurrence relations by generating functions
- Solve problems using the principle of inclusion and exclusion
- know the applications of Polya's fundamental theorem in Combinatorics

APPLICATIONS OF GRAPH THEORY

Subject Code: P19MAE41 / P19MAE31

- To help the students to know various applications of Graph theory and motivate them towards research on Graph theory.

ADVANCED TOPOLOGY

Subject code: P19MAE42

- To get deep knowledge about various compactifications and metrization and theorems on completeness.

Elective 3C - Stochastic Processes

Subject code: P19MAE43

- To introduce the basic concepts in stochastic process.
- To motivate preliminary definitions in Markov Chain, Markov, Process, Poisson Process etc.



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COURSE OUTCOME

SELF LEARNING

RESEARCH TOPICS IN MATHEMATICS

Subject code: P19MASL31

- To motivate the students to learn about completeness in functions spaces and the notion of various convergence in the topological spaces.
- To motivate the students to learn about the regular and semi regular graphs and some interesting properties of switching in graphs



COURSE OUTCOMES

UNDERGRADUATE

III - Year

V - Semester

Employability Skills

Subject Code: U1PS51

In this course, the students will

CO1:	Enrich them with the employability skills like reasoning skills and aptitude skills.
CO2:	Get adequate exposure to various types of competitive examinations.
CO3:	Get enough training in OMR based answer sheet.



COURSE OUTCOMES

UNDERGRADUATE

I - Semester

Value Education

Subject Code: U1VE11

In this course, the students will

CO1:	Learn to choose their own personal moral and spiritual values.
CO2:	Learn to become responsible citizens.
CO3:	Get sensitized to value formation.