RANIGANJ GIRLS' COLLEGE
DEPARTMENT OF MATHEMATICS

COURSE LEARNING OUTCOMES
LEARNING OUTCOME BASED CURRICULUM
FRAMEWORK (LOCF)
UNDER THE
CHOICE BASED CREDIT SYSTEM (CBCS)
OF
KAZI NAZRUL UNIVERSITY

SEMESTER-I

CORE COURSE-1

Course Name: Calculus, Geometry & Differential Equations

Course Code: BSCHMTMC101

Course Type: **Core** (Theoretical)	Course Details: **CC-1**		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	……	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):

- Understand various kinds of standard functions and graphs, techniques of integrations and limits.
- Learn about real numbers and its basic properties.
- Understand the concepts on three-dimensional geometry.
- Understand the genesis of ordinary differential equations.
- Understand the various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order.

CORE COURSE-2

Course Name: Algebra

Course Code: BSCHMTMC102

Course Type: **Core** (Theoretical)	Course Details: **CC-2**		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	……	**40**

Course Learning Outcomes*:* This course will enable the students to
- Understand the importance of roots of real and complex polynomials and learn various methods of obtaining roots.
- Employ De Moivre's theorem in a number of applications to solve numerical problems.
- Recognize consistent and inconsistent systems of linear equations by the row echelon
  form of the augmented matrix, using rank.
- Find eigenvalues and corresponding eigenvectors for a square matrix.

SEMESTER-II

CORE COURSE-3

Course Name: Real Analysis

Course Code: BSCHMTMC201

Course Type: **Core** **(Theoretical)**	Course Details: **CC-3**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks	
Credit: **6**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	……	**40**

Course Learning Outcomes: This course will enable the students to
- Understand many properties of the real line R and learn to define sequence in terms of functions from R to a subset of R.
- Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.
- Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.
- Understand the theory and concepts of Riemann integration.
- Understand the applications of the fundamental theorems of integration.

Course Name: Differential Equations and Vector Calculus

Course Code: BSCHMTMC202

Course Type: **Core** (Theoretical)	Course Details: **CC-4**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks	
Credit: **6**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	……	**40**

Course Learning Outcomes*: This course will enable the students to
- Learn the Picard's method of obtaining successive approximations of solutions of first order ordinary differential equations.
- Know how to solve linear homogeneous and non-homogeneous equations of higher order with constant coefficients.
- Understand the system of linear differential equations and the solution techniques.
- Learn conceptual differences between usual solution and power series solution of some second order ODEs .
- Understand the theory and applications of vector analysis.

SEMESTER- III

Course Name: Multivariable Calculus

Course Code: BSCHMTMC301

Course Type: **Core** (Theoretical)	Course Details: **CC-5**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks	
Credit: **6**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	……	**40**

Course Learning Outcomes: This course will enable the students to
- Learn conceptual differences while advancing from one variable to several variables in calculus.
- Apply multivariable calculus in various optimization problems.
- Understand inter-relationship amongst the line integral, double and triple integral formulations.
- Visualise the structure of curves and surfaces in plane and space etc.
- Learn the applications of multivariable calculus in different fields like Physics, Economics, Medical Sciences, Animation& Computer Graphics etc.
- Realize importance of Green, Gauss and Stokes' theorems in other branches of Mathematics.

CORE COURSE-6

Course Name: Group Theory

Course Code: BSCHMTMC302

Course Type: **Core (Theoretical)**	Course Details: **CC-6**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks	
Credit: **6**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	……	**40**

Course Learning Outcomes: The course will enable the students to:
- Realize the basic concept of mathematical composition.
- Link the fundamental concepts of groups and symmetries of geometrical objects.
- Explain the significance of the notions of cossets, normal subgroups, and factor groups.
- Analyze consequences of Lagrange's theorem.
- Learn about structure preserving maps between groups and their consequences.

Course Name: Probability and Statistics

Course Code: BSCHMTMC303

Course Type: **Core** (Theoretical)	Course Details: **CC-7**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks	
Credit: **6**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		…	**10**	**…….**	**40**

**Course Learning Outcomes*:* This course will enable the students to

- Understand distributions in the study of the joint behaviour of two random variables.
- Establish a formulation helping to predict one variable in terms of the other, i.e., correlation and linear regression.
- Understand central limit theorem, which establish the remarkable fact that the empirical frequencies of so many natural populations, exhibit a bell shaped curve.

(Choose any one from the following)

Course Name: Mathematical Logic

Course Code: BSCHMTMSE301

Course Type: **SE**	Course Details: **SEC-1**		L-T-P: **4-0-0**	
		CA Marks		ESE Marks	
Credit: **4**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	**…….**	**40**

**Course Learning Outcomes*:* This course will enable the students to

- Understand the syntax of first-order logic and semantics of first-order languages

- Understand about truth table, different propositions, predicates and quantifiers, basic Theorems like the Compactness Theorem, Meta Theorem and Post Tautology Theorem.
- Grasp the concept of completeness interpretations and their applications with special stress on applications in Algebra.

Course Name: Programming Language in C
Course Code: BSCHMTMSE302

Course Type: **SE**	Course Details: **SEC-1**		L-T-P: **4-0-0**	
		CA Marks		ESE Marks
Credit: **4**	Full Marks:	Practical	Theoretical	Practical	Theoretical
	50	……	**10**	**…….**	**40**

Course Learning Outcomes: This course will enable the students to
- Acquire knowledge about one of the advanced computer language C and its applications.
- Understand basic structure, characters, keywords, identifiers, data types, operators, expressions, etc. in C language.
- Write flow chart and corresponding C-program for solving problems requiring decision making, branching, looping and other control statements.
- Learn to implement arrays and functions in C programming.
- Familiarize with the concepts of structure, union and pointers.

SEMESTER IV

C O R E   C O U R S E - 8

Course Name: Mechanics

Course Code: BSCHMTMC401

Course Type: **C**	Course Details: **CC-8**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks
Credit: **6**	Full Marks:	Practical	Theoretical	Practical	Theoretical
	50	……	**10**	**…….**	**40**

Course Learning Outcomes: This course will enable the students to:

- Familiarize with subject matter, which has been the single centre, to which were drawn mathematicians, physicists, astronomers, and engineers together.
- Understand necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a rigid body.
- Determine the centre of gravity of some materialistic systems and discuss the equilibrium of a uniform cable hanging freely under its own weight.
- Deal with the kinematics and kinetics of the rectilinear and planar motions of a particle including the constrained oscillatory motions of particles.
- Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton.

CORE COURSE-9

Course Name: Linear Algebra
Course Code: BSCHMTMC402

Course Type: **C**	Course Details: **CC-9**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks	
Credit: **6**	Full Marks:	Practical	Theoretical	Practical	Theoretical
	50	……	**10**	…….	**40**

Course Learning Outcomes: This course will enable the students to:
- Understand the concepts of vector spaces, subspaces, bases, dimension and their properties.
- Relate matrices and linear transformations; compute eigen values and eigen vectors of linear transformations.
- Learn properties of inner product spaces and determine orthogonality in inner product spaces.
- Realise the importance of adjoint of a linear transformation and its canonical form.

CORE COURSE-10

Course Name: Partial Differential Equations and Calculus of Variations

Course Code: BSCHMTMC403

Course Type: **C**	Course Details: **CC-10**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks
	Full Marks:	Practical	Theoretical	Practical	Theoretical
Credit: **6**	**50**	……	**10**	…….	**40**

Course Learning Outcomes*: This course will enable the students to
- Understand the geometric and physical nature of Partial Differential Equations and classify them accordingly.
- Apply a range of techniques to solve first and second order partial differential equations.
- Model physical phenomena using partial differential equations such as the heat and wave equations.
- Understand problems, methods and techniques of calculus of variations.

SKILL ENHANCEMENT COURSE-2

(Choose any one from the following)

Course Name: Graph Theory

Course Code: BSCHMTMSE401

Course Type: **SE**	Course Details: **SEC-2**		L-T-P: **4-0-0**	
		CA Marks		ESE Marks
	Full Marks:	Practical	Theoretical	Practical	Theoretical
Credit: **4**	**50**	……	**10**	…….	**40**

Course Learning Outcomes*: This course will enable the students to
- Appreciate the definition and basics of graphs along with types and their examples.
- Understand the Eulerian circuits, Eulerian graphs, Hamiltonian cycles, representation of a graph by matrix.
- Relate the graph theory to the real-world problems.

Course Name: Object Oriented Programming in C++

Course Code: BSCHMTMSE402

Course Type: **SE**	Course Details: **SEC-2**		L-T-P: **4-0-0**	
		CA Marks		ESE Marks
Credit: **4**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes*: This course will enable the students to

- Understand the basic characteristics of object oriented programming languages, different components and structures in C++ programming language.
- Understand and apply the programming concepts of C++ which is important for mathematical investigation and problem solving.
- Use mathematical libraries for computational objectives.
- Represent the outputs of programs visually in terms of well formatted text and plots.

SEMESTER V

C O R E   C O U R S E - 1 1

Course Name: Set Theory and Metric Spaces

Course Code: BSCHMTMC501

Course Type: **C**	Course Details: **CC-11**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks
Credit: **6**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes: This course will enable the students to:

- Learn basics about the cardinality of a set.

- Learn abstract formulation of the notion "distance" on an arbitrary set and learn how known concepts like continuity, convergence of sequences etc behave in such abstract setting.
- Understand several standard concepts of metric spaces and their properties like openness, closeness, completeness, compactness, Bolzano-Weierstrass property, and connectedness.
- Identify the continuity of a function defined on metric spaces and homeomorphisms.

CORE COURSE-12

Course Name: Advanced Algebra
Course Code: BSCHMTMC502

Course Type: **C**	Course Details: **CC-12**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks	
Credit: **6**	Full Marks:	Practical	Theoretical	Practical	Theoretical
	50	……	**10**	**…….**	**40**

Course Learning Outcomes: This course will enable the students to
- Understand the automorphism, inner automorphism and the fundamental concepts of group actions and their applications
- Understand the application ofSylow theorems to characterize certain Finite Groups.
- Be acquainted with the basic concepts of Ring Theory such as the concepts of ideals, quotient rings, Integral domains and Fields.
- Know in detail about polynomial rings, fundamental properties of finite field extensions and classification of Finite Fields.

DESCIPLINE SPECIFIC ELECTIVE (DSE-1 &DSE-2)

(Choose any Two from the following)

Course Name: Tensors & Differential Geometry
Course Code: BSCHMTMDSE501

Course Type: **DSE**	Course Details: **DSE-1 & DSE-2**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks	
Credit: **6**	Full Marks:	Practical	Theoretical	Practical	Theoretical
	50	……	**10**	**…….**	**40**

Course Learning Outcomes: This course will enable the students to
- Explain the basic concepts of tensors.

- Understand role of tensors in differential geometry.
- Learn various properties of curves including Frenet-Serret formulae and their applications.
- Know the interpretation of the curvature tensor, Geodesic curvature, Gauss and Weingarten formulae.
- Understand the role of Gauss's TheoremaEgregium and its consequences.
- Apply problem-solving with differential geometry to diverse situations in physics, engineering and in other mathematical contexts.

Course Name: Integral Transforms and Fourier Analysis

Course Code: BSCHMTMDSE502

Course Type: DSE	Course Details: DSE-1 & DSE-2		L-T-P: 5-1-0	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes: This course will enable the students to

- Learn Fourier series, Bessel's inequality, term by term differentiation and integration of Fourier series.
- Know about Fourier Transform and its relation with Fourier Series, Laplace Transform and its relation with Fourier Transform and the sufficient conditions for their existence.
- Familiarise with the properties of Fourier and Laplace Transforms.
- Learn to apply Fourier and Laplace Transforms to well-known functions.
- Learn to find inverse Laplace Transform and inverse Fourier Transform.
- To be able to solve real world initial value, boundary value and initial-boundary problems using Integral Transforms or Fourier Series.

Course Name: Linear Programming and Game Theory

Course Code: BSCHMTMDSE503

Course Type: DSE	Course Details: DSE-1 & DSE-2		L-T-P: 5-1-0	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes: This course will enable the students to

- Analyze and solve linear programming models of real life situations.
- Provide graphical solution of linear programming problems with two variables, and illustrate the concept of convex set and extreme points.
- Solve linear programming problems using simplex method.
- Learn techniques to solve transportation and assignment problems.
- Solve two-person zero sum game problems.

Course Name: Special Theory of Relativity
Course Code: BSCHMTMDSE504

Course Type: **DSE**	Course Details:**DSE-1** & **DSE-2**		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	**…….**	**40**

Course Learning Outcomes: This course will enable the students to
- Understand the basic concepts of Special Relativity including Michelson-Morley experiment and geometrical interpretations of Lorentz transformation equations.
- Learn about length contraction, time dilation and relativity of simultaneity.
- Study 4-dimensional Minkowskian space-time and its properties.
- Understand the concepts of 4-vectors, mass-energy equivalence and equations of motion as a part of relativistic mechanics.
- Imbibe connections between relativistic mechanics and electromagnetism.

SEMESTER VI

CORE COURSE-13

Course Name: Complex Analysis

Course Code: BSCHMTMC601

Course Type: **C**	Course Details: **CC-13**		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	**…….**	**40**

Course Learning Outcomes: This course will enable the students to:
- Visualize complex numbers as points of $\mathbb{R}^2$ and stereographic projection of complex plane on the Riemann sphere.

- Understand the significance of differentiability and analyticity of complex functions leading to the Cauchy-Riemann equations.
- Learn the role of Cauchy-Goursat theorem and Cauchy integral formula in evaluation of contour integrals.
- Apply Liouville's theorem in fundamental theorem of algebra.
- Understand the convergence, term by term integration and differentiation of a power
   series.
- Learn Taylor and Laurent series expansions of analytic functions, classify the nature of singularity, poles and residues and application of Cauchy Residue theorem.

CORE COURSE-14

Course Name: Numerical Methods & Numerical Lab

Course Code: BSCHMTMC602

Course Type: **C** (Theoretical + Practical)	Course Details: **CC-14**		L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

Course Learning Outcomes: This course will enable the students to

- Understand the problem solving skills using numerical methods,
- Handle large system of equations, non-linearity and that are often impossible to solve analytically,
- Solve differential equations by numerical methods,

- Develop problem solving skills using computer programming,
- Acquire knowledge of C programming language,
- Solve different numerical problems using algorithm, flowchart, C language programming.

(Choose any two from the following)

Course Name: Discrete Mathematics

Course Code: BSCHMTMDSE601

Course Type: **DSE**	Course Details: **DSE-3 & DSE-4**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks	
Credit: **6**	Full Marks:	Practical	Theoretical	Practical	Theoretical
	50	……	**10**	**…….**	**40**

Course Learning Outcomes: This course will enable the students to
- Learn about partially ordered sets, lattices and their types.
- Understand Boolean algebra and Boolean functions, logic gates, switching circuits andtheir applications.
- Solve real-life problems using finite-state and Turing machines.
- Assimilate various graph theoretic concepts and familiarize with their applications.

Course Name: Number Theory

Course Code: BSCHMTMDSE602

Course Type: **DSE**	Course Details: **DSE-3 & DSE-4**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks	
Credit: **6**	Full Marks:	Practical	Theoretical	Practical	Theoretical
	50	……	**10**	**…….**	**40**

Course Learning Outcomes: This course will enable the students to:
- Learn about some important results in the theory of numbers including the prime number theorem, Chinese remainder theorem, Euler's theorem, Wilson's theorem and their consequences.
- Learn about number theoretic functions, modular arithmetic and their applications.
- Familiarise with modular arithmetic and find primitive roots of prime and composite numbers.
- Know about open problems in number theory, namely, the Goldbach conjecture and Twin-prime conjecture.
- Apply public crypto systems, in particular, RSA.

Course Name: Advanced Mechanics
Course Code: BSCHMTMDSE603

Course Type: **DSE**	Course Details: **DSE-3 & DSE-4**		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes: This course will enable the students to
- Understand the reduction of force system in three dimensions to a resultant force acting at a base point and a resultant couple.
- Learn about a null point, a null line, and a null plane with respect to a system of forces acting on a rigid body together with the idea of central axis.
- Know the inertia constants for a rigid body and the equation of momental ellipsoid together with the idea of principal axes and principal moments of inertia to derive Euler's dynamical equations.
- Study the kinematics and kinetics of fluid motions to understand the equation of continuity in cartesian, cylindrical polar and spherical polar coordinates which are used to derive Euler's equations and Bernoulli's equation.
- Deal with two-dimensional fluid motion using the complex potential.
- Understand the concepts of sources, sinks, doublets and the image systems of these with regard to a line and a circle.

Course Name: Bio Mathematics
Course Code: BSCHMTMDSE604

Course Type: **DSE**	Course Details:**DSE-3 & DSE-4**		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes: This course will enable the students to
- Grasp the idea of various bio-mathematical models and techniques which will help them to tackle physical world problems.

[Students of a Particular Honours department will choose one Generic Elective Paper of any other existing Honours Department except his/her Department from the pool provided below]

Semester I

GENERIC ELECTIVES [GE-1(1)]

Course Name: Differential Calculus

Course Code: BSCHMTMGE101

Course Type: **GE**	Course Details: **GEC-1**		L-T-P: **5-1-0**	
Credit: 6	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes: This course will enable the students to
- Assimilate the notions of limit of a sequence and convergence of a series of real numbers.
- Calculate the limit and examine the continuity of a function at a point.
- Understand the concepts and applications of various mean value theorems for differentiable functions.
- Sketch curves in Cartesian and polar coordinate systems.

Semester II

GENERIC ELECTIVES [GE-1(2)]

Course Name: Differential Equations and Vector Calculus

Course Code: BSCHMTMGE201

Course Type: **GE**	Course Details: **GEC-2**		L-T-P: **5-1-0**	
Credit: 6	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes: This course will enable the students to

- Learn various methods to find the solutions of ordinary differential equations.
- Understand the central concepts in multivariable analysis, including space curves;

directional derivative; gradient; multiple integrals; line and surface integrals; vector fields; divergence, curl and flux;

Semester III

GENERIC ELECTIVES [GE-1(3)]

Course Name: Linear and Modern Algebra

Course Code: BSCHMTMGE301

Course Type: **GE**	Course Details: **GEC-3**		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	**……**	**40**

Course Learning Outcomes*:* This course will enable the students to
- Understand the concepts of different types of groups, rings and field.
- Understand the basic concepts of group actions and their applications.
- Understand the concepts of vector spaces, sub-spaces, linear dependence and linear independence of a finite set of vectors.

Semester IV

GENERIC ELECTIVES [GE-1(4)]

Course Name: Basics in Real Analysis

Course Code: BSCHMTMGE401

Course Type: **GE**	Course Details: **GEC-4**		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	**……**	**40**

Course Learning Outcomes: This course will enable the students to
- Understand about sets in R, sequences, series of functions and infinite series.

BSC PROGRAM IN MATHEMATICS
COURSE LEARNING OUTCOMES

SEMESTER I

CORE COURSE-1(1)

Course Name: Differential Calculus

Course Code: BSCPMTMC101

Course Type: C	Course Details: CC-**1(1)**		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):
- Understand limit, continuity, differentiability and partial differentiation.
- Learn Rolle's Theorem, mean value theorems, maxima and minima, indeterminate forms and different applications of calculus.

SEMESTER II

CORE COURSE-1(2)

Course Name: Differential Equations and Vector Calculus

Course Code: BSCPMTMC201

Course Type: C	Course Details: CC-**1(2)**		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):

- Learn various methods to find the solutions of ordinary differential equations.
- Understand the central concepts in vector calculus; vector-valued functions; gradient, divergence and curl.

SEMESTER III

CORE COURSE-1(3)

Course Name: Basics in Algebra
Course Code: BSCPMTMC301

Course Type: C	Course Details: CC-**1(3)**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks
Credit: **6**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):
- Understand the concepts of different types of groups, rings and field.
- Solve a system of non-homogeneous linear equations.
- Understand the concepts of real vector space, sub-space and linear dependence and independence of a finite set of vectors.

SEMESTER IV

CORE COURSE-1(4)

Course Name: Introduction to Real Analysis
Course Code: BSCPMTMC401

Course Type: C	Course Details: CC-**1(4)**		L-T-P: **5-1-0**	
		CA Marks		ESE Marks
		Practical	Theoretical	Practical	Theoretical

Credit: **6**	Full Marks: **50**	......	**10**	....	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):

- Understand about sets in R, sequences, series of functions and infinite series.

SEMESTER V

DESCIPLINE SPECIFIC ELECTIVE(DSE-1(1))

(Choose any one from the following)

Course Name: Mechanics

Course Code: BSCPMTMDSE501

Course Type: DSE	Course Details: DSEC-1(1)		L-T-P: **5-1-0**	
		CA Marks		ESE Marks	
Credit: **6**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		......	**10**	....	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):

- Understand the basic concepts of mechanics with examples and applications of real world problems.

Course Name: Numerical Analysis

Course Code: BSCPMTMDSE502

Course Type: DSE	Course Details: DSEC-1(1)		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):
- Understand the problem solving skills using numerical methods,
- Handle large system of equations, non-linearity and and that are often impossible to solve analytically,
- Solve differential equations by numerical methods.

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE (DSE-1(2))

(Choose any one from the following)

Course Name: Linear Programming Problems

Course Code: BSCPMTMDSE601

Course Type: DSE	Course Details: DSEC-1(2)		L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):
- Analyze and solve linear programming models of real life situations.
- Provide graphical solution of linear programming problems with two variables, and illustrate the concept of convex set and extreme points.
- Solve linear programming problems using simplex method.
- Learn techniques to solve transportation and assignment problems.

Course Name: Probability & Statistics

Course Code: BSCPMTMDSE602

Course Type: DSE	Course Details: DSEC-1(2)		L-T-P: **5-1-0**	
		CA Marks	ESE Marks	
Credit: **6**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):
- Understand the basic concepts on probability and statistics.
- Understand the various probability distributions and their applications, mathematical expectation, moments.

Semester III

SKILL ENHANCEMENT COURSE (SEC-1)

Course Name: Sets and Mathematical Logic

Course Code: BSCPMTMSE301

Course Type: **SE**	Course Details: **SEC-1**		L-T-P: **4-0-0**	
		CA Marks	ESE Marks	
Credit: **4**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):

- Understand about different propositions of logic, truth table, logical operators, various operations and relations related to sets.

Semester IV

Course Name: Boolean Algebra

Course Code: BSCPMTMSE401

Course Type: **SE**	Course Details: **SEC-2**		L-T-P: **4-0-0**	
		CA Marks		ESE Marks	
Credit: **4**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):
- Understand Boolean algebra and Boolean functions, logic gates,switching circuitsand their applications.
- Apply a number of proof techniques to theorems in language design.

Semester V

Course Name: Number Theory

Course Code: BSCPMTMSE501

Course Type: **SE**	Course Details: **SEC-3**		L-T-P: **4-0-0**	
		CA Marks		ESE Marks	
Credit: **4**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):
- Learn Lame's theorem, linear Diophantine equation, congruences, Goldbach conjecture, Euler's phi-function.

Semester VI

Course Name: Graph Theory

Course Code: BSCPMTMSE601

Course Type: **SE**	Course Details: **SEC-4**		L-T-P: **4-0-0**	
		CA Marks		ESE Marks	

Course Type: **SE**	Course Details: **SEC-4**		L-T-P: **4-0-0**	
Credit: **4**	Full Marks: **50**	Practical	Theoretical	Practical	Theoretical
		……	**10**	…….	**40**

Course Learning Outcomes:
(After the completion of course, the students will have ability to):
- Appreciate the definition and basics of graphs along with types and their examples.
- Understand the Eulerian circuits, Eulerian graphs, Hamiltonian cycles, representation of a graph by matrix.
- Relate the graph theory to the real-world problems.