Maharashtra Education Society's

Abasaheb Garware College

(Autonomous)

(Affiliated to Savitribai Phule Pune University)

Syllabi under NEP-2020

F. Y. B. Sc. (Mathematics)

To be implemented from Academic Year 2023-2024

Title of the Course: B. Sc. (Mathematics)

Preamble:

Taking into consideration the rapid changes in science and technology and new approaches in different areas of Mathematics and related subjects board of studies in Mathematics with concern of teachers of Mathematics and industry has prepared the syllabus of F.Y.B.Sc. Mathematics under the NEP-2020. To develop the syllabus the U.G.C. Model curriculum is followed.

Program Outcomes:

1. To give knowledge of fundamental principles, methods, Mathematical ideas and tools.
2. Reflecting the broad nature of the subject and developing Mathematical tools for continuing further study in various fields of science and technology.
3. Enhancing students' overall development and to equip them with Mathematical abilities and problem-solving skills.
4. Enabling students to develop a positive attitude towards Mathematics as an interesting and valuable subject of study.

Eligibility:

12^{th} science or equivalent as per SPPU rules.

Structure of the course B. Sc. Mathematics:

Year	Level/ Difficulty	Semester	Course Type	Course Code	Course Title	Remark	Credit	No. of Lectures/Practical to be conducted
1	4.5/100	I	Major	MTS-101-MJ	Algebra	Theory	2	30
				MTS-102-MJ	Calculus-I	Theory	2	30
				MTS-103-MJP	Mathematics Practical Based on Algebra and Calculus-I	Practical	2	12
			VSC (Related to Major)	MTS-121-VSC	Mathematical Communication skills	Practical	2	12
			IKS	MTS-100-IKS	Ancient Indian Mathematics	Theory	2	30
			GE/OE	OE-101-MTS	Basic Algebra	Theory	2	30
				OE-102-MTS	Mathematics Practical Based on Basic Algebra	Practical	2	12
			SEC	SEC-101-MTS	Discrete Mathematics	Practical	2	12
		II	Major	MTS-151-MJ	Analytical Geometry	Theory	2	30
				MTS-152-MJ	Calculus-II	Theory	2	30
				MTS-153-MJP	Mathematics Practical Based on Analytical Geometry and Calculus-II	Practical	2	12
			VSC (Related to Major)	MTS-171-VSC	Latex	Practical	2	12
			Minor	MTS-191-MN	Applied Algebra	Theory	2	30
			GE/OE	OE-151-MTS	Basic Calculus	Theory	2	30
				OE-152-MTS	Mathematics Practical Based on Basic Calculus	Practical	2	12

			SEC	SEC-151-MTS	Mathematics for Life Sciences	Practical	2	12
2	5.0/200	III	Major	MTS-201-MJ	Differential Calculus	Theory	2	30
				MTS-202-MJ	Linear Algebra-I	Theory	2	30
				MTS-203-MJ	Differential Equations	Theory	2	30
				MTS-204-MJP	Mathematics Practical Based on Differential Calculus and Linear Algebra-I	Practical	2	12
			VSC (Related to Major)	MTS-221-VSC	Introduction to Python	Practical	2	12
			Minor	MTS-241-MN	Applied Differential Equations	Theory	2	30
				MTS-242-MNP	Mathematics Practical Based on Applied Differential Equations	Practical	2	12
		IV	Major	MTS-251-MJ	Integral Calculus	Theory	2	30
				MTS-252-MJ	Linear Algebra-II	Theory	2	30
				MTS-253-MJ	Optimization Techniques	Theory	2	30
				MTS-254-MJP	Mathematics Practical Based on Integral Calculus and Linear Algebra-II	Practical	2	12
			Minor	MTS-291-MN	Applied Linear Algebra	Theory	2	30
				MTS-292-MNP	Mathematics Practical Based on Applied Linear Algebra	Practical	2	12
			SEC	SEC-251-MTS	Laplace Transform	Practical	2	12

Year	Level/ Difficulty	Semester	Course Type	Course Code	Course Title	Remark	Credit	No. of Lectures/Practical to be conducted
3	5.5/300	V	Major	MTS-301-MJ	Real Analysis-I	Theory	2	30
				MTS-302-MJ	Group Theory	Theory	2	30
				MTS-303-MJ	Metric Spaces	Theory	2	30
				MTS-304-MJP	Mathematics Practical Based on Group Theory and Metric Spaces	Practical	2	12
				MTS-305-MJP	Computational Geometry	Practical	2	12
			Major Elective	MTS-310-MJ	Financial Mathematics	Theory Choose any one	2	30
				MTS-311-MJ	Number Theory			
				MTS-312-MJ	Integral Transforms and Fourier Analysis			
				MTS-313-MJP	Mathematics Practical-I	Practical	2	12
			VSC	MTS-321-VSC	Machine Learning	Practical	2	12
			Minor	MTS-341-MN	Applied Group Theory	Theory	2	30
				MTS-342-MNP	Mathematics Practical Based on Applied Group Theory	Practical	2	12
		VI	Major	MTS-351-MJ	Real Analysis-II	Theory	2	30
				MTS-352-MJ	Ring Theory	Theory	2	30
				MTS-353-MJ	Complex Analysis	Theory	2	30
				MTS-354-MJP	Mathematics Practical Based on Ring Theory and Complex Analysis	Practical	2	12
				MTS-355-MJP	Operations Research	Practical	2	12
			Major Elective	MTS-360-MJ	Probability and Statistics	Theory Choose any one	2	30
				MTS-361-MJ	Graph Theory			
				MTS-362-MJ	Partial Differential Equations			
				MTS-363-MJP	Mathematics Practical-II	Practical	2	12
			Minor	MTS-391-MN	Numerical Methods	Theory	2	30
				MTS-392-MNP	Mathematics Practical Based on Numerical Methods	Practical	2	12

SEMESTER-I

Major Paper No: I

Course Code: MTS-101-MJ **Title: Algebra**

Lectures: 30 (Credits-2)

Course Outcomes:

1. Students learn method to solve the system of equations.
2. Students learn properties of determinant and inverse.
3. Students are able to understand finding roots of polynomial and relationship between Zeroes and Coefficients of a Polynomial.
4. Students are able to understand De-Moivre's theorem, finding roots of complex numbers.

Unit 1: System of Linear Equations and Matrices (15 Lectures)

1.1 Introduction to Systems of Linear Equations
1.2 Gaussian Elimination
1.3 Inverses; Algebraic Properties of Matrices
1.4 Elementary Matrices and a Method for Finding A^{-1}
1.5 More on Linear Systems and Invertible Matrices
1.6 Diagonal, Triangular, and Symmetric Matrices
1.7 LU Decomposition
1.8 Determinants by Cofactor Expansion
1.9 Evaluating Determinants by Row Reduction
1.10 Properties of Determinants; Cramer's Rule

Unit 2: Polynomials (9 lectures)

2.1 Integral rational functions or polynomials.
2.2 Multiplication of polynomials.
2.3 Division of polynomials.
2.4 The remainder theorem.
2.5 Synthetic division.
2.6 Highest Common divisor of two polynomials.
2.7 The fundamental theorem of Algebra.
2.8 Relations between roots and coefficients.

Unit 3: Complex Numbers (6 lectures)

3.1 Sums and Products, Basic Algebraic Properties, Moduli, Complex Conjugates, Exponential form, Products and Quotients, De-Moivre's theorem.
3.2 Roots of Complex Numbers: The nth roots of unity.
3.3 Regions in Complex Plane

Recommended Books:

1. Elementary Linear Algebra by Howard Anton, Chris Rorres, 11th edition.
2. Theory of Equations, J. V. Uspensky, McGraw Hill Book Company.
3. Complex Variables and Applications, James Ward Brown and Ruel V. Churchill, Mc-Graw Hill, Seventh Edition.

SEMESTER-I
Major Paper No: II

Course Code: MTS-102-MJ Title: Calculus - I

Lectures: 30 (Credits-2)

Course Outcomes:

1. Students are able to understand the difference between rational and real number system.
2. Students are able to understand the role of supremum and infimum and their applications.
3. Students are able to use the notion of convergence of sequences.

Unit 1: Real Numbers (6 lectures)

Algebraic and order properties of R, Absolute value function, The completeness property of R, Applications of the supremum property, Intervals

Unit 2: Sequences (6 lectures)

Sequences and there limits, Limit Theorems, Monotone sequences, Subsequences and Bolzano-Weierstrass theorem

Unit 3: Limits (6 lectures)

Limits of functions, Limit theorems, some extensions of limit concept

Unit 4: Continuous Functions (12 lectures)

Definition, Combinations of continuous functions, Continuous functions on intervals, Monotone and Inverse function

Recommended Books:

1. Introduction to Real Analysis: Robert G Bartle and Donald R Sherbert, 3rd edition, John Wiley and sons, Inc.

Reference Books:

1. T.M. Apostol, Calculus Vol. I (2nd Edition), John Wiley, New York, (1967).

2. Problems in Mathematical analysis –II, W.J. Kaczor, M.T. Nowak, AMS, student Mathematical Library.
3. First course in real analysis, Sterling Berberian, Springer Publication.
4. A First course in Calculus and real analysis, Sudhir R. Ghorpade and Balmohan V. Limaye, Springer Publication.

SEMESTER-I
Major Paper No: III

Course Code: MTS-103-MJP **Title: Mathematics Practical Based on Algebra and Calculus-I**
(Credits-2)

MTS-103-MJP is a practical based on MTS-101-MJ and MTS-102-MJ.
Practical 1 to 6 based on problems from MTS-101-MJ and Practical 7 to 12 based on problems from MTS-102-MJ.

SEMESTER-I
VSC

Course Code: MTS-121-VSC **Title: Mathematical Communication Skills**
(Credits-2)

Course Outcomes:

1. Students are able to understand the general concept of a function, including such notions as range, domain, and function type.
2. Students are able to develop Mathematical ideas from basic axioms.
3. Students learn divisibility theory and its applications.

This is a practical course consisting of 12 practicals based on the following syllabus.

Unit 1: Sets and Relation

1.1 Sets (Revision)
1.2 Operations on sets
1.3 Power sets

1.4 Cartesian product of sets
1.5 Relations on sets
1.6 Equivalence relations
1.7 Equivalence classes and partitions of a set

Unit 2: Functions

2.1 Basic definitions
2.2 One-one, onto functions and Bijections
2.3 Composition of functions
2.4 Inverse of a function
2.5 Image of subsets under functions
2.6 Inverse image of subsets under functions

Unit 3: Divisibility Theory in the Integers

3.1 The Induction Principle
3.2 The Strong Induction Principle
3.3 The Well-ordering Principle
3.4 Divisibility in Integers
3.5 Division Algorithm
3.6 Unique Factorization Theorem.
3.7 Congruence relation

Recommended Books:

1. A Foundation Course in Mathematics, Ajit Kumar, S. Kumaresan, Bhaba Kumar Sarma, Narosa Publication.
2. An introduction to Number Theory, I. Niven, H. Zukerman.

Reference Books:

1. Introduction to Real Analysis by R.G. Bartle and D.R. Sherbert, John Wiley and Sons Inc, Fourth Edition.
2. Elementary Number Theory, David M. Burton, Tata McGraw Hill, Sixth Edition.

SEMESTER-I

IKS

Course Code: MTS-100-IKS **Title: Ancient Indian Mathematics**

(Credits-2)

Course Outcomes:

1. Students are able to know methods and concepts in Mathematics in ancient India.
2. Students are able to find connections between methods in ancient Indian Mathematics to Modern Mathematics.

Unit 1: Vedic Geometry **(07 Lectures)**

1.1 The Sulbhsutra
1.2 The Theorem of the Diagonal
1.3 Rectilinear Figures and their Transformations
1.4 Circle from square: The direct construction
1.5 The inverse formula: Square from Circle

Unit 2: Decimal Numbers **(07 Lectures)**

2.1 Numbers and Based Numbers
2.2 The Place –value Principle and its Realizations
2.3 The Choice of a Base

Unit 3: The Mathematics of the Ganitapada **(10 Lectures)**

3.1 General survey
3.2 The linear Diophantine Equation- Kuttaka method
3.3 The Invention of Trigonometry
3.4 The making of Sine Table
3.5 Aryabhata's Legacy

Unit 4: From Bramhagupta to Bhaskara -II **(06 Lectures)**

4.1 The Quadratic Diophantine Problem – Bhavana.
4.2 Methods of Solution: Cakravala
4.3 A Different Circle Geometry: Cyclic Quadrilaterals

Recommended Book: The Mathematics of India: Concepts, Methods Connections, P.P. Divakaran, Hindustan Book Agency

Reference Books:

1. A Modern Introduction to Ancient Indian Mathematics, T. S. Bhanu Murthy, New Age

International Publisher
2. Proceedings of National Workshop of Ancient Indian Mathematics with special reference to Vedic Mathematics and Astronomy, Prof Harikrishna sathapathy, Prof G. Umashamkar, Dr. Ramesh Babu, Rashtriya Sanskrit Vidyapeeth Tirupati.

SEMESTER-I

GE/OE

Course Code: OE-101-MTS **Title: Basic Algebra**

(Lectures: 30 Credits-2)

Course Outcomes:

1. Students are able to understand matrices and determinants.
2. Students are able to solve system of linear equations.
3. Students are able to solve LPP and apply it in real life problems.

Unit 1: Matrices and Determinants (10 Lectures)

Definition of a Matrix, Types of Matrices, Algebra of Matrices, Determinants, Adjoint of a Matrix, Inverse of a Matrix via Adjoint Matrix

Unit 2: System of Linear Equations (8 lectures)

Homogeneous System of Linear equations, Condition for Consistency of homogeneous system, Solution of Non-homogeneous System of Linear equations (not more than three variables), Applications in Business and Economics, Examples and Problems.

Unit 3: Simple and Compound Interest (7 lectures)

Concept of Present value and Future value, Simple interest, Compound interest, Nominal and Effective rate of interest, Examples and Problems

Unit 4: LPP (5 lectures)

Definition and terms in a LPP, formulation of LPP, Solution by Graphical method, Examples and Problems

Recommended Books:

1. Practical Business Mathematics S. A. Bari New Literature Publishing Company New Delhi.
2. Mathematics for Commerce K. Selvakumar Notion Press Chennai.

3. Business Mathematics with Applications Dinesh Khattar & S. R. Arora S. Chand Publishing New Delhi.
4. Operations Research P. K. Gupta & D. S. Hira S. Chand Publishing New Delhi.

SEMESTER-I
GE/OE

Course Code: OE-102-MTS **Title: Mathematics Practical Based on Basic Algebra**

(Credits-2)

It is a practical course consisting of 12 practicals based on Basic Algebra (OE-101-MTS).

SEMESTER-I
SEC

Course Code: SEC-101-MTS **Title: Discrete Mathematics**

(Credits-2)

Course outcomes:

1. Students learns propositional logic and methods of proof.
2. Students learn techniques of counting.
3. Students are able to apply inclusion exclusion principle for counting.

It is a practical course consisting of 12 practicals based on following topics.

Unit 1: Logic and Proofs

1.1 Propositional logic
1.2 Propositional equivalences
1.3 Predicates and quantifiers
1.4 Nested quantifiers
1.5 Rules of inference

1.6 Introduction to proofs

Unit 2: Counting

2.1 The basics of counting
2.2 Permutation and combinations
2.3 Generalized permutation and combinations
2.4 Inclusion-Exclusion

Recommended book:

1. Discrete Mathematics and Its Applications, Kenneth H Rosen, Seventh Edition, McGraw Hill.
2. Bernard Kolman, Robert C. Busby, Sharon Cutler Ross and Nadeem-ur-Rehman: Discrete Mathematical Structures, Fifth Edition, Pearson Education, Inc., 2004.

SEMESTER-II
Major Paper No: I

Course Code: MTS-151-MJ **Title: Analytical Geometry**

Lectures: 30 (Credits-2)

Course Outcomes:

1. Students are able to understand the geometrical terminology and have a detailed idea of the Planes, Straight lines in 3D.
2. Students can understand different equation s of planes and lines.
3. Students are able to understand intersection of line and Sphere, plane and Sphere.

Unit 1: Analytical Geometry of Two Dimension (8 Lectures)

1.1 Change of axes: translation and rotation.
1.2 Conic Sections: General equation of second degree in two variables
1.3 Reduction to standard form, centre of conic, nature of conic

Unit 2: Planes (12 Lectures)

2.1 Direction cosines and direction ratios,
2.2 Equation of plane, Normal form, Transform to the normal form, Plane passing through non-collinear points, Intercept form, Angle between two planes.

2.3 Distance of a point from a plane, Distance between parallel planes, Systems of planes, two sides of planes, Bisector planes

Unit 3: Lines in three dimension (6 lectures)

3.1 Equations of a line in Symmetric and unsymmetrical forms, Line passing through two points, Angle between a line and a plane.

3.2 Perpendicular distance of a point from a plane, Condition for two lines to be Coplanar, number of arbitrary constants in the equation of line.

Unit 4: Sphere (6 lectures)

4.1 Equation of a sphere in different forms, plane section of a sphere.

4.2 Sphere through a given circle.

4.3 Intersection of a sphere and a line, equation of Tangent plane to the Sphere.

Recommended Book:

1. Analytical Solid Geometry: Shantinarayan; S. Chand and Company Ltd, New Delhi, 1998.

Reference Books:

1. P. K. Jain and Khalil Ahmad, A Text Book of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd. 1999.

SEMESTER-II

Major Paper No: II

Course Code: MTS-152-MJ **Title: Calculus-II**

Lectures: 30 (Credits-2)

Course Outcomes:

1 Students able to understand the definition of the derivative and able to find the derivative of a function of one variable.

2 Students are able to apply mean value theorems and extreme value theorems for derivatives in the problems.

3. Students are able to find the nature of graphs of functions of one variable using derivative.

Unit 1: The Derivative of function of one variable (10 Lectures)

1.1 Definition of derivative and examples

1.2 Rule for finding derivatives and examples
1.3 Caratheodory theorem and chain rule and examples
1.4 Inverse functions and inverse function theorem for functions of one real variable

Unit 2: Mean value theorems (12 Lectures)

2.1 Interior extermum theorem
2.2 Rolle's theorem
2.3 Lagrange's Mean value theorem and its applications
2.4 First derivative test for extrema
2.5 Intermediate value Property of Derivative
2.6 L' Hospital's rules
2.7 Taylor's Theorem

Unit 3: Convex functions (03 Lectures)

3.1 Second derivative test for convexity
3.2 Newton's method to find approximate zero of $f(x)$

Unit 4: Graphs of Functions of one variable (05 Lectures)

4.1 Graphs of polynomial functions like $(x-a)(x-b)(x-c)$ and rational functions $\frac{(x-a)(x-b)(x-c)}{(x-d)(x-e)}$
4.2 Definition of circular functions, exponential function, logarithmic function and their graphs
4.3 Relation between graph of function and its inverse
4.4 Graphs of the functions $f(x+a),\ f(ax), f(x)+a,\ af(x), |f(x)|$
4.5 Graphs of some composite functions like $\frac{e^x-1}{e^x+1}, max(f(x), g(x)), min(f(x), g(x))$

Recommended Book:

1. Introduction to Real Analysis by Robert G. Bartle and Donald R. Sherbert, John Wiley and Sons Inc. , Third Edition
2. Play with graphs, Amit Agrawal, Arihant Publications.

Reference Books:

5. T.M. Apostol, Calculus Vol. I (2nd Edition), John Wiley, New York, (1967).
6. Problems in Mathematical analysis –II, W.J. Kaczor, M.T. Nowak, AMS, student Mathematical Library.
7. First course in real analysis, Sterling Berberian, Springer Publication.
8. A First course in Calculus and real analysis, Sudhir R. Ghorpade and Balmohan V. Limaye, Springer Publication.

SEMESTER-I
Major Paper No: III

Course Code: MTS-153-MJP **Title: Mathematics Practical Based on Analytical Geometry and Calculus-II**
(Credits-2)

MTS-153-MJP is a practical course based on MTS-151-MJ and MTS-152-MJ. Practical 1 to 6 based on problems from MTS-151-MJ and Practical 7 to 12 based on problems from MTS-152-MJ.

SEMESTER-II
VSC

Course Code: MTS-171-VSC **Title: LATEX**
(Credits-2)

Course Outcomes:

1. Students are able to write Mathematical symbols using Latex.
2. Students are able to write mathematical expressions using Latex.
3. Learn to write documents containing mathematical formulas using Latex.

MTS-171-VSC is a practical course on Latex.

Practical 1: Introduction to LATEX
Practical 2: Syntax, Fonts, Keyboard Characters in LATEX
Practical 3: Sections, Labelling and Text Alignment in LATEX
Practical 4: New Lines, Paragraphs, Blank Space and Dashes in LATEX
Practical 5: Listing Texts
Practical 6: Table through the Tabular Environment
Practical 7: Positioning and Texts in Tables
Practical 8: Equation Writing: Simple equations, Array of Equations
Practical 9: Conditional Expressions, Evaluation and splitting of equations
Practical 10: Text and Blank space in Math-Mode
Practical11: Vectors, Matrices, over lining and Underlining, Side-by-Side Equations
Practical 12: User-Defined Macros

Recommended Textbook: LATEX in 24 hours, Dilip Datta.

SEMESTER-II

Minor Paper No: I

Course Code: MTS-191-MN **Title: Applied Algebra**

Lectures: 30 (Credits-2)

Course Outcomes:

1. Students learn method to solve the system of equations.
2. Students learn properties of determinant and inverse.
3. Study of some applications of linear system in network analysis, electrical circuits and balancing chemical equations.
4. Students are able to find eigenvalues and eigenvectors and their application to solve differential equations and in dynamical systems.

Unit 1: System of Linear Equations and Matrices (15 Lectures)

1.1 Introduction to Systems of Linear Equations
1.2 Gaussian Elimination Inverses; Algebraic Properties of Matrices
1.3 Elementary Matrices and a Method for Finding A^{-1}
1.4 More on Linear Systems and Invertible Matrices
1.5 Diagonal, Triangular, and Symmetric Matrices
1.6 Matrix Transformations

Unit 2: Applications of System of Linear Equations (6 Lectures)

2.1 LU Decomposition
2.2 Applications of Linear Systems
- Network Analysis (Traffic Flow)
- Electrical Circuits
- Balancing Chemical Equations

Unit 3: Eigenvalues and Eigenvectors (9 Lectures)

3.1 Eigenvalues and Eigenvectors
3.2 Diagonalization
3.3 Applications:
- Differential Equations
- Dynamical Systems

Recommended Books:

Elementary Linear Algebra by Howard Anton, Chris Rorres, 11th edition.

Reference book:

Elementary Linear Algebra by Gilbert Strang

SEMESTER-II
GE/OE

Course Code: OE-151-MTS **Title: Basic Calculus**
(Lectures: 30 Credits-2)

Course Outcomes:

1. Students are able to understand the definition of the derivative and able to find the derivative of a function of one variable.
2. Students are able to apply mean value theorems and extreme value theorems for derivatives in the problems.
3. Students are able to find the nature of graphs of functions of one variable using derivatives.

Unit 1: Numbers and functions **(07 Lectures)**

1.1 Integers , Rational numbers, real numbers
1.2 Inequalities.
1.3 Functions
1.4 Powers

Unit 2: Graphs and curves **(07 Lectures)**

2.1 Coordinates
2.2 Graphs
2.3 The straight line
2.4 Distance Between two points
2.5 Curves and equations
2.6 The circle
2.7. Dilations and the ellipse
2.8 The Parabola
2.9. The Hyperbola

Unit 3: Differentiation and Integration of Elementary Functions. **(10 Lectures)**

3.1 Limits
3.2 The Derivative and the slope of a curve.
3.3 Derivatives of Powers, sums, Products and Quotients

3.4 The Chain rule
3.6 Higher order derivatives
3.7 Implicit Differentiation
3.8 rate of Change
3.9 Integration of some basic functions

Unit 4: Sine and Cosine (06 Lectures)

4.1 The radian measure
4.2 Sine and cosine functions
4.3 Exponential and Logarithmic functions.
4.4 The graphs
4.5 Addition formula for sine and cosines
4.6 The derivative
4.7 Two basic limits
4.8 Polar coordinates

Recommended Book: First course in Calculus, Serge Lang, Springer Publication, Fifth Edition.

Reference Books:

1. T.M. Apostol, Calculus Vol. I (2nd Edition), John Wiley, New York, (1967).
2. Problems in Mathematical analysis –II, W.J. Kaczor, M.T. Nowak, AMS, student Mathematical Library.
3. First course in real analysis, Sterling Berberian, Springer Publication.
4. A First course in Calculus and real analysis, Sudhir R. Ghorpade and Balmohan V. Limaye, Springer Publication.

SEMESTER-II

GE/OE

Course Code: OE-152-MTS **Title: Mathematics Practical Based on Basic Calculus**

(Credits-2)

It is a practical course consisting of 12 practicals based on Basic Calculus (OE-151-MTS).

SEMESTER-II

SEC

Course Code: SEC-151-MTS **Title: Mathematics for Life Sciences**

(Credits-2)

Course Outcomes:

1. Students able to solve linear system of equations, system of linear differential Equations.
2. Students able to sketch the curves.
3. Students able to find indefinite integrals and derivatives of some functions.

It is a practical course consisting of 12 practicals based on following topics.

Unit 1: Graphs and curves

1.1 Coordinates
1.2 Graphs
1.3 The straight line
1.4 Distance between two points
1.5 Curves and equations
1.6 Graphs of some basic functions

Unit 2: Differentiation and integration

2.1 Definition of differentiable functions and examples
2.2 Rules for derivatives
2.3 Extreme value theorem
2.4 Indefinite integral of standard functions

Unit 3: Differential equations

3.1 First order differential equations and their solutions
3.2 System of first order differential equations with constant coefficients

Unit 4: Linear system of equations

4.1 Solving system of linear equations using row reduced echelon form
4.2 Row space and null space of a matrix.

Reference Books:

1. Calculus Vol-II, Tom Apostal, John Wiley and sons.
2. Differential equations and Dynamical system, Stephen smale and Morris Hirsh, springer Publication.
3. Thomas' Calculus, Pearson Addison Wesley