

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR
UNIVERSITY, NAGPUR**



National Education Policy-2020

**B.Sc. Four Year (Honors/Research) Degree Programme
(Mathematics)**

**Syllabus for B. Sc. Semester-III, IV Degree Course with
Mathematics Major**

B.Sc. Part II (Semester III and IV)

Commencement Year: 2025- 2026

B.Sc. Semester-III (MATHEMATICS)	
<p>Semester-III Paper-I</p> <p>DSC (Core) Code: BMT3T05</p> <p>Credits-2</p> <p>No. of hours 30</p>	<p>Course Title: PARTIAL DIFFERENTIAL EQUATIONS</p> <p><i>Course Outcomes:</i></p> <p>CO1: Foundational Knowledge: Students will have the opportunity to enhance their understanding of the fundamental concepts of partial differential equations.</p> <p>CO2: Elementary Skills: Students will gain an understanding of the significance of integral curves and surfaces associated with vector fields.</p> <p>CO3: Basic Analytic skills: The primary objective of the course is to provide students with essential foundational analytical skills for effective problem-solving.</p> <p>CO4: Application: By applying the principles of basic tools through the course curriculum, students can solve a variety of practical problems in science and engineering.</p>
	<p>Syllabus for B.Sc. Semester – III</p> <p>Paper -I: BMT3T05: Partial Differential Equations</p> <p>Unit I – Simultaneous differential equations of the first order and the first degree in three variables, Methods of solution of $dx/P = dy/Q = dz/R$, Pfaffian differential forms and equations, Solution of Pfaffian differential equation in three variables. (08 Hrs.)</p> <p>Unit II – Partial differential equations, Origins of first order partial differential equations, Linear Partial differential equations of the first order, Integral surfaces passing through a given curve. (07 Hrs.)</p> <p>Unit III – Nonlinear Partial differential equations of the first order, Compatible systems of first order equations, Charpit’s method, Special types of first order equations, Jacobi’s method. (08 Hrs.)</p> <p>Unit IV – Second order Partial differential equations, Higher order Linear partial differential equation with constant coefficients, Equations reducible to Linear partial differential equation with constant coefficients. (07 Hrs.)</p> <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Ordinary and Partial Differential Equations by M. D. Raisinghania, S. Chand and Company Ltd., 1976. 2. Elements of Partial Differential Equations by IAN N. Sneddon, McGraw-Hill Book Company, 1986 3. Advanced Engineering Mathematics by Erwin Kreyzig, John Wiley and Son’s, Inc., New York, 1999 4. Suggested digital platform: NPTEL/SWAYAM/MOOCs

PRACTICAL: BMT3P05: Partial Differential Equations	
<p>Semester-III Paper-I</p> <p>DSC (Core) Code: BMT3P05</p> <p>Credits- 1</p> <p>No. of hours 30</p>	<p><i>Course Title: PARTIAL DIFFERENTIAL EQUATIONS</i></p> <p>Course Outcomes:</p> <p><i>CO1: Students will be able to solve simultaneous differential equations of first order and first degree in three variables.</i></p> <p><i>CO2: Students will be able to solve Pfaffian differential equations in three variables.</i></p> <p><i>CO3: Students will be able to form the Partial differential equations of first and second order.</i></p> <p><i>CO4: Students will be able to differentiate between first order linear and non-linear PDEs and solve them accordingly.</i></p> <p><i>CO5: Students will be able to identify and solve homogeneous and non-homogeneous second order Partial differential equations with constant coefficients.</i></p> <p><i>CO6: Students will get the introduction of PDE with variable coefficients.</i></p>
	<p>Practical for B.Sc. Semester – III BMT3P05: Partial Differential Equations</p> <p>Note: Minimum 12 topics from listed practical problems must be conducted, at least 3 from every unit.</p> <p>List of Topics for Practical Problems:</p> <ol style="list-style-type: none"> (1) To find Integral Curves of the ordinary differential equation $dx/P = dy/Q = dz/R$, (2) To find the Criterion for Integrability of Pfaffian Differential equation (3) To solve the Pfaffian Differential Equation by inspection (4) To solve the Pfaffian Differential Equation by using various methods. (5) To solve the Pfaffian Differential Equation by reducing it to Ordinary Differential in two variables. (6) To obtain the order and degree of a Partial Differential equation. (7) To form first order PDE by eliminating arbitrary constants. (8) To form first order PDE by eliminating arbitrary functions. (9) To find the solution of Lagrange's equations. (10) To find the Integral surface passing through a given curve (11) To find whether the equations are compatible. (12) To solve the compatible differential equations. (13) To study occurrence of wave equation in physics: <ol style="list-style-type: none"> (a) Transverse Vibrations of a string (b) Longitudinal Vibrations in a Bar (c) Longitudinal sound waves (d) Sound waves in Space

	<p>(14) To obtain special cases of Charpit's method.</p> <p>(15) To study solution of two-dimensional Laplace Equation</p> <p>(16) To form second order linear PDE.</p> <p>(17) To solve some special second order linear PDE.</p> <p>(18) To find the general solution of homogeneous Linear PDEs with Constant Coefficients</p> <p>(19) To find the general solution of non-homogeneous Linear PDEs with Constant Coefficients</p> <p>(20) To solve PDEs with variable coefficients by reducing it to PDE with Constant Coefficients.</p>
	<p>References:</p> <ol style="list-style-type: none"> 1. Ordinary and Partial Differential Equations by M. D. Raisinghania, S. Chand & Company Ltd., 1976. 2. Elements of Partial Differential Equations by IAN N. Sneddon, McGraw-Hill Book Company, 1986 3. Advanced Engineering Mathematics by Erwin Kreyzig, John Wiley and Son's, Inc., New York, 1999

B.Sc. Semester-III (MATHEMATICS)	
<p>Semester-III Paper-II</p> <p>DSC (Core) Code: BMT3T06</p> <p>Credits-2 No. of hours 30</p>	<p>Course Title: ANALYTICAL SOLID GEOMETRY</p> <p>Course Outcomes:</p> <p><i>CO1: To understand concepts on Two and Three-Dimensional Geometry.</i></p> <p><i>CO2: To find equations of Right lines, Planes, Spheres, Cones and Cylinders.</i></p> <p><i>CO3: To find the Direction cosines of any line under the different given conditions.</i></p> <p><i>CO4: To understand the intersection of any two or three, three dimensional geometrical figures.</i></p>
	<p>Syllabus for B.Sc. Semester – III</p> <p>Paper -II: BMT3T06: Analytical Solid Geometry</p> <p>Unit I – Co-ordinates: Direction cosines of a line, Relation between direction cosines, Projection on a straight line, Angle between two lines.</p> <p>The Plane: Equation of planes, Determination of plane under given conditions, System of planes, Length of perpendicular from a point to a plane, Joint equation of two planes.</p> <p>Unit II – Right line: Equation of lines, Angle between a line and a plane, Condition for a line to lie in a plane, Coplanar lines, Condition for coplanarity of lines, The</p>

	<p>shortest distance between two lines, Length of the perpendicular from a point to a line. Transformation of Co-ordinates: Relation between direction cosines of three mutual perpendicular lines.</p> <p>Unit III – The Sphere: Equations of Sphere, The sphere through four given points, Plane section of a sphere, Intersection of a sphere and a line, Equation of a tangent plane, Angle of intersection of two spheres.</p> <p>Unit IV – Cones and Cylinders: Definition, The right circular cone and its equation, The cylinder and its equation, the right circular cylinder and its equation.</p>
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Analytical Solid Geometry, by Shanti Narayan and Dr. P.K. Mittal, S. Chand Publication. 2. Text Book on coordinate Geometry, by Gorakh Prasad, H.C. Gupta; Pothishala Publication. 3. Elementary Treatise on Co-ordinate geometry of three Dimensions by R.J.T. Bell, Mac Millan India Ltd. 4. A Text Book of Analytical Geometry of Three dimensions, by P. K. Jain and Khalil Ahmad, Wiley Eastern Ltd. 5. Analytical Geometry of two and three dimensions, by Quiz Zameeruddin: Narsoba Publication. 6. Analytical Geometry of Three dimensions, by N. Saran and R.S. Gupta, Pothishala Publication.

PRACTICAL: BMT3P06: Analytical Solid Geometry	
<p>Semester-III Paper-II</p> <p>DSC (Core) Code: BMT3P06</p> <p>Credits- 1</p> <p>No. of hours 30</p>	<p><i>Course Title: ANALYTICAL SOLID GEOMETRY</i></p> <p>Course Outcomes:</p> <p><i>Upon completion of a practical course in Analytical Solid Geometry students should be able to understand, identify and sketch and solve related problems.</i></p> <p>CO1: Understanding: <i>Students should develop a strong understanding of the concepts and properties of various three-dimensional geometric objects such as planes, lines, spheres, cylinders using analytical methods and able to solve related problems.</i></p> <p>CO2: Identifying and Sketching: <i>Students should be able to identify and sketch various geometric objects including planes, straight lines, spheres, cones, and cylinders.</i></p> <p>CO3: Analytical Methods: <i>Students should be able to derive equations of planes, lines, spheres, and other geometric objects.</i></p> <p>CO4: Applications: <i>Students should be able to apply the concepts of analytical solid geometry to solve problems in other areas of mathematics and science.</i></p>

Practical for B.Sc. Semester – III

BMT3P06: Analytical Solid Geometry

Note: Minimum 12 topics from listed practical problems must be conducted, at least 3 from every unit.

List of Practical Problems:

- (1) To find direction cosines of the line joining two points.
- (2) To find angle between the lines whose direction ratios are given.
- (3) To find the direction cosines of the normal to the plane.
- (4) To find angles between the pair of planes.
- (5) To find equation of the plane through the given points.
- (6) To find co-ordinates of the point of intersection of line with the plane.
- (7) To find the symmetrical form of the equation of given line.
- (8) To find angle between the lines.
- (9) To show that given lines are coplanar, find also the co-ordinates of their point of intersection and find the equation of the plane containing them.
- (10) To find relation between the direction cosines of three mutually perpendicular lines.
- (11) To find equation of the sphere through given four points.
- (12) To find equation of sphere having centre at origin and touches the plane.
- (13) To find centres of two spheres touching the given plane.
- (14) To find the equation of tangent plane at any point of the sphere.
- (15) To show that the given plane touches the given sphere.
- (16) To derive equation of right circular cone
- (17) To find the equation of cone whose vertex is the origin and the direction cosines l, m, n of the generator.
- (18) To find the point of intersection of a line with the cone.
- (19) To find the equation of right circular cylinder whose radius and axis are given.
- (20) To derive the equation of the right circular cylinder.

Reference Books:

1. Analytical Solid Geometry, By Shanti Narayan and Dr. P.K. Mittal, S. Chand Publication.
2. Text Book on coordinate Geometry, by Gorakh Prasad, H.C. Gupta; Pothishala Publication.

B.Sc. Semester-IV (MATHEMATICS)	
Semester-IV Paper-I DSC (Core) Code: BMT4T07 Credits-2 No. of hours 30	<p>Course Title: MATHEMATICAL METHODS</p> <p>Course Outcomes:</p> <p><i>CO1: The student will be able to find the Laplace transform, inverse Laplace transform and Fourier transform. The course in mathematical methods basically develops a problem-solving skill in the students.</i></p> <p><i>CO2: Upon successful completion, students will have the knowledge of various types of transformations, their terminology and applications.</i></p>
	<p style="text-align: center;">Syllabus for B.Sc. Semester – IV</p> <p style="text-align: center;">Paper -I: BMT4T07: Mathematical Methods</p> <p>Unit I – Laplace Transforms: Definition, Basic Properties. Laplace transforms of some standard functions. Laplace transforms of Periodic functions. Laplace transform of derivative and integral of a function. Heaviside function. Dirac-delta function. Convolution theorem.</p> <p>Unit II – Inverse Laplace Transforms: Definition and its properties. Applications to Ordinary differential equations with constant coefficients, Ordinary differential equations with variable coefficients, Simultaneous ordinary differential equations and Partial differential equations.</p> <p>Unit III – Fourier Series: Periodic functions. Fourier Coefficients. Fourier series of functions with period 2π and period $2L$. Fourier series of even and odd functions. Half range Cosine and Sine series.</p> <p>Unit IV – Fourier Transforms: Finite Fourier Cosine and Sine transform. The Convolution theorem, Transforms of derivatives, Relationship of Fourier and Laplace transforms.</p>
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Murry R. Spiegel: Laplace Transform (SCHAUM Outline Series), McGraw-Hill. 2. J. F. James: A student’s guide to Fourier transforms, Cambridge University Press. 3. Ronald N. Bracewell: The Fourier transforms and its applications, Mcgraw Hill. 4. J. H. Davis: Methods of Applied Mathematics with a MATLAB Overview, Birkhäuser, Inc., Boston, MA, 2004. 5. Suggested digital platform: NPTEL/SWAYAM/MOOCs

PRACTICAL: BMT4P07: Mathematical methods	
<p>Semester-IV Paper-I</p> <p>DSC (Core) Code: BMT4P07</p> <p>Credits-1 No. of hours: 30</p>	<p><i>Course Title: MATHEMATICAL METHODS</i></p> <p>Course Outcomes:</p> <p><i>CO1: Students will be able to find the Laplace transforms of some standard and periodic functions.</i></p> <p><i>CO2: Students will be able to find the Laplace transforms of derivative and integral of a function.</i></p> <p><i>CO3: Students will be able to verify Convolution Theorem in case of Laplace transform and Fourier transform.</i></p> <p><i>CO4: Students will be able to find the inverse Laplace transform of simple functions.</i></p> <p><i>CO5: Students will be able to solve ordinary linear differential equation, simultaneous linear differential equations and partial differential equation using Laplace transform.</i></p> <p><i>CO6: Students will be able to find Fourier series of some simple functions with period 2π, with period 2π divided into two or more segments and with period $2L$.</i></p> <p><i>CO7: Students will be able to find Fourier series of even and odd functions, also Half range sine and cosine series of some simple functions,</i></p> <p><i>CO8: Students will be able to find Sine and Cosine Fourier transform.</i></p> <p><i>CO9: Students will be able to find the Fourier transforms of derivative of a function.</i></p> <p><i>CO10: Students will be able to established relationship of Fourier and Laplace transforms.</i></p>
	<p>Practical for B.Sc. Semester – III BMT4P07: Mathematical methods</p> <p>Note: Minimum 12 topics from listed practical problems must be conducted, at least 3 from every unit.</p>
	<p>List of Practical Problems:</p> <ol style="list-style-type: none"> (1) To find the Laplace transforms of some standard functions. (2) To find the Laplace transforms of periodic functions. (3) To find the Laplace transforms of derivative of a function. (4) To find the Laplace transforms of integral of a function. (5) To verify Convolution Theorem in case of Laplace transform. (6) To find the inverse Laplace transform of simple functions. (7) To solve ordinary linear differential equation with constant coefficient using Laplace transform. (8) To solve ordinary linear differential equation with variable coefficient using Laplace transform.

	<p>(9) To solve simultaneous linear differential equations using Laplace transform.</p> <p>(10) To solve partial differential equation using Laplace transform.</p> <p>(11) To find Fourier series of some simple functions with period 2π.</p> <p>(12) To find Fourier series of some simple functions with period 2π divided into two or more segments.</p> <p>(13) To find Fourier series of some simple functions with period $2L$.</p> <p>(14) To find Fourier series of even and odd functions.</p> <p>(15) To find Half range sine and cosine series of some simple functions and plotting them.</p> <p>(16) To find Cosine Fourier transform.</p> <p>(17) To find Sine Fourier transform.</p> <p>(18) To verify Convolution Theorem in case of Fourier transform.</p> <p>(19) To find the Fourier transforms of derivative of a function.</p> <p>(20) To established relationship of Fourier and Laplace transforms.</p>
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Murry R. Spiegel: Laplace Transform (SCHAUM Outline Series), McGraw-Hill. 2. J. F. James: A student's guide to Fourier transforms, Cambridge University Press. 3. Ronald N. Bracewell: The Fourier transforms and its applications, Mcgraw Hill. 4. J. H. Davis: Methods of Applied Mathematics with a MATLAB Overview, Birkhäuser, Inc., Boston, MA, 2004.

B.Sc. Semester-IV (MATHEMATICS)	
<p>Semester-IV Paper-II</p> <p>DSC (Core) Code: BMT4T08</p> <p>Credits-2 No. of hours 30</p>	<p>Course Title: SEQUENCE AND SERIES</p> <p><i>Course Outcomes:</i></p> <p>CO1: The student will be able to - define a sequence; understand the meaning of convergence and divergence of a sequence; test the convergence of a sequence.</p> <p>CO2: The student will be able to - define a series; understand the meaning of convergence and divergence of a series; test the convergence of a series; explain the difference between absolute and conditional convergence of a series.</p>
	<p>Syllabus for B.Sc. Semester – IV</p> <p>Paper -II: BMT4T08: Sequence and Series</p> <p>Unit I – Sequences: Definition and examples of sequences, Limit of a sequence, Convergent and Divergent sequences, Bounded sequences, Theorems on convergent sequences.</p>

	<p>Unit II – Sequences: Monotone Sequences, operations on Sequences, Cauchy sequences, limit superior and limit inferior.</p> <p>Unit III – Infinite series: Convergence and divergence of series, Cauchy's criterion for convergence of a series, series of positive terms, Geometric series, Comparison test.</p> <p>Unit IV – Infinite series: p-series, Cauchy's root test, D'Alembert's ratio test, Alternating series, Leibnitz test, Absolute and conditional Convergence.</p>
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. P. K. Jain and S. K. Kaushik: An Introduction to Real Analysis, S. Chand and Company 2. R. R. Goldberg: Methods of Real Analysis, Oxford and IBH Publishing Co. Pvt. Ltd New Delhi 1970. 3. T. M. Apostol: Mathematical Analysis, Narosa publishing House, New Delhi, 1985. 4. D. Somasundaram and B. Chaudhary: A first course in Mathematical Analysis, S. Chand Co., New Delhi, 2000. 5. M. K. Singal and Asha Rani: A first Course in Real Analysis, R. Chand and Co., Delhi, 3rd Edition 1973. 6. R. G. Bartle and D. R. Sherbert: Introduction to Real Analysis, John Wiley and Sons (Asia) Pvt. Ltd., 2000. 7. Suggested digital platform: NPTEL/SWAYAM/MOOCs

b

PRACTICAL: BMT4P08: Sequence and Series	
<p>Semester-IV Paper-II DSC (Core) Code: BMT4P08 Credits-1 No. of hours: 30</p>	<p><i>Course Title: SEQUENCE AND SERIES</i></p> <p>Course Outcomes:</p> <p><i>CO1: Students will be able to use ε-m technique to verify whether the given number is a limit of a sequence or not.</i></p> <p><i>CO2: Students will be able to determine if a given sequence is bounded, monotonic, and a Cauchy sequence.</i></p> <p><i>CO3: Students will be able to determine whether a given sequence is convergent or divergent by using the appropriate tests.</i></p> <p><i>CO4: Students will be able to determine the limit superior and limit inferior of sequences.</i></p> <p><i>CO5: Students will be able to find the sequence of partial sums of an infinite series.</i></p>

	<p>CO6: Students will be able to determine whether an infinite series is convergent or divergent by applying the appropriate tests such as limit/ratio comparison test, p-series test, Cauchy's root test, D'Alembert's ratio test, etc.</p> <p>CO7: Students will be able to check the absolute and conditional convergence of a series</p>
	<p>Practical for B.Sc. Semester – IV BMT4P08: Sequence and series</p> <p>Note: Minimum 12 topics from listed practical problems must be conducted, at least 3 from every unit.</p> <p>List of Practical Problems:</p> <ol style="list-style-type: none"> (1) Verification of limit of sequences using ε-m definition. (2) To discuss the convergence of a sequence using ε-m definition of limit of a sequence. (3) To prove the limit of sum, difference, product and quotient of two sequences equal to sum, difference, product and quotient of their limits. (4) To discuss the boundedness of sequences. (5) To discuss the convergence of sequences using sandwich theorem. (6) To test the convergence of monotonic sequences. (7) To test the convergence of sequences using Cauchy's general principle of convergence. (8) To test the convergence of sequences using Cauchy's theorems on limit of a sequence. (9) To examine the divergence of sequences. (10) To find the limit superior and limit inferior of sequences. (11) To test the convergence of series using Cauchy's criterion for convergence of series. (12) To test the convergence of series using geometric series test. (13) To prove the limit comparison test for convergence of series. (14) To test the convergence of series using limit comparison test. (15) To test the convergence of series using ratio comparison test. (16) To test the convergence of series using p-series test. (17) To test the convergence of series using Cauchy's root test. (18) To test the convergence of series using D'Alembert's ratio test. (19) To test the convergence of alternating series using Leibintz test. (20) To test the absolute and conditional convergence of series.

Reference Books:

1. P. K. Jain and S. K. Kaushik: An Introduction to Real Analysis, S. Chand and Company
2. R. R. Goldberg: Methods of Real Analysis, Oxford and IBH Publishing Co. Pvt. Ltd New Delhi 1970.
3. T. M. Apostol: Mathematical Analysis, Narosa publishing House, New Delhi, 1985.
4. D. Somasundaram and B. Chaudhary: A first course in Mathematical Analysis, S. Chand Co., New Delhi, 2000.
5. M. K. Singal and Asha Rani: A first Course in Real Analysis, R. Chand and Co., Delhi, 3rd Edition 1973.
6. R. G. Bartle and D. R. Sherbert: Introduction to Real Analysis, John Wiley and Sons (Asia) Private. Ltd., 2000.

Theory and Practical Examination, Evaluation and Assessment Process:

The total marks for each theory/practical paper shall be based on Continuous Internal Evaluation /Assessment (CIE) and Semester End Examination (SEE). Each theory course of Major (DSC), Minor, GE/OE, SEC, VEC as prepared by the Board of Studies shall be evaluated as per the scheme as mentioned in the Scheme of Examination.

Continuous internal evaluation/assessment shall be carried out by the respective course teacher (by choosing variety of assessment tools/methods such as class test, record book, seminar, case study, field work, mini project work, quiz or any innovative method) as under:

Theory Internal Assessment (20 Marks)	<p>1. Two Unit Tests (10 Marks each)</p> <p style="padding-left: 40px;">a. Unit Test 1: MCQ based</p> <p style="padding-left: 40px;">b. Unit Test 2: Descriptive</p> <p style="padding-left: 80px;">(Consider best of one for Internal Assessment)</p> <p>2. Assignment (05 Marks)</p> <p>3. Presentation / Field Work / Quiz / Mini Project work / Attendance (05 Marks)</p>
--	--

Practical Assessment (50 Marks) Credit: 1	Continuous Internal Evaluation (CIE): Internal Practical Assessment (25 Marks)	<p>1. Practical Record- 15 Marks</p> <p>2. Viva voce – 10 Marks</p>
	Session End Examination (SEE): External Practical Assessment (25 Marks)	<p>1. Practical Performed – 20 Marks (Perform any four, each carry 05 Marks)</p> <p>2. Viva voce- 05 Marks</p>

Abbreviations: Discipline Specific Core (Course) (DSC); Generic/Open Electives (GE/OE); Vocational Skill Courses (VSC); Skill Enhancement Courses (SEC); Ability Enhancement Courses (AEC); Indian Knowledge System (IKS); Value Education Courses (VEC); Field projects (FP); Community Engagement and Service (CEP); Co-curricular Courses (CC).



Vocational Skill Course (VSC): BVS3P05: GeoGebra	
Semester-III	<i>Course Title: GeoGebra</i>
VSC-Code: BVS3P05	GeoGebra is a dynamic mathematics software that integrates geometry, algebra, spreadsheets, graphing, statistics and calculus and hence it is suite for learning and teaching Science, Technology, Engineering and Mathematics.
Credits-2	<i>Course Outcomes:</i> <i>After successful completion of this course student will be able to:</i>
No. of hours: 60	<i>CO1: Gain experimental, problem-oriented and research-oriented skills of learning of mathematics</i> <i>CO2: Create interactive work sheets and learning materials</i> <i>CO3: Create interactive learning resources as web pages</i>
	Practical for B.Sc. Semester – III BVS3P05: GeoGebra
	Topics: Unit I: Geometry - Points, lines, Circle, polygons, Equilateral triangles and regular hexagons inscribed in circles, Transformations (translation, rotation, reflection) Unit II: Algebra - Equations and inequalities, Solving equations and systems of equations, Matrices Unit III: Calculus I – Functions, Inverse functions, Composite functions Unit IV: Calculus II – Derivatives, Integrals
	Reference Books: 1. Wiley – College Geometry with GeoGebra 2. Judith Hohenwarter and Markus Hohenwarter- Introduction to GeoGebra 3. Malin Christersson – MalinC’s GeoGebra 4. www.geogebra.org

Skill Enhancement Course (SEC): BVS4P06: Applied Mathematics for Data Science in Excel	
<p>Semester-IV</p> <p>SEC-Code: BVS4P06</p> <p>Credits-2</p> <p>No. of hours: 60</p>	<p>Course Title Applied Mathematics for Data Science in Excel</p> <p>Course Outcomes:</p> <p><i>After successful completion of this course student will be able to:</i></p> <p>CO1: Analyse the data and interpret it.</p> <p>CO2: Infer decisions on the basis of data interpretations.</p> <p>CO3: Apply appropriate formats for generating data reports.</p> <p>CO4: Enhance visual presentation of data through visualisations tools.</p>
	<p>Practical for B.Sc. Semester – IV</p> <p>BVS3P06: Applied Mathematics for Data Science in Excel</p> <p>Unit I: Introduction To Applied Mathematics and Data Science: Basics of Applied Mathematics, What Is Data Science, Need for Analysis of Data, Applications of Data Science, Tools for Analysis of Data.</p> <p>Excel Interface: Introduction To Spread Sheets, Spread Sheet Basics, Keyboard Shortcuts for Excel.</p> <p>Unit II: Structuring and Formatting of Data: Arranging Data in Excel, Viewing, Entering and Editing Data, Copying and Filling Data, Formatting Cells and Data, Conditional Formatting</p> <p>Unit III: Designing of User defined formulae’s, Using Built-in Functions:</p> <p>Basic: SUM(), MIN(), MAX(), AVERAGE(), COUNT(), POWER(), CEILING(), FLOOR(), CONCAT(), TRIM(), REPLACE(), SUBSTITUTE(), LEFT(), RIGHT(), MID(), UPPER(), LOWER(), PROPER(), NOW(), TODAY(), DATEDIF() AND IF()</p> <p>Advanced: IF, NESTED IFs AND IFS, IF(AND and IF(OR, SUMIFS, SUMPRODUCT, SUBTOTAL, PIVOT, HLOOKUP, VLOOKUP, PI, AVERAGEA(), AVERAGEIF(), FREQUENCY(), GEOMEAN(), HARMEAN(), LARGE(), INTERCEPT(), RANK(), MEAN(), MODE(), MEDIAN()).</p> <p>Unit IV: Introduction to Visualization: Pie Chart, Histograms, Bar Charts, Line Charts, Radial Charts, Spark Lines, Combo Charts, Scatter Plots</p> <p>Case Studies: To analyse the Realtime data for an organization</p>

	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Jugal Kalita, Dhruba Bhattacharyya, Swarup Roy, “Fundamentals of Data Science” Academic Press ISBN 9780323972635 2023 2. John Walkenbach, et. al. “Microsoft Office 2010 Bible”, Wiley India Pvt. Ltd. 3. Gini Courter, Annette Marquis ”Microsoft Office 2000” BPB Publication
--	---

VSC Basket (Mathematics)

Semester	Course Category	Name of Course	BoS	Course Code
I	VSC	Sage Math software system	Mathematics	BVS1P01
II	VSC	Maxima software system	Mathematics	BVS2P03
III	VSC	GeoGebra	Mathematics	BVS3P05
V	VSC	Scilab	Mathematics	BVS5P07
VI	VSC	LATEX for beginners	Mathematics	BVS6P08
