Revised Syllabus

DEPARTMENT OF MATHEMATICS

COURSE CURRICULUM & MARKING SCHEME

B.Sc. I & II Semester
MATHEMATICS

(Based on Choice Based Credit System)

SESSION : 2022-23

ESTD : 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)
NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)
Phone : 0788-2212030
Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com

DEPARTMENT OF MATHEMATICS
GOVT. V. Y. T. AUTONOMOUS COLLEGE, DURG (C.G)

Approved syllabus for **B.Sc.** by the members of Board of studies for the session 2022-2023. The syllabus with the paper combinations is as under

B.Sc. Semester -I

| Core Course	Skill Enhancement Course (any one)
I : BMT101- Calculus	IIA : BMTSE01- Introduction to Logic
	IIB : BMTSE02-Vector Calculus
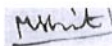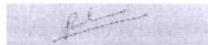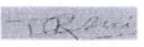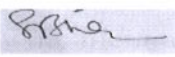
B.Sc. Semester -II
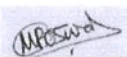
Core Course	Skill Enhancement Course (any one)
I : BMT201-Differential Equations	IIA : BMTSE03- Set Theory
	IIB : BMTSE04 - Boolean Algebra

The syllabus for B.Sc. is hereby approved by the members of Board of studies for the session 2022-23.

In case, any change or modification is prescribed by central Board of Studies or Higher Education Dept., Govt. of Chhattisgarh with respect to content or distribution of marks for Undergraduate syllabi, it will be implemented accordingly.

Name & Signature:

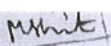|	
Chairperson / H.O.D - Dr. M.A. Siddiqui	Faculty members –
Subject Expert - Dr. Madhu Shrivastava	Dr. Padmavati –
Subject Expert - Dr. Shabnam Khan	Dr. Rakesh Tiwari –
Subject Expert - Dr. S. K. Bhatt	Dr. (Smt.) Prachi Singh –
Representative Members -	
1. Dr. Anil Kashyap -	Dr. Shobha Rani -
2. Shri A. K. Pandey -	
3. Dr. Mayur Puri Goswami -	

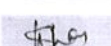# Govt. V.Y.T. PG Autonomous College, Durg (C.G.)

Examination Cell
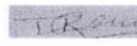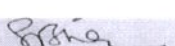
Question Paper Format and Distribution of Marks for Under Graduate Examination

1. The question paper for UG Classes is to be divided into three Sections - A, B & C.
2. Section A shall contain very short answer type questions (answer in one or two sentences) or objective type questions. (No Multiple choice questions. No 'fill in the blank' type Questions)
3. Section B shall contain short answer type questions.
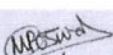4. Section C shall contain long answer/descriptive type questions. The students are required to answer precisely.
5. The scheme of marks should be as follows :

Question Type	MM 75 (Marks x No. of Questions)
A (Very short Answer)	1x10 = 10
B (Short Answer)	4x5 = 20
C (Long Answer)	9x5 = 45

6. The half yearly internal examinations will be held. 10% out of marks obtained by the students in each paper in internal examinations will be added to 90% of marks obtained in each paper of annual examination.
7. The students are required to study the content mentioned in the curriculum exhaustively.

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2

DEPARTMENT OF MATHEMATICS
GOVT. V.Y. T. PG. AUTONOMOUS COLLEGE, DURG

SYLLABUS for B.Sc. Semester - I

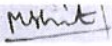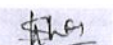The syllabus with the paper combinations and Marking Scheme for the session 2022-2023.
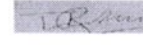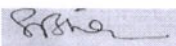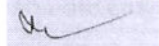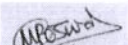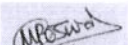
Title	Paper No.	Title of the Paper	Marks Allotted		Credit
			Theory	Practical / Project	
Core Course	BMT101	Calculus	75	25	4(3 + 1)
Skill Enhancement Course (Any One)	BMTSE01	Introduction to Logic	25	25	2(1+1)
	BMTSE02	Vector Calculus	25	25	2(1+1)

Total Marks - 150

The syllabus for **B.Sc. Semester - I** is hereby approved by the members of Board of Studies for the session 2022-23.

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Subject Expert- Dr. Shabnam Khan	Dr. Rakesh Tiwari –
	Dr. (Smt.) Prachi Singh -
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3. Dr. Mayur Puri Goswami -	

B. Sc. Semester-1
Paper BMT101: Calculus

(3 credit)

Course Title	B. Sc. Semester -I, Calculus
CO No.	**Course Outcomes - This course will enable the student to :**
CO No. – 1	Understand and consequences of various mean value theorems
CO No. – 2	Draw curves in Cartesian and polar coordinate systems .
CO No.- 3	Understand conceptual variation while advancing from one variable to several variables in Calculus.
CO No.- 4	Evaluate surface and volumes of solid regions.

UNIT-I: Differentiability
Differentiability and its geometrical interpretation; Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem and their geometrical interpretation.

UNIT-II: Expansion of functions
Successive differentiation and Leibnitz theorem, Maclaurin's and Taylor's theorems for expansion of functions.

UNIT-III: Asymptotes and Curve Tracing
Asymptotes of general algebraic curves, parallel Asymptotes, asymptotes parallel toaxes; ymmetry concavity and convexity, point of inflection, tangent at origin, multiple points, position nd nature of double points; tracing of Cartesian.

UNIT-IV: Function of several variables
Limit, continuity and first order partial derivatives, Higher order partial derivatives, change of variables (**only** $x \rightarrow z, t, \theta$ **and** $(x,y) \rightarrow (r,\theta)$) in total differentiation, Euler's theorem for homogeneous functions.
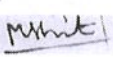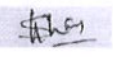
UNIT-V: Double and triple integrals
Double integration over rectangular and non-rectangular regions, Triple integral over a parallelepiped and solid regions.
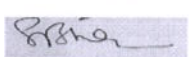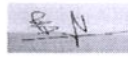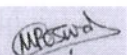
References:
1. Howard Anton, I Bivens & Stephan Davis (2016). Calculus (10th edition). Wiley India.

2. Gabriel Klambauer (1986). Aspects of Calculus. Springer-Verlag

3. Wieslaw Krawcewicz & Bindhyachal Rai (2003). Calculus with Maple Labs. Narosa.

4. Gorakh Prasad (2016). Differential Calculus (19th edition). Pothishala Pvt Ltd.

5. George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir (2018). Thomas Calculus (14th edition). Pearson Education.

6. Jerrold Marsden, Anthony J. Tromba & Alan Weinstein (2009). Basic Multivariable Calcular, Springer India Pvt. Limited.

7. James Stewart (2012). Multivariable Calculus (7th edition) Brooks/Cole. Cengage.

8. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith (2011). Calculus (3rd edition). Pearson Education.

9. George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir (2018). Thomas Calculus (14th edition). Pearson Education.

10. Jerrold Marsden, Anthony J. Tromba & Alan Weinstein (2009). Basic Multivariable Calcular, Springer India Pvt. Limited.

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12. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith (2011). Calculus (3rd edition). Pearson Education. Dorling Kindersley (India) Pvt. Ltd.

13. A.S. Gupta, Calculus of variations with-applications, Prentice-Hall of India, 1997.

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1. Dr. Anil Kashyap -	
2. Shri A. K. Pandey -	
3. Dr. Mayur Puri Goswami -	

List of Practical (Using any software) (1 Credit)

1. Plotting of graphs of function e^{ax+b}, log (ax+b).
2. Plotting of graphs of function $\frac{1}{ax+b}\sin(ax+b)$, cos(ax+b), $|ax+b|$ and to illustrate the effect of a and b on the graph.
3. Plotting of graphs of polynomial of degree 4 and 5.
4. Plotting of graphs of the second derivative graphs and comparing them.
5. Sketching parametric curves (Examples: Trochoid, cycloid, epicycloids, hypocycloid).
6. Obtaining surface of revolution of curves.
7. Tracing of conics in Cartesian coordinates.
8. Plotting of graphs of $\int x\cos(x^2)dx$.
9. Plotting of graphs of $\iint(x^2+y^2)dydx$.
10. Plotting of graphs of $\iiint(x^3y^3)dydx$.

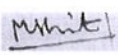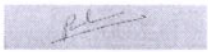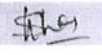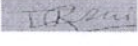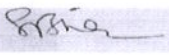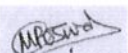## Books Recommended

1. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005.
2. M.J. Strauss, G.L. Bradiey and K.J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. ltd (Peqarson Education), Delhi, 2007.
3. H. Anton, I. Bivens and S. Davis, calculus, 7th Ed., John Wiley and sons (Asia) P. Ltd., Singapore, 2002.
4. R. Courant and F. John, Introduction to calculus and Analysis (Volumes 1st and 2nd) Springer –Verlag, New York, Inc., 1989.

Practical examination scheme

Max. Marks -25	Time Duration -03 Hour
Practical (Two)	15Marks (7.5 Marks Each)
Viva	05 Marks
Sessional	05 Marks

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B. Sc. Semester-1
Paper BMTSE01
Introduction to Logic

SEC (Skill)

(2 credit)
(Theory-1+Practical/Project-1)

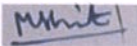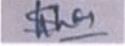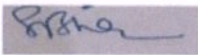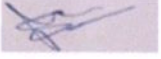| Course Title	B. Sc. Semester -I, Introduction to Logic
CO No.	**Course Outcomes - This course will enable the student to :**
CO No. – 1	Remember results of Prepositions, truth table, negation, conjunction and disjunction and equivalence relation.
CO No. – 2	Understand Logical equivalence, Predicates and Quantifiers.
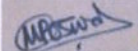
Introduction, propositions, truth table, negation , conjunction and Disjunction, implications, bi-conditional propositions, converse, contra positive and inverse propositions and precedence of logical operators.

Propositional equivalence : Logical equivalences. Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

Book recommended:

R.P. Grimaldi, Discrete Mathematics and Combinatorial Mathematics,Pearson education, 1998.

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B.Sc. Semester -I (MATHEMATICS)
2022-2023
BMTSE02 - Vector Analysis

SKill(SEC)

(2 credit)
(Theory-1+Practical/Project-1)

Course Title	B. Sc. Semester -I, Vector Analysis
CO No.	**Course Outcomes - This course will enable the student to :**
CO No. – 1	Remember scalar and vector product of three vectors and Reciprocal vector.
CO No. – 2	Understand Vector differentiation, Gradient, divergence and curl.
CO No.- 3	Apply Vector integration in various types of calculation.

Scalar and vector product of three vectors. Product of four vectors. Reciprocal vector. Examples and Applications.

Vector differentiation, Gradient, divergence and curl. Vector integration. Examples and Applications.
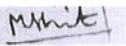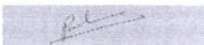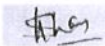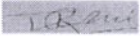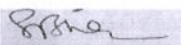
TEXT BOOK :

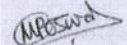1. N. Saran and S.N. Nigam, Introduction to Vector Analysis, Pothishala Pvt. Ltd. Allahabad .

REFERENCES :

1. Murray R. Spiegel, Vector Analysis, Schaum Publishing Company, New York.

2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 1999 .

3. Shanti Narayan, A Text book of Vector Calculus, S.Chand & Co. New Delhi.

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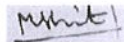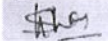
SYLLABUS for B.Sc. Semester - II
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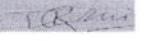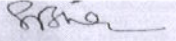
Title	Paper No.	Title of the Paper	Marks Allotted		Credit
			Theory	**Practical / Project**	
Core Course	BMT201	Differential Equations	75	25	4(3 + 1)
Skill Enhancement Course (Any One)	BMTSE03	Set Theory	25	25	2(1+1)
	BMTSE04	Boolean Algebra	25	25	2(1+1)

Total Marks - 150

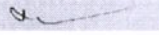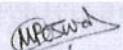The syllabus for **B.Sc. Semester - II** is hereby approved by the members of Board of Studies for the session 2022-23.

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Representative Members -	Dr. Shobha Rani -
1.) Dr. Anil Kashyap - 2.) Shri A. K. Pandey - 3.) Dr. Mayur Puri Goswami -	

B.Sc. Semester – II (Mathematics)
Paper BMT201 -Differential Equations

(3 credit)

Course Title	B. Sc. Semester -II, Differential Equations
CO No.	**Course Outcomes - This course will enable the student to :**
CO No. – 1	Understand the genesis of ordinary differential equations.
CO No. – 2	Evaluate solutions of solvable first order differential equation and linear differential equations of higher order.
CO No.- 3	Apply power series method for higher order linear equations, especially in cases when there is no method available to solve such equations.
CO No.- 4	Analyze Applications of Differential equations in Mechanics.

Unit -1 First order differential equations

Basic Concept and genesis of ordinary differential equations, order and degree of a differential equation, differential equation of first order and first degree. Equations in which variables are separable, homogeneous equations, linear differential equations and equations reducible to linear form.

Unit -2: Second order linear differential equations

Statement of existence and uniqueness theorem for linear differential equations, genera theory of linear differential equations of second order with variable coefficients ,solution o homogeneous linear ordinary differential equations of second order with constan coefficients.

Unit -3: Higher order linear differential equations

linearly dependent and linearly independent solutions on an Interval, Wronskian and its properties,concept of a general solution of a linear differential equation.

Unit -4: Series solution of differential equation

Power series method, Bessel's equation, Bessel's function and their properties, Recurrence relations.
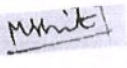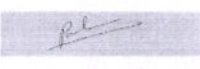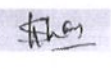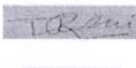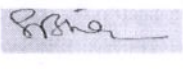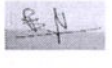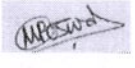
Unit -5: Applications

Applications of Differential equations in Mechanics : Simple harmonic motion,Velocitie and acceleration along radial and transverse direction.

References:

1. Belinda Barnes & Glenn Robert Fulford(2015).Mathematical Modeling With Case Studies:A Differential Equation Approach Using Maple And MATLAB (2nd Edition).Chapman & Hall/CRC Press, Taylor &Francis.
2. H.I. Freedman (1980).Deterministic Mathematical Models In Population Ecology.Marcel Dekker Inc.
3. Erwin Kreyszig(2011).Advanced Engineering Mathematics(10th Edition).Wiley.
4. Daniel A.Murray (2003).Introductory Course In Differential Equations,Orient.
5. B.Rai,D.P.Choudhury & H.I.Freedman(2013).A Course In Ordinary Differential Equations(2nd Edition).Narosa.
6. Shepley L.Ross(2007).Differential Equations(3rd Edition),Wiley India.
7. George F.Simmons(2017).Differential Equations With Applications And Historical Notes(3rd Edition).CRC Press.Taylor & Francis.

Name & Signature :

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Representative Members	
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3. Dr. Mayur Puri Goswami -	

List of practical (Using any software) (1 Credit)

1. Solution of first order differential equation.
2. Plotting of second order solution family of differential equations.
3. Plotting of third order solution family of differential equation.
4. Solution of differential equation by variation of parameter method.
5. Solution of system of ordinary differential equation.
6. Solution of Cauchy problem for first order partial differential equation.
7. Plotting the characteristics of the first order partial differential equation.
8. Plot the integral surfaces of the first order partial differential equation with initial data.
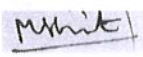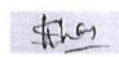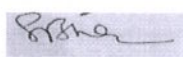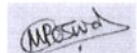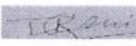
Books Recommended:

1. Belinda Barners and Glenn R. Fulford, Mathematical Modeling with Case Studies, A Differential Equation Approach using Maple and Matlab, 2nd Ed., Taylor and Francis group, London and New York, 2009.
2. C.H. Edwards and D.E. Penny, Differential Equations and Boundary Value problems Computing and Modeling, Pearson Education India, 2005.
3. S.L. Ross, Differential Equations, 3rd Ed., John Wiley and sons, India, 2004.
4. Martha L Abell, James P Braselton, Differential Equations with MATHEMATICA, 3rd Ed., Elsevier Academic Press, 2004.

Practical examination scheme

Max. Marks -25	Time Duration – 03 Hour
Practical (Two)	15 Marks (7.5 Marks Each)
Viva	05 Marks
Sessionals	05 Marks

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B. Sc. Semester-II
Paper BMTSE03
Set Theory

(2 credit)
(Theory-1+Practical/Project-1)

Course Title	B. Sc. Semester -I, Set Theory
CO No.	**Course Outcomes - This course will enable the student to :**
CO No.- 1	Apply Concepts of sets, subset, set operations and Venn diagram in real life problems
CO No.- 2	Evaluate practical problems on counting principal and power set of a set.

Sets ,subsets, set operations, the low of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle. Empty set, Properties of empty set. Standard set operations. Classes of sets. Power set of a set.
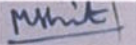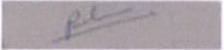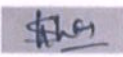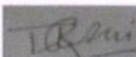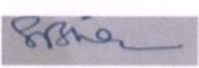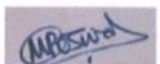
Difference and symmetric difference of two sets. Set identities, Generalized union and intersections and applications of above topics.

Relation : product set, composition of relations. Types of relations partitions and its applications, Equivalence Relations with example of congruence modulo relation.

Book recommended:
1. P.R. Halmos, Naive set theory, Springer , 1974.
2. E. Kamke, Theory of sets, Dover Publishers, 1950.

Name & Signature:

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B.Sc. Semester –II
(MATHEMATICS)2022-2023
BMTSE03 – Boolean Algebra

(2 credit)

(Theory-1+Practical/Project-1)

Course Title	B. Sc. Semester -I, Boolean Algebra
CO No.	Course Outcomes - This course will enable the student to :
CO No. – 1	Remember properties of ordered sets, partial order sets, Hasse diagram, duality principal, maximal and minimal elements.
CO No. – 2	Understand Lattices as ordered sets, complete lattices ,lattices as algebraic structures ,sub lattices ,product and Homomorphism.
CO No. – 3	Apply concepts of Karnaugh diagrams, switching circuits.
CO No. – 4	Evaluate problems on Boolean algebras and its properties , Boolean polynomials, minimal forms of Boolean polynomials.

Definition, examples and basic properties of ordered sets, maps between ordered sets, Partial ordered set, Hasse Diagram, duality principle, maximal and minimal elements.

Lattices as ordered sets, complete lattices, lattices as algebraic structures, sub-lattices, products and Homomorphism. Definition, examples and properties of modular and distributive lattices,Complete lattice, Complemented lattice, Bounded lattice and some theorems.

Boolean Algebra and its properties, Boolean polynomials, minimal forms of Boolean polynomials.

Quinn-Mccluskey method, Karnaugh diagrams, switching circuits andapplications of switching circuits.
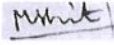
Book recommended:

1. B. A. Davey and H.A. Priestley, Introduction to lattices and order .Cambridge university press ,Cambridge,1990.
2. Rudolf Lidl and Gunter Pilz, Applied Abstract Algebra ,2nd Ed., Undergraduate texts in mathematics , Springer (SIE) , Indian reprint ,2004.
3. C. L. Liu, Elements of Discrete Mathematics, Tata McGraw-Hill Publishing Company Limited.

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