Academic Council Meeting No. 11 and Date: June 27, 2025

Agenda Number : 2 **Resolution Number : 50, 51 /2.4, 2.10**

Vidya Prasarak Mandal's

B. N. Bandodkar College of Science (Autonomous), Thane

Syllabus for

Programme: Bachelor of Science

Specific Programme: Mathematics

[T.Y.B.Sc. MATHEMATICS]

Level 5.5

Choice Based Grading System

Revised under NEP

From Academic Year 2025-26

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Preamble

Department of Mathematics of VPM'S B. N. Bandodkar College of Science Autonomous has designed the syllabus of T.Y.B.Sc. Mathematics for the academic year 2025-26 under NEP 2020.

Mathematics is the most fundamental subject and an essential tool in the field of Science and Technology. The syllabus has been developed to prepare the students in pursuing research in Mathematics as well as to enhance their analytical skills and knowledge of mathematical tools and techniques required in industry for employment.

In recent decades, the extent of application of Mathematics to real world problems has increased by leaps and bounds. Taking into consideration the rapid changes in science and technology and new approaches in different areas of mathematics and related subjects like Physics, Statistics and Computer Sciences, the board of studies in Mathematics has prepared the syllabus of T.Y.B.Sc. Mathematics. The present syllabi of T. Y. B. Sc. for Semester V and Semester VI has been designed as per U.G.C. Model curriculum so that the students learn Mathematics needed for these branches, learn basic concepts of Mathematics and are exposed to rigorous methods gently and slowly. The syllabi would consist of two semesters and each semester would comprise of three courses for T.Y.B.Sc Mathematics. Course I is 'Multivariable Calculus II and Basic complex Analysis'. Calculus is applied and needed in every conceivable branch of science. Course II, 'Group Theory and Ring Theory' develops mathematical reasoning and logical thinking and has applications in science and technology. Course III, 'Topology of Metric Spaces I and II' is the core mathematical subject. Vocational Skill Enhancement course of Java Programming is very much crucial for the students in the world of computers. Course of Indian Knowledge System is the backbone of the Mathematical knowledge with Indian Mathematician perspective.

PROGRAMME OUTCOMES (POs) OF BACHELOR OF SCIENCE (B.Sc.)

The Undergraduate Programmes of Science are intended to cater quality education and attain holistic development of learners through the following programme outcomes:

PO1 - Disciplinary Knowledge

Lay a strong foundation of conceptual learning in science. Instil ability to apply science in professional, social and personal life.

PO2 - Inculcation of Research Aptitude

Ignite spirit of inquiry, critical thinking, analytical skills and problem-solving approach which will help learners to grasp concepts related to research methodology and execute budding research ideas.

PO3 - Digital Literacy

Enhance ability to access, select and use a variety of relevant information e-resources for curricular, co-curricular and extracurricular learning processes.

PO4 - Sensitization towards Environment

Build a cohesive bond with nature by respecting natural resources, encouraging eco-friendly practices and creating awareness about sustainable development.

PO5 - Individuality and Teamwork

Encourage learners to work independently or in collaboration for achieving effective results through practical experiments, project work and research activities.

PO6 - Social and Ethical Awareness

Foster ethical principles which will help in developing rational thinking and becoming socially aware citizens. Build an attitude of unbiased, truthful actions and avoid unethical behaviour in all aspects of life.

Eligibility: S.Y.B.Sc.

Duration: 1 Year (SEM V and SEM VI)

Mode of Conduct: Offline

Total Credits for the Programme: 176

Starting year of implementation: 2025 - 26

Discipline/Subject: Mathematics

Programme Specific Outcomes

- To understand the basic concepts and fundamental theories of Mathematics
- To develop problem solving and computing skills
- To use mathematical concepts learnt for deducing proofs with logical reasoning
- To develop analytical skills and understanding of abstract theories of Mathematics
- To learn various mathematical tools and techniques and apply them in real world

Specific Programme: T.Y.B.Sc. (Mathematics - Major)

Assessment:

Weightage for assessments (in percentage) For Major and Minor

Type of Course	Formative Assessment / IA	Summative Assessment
Theory	40%	60%

T. Y. B. Sc. Mathematics Structure of Programme

Semester V			
Major			
Course Code	**Course Title**	**No. of lectures in hours**	**Credits**
25BUMT5T01	Multivariable Calculus II	**30**	**2**
25BUMT5T02	Group Theory	**30**	**2**
25BUMT5T03	Topology of Metric Spaces I	**30**	**2**
25BUMT5TE1	Introduction to SQL	**30**	**2**
25BUMT5TE2	Introduction to Partial Differential Equations		
25BUMT5P01	Practical based on 25BUMT5T01	**60**	**2**
25BUMT5P02	Practical based on 25BUMT5T02	**60**	**2**
25BUMT5P03	Practical based on 25BUMT5T03	**60**	**2**
25BUMT5PE1	Practical based on 25BUMT5TE1	**60**	**2**
25BUMT5PE2	Practical based on 25BUMT5TE2		
25BUMT5VSC	Introduction to Java Programming I	**45**	**2**
25BUMT5OJT	On Job Training in Mathematics I	**60**	**2**
25BUMT5FPR	Field Project in Mathematics III		
	Total	**465**	**20**
Minor			
Course Code	**Course Title**	**No. of lectures in hours**	**Credits**
25BUMT5TMN	Double Integral and Line Integral	**30**	**2**
	Total	**30**	**2**

Semester VI			
Major			
Course Code	**Course Title**	**Lectures**	**Credits**
25BUMT6T01	Surface Integral and Basic Complex Analysis	**30**	**2**
25BUMT6T02	Ring Theory	**30**	**2**
25BUMT6T03	Topology of Metric Spaces II	**30**	**2**
25BUMT6IKS	Ancient Indian Mathematics	**30**	**2**
25BUMT6TE1	Introduction to PL/SQL	**30**	**2**
25BUMT6TE2	Integral Transforms		
25BUMT6P01	Practical based on 25BUMT6T01	**60**	**2**
25BUMT6P02	Practical based on 25BUMT6T02	**60**	**2**
25BUMT6P03	Practical based on 25BUMT6T03	**60**	**2**
25BUMT6PE1	Practical Based on 25BUMT6TE1	**60**	**2**
25BUMT6PE2	Practical Based on 25BUMT6TE2		
25BUMT6VSC	Introduction to Java Programming II	**45**	**2**
25BUMT6OJT	On Job Training in Mathematics II	**60**	**2**
25BUMT6FPR	Field Project in Mathematics IV		
	Total	**465**	**22**

Semester V

Major Courses

25BUMT5T01

CO1	Solve the examples of Double and Triple Integrals.	L3
CO2	Prove Fubini's Theorem and its properties.	L5
CO3	Solve the problems based on Line Integrals.	L3
CO4	Prove Green's Theorem and Fundamental theorems.	L5

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	0	1	0
CO2	2	2	1	0	1	0
CO3	2	2	1	0	1	0
CO4	2	2	1	0	1	0

Course Code 25BUMT5T01	**Course Title Multivariable Calculus II**	**Credits 2**	**No. of lectures 30**
Unit I:	**Multiple Integrals** 1. Definition of double (resp: triple) integral of a function and bounded on a rectangle (resp: box). Geometric interpretation as area and volume. Fubini's Theorem over rectangles and any closed bounded sets, Iterated Integrals. Basic properties of double and triple integrals using the Fubini's theorem 2. Integrability of the sums, scalar multiples, products, and (under suitable conditions) quotients of integrable functions. Formulae for the integrals of sums and scalar multiples of integrable functions. 3. Integrability of continuous functions. More generally, Integrability of functions with a "small" set of (Here, the notion of "small sets" should include finite unions of graphs of continuous functions.) 4. Domain additivity of the integral. Integrability and the integral over arbitrary bounded domains. Change of variables formula (Statement only). Polar, cylindrical and spherical coordinates, and integration using these coordinates. Differentiation under the integral sign. Applications to finding		**15**

	the center of gravity and moments of inertia.	
Unit II:	**Line Integrals** 1. Review of Scalar and Vector fields on R^n, Vector Differential Operators, Gradient, Curl, Divergence. Paths (parametrized curves) in R^n (emphasis on R^2 and R^3), Smooth and piecewise smooth paths. Closed paths. Equivalence and orientation preserving equivalence of paths. Definition of the line integral of a vector field over a piecewise smooth path. Basic properties of line integrals including linearity, path-additivity and behaviour under a change of parameters. Examples. 2. Line integrals of the gradient vector field, Fundamental Theorem of Calculus for Line Integrals, Necessary and sufficient conditions for a vector field to be conservative. Green's Theorem (proof in the case of rectangular domains). Applications to evaluation of line integrals.	**15**

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Calculus, Vol. 2, Second Ed	Apostol	John Wiley, New York	second	1969
2.	Calculus and Analytic Geometry	G. B. Thomas and R.L Finney	Springer-Verlag	Ninth	1998
3.	Marsden and Jerrold E. Tromba	Vector Calculus	W.H. Freeman and Co	Fourth	1996
4.	Mathematical Analysis	T. Apostol	Narosa, New Delhi	Second	1947

25BUMT5T02

CO1	Solve examples of Groups, Subgroups.	L3
CO2	Prove the properties of Groups, Subgroups.	L5
CO3	Solve examples of Cyclic Groups, Normal Subgroups.	L3
CO4	Prove the properties of Cyclic Groups, Normal Subgroups.	L5

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	0	1	0
CO2	2	2	1	0	1	0
CO3	2	2	1	0	1	0
CO4	2	2	1	0	1	0

Course Code 25BUMT5T02	Course Title Group Theory	Credits 2	No. of lectures 30
Unit I :	Groups, Subgroups and Cyclic groups (1) Definition and properties of a Group. Order of a Group. Subgroups. Abelian Groups. Centre of a Group. Homomorphism and Isomorphism of Groups. (2) Definition and Properties of Cyclic Groups. (3) Finite Cyclic Groups, Infinite Cyclic Groups and their generators. (4) Properties of Generators.		**15**
Unit II:	Normal Subgroups (1) Cosets of a subgroup in a group. Lagrange's Theorem. (2) Normal subgroups. External Direct Product. (3) Fundamental Theorem of homomorphisms of groups.		**15**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Topics in Algebra	I. N. Herstein	Wiley Eastern Limited		
2	Abstract Algebra	P. B. Bhattacharya, S.K. Jain, S. Nagpaul	Foundation Books, New Delhi		
3	University Algebra	N. S. Gopalkrishnan	Wiley Eastern Limited		
4	Algebra	M. Artin	Prentice Hall of India, New Delhi		

25BUMT5T03

CO1	Prove properties of open balls, open sets and interior of a set	L5
CO2	Solve examples of metric spaces, normed linear spaces, open sets and equivalent metrics	L3
CO3	Prove theorems on closure set, sequences and complete metric spaces	L5
CO4	Solve examples of closed sets, convergent sequences, Cauchy	L3

	sequences and complete metric spaces	

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	1	0
CO2	2	0	0	0	1	0
CO3	2	0	0	0	1	0
CO4	2	0	0	0	1	0

Course Code **25BUMT5T03**	**Course Title** **Topology of Metric Spaces I**	**Credits** **2**	**No. of lectures** **30**
Unit II:	**Introduction to Metric Spaces:** Definition and examples of metric spaces such as R, R^2, R^n with its Euclidean, sup and sum metrics, C (complex numbers). l_1 and l_2 spaces of sequences, $C[a,b]$ the space of real valued continuous functions on $[a,b]$. Discrete metric space. Definition and examples of Normed linear spaces. Metric induced by the norm. Translation invariance of the metric induced by the norm. Metric subspaces. Product of two metric spaces. Open balls and open sets in a metric space. Examples of open sets in various metric spaces. Hausdorff property. Interior of a set. Properties of open sets. Structure of an open set in R. Equivalent metrics. Distance of a point from a set, Distance between sets. Diameter of a set. Bounded sets.		**15**
Unit II:	**Sequences and Complete metric spaces:** Closed balls. Closed sets. Examples. Limit point of a set. Closure of a set. Boundary of a set. Definition and examples of relative openness/closeness in subspaces. Sequences in a metric space. Convergent sequence in metric space. Cauchy sequence in a metric space. Subsequences. Examples of convergent and Cauchy sequences in different metric spaces. Characterization of limit points and closure points in terms of sequences. Dense subsets in a metric space. Definition of complete metric spaces. Examples of complete metric spaces. Completeness property in subspaces. Cantor's Intersection Theorem. Applications of Cantor's Intersection Theorem.		**15**

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Topology of Metric spaces	S. Kumaresan	Narosa	Second	
2.	Metric Spaces	E. T. Copson	Universal Book Stall, New Delhi		1996
3.	Metric Spaces	P. K. Jain, K. Ahmed	Narosa, New Delhi		1996

Major DSE Courses

25BUMT5TE1

CO1	Apply the concept, role and importance of Structured Query Language	L3
CO2	Solve the queries based on SQL	L3
CO3	Apply Functions in SQL to solve real life problems	L3
CO4	Solve problems using Tables in SQL	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	0	2	0
CO2	2	2	3	0	2	0
CO3	2	2	3	0	2	0
CO4	2	2	3	0	2	0

Course Code 25BUMT5TE1	**Course Title Introduction to SQL**	**Credits 2**	**No. of lectures 30**
Unit I :	**Basic Commands in SQL** 1. Introduction to Data base Concepts: Database, Overview of data base management system. Data base Languages- Data Definition Languages (DDL) and Data Manipulation Languages (DML). 2. Entity Relation Model: Entity, attributes, keys, relations, Designing ER diagram, integrity Constraints over relations, conversion of ER to relations with and without constrains. 3. Creating and altering tables: CREATE statement with		**15**

	constraints like KEY, CHECK, DEFAULT, ALTER and DROP statement. 4. Handling data using SQL: selecting data using SELECT statement, FROM clause, WHERE clause, HAVING clause, ORDERBY, GROUP BY, DISTINCT and ALL predicates, adding data with INSERT statement, changing data with UPDATE statement, removing data with DELETE statement.	
Unit II:	**Functions and Tables in SQL** 1. Functions: Aggregate functions- AVG, SUM, MIN, MAX and COUNT, Date functions- ADD_MONTHS (), CURRENT_DATE (), LAST_DAY (), MONTHS_BETWEEN (), NEXT_DAY (). String functions- LOWER (), UPPER (), LTRIM (), RTRIM (), TRIM (), INSERT (), RIGHT(), LEFT(), LENGTH(), SUBSTR(). Numeric functions: ABS (), EXP (), LOG(), SQRT(), POWER(), SIGN(), ROUND(number). 2. Multitable Queries: Joining tables: Inner, outer and cross joins, Unions.	**15**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Understanding SQL	Martin Gruber	B.P.B. Publications.		
2.	Murach's Oracle SQL and PLSQL	Joel Murach	Murach and Associates		
3.	SQL The Complete Reference	James Groff,Paul Weinberg,Andrew J Oppel	Mc Grawall Hill	third	
4.	Fundamentals of Database Systems	Ramez Elmasri & Shamkant B.Navathe	Pearson Education	Sixth	2010
5.	Database Management Systems	Ramakrishnam, Gehrke	Mc Grawall Hill	Sixth	2007

25BUMT5TE2

CO1	Apply concepts on curves and surfaces	L3
CO2	Solve first order linear equations	L3
CO3	Solve Cauchy problems	L3
CO4	Solve Lagrange's equation	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	0	2	0
CO2	2	2	2	0	2	0
CO3	2	2	2	0	2	0
CO4	2	2	2	0	2	0

Course Code 25BUMT5TE2	**Course Title Introduction to Partial Differential Equations**	**Credits 2**	**No. of lectures 30**
Unit I :	**First order Partial Differential Equation** Curves and surfaces, Genesis of First order PDE, Classification of first order PDE, Classification of integrals. The Cauchy problem. Linear equation of first order, Lagrange's equation.		**15**
Unit II:	**Compatible system of first order Partial Differential Equations** Definition, Necessary and sufficient condition for integrability, Charpit's method, Some standard types, Jacobi's method		**15**

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	An Elementary Course in Partial Differential Equation	T. Amarnath	Narosa Publishing House	second	
2.	Elements of Partial Differential Equations	Ian Sneddon	McGraw Hill Book		

Major Practical Courses

25BUMT5P01

CO1	Solve problems based on Double Integrals.	L3
CO2	Solve problems based on Fubini's theorem.	L3
CO3	Solve problems based on Line Integrals.	L3
CO4	Solve problems on applications of Line integrals.	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	0	2	0
CO2	2	2	1	0	2	0
CO3	2	2	1	0	2	0

CO4	2	2	1	0	2	0

Course Code 25BUMT5P01	Course Title Practical based on 25BUMT5T01	Credits 2	No. of lectures
Practical 1	Evaluation of Double integrals.		4
Practical 2	Evaluation of Triple integrals.		4
Practical 3	Change of variables in Double integrals.		4
Practical 4	Change of variables in Triple integrals.		4
Practical 5	Verification of Fubini's Theorem		4
Practical 6	Find the Area of the region using double integral		4
Practical 7	Find the Volume of the region using Triple integral		4
Practical 8	Applications to find the Centre of gravity.		4
Practical 9	Applications to find the moment of inertia.		4
Practical 10	Line integrals of Scalar fields.		4
Practical 11	Line integrals of Vector fields.		4
Practical 12	Applications of Green's Theorem.		4
Practical 13	Conservative field.		4
Practical 14	Applications to evaluation of line integrals.		4
Practical 15	Miscellaneous theory questions on unit 1 and 2.		4
	Total		**60**

25BUMT5P02

CO1	Solve problems based on Groups and Subgroups.	L3
CO2	Solve problems based on Cyclic Groups.	L3
CO3	Solve problems based on Lagrange's Theorem and Cayley's Theorem.	L3
CO4	Solve problems based on Normal Subgroups and Quotient groups.	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	0	2	0
CO2	2	2	1	0	2	0
CO3	2	2	1	0	2	0

CO4	2	2	1	0	2	0

Course Code 25BUMT5P02	Course Title Practical based on 25BUMT5T02	Credits 2	No. of lectures
Practical 1	Examples of Groups and Groups of Symmetries		4
Practical 2	Order of an element in a group		4
Practical 3	Center of Groups and Subgroups		4
Practical 4	Homomorphism of Groups		4
Practical 5	Isomorphism of Groups		4
Practical 6	Cyclic Groups I		4
Practical 7	Cyclic Groups II		4
Practical 8	Finite and Infinite Cyclic Groups		4
Practical 9	Left Cosets and Right Cosets of Groups		4
Practical 10	Lagrange's Theorem		4
Practical 11	Cayley's Theorem		4
Practical 12	Normal Subgroups I		4
Practical 13	Normal Subgroups II		4
Practical 14	Quotient Groups		4
Practical 15	Miscellaneous Problems		4
	Total		**60**

25BUMT5P03

CO1	Solve examples of metric spaces and normed linear spaces	L3
CO2	Examine problems based on open balls, open sets, interior of a set, equivalent metrics, closed sets, subspaces, limit points and closure points	L4
CO3	Test for convergent sequences, Cauchy sequences, completeness of a Metric Space	L4
CO4	Solve examples of Cantor's Intersection Theorem	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	1	0	2	0

CO2	2	0	1	0	2	0
CO3	2	0	1	0	2	0
CO4	2	0	1	0	2	0

Course Code 25BUMT5P03	**Course Title Practical based on 25BUMT5T03**	**Credits 2**	**No. of lectures**
Practical 1	Examples of Metric Spaces I		4
Practical 2	Examples of Metric Spaces II		4
Practical 3	Examples of Normed Linear Spaces I		4
Practical 4	Examples of Normed Linear Spaces II		4
Practical 5	Open balls		4
Practical 6	Open sets I		4
Practical 7	Open sets II		4
Practical 8	Interior of a set and Equivalent Metrics		4
Practical 9	Closed balls and Closed sets		4
Practical 10	Subspaces, Limit points and Closure points		4
Practical 11	Convergent and Cauchy Sequences in a Metric Space		4
Practical 12	Complete Metric Spaces		4
Practical 13	Cantor's Intersection Theorem		4
Practical 14	Miscellaneous Theoretical Questions based on Unit I		4
Practical 15	Miscellaneous Theoretical Questions based on Unit II		4
	Total		**60**

25BUMT5PE1

CO1	Solve queries by creating tables in SQL	L3
CO2	Solve the queries based on SQL	L3
CO3	Solve problems based on various functions in SQL	L2
CO4	Solve problems based on Joining Tables in SQL	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	0	2	0

CO2	2	2	3	0	2	0
CO3	2	2	3	0	2	0
CO4	2	2	3	0	2	0

Course Code 25BUMT5PE1	**Course Title Practical based on 25BUMT5TE1**	**Credits 2**	**No. of lectures 60**
Practical 1	Creating a single table with constraints and executing queries		4
Practical 2	Creating a single table without constraints and executing queries		4
Practical 3	CREATE statement with constraints like KEY, CHECK statement.		4
Practical 4	CREATE statement with constraints like DEFAULT, ALTER and DROP statement.		4
Practical 5	Handling data using SQL: selecting data using SELECT statement		4
Practical 6	Handling data using SQL: selecting data using ORDERBY		4
Practical 7	Handling data using SQL: selecting data using,GROUP BY		4
Practical 8	Handling data using SQL: selecting data using DISTINCT		4
Practical 9	Queries based on aggregate functions- AVG, SUM, MIN, MAX and COUNT,		4
Practical 10	Queries based on Date functions- ADD_MONTHS (), CURRENT_DATE (), LAST_DAY (), MONTHS_BETWEEN (), NEXT_DAY ().		4
Practical 11	Queries based on String functions- LOWER (), UPPER (), LTRIM (), RTRIM (), TRIM (), INSERT (), RIGHT(), LEFT(), LENGTH(), SUBSTR().		4
Practical 12	Queries based on altering table structure		4
Practical 13	Queries based on deleting table		4
Practical 14	Creating and altering a single table and executing queries.		4
Practical 15	Mathematics Projects- Using SQL.		4
	Total		**60**

25BUMT5PE2

CO1	Apply concepts on curves and surfaces	L3
CO2	Solve first order linear equations	L3
CO3	Solve Cauchy problems	L3
CO4	Solve Lagrange's equation	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	0	2	0
CO2	2	2	2	0	2	0
CO3	2	2	2	0	2	0
CO4	2	2	2	0	2	0

Course Code 25BUMT5PE2	**Course Title Practical based on 25BUMT5TE2**	**Credits 2**	**No. of lectures 60**
Practical 1	Curves and surfaces		4
Practical 2	First order PDE		4
Practical 3	Integrals		4
Practical 4	The Cauchy Problem I		4
Practical 5	The Cauchy Problem II		4
Practical 6	Linear equation of first order		4
Practical 7	Lagrange's equation		4
Practical 8	Lagrange's equation		4
Practical 9	Miscellaneous problems on unit 1		4
Practical 10	Problems based on system of first order PDE.		4
Practical 11	Charpits method		4
Practical 12	Charpits Method		4
Practical 13	Jacobi Method		4
Practical 14	Jacobi Method		4
Practical 15	Miscellaneous problems on unit 2		4

Vocational and Skill Enhancement Course

25BUMT5VSC

CO1	Summarize Data Types, Operators, Expressions and selection statements	L2
CO2	Explain control statements and Arrays	L2
CO3	Construct Java programs using Data Types, Operators, Expressions, selection statements	L3
CO4	Develop Java programs using control statements and Arrays	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	1	0	2	2
CO2	2	1	1	0	2	2
CO3	2	1	1	0	2	2
CO4	2	1	1	0	2	2

Course Code 25BUMTVSC5	**Course Title Introduction to Java Programming I**	**Credits 2**	**No. of lectures 45**
Unit I:	History and Features of Java, structure of a Java program, writing a simple program, Compiling and executing, Data Types, Literals and Variables, Operators and expressions, Selection Statements, Loop – while, do-while, for, Nested loops, break, continue and Arrays		**15**
Practical 1	Starting with Java Programs		**2**
Practical 2	Operators and Datatypes I		**2**
Practical 3	Operators and Datatypes II		**2**
Practical 4	Scanner Class		**2**
Practical 5	Operators and Expressions I		**2**
Practical 6	Operators and Expressions II		**2**
Practical 7	Selection Statements I		**2**
Practical 8	Selection Statements II		**2**
Practical 9	While Loop		**2**
Practical 10	Do-while Loop		**2**
Practical 11	For Loop		**2**
Practical 12	Nested Loops		**2**

Practical 13	One Dimensional arrays I	**2**
Practical 14	One Dimensional arrays II	**2**
Practical 15	Two dimensional arrays	**2**

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Java: A Beginner's Guide	Herbert Schildt	McGraw Hill	8th	2018
2.	Programming with Java	E. Balagurusamy	McGraw Hill	7th	2023

On Job Training in Mathematics I

25BUMT5OJT

CO1	Search various Job Oriented Fields.	L2
CO2	Apply theoretical mathematical concepts to real-world situations or other disciplines related to Job oriented field.	L3
CO3	Conclude the results of the training.	L5
CO4	Demonstrate the results through a report and presentation.	L2

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	1	2	1
CO2	2	2	2	1	2	1
CO3	2	2	2	1	2	1
CO4	2	2	2	1	2	1

Field Project in Mathematics III

25BUMT5FPR

CO1	Formulate an appropriate research problem for field project	L6
CO2	Apply theoretical mathematical concepts to real-world situations or other disciplines, such as physics, engineering, economics, or computer science	L3
CO3	Conclude the results of the project	L5
CO4	Demonstrate the results through a report and presentation.	L2

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	1	2	1
CO2	2	2	2	1	2	1
CO3	2	2	2	1	2	1
CO4	2	2	2	1	2	1

Minor Course

25BUMT5TMN

CO1	Solve the examples of Double Integrals.	L3
CO2	Apply Fubini's Theorem and its properties.	L3
CO3	Solve the problems based on Line Integrals.	L3
CO4	Apply Green's Theorem and Fundamental Theorem.	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	0	1	0
CO2	2	2	1	0	1	0
CO3	2	2	1	0	1	0
CO4	2	2	1	0	1	0

Course Code **25BUMT5TMN**	**Course Title** **Double Integral and Line Integral**	**Credits** **2**	**No. of lectures** **30**
Unit I:	**Double Integral** 1. Definition of double integral of a function and bounded on a rectangle. Geometric interpretation as area and volume. Fubini's Theorem over rectangles and any closed bounded sets, Iterated Integrals. Basic properties of double integrals using the Fubini's theorem		**15**

	2. Integrability of the sums, scalar multiples, products, and (under suitable conditions) quotients of integrable functions. Formulae for the integrals of sums and scalar multiples of integrable functions. 3. Integrability of continuous functions. Domain additivity of the integral. Integrability and the integral over arbitrary bounded domains. Change of variables formula (Statement only). Polar, cylindrical and spherical coordinates, and integration using these coordinates. Differentiation under the integral sign. Applications to finding the center of gravity and moments of inertia.	
Unit II:	**Line Integrals** 1. Review of Scalar and Vector fields on R^n, Vector Differential Operators, Gradient, Curl, Divergence. Paths (parametrized curves) in R^n (emphasis on R^2 and R^3), Smooth and piecewise smooth paths. Closed paths. Equivalence and orientation preserving equivalence of paths. Definition of the line integral of a vector field over a piecewise smooth path. Basic properties of line integrals including linearity, path-additivity and 23ehavior under a change of parameters. Examples. 2. Line integrals of the gradient vector field, Fundamental Theorem of Calculus for Line Integrals, Necessary and sufficient conditions for a vector field to be conservative. Green's Theorem (proof in the case of rectangular domains). Applications to evaluation of line integrals.	**15**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Calculus, Vol. 2, Second Ed	Apostol	John Wiley, New York	second	1969
2.	Calculus and Analytic Geometry	G. B. Thomas and R.L Finney	Springer-Verlag	Ninth	1998
3.	Marsden and Jerrold E. Tromba	Vector Calculus	W.H. Freeman and Co	Fourth	1996
4.	Mathematical Analysis	T. Apostol	Narosa, New Delhi	Second	1947

Semester VI

Major DSC Courses

25BUMT6T01

CO1	Explain Concepts of Surface Integral.	L2
CO2	Apply the Stoke's and Gauss Divergence theorem.	L5
CO3	Explain Concepts of functions of Complex Variabes.	L3
CO4	Prove Cauchy-Reimann Equations and Analytic Functions.	L5

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	0	1	0
CO2	2	2	1	0	1	0
CO3	2	2	1	0	1	0
CO4	2	2	1	0	1	0

Course Code 25BUMT6T01	**Course Title Surface Integral and Basic Complex Analysis**	**Credits 2**	**No. of lectures 30**
Unit I:	**Surface Integrals** Parameterized surfaces. Smoothly equivalent parameterizations. Area of such surfaces. Definition of surface integrals of scalar-valued functions as well as of vector fields defined on a surface. Curl and divergence of a vector field. Elementary identities involving gradient, curl and divergence. Stoke's Theorem (proof assuming the general from of Green's Theorem). Examples. Gauss' Divergence Theorem (proof only in the case of cubical domains). Examples.		**15**
Unit II:	**Introduction to Complex Analysis** Review of complex numbers: Complex plane, polar coordinates, exponential map, powers and roots of complex numbers, De – Moivre's formula, C as a metric space, bounded and unbounded sets. Convergence of sequences of complex numbers and related results. Limit of a function $f : C \to C$, real and imaginary part of functions, continuity at a point and algebra of continuous functions. Derivative of $f : C \to C$, comparison between differentiability in real and complex sense, Cauchy-Riemann equations, sufficient conditions for differentiability, analytic function, if f, g analytic then $f + g, f - g, fg$ and f/g are analytic, chain rule.		**15**

	Theorem: If $f'(z) = 0$ everywhere in a domain D, then $f(z)$ must be constant throughout D. Harmonic functions and harmonic conjugate.	

Books and references:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1	Marsden and Jerrold E. Tromba	Vector Calculus	W.H. Freeman and Co	Fourth	1996
2	Calculus, Vol. 2, Second Ed	Apostol	John Wiley, New York	second	1969
3	Complex analysis and Applications	J.W. Brown and R.V. Churchill	McGraw Hill	Ninth	2013
4	Function theory of one complex variable	Robert E. Greene and Steven G. Krantz			
5	Complex analysis	T.W. Gamelin	Springer		2001

25BUMT6T02

CO1	Solve the problems on Rings, fields, Integral Domains	L3
CO2	Prove the properties of Rings, fields, Integral Domains.	L3
CO3	Solve the problems based on Ideals, Homomorphism of Rings.	L3
CO4	Prove the properties of Ideals and Homomorphism	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	0	1	0
CO2	2	2	1	0	1	0
CO3	2	2	1	0	1	0
CO4	2	2	1	0	1	0

Course Code 25BUMT6T02	**Course Title Ring Theory**	**Credits 2**	**No. of lectures 30**

Unit I :	**Rings** Definition and elementary properties of Rings, commutative rings, integral domains and fields. Examples. Units in a ring. A finite integral domain is a field. Characteristics of a ring.	**15**
Unit II :	**Ideals and special Rings** Ideals in a ring. Sums and products of ideals. Quotient rings. Examples. Prime ideals and maximal ideals. Characterization of prime ideals and maximal ideals in a commutative ring in terms of their quotient rings. Description of the ideals and the prime ideals in Z, R[X] and C[X]. Homomorphisms and isomorphism of rings. Kernel and the image of a homomorphism. Fundamental Theorem of homomorphism of a ring.	**15**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Contemporary Abstract Algebra	J. Gallian	Narosa, New Delhi		
2.	Topics in Algebra	I. N. Herstein	Wiley Eastern Limited	2nd	
3.	Abstract Algebra	P. B. Bhattacharya, S.K. Jain, S. Nagpaul	Foundation Books, New Delhi	2nd	
4.	University Algebra	N. S. Gopalkrishnan	Wiley Eastern Limited		
5.	Algebra	M. Artin	Prentice Hall of India, New Delhi		

6.	A first course in Abstract Algebra	J. B. Fraleigh	Narosa, New Delhi	3rd	

25BUMT6T03

CO1	Prove results of continuity and uniform continuity	L5
CO2	Solve problems on continuity and uniform continuity	L3
CO3	Prove theorems of connected sets and path connected sets	L5
CO4	Solve problems on connected sets and path connected sets	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	0	0	1	0
CO2	2	0	0	0	1	0
CO3	2	0	0	0	1	0
CO4	2	0	0	0	1	0

Course Code 25BUMT6T03	**Course Title Topology of Metric Spaces II**	**Credits 2**	**No. of lectures 30**
Unit I:	**Continuity** Epsilon-delta definition of continuity of a function at a point from one metric space to another. Characterization of continuity at a point in terms of sequences, open sets and closed sets and examples. Algebra of continuous real valued functions on a metric space. Continuity of composite function. Uniform continuity in a metric space, examples. Contraction mapping and fixed-point theorem.		**15**
Unit II:	**Connectedness** Separated sets – Definition and examples. Connected and disconnected sets. Connected and disconnected metric spaces. Characterization of a connected space, viz. a metric space is connected if and only if every continuous function from X to $\{1, -1\}$ is a constant function. Results such as: A subset of R is connected if and only if it is an interval. A continuous image of a connected set is connected. Path connectedness in R^n, definition and examples. A path connected subset of R^n is connected, convex sets are path connected.		**15**

Books and references:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1	Topology of Metric spaces	S. Kumaresan	Narosa	Second	
2	Metric Spaces	E. T. Copson	Universal Book Stall, New Delhi		1996
3	Metric Spaces	P. K. Jain, K. Ahmed	Narosa, New Delhi		1996

25BUMT6IKS

CO1	Understand the history of Indian Mathematics	L2
CO2	Understand the contributions of Indian Mathematicians.	L2
CO3	Understand the Ancient Indian Mathematical Methods.	L3
CO4	Solve the problems using Ancient Indian Methods.	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	0	2	0
CO2	2	2	2	0	2	0
CO3	2	2	2	0	2	0
CO4	2	2	2	0	2	0

Course Code 25BUMT6IKS	**Course Title Ancient Indian Mathematics**	**Credits 2**	**No. of lectures 30**
Unit I :	**History Of Indian Mathematics.** 1. Development of number system and numerals in India. 2. Introduction of Ancient Indian Mathematicians. 3. Historical development of Algebra – in context of Indian Mathematicians. 4. Historical development of Calculus – in context of Indian Mathematicians.		**15**
Unit II:	**Basic Mathematical Methods**. 1. Product of two numbers, division of two numbers. 2. Square root and cube root of a number. 3. Magic squares, Digit sum method.		**15**

	4. Dates and Calendar.	

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	The History of Mathematics	Roger L Cooke	John Wiley & Sons		2013
2.	The History of Mathematics : An Introduction	David M Burton	McGraw Hill		2011
3.	Vedic Mathematics: Made Easy	Dhaval Bhatia	Jaico Publishing House		2021
4.	Vedic Mathematics	Jagadguru Swami Sri Bharati Krishna	Motilal Banarasidass		2015

Major DSE Courses

25BUMT6TE1

CO1	Apply the concepts of PL/SQL	L3
CO2	Classify Data Type in PL/SQL	L2
CO3	Solve problems using the control structures	L3
CO4	Solve programs using iterative constructs	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	0	2	0
CO2	2	2	2	0	2	0
CO3	2	2	2	0	2	0
CO4	2	2	2	0	2	0

Course Code 25BUMT6TE1	**Course Title Introduction To PL/SQL**	**Credits 2**	**No. of lectures 30**

Unit I:	**Fundamentals of PL/SQL** 1. Features of PL/SQL, Environment Setup. Basic Syntax- Defining variables and constants, PL/SQL expressions and comparisons: Logical Operators, Boolean Expressions, CASE Expressions Handling, Null Values in Comparisons and Conditional Statements. Examples. 2. PL/SQL Data Types: Number Types, Character Types, Boolean Type. Date time and Interval types. Examples.	**15**
Unit II:	**PL/SQL Control Structures** 1. Conditional Control: IF and CASE Statements, IF-THEN Statement, IF-THEN-ELSE Statement, IF-THEN-ELSIF Statement, CASE Statement. Examples. 2. Iterative Control**:** LOOP and EXIT Statements, WHILE-LOOP, FOR-LOOP, Sequential Control: GOTO and NULL Statements. Examples. 3. Strings Functions and Operators: Declaring String Variables . Examples	**15**

Sr. No.	Title	Author/s	Publisher	Edition	
1	Mastering PL/SQL Through Illustrations: From Learning Fundamentals to Developing Efficient PL/SQL Blocks	Dr. B. Chandra,	BPB Publication		
2	Oracle PL/SQL Programming	Bill Pribyl and Steven Feuerstein	BPB Publication	sixth	
3	Advanced Oracle PL/SQL Developer's Guide	Saurabh K. Gupta	Second	2	
4	Oracle PL/SQL by Example	Benjamin Rosenzweig; Elena Rakhimov	Pearson Education Fifth 2009		
5	Programming with PL/SQL for Beginners	H. Dand, R. Patil and T. Sambare	X-Team	First	2011

25BUMT6TE2

CO1	Solve Laplace transforms of some elementary functions and properties	L3
CO2	Solve Inverse Laplace Transform	L3
CO3	Solve Fourier transform of elementary functions and properties	L3
CO4	Solve problems on Convolution Theorem	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	0	2	0
CO2	2	2	2	0	2	0
CO3	2	2	2	0	2	0
CO4	2	2	2	0	2	0

Course Code 25BUMT6TE2	**Course Title Integral Transforms**	**Credits 2**	**No. of lectures 30**
Unit I:	**The Laplace Transform** Definition of Laplace Transform, theorem. Laplace transforms of some elementary functions, Properties of Laplace transform. L.T. of derivatives and integrals, Inverse Laplace Transform. Properties of inverse Laplace Transform, Convolution Theorem. Laplace transform of special function: Heaviside unit step function, Dirac delta function and Periodic function. Solving differential equation using Laplace transform.		**15**
Unit II:	**The Fourier Transform** Fourier integral representation, Fourier integral theorem, Fourier Sine and Cosine integral representation, Fourier Sine and Cosine transform pairs. Fourier transform of elementary functions. Properties of Fourier Transform. Convolution Theorem, Parseval's Identity.		**15**

Books and References:

Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Integral Transforms and their	Lokenath	CRC Press Taylor	Third	2015

	Applications	Debnath and Dambaru Bhatta	and Francis		
2.	The Use of integral Transforms	I. N Sneddon	Tata Mcgraw Hill		1972
3.	Integral Transforms for Engineers	L.Andrews and B.Shivamogga	Prentice Hall of India		

Major Practical Courses

25BUMT6P01

CO1	Solve problems based on Surface Integral.	L3
CO2	Solve problems based on Stoke's theorem and Gauss Divergence theorem.	L3
CO3	Solve problems based on Limits, Continuity and Derivatives of Complex variables	L3
CO4	Solve problems Cauchy-Riemann Equations and Analytic Functions.	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	0	2	0
CO2	2	2	1	0	2	0
CO3	2	2	1	0	2	0
CO4	2	2	1	0	2	0

Course Code 25BUMT6P01	**Course Title Practical based on 25BUMT6T01**	**Credits 2**	**No. of lectures 60**
Practical 1	Parameterization of surfaces		4
Practical 2	Evaluation of surface integral of scalar field function –I.		4
Practical 3	Evaluation of surface integral of scalar field function –II.		4
Practical 4	Evaluation of surface integral of vector field function.		4
Practical 5	Evaluation of surface integral of vector field function.		4
Practical 6	Applications of Surface Integral.		4
Practical 7	Problems based on Stokes's theorem.		4
Practical 8	Problems based on Gauss Divergence theorem.		4
Practical 9	Limits of functions of complex variables.		4

Practical 10	Continuity of functions of complex variables.	4
Practical 11	Derivatives of functions of Complex variables.	4
Practical 12	Cauchy-Riemann Equations.	4
Practical 13	Analytic Function, Harmonic Conjugate.	4
Practical 14	Miscellaneous theory questions based on unit 1.	4
Practical 15	Miscellaneous theory questions based on unit 2.	4
	Total	**60**

25BUMT6P02

CO1	Solve the problems on Rings, fields, Integral Domains	L3
CO2	Prove the properties of Rings, fields, Integral Domains.	L3
CO3	Solve the problems based on Ideals, Homomorphism of Rings.	L3
CO4	Prove the properties of Ideals, Homomorphism of Rings.	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	0	2	0
CO2	2	2	1	0	2	0
CO3	2	2	1	0	2	0
CO4	2	2	1	0	2	0

Course Code 25BUMT6P02	**Course Title Practical based on 25BUMT6T02**	**Credits 2**	**No. of lectures 60**
Practical 1	Examples of Rings I		4
Practical 2	Examples of Ring II		4
Practical 3	Properties of Ring.		4
Practical 4	Integral Domains I		4
Practical 5	Integral Domain II		4
Practical 6	Fields – I		4
Practical 7	Fields – II		4
Practical 8	Characteristics of Rings		4

Practical 9	Ideals in a Ring	4
Practical 10	Prime Ideals	4
Practical 11	Maximal Ideals	4
Practical 12	Homomorphism of Rings	4
Practical 13	Isomorphism of Rings.	4
Practical 14	Miscellaneous Theoretical Questions based on Unit 1	4
Practical 15	Miscellaneous Theoretical Questions based on Unit 2	4
	Total	**60**

25BUMT6P03

CO1	Solve problems on continuity	L3
CO2	Solve problems on uniform continuity	L3
CO3	Examine sets for connectedness and path connectedness	L4
CO4	Prove the properties of connectedness and path connectedness	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	0	1	0	2	0
CO2	2	0	1	0	2	0
CO3	2	0	1	0	2	0
CO4	2	0	1	0	2	0

Course Code 25BUMT6P03	**Course Title Practical based on 25BUMT6T03**	**Credits 2**	**No. of lectures 60**
Practical 1	Epsilon-delta definition of continuity		4
Practical 2	Sequential criterion of continuity		4
Practical 3	Characterization of continuity in terms of open sets.		4
Practical 4	Characterization of continuity in terms of closed sets		4
Practical 5	Examples of Uniform Continuous functions I		4
Practical 6	Examples of Uniform Continuous functions II		4
Practical 7	Contraction mapping and Fixed-point theorem		4

Practical 8	Separated sets	4
Practical 9	Connected sets I	4
Practical 10	Connected sets II	4
Practical 11	Disconnected sets	4
Practical 12	Path Connectedness and Convex sets	4
Practical 13	Continuity and Connectedness	4
Practical 14	Miscellaneous Theoretical Questions based on unit I.	4
Practical 15	Miscellaneous Theoretical Questions based on unit II.	4
	Total	**60**

25BUMT6PE1

CO1	Solve the programs of PL/SQL	L3
CO2	Solve programs on Data Type in PL/SQL	L3
CO3	Solve problems using the control structures	L3
CO4	Solve programs using iterative constructs	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	0	2	0
CO2	2	2	2	0	2	0
CO3	2	2	2	0	2	0
CO4	2	2	2	0	2	0

Course Code 25BUMT6PE1	**Course Title Practical based on 25BUMT6TE1**	**Credits 2**	**No. of lectures 60**
Practical 1	PL/SQL Basics – Use of variables.		**4**
Practical 2	PL/SQL Basics – Write executable statements.		**4**
Practical 3	Control Structure in PL/SQL using while loop		**4**

Practical 4	Control Structure in PL/SQL, using Do loop	**4**
Practical 5	Control Structure in PL/SQL, using For loop	**4**
Practical 6	Control Structure in PL/SQL, using GOTO statement	**4**
Practical 7	Create conditional statement if statement	**4**
Practical 8	Create conditional statement using if else statement	**4**
Practical 9	Create conditional statement using elsif ladder	**4**
Practical 10	Create conditional statement using CASE expression.	**4**
Practical 11	Program based on Iterative control statement in PL/SQL	**4**
Practical 12	Sequential control statement in PL/SQL using GOTO statements	**4**
Practical 13	Program based on string function.	**4**
Practical 14	Program based on string operator.	**4**
Practical 15	Mathematics Projects-Using PL/SQL	**4**
	Total	**60**

25BUMT6PE2

CO1	Solve Laplace transforms of some elementary functions and properties	L3
CO2	Solve Inverse Laplace Transform	L3
CO3	Solve Fourier transform of elementary functions and properties	L3
CO4	Solve problems on Convolution Theorem	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	0	2	0
CO2	2	2	2	0	2	0
CO3	2	2	2	0	2	0
CO4	2	2	2	0	2	0

Course Code 25BUMT6PE2	**Course Title Practical Based on 25BUMT6TE2**	**Credits 2**	**No. of lectures 60**
Practical 1	Laplace Transform-examples		4

Practical 2	Properties of Laplace transform	4
Practical 3	L.T. of derivatives	4
Practical 4	L.T. of integrals	4
Practical 5	Inverse Laplace Transform	4
Practical 6	Properties of inverse Laplace Transform,	4
Practical 7	Convolution Theorem	4
Practical 8	Laplace transform of special function	4
Practical 9	Fourier integral representation	4
Practical 10	Problems on Fourier integral theorem	4
Practical 11	Fourier transform of elementary functions	4
Practical 12	Properties of Fourier Transform	4
Practical 13	Transform. Convolution Theorem	4
Practical 14	Parseval's Identity	4
Practical 15	Miscellaneous	4

Vocational Skill Enhancement Course

25BUMT6VSC

CO1	Illustrate concepts of class, objects, methods, constructors and inheritance	L2
CO2	Explain various applet display methods	L2
CO3	Construct Java programs using methods and constructors	L6
CO4	Construct applets using simple display methods	L3

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	1	0	2	2
CO2	2	1	1	0	2	2
CO3	2	1	1	0	2	2
CO4	2	1	1	0	2	2

Course Code 25BUMT6VSC	Course Title Introduction to Java Programming II	Credits 2	No. of lectures 45
Unit I:	Basics of OOPs, Fundamentals of class & object, New keyword, Reference variables, Methods, Constructors, Overloading Methods, Overloading Constructors, Basics of inheritance, Members accessibility in inheritance, Using super keyword, Multilevel inheritance, Method overriding Applet Basics, AWT package, Lifecycle of an applet, How to run an applet, Font class, Color class, Simple Applet Display Methods		**15**
Practical 1	Class with and without methods.		**2**
Practical 2	Class with constructors.		**2**
Practical 3	Class with Overloading Methods and Overloading Constructors.		**2**
Practical 4	Write Java programs to create a class with Inheritance and method overriding		**2**
Practical 5	Create Applets to display texts in different fonts and colors.		**2**
Practical 6	Drawing Lines in Applet		**2**
Practical 7	Drawing Rectangles in Applet		**2**
Practical 8	Drawing Ovals in Applet		**2**
Practical 9	Drawing Arcs in Applet		**2**
Practical 10	Drawing Polygon in Applet		**2**
Practical 11	Use of loops in Applet		**2**
Practical 12	Project using applet		**8**

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Java: A Beginner's Guide	Herbert Schildt	McGraw Hill	8th	2018
2.	Programming with Java	E. Balagurusamy	McGraw Hill	7th	2023

On Job Training in Mathematics II

25BUMT6OJT

CO1	Search various Job Oriented Fields.	L2

CO2	Apply theoretical mathematical concepts to real-world situations or other disciplines related to Job oriented field.	L3
CO3	Conclude the results of the training.	L5
CO4	Demonstrate the results through a report and presentation.	L2

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	1	1	1
CO2	2	2	2	1	1	1
CO3	2	2	2	1	1	1
CO4	2	2	2	1	1	1

Field Project in Mathematics IV

25BUMT6FPR

CO1	Formulate an appropriate research problem for Field project	L6
CO2	Apply theoretical mathematical concepts to real-world situations or other disciplines, such as physics, engineering, economics, or computer science	L3
CO3	Conclude the results of the project	L5
CO4	Demonstrate the results through a report and presentation.	L2

Grading will be as 3: High (>60%), 2: Moderate (40%-60%), 1: Low (<40%), 0: No mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	1	1	1
CO2	2	2	2	1	1	1
CO3	2	2	2	1	1	1
CO4	2	2	2	1	1	1

Curriculum mapping for the Undergraduate Degree Programme T.Y.B.Sc. Mathematics

	SEMESTER – V	Course imparts Employability (EM), Entrepreneurship (EN), Skill Development (SD)			Course integrates with Professional Ethics (PE), Gender Equity (GE), Human Value (HV), Environmental Sustainability (ES)			
Course Code	**Major Course Title**	**EM**	**EN**	**SD**	**PE**	**GE**	**HV**	**ES**
25BUMT5T01	Multivariable Calculus II			✔				
25BUMT5T02	Group Theory			✔				
25BUMT5T03	Topology of Metric Spaces I			✔				
25BUMT5TE1	Introduction to SQL	✔	✔	✔				
25BUMT5TE2	Introduction to Partial Differential Equations			✔				
25BUMT5P01	Practical based on 25BUMT5T01			✔				
25BUMT5P02	Practical based on 25BUMT5T02			✔				
25BUMT5P03	Practical based on 25BUMT5T03			✔				
25BUMT5PE1	Practical based on 25BUMT5TE1			✔				
25BUMT5PE2	Practical based on 25BUMT5TE2			✔				
25BUMT5VSC	Introduction to Java Programming I	✔	✔	✔				✔
25BUMT5OJT	On Job Training in Mathematics I	✔	✔	✔				✔
25BUMT5FPR	Field Project in Mathematics III	✔	✔	✔	✔	✔	✔	✔
	Minor Course Title							
25BUMT5TMN	Double Integral and Line Integral			✔				

14	***Total***	**4**	**4**	**14**	**1**	**1**	**1**	**3**

	SEMESTER – VI	**Course imparts Employability (EM), Entrepreneurship (EN), Skill Development (SD)**			**Course integrates with Professional Ethics (PE), Gender Equity (GE), Human Value (HV), Environmental Sustainability (ES)**			
Course Code	**Major Course Title**	**EM**	**EN**	**SD**	**PE**	**GE**	**HV**	**ES**
25BUMT6T01	Surface Integral and Basic Complex Analysis			✔				
25BUMT6T02	Ring Theory			✔				
25BUMT6T03	Topology of Metric Spaces II			✔				
25BUMT6T04	Graph Theory			✔				
25BUMT6TE1	Introduction to PL/SQL	✔	✔	✔				✔
25BUMT6TE2	Integral Transforms			✔				
25BUMT6P01	Practical based on 25BUMT6T01 and 25BUMT6T04			✔				
25BUMT6P02	Practical based on 25BUMT6T02 and 25BUMT6T04			✔				
25BUMT6P03	Practical based on 25BUMT6T03 and 25BUMT6T04			✔				
25BUMT6PE1	Practical Based on 25BUMT6TE1			✔				
25BUMT6PE2	Practical Based on 25BUMT6TE2			✔				
25BU6VSC03	Introduction to Java Programming II	✔	✔	✔				✔
25BUMT6OJT	On Job Training in Mathematics II	✔	✔	✔				✔
25BUMT6FPR	Field Project in Mathematics IV	✔	✔	✔	✔	✔	✔	✔

14	***Total***	**4**	**4**	**14**	**1**	**1**	**1**	**3**