Karmaveer Bhaurao Patil University, Satara

Syllabus for

B. Sc. III Mathematics

Under

Faculty of Science and Technology

(As per NEP 2020)

With effect from Academic Year 2026-2027

1. STRUCTURE OF COURSE:

As per NEP-2020 (2.0)

Sem (Level)	Courses		VSC/ SEC	AEC/ VEC/ IKS	OJT/ FP/ CEP/ CC/ RP	Total Credits
	Course I	Course II				
	Major Mandatory	Major Elective				
Sem V (5.5)	Major IX (2) Major X (2) Major XI (2) Major P V (2)	Major XII (Elect.) (2) Major P VI (Elect.) (2)	VSC III (2) (P) (Major specific)	AEC 3 (2) (English)	OJT (4) CEP (2)	22
Sem VI (5.5)	Major XIII (2) Major XIV (2) Major XV (2) Major P VII (2)	Major XVI (Elect.) (2) Major P VIII (Elect.) (2)	VSC IV (2) (P) (Major specific) SEC III (2) (P)	AEC 4 (2) (English)	FP (2) CC (2)	22
Credits	16	08	06	04	10	44

2. COURSE TITLE

1) Fifth Semester

Sr. No.	**Subject**	**Theory**				**Practical**		
		Course Code	**Title of Course**	**No. of lectures per week**	**Credits**	**Course Code & Course Title**	**No. of Practical Per week**	**Credits**
1.	Major IX	BMT 351	Mathematical Analysis	2	2	BMP 356: Practical Based on BMT 351, BMT 352 & BMT 353	1	2
2.	Major X	BMT 352	Abstract Algebra	2	2			
3.	Major XI	BMT 353	Optimization Techniques	2	2			
5.	Major XII (Elect.)	BMT 354	Numerical Methods – I	2	2	BMP 357: Practical Based on BMT 354 or BMT 355	1	2
		BMT 355	Integral Transforms					
6.	AEC	BMTAEC 3	English for Communication III	2	2	--	--	--
7.	VSC	--	--	--	--	BMPVSC III	1	2
8.	OJT	--	--	--	--	BMPOJT I	2	4
9.	CEP	--	--	--	--	BMPCEP I	1	2

2) Sixth Semester

Sr. No.	Subject	Theory				Practical		
		Course Code	Title of Course	No. of lectures per week	Credits	Course Code & Course Title	No. of Practical Per week	Credits
1.	Major XIII	BMT 361	Metric Spaces	2	2	BMP 366: Practical Based on BMT 361, BMT 362 & BMT 363	1	2
2.	Major XIV	BMT 362	Linear Algebra	2	2			
3.	Major XV	BMT 363	Complex Analysis	2	2			
4.	Major XVI (Elect.)	BMT 364	Numerical Methods – II	2	2	BMP 367: Practical Based on BMT 364 or BMT 365	1	2
		BMT 365	Discrete Mathematics					
5.	AEC	BMTAEC 4	English for Communication IV	2	2	--	--	--
6.	VSC	--	--	--	--	BMPVSC IV	1	2
7.	SEC	--	--	--	--	BMPSEC III	1	2
8.	FP	--	--	--	--	BMPFP I	1	2
9.	CC	--	--	--	--	BMPCC I	1	2

3. EVALUATION STRUCTURE:

Semester V (5.5)

Course	Course Category	Course Code	Internal Evaluation			ESE	Total Marks	Credits
			CCE – I	CCE – II	CCE – III			
Major	T	BMT 351	10	10	10	30	50	02
	T	BMT 352	10	10	10	30	50	02
	T	BMT 353	10	10	10	30	50	02
	P	BMP 356	20			30	50	02
Major (Elective) (1 Theory Paper Out of Two)	T	BMT 354	10	10	10	30	50	02
	T	BMT 355	10	10	10	30	50	02
	P	BMP 357	20			30	50	02
AEC	T	AEC III	10	10	10	30	50	02
VSC	P	BMPVSC III	20			30	50	02
OJT	P	BMPOJT I	40			60	100	04
CEP	P	BMPCEP I	20			30	50	02
						Total	550	22

Semester VI (5.5)

Course	Course Category	Course Code	Internal Evaluation			ESE	Total Marks	Credits
			CCE – I	CCE – II	CCE – III			
Major	T	BMT 361	10	10	10	30	50	02
	T	BMT 362	10	10	10	30	50	02
	T	BMT 363	10	10	10	30	50	02
	P	BMP 366	20			30	50	02
Major (Elective) (1 Theory Paper Out of Two)	T	BMT 364	10	10	10	30	50	02
	T	BMT 365	10	10	10	30	50	02
	P	BMP 367	20			30	50	02
AEC	T	AEC IV	10	10	10	30	50	02
VSC	P	BMPVSC IV	20			30	50	02
SEC	P	BMPSEC III	20			30	50	02
FP	P	BMPFP I	20			30	50	02
CC	P	BMPCC I	10	10	10	30	50	02
						Total	550	22

DSC: Discipline Specific Course; **DSE**: Discipline Specific Elective **VSC**: Vocational Skill Course; **OJT**: On Job Training; **FP**: Field Project; **CEP**: Community Engagement Program, **SEC**: Skill Enhancement Course; **AEC**: Ability Enhancement Course; **T**: Theory; **P**: Practical

CONTINOUS AND COMPHERENSIVE EVALUATION (CCE) STRUCTURE:

- Internal evaluation of theory papers shall carry a weightage of 40%.
- For the internal evaluation of theory papers, departments have the flexibility to adopt a variety of assessment methods, including class tests, assignments, book review, tutorials, seminars, case studies, fieldwork, project work, quizzes, and similar tools for CCE I and CCE II.
- CCE III shall consist of multiple-choice questions.
- Each CCE will carry 10 marks for 2-credit theory papers and 20 marks for 4-credit theory
- papers, and the best two scores will be considered for final mark entry.
- Internal evaluation of practical papers shall carry a weightage of 50%.
- For practical examinations, internal evaluation will be based on student performance, attendance, journal records, and viva voce.

4. OTHER FEATURES:

A) LIBRARY:

Reference books, Textbooks, journals, and Periodicals are available in Institute and Departmental Library. (Separate reference lists are attached along with the respective course syllabus)

B) EQUIPMENT:

a) Computer, LCD projector, visualizer, smart board

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - V
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMT 351 Mathematical Analysis

Course Objectives: By the end of the course, students should be able to……

1. explain the integration of bounded functions on closed and bounded intervals.
2. apply the fundamental properties of Riemann integrable functions.
3. examine the extension of Riemann integrals to handle improper integrals.
4. analyze the expansion of functions into standard and half-range Fourier series.

Course Outcomes: By the end of the course, students will be able to……

1. evaluate Riemann integrability using Darboux sums and measure zero properties.
2. solve mathematical problems using integral algebra and fundamental calculus theorems.
3. analyze the convergence of improper integrals using standard comparison tests.
4. compute Fourier series expansions for continuous and piecewise functions.

Module	Title and Contents	Hrs
Module - 1:	**Riemann Integration** 1.1 Definition of Riemann integration and simple examples 1.2 Norm of subdivision, lower and upper sum, lower and upper integrals, oscillatory sums, Riemann Integral, Inequalities for lower and upper Darboux's sums 1.3 Necessary and sufficient conditions for Riemann integrability 1.4 Set of Measure zero, almost everywhere property 1.5 Existence of Riemann integral	08
Module - 2:	**Properties of Riemann Integral** 2.1 Riemann integrability of monotonic functions and continuous functions 2.2 Algebra and properties of Riemann integrable functions 2.3 Piecewise monotonic and Piecewise continuous functions 2.4 Intermediate value theorem for integrals, Primitive of a function 2.5 First and second fundamental theorems of integral calculus, Integration by parts, Change of variable	07
Module - 3:	**Improper Integrals** 3.1 Definition of improper integral of first kind, second kind, third kind and its examples 3.2 Comparison test, μ – test for Convergence, Absolute and conditional convergence, Integral test for convergence of series 3.3 Definition of improper integral of second kind and some tests for their convergence 3.4 Cauchy Principal Value	08

Module - 4:	**Fourier series** 4.1 Definition of Fourier series and examples on the expansion of functions in Fourier series 4.2 Fourier series corresponding to even and odd functions 4.3 Half range Fourier series 4.4 Half range sine and cosine Series	07

Reference Books: -

1. D Somasundaram and B Choudhary, "First Course in Mathematical Analysis", Narosa Publishing House New Delhi, Eighth Reprint 2013 (Chapter 8, Chapter 10, Art 10.1)
2. HariKishan, "Real Analysis", Pragati Prakashan, Meerut, Fourth Edition 2012
3. Kenneth. A. Ross, "Elementary Analysis: The Theory of Calculus, Second Edition", Undergraduate Texts in Mathematics, Springer, 2013. (Chapter 6, Art. 32.1 to 32.11, 33.1 to 33.6 and 34.1 to 34.4)
4. R. G. Bartle and D. R. Sherbert, "Introduction to Real Analysis", Wiley India Pvt. Ltd., Fourth Edition 2016
5. R. R. Goldberg, "Methods of Real Analysis", Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Shanti Narayan and Dr. M. D. Raisinghania, "Elements of Real Analysis", S. Chand & Company Ltd. New Delhi, Fifteenth Revised Edition 2014.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Assignment/Class Tests, • CCE - II: 10 Marks: Case study/ Seminar/ Field Work • CCE – III: 10 Marks: Multiple Choice questions (The Best of two will be considered for the final mark entry)	• Q.1) Solve the following questions. [5X2=10] • Q.2) Attempt any two questions. [2X10=20] • Q.3) Attempt any four questions. [4X5=20] Note: Conversion of 50 marks of ESE evaluation to 30 marks.

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - V
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMT 352 Abstract Algebra

Course Objectives: By the end of the course, students should be able to……

1. study basic concepts of groups with examples.
2. identify whether the given set with the compositions form Ring, Integral domain or Field.
3. learn homomorphism and imbedding of rings.
4. gain the knowledge of polynomial rings, its properties and unique factorization domain.

Course Outcomes: By the end of the course, students will be able to……

1. state fundamental theorem, Isomorphism theorems of groups.
2. classify ring, integral domain and field.
3. differentiate between maximal ideal and prime ideal.
4. solve problems on polynomial rings and UFD.

Module	Title and Contents	Hrs
Module - 1:	**Groups** 1.1 Definition and examples of groups 1.2 Group S3 and Dihedral group D4 1.3 Commutator subgroups and its properties 1.4 Conjugacy in group and class equation	07
Module - 2:	**Rings** 2.1 Definition and examples of Rings 2.2 Commutative ring, non-commutative ring, Ring with unity, Ring with Zero divisor, Ring without zero divisor 2.3 Integral Domain, Division Ring, Field, Boolean ring, Subring, Characteristic of a ring: Nilpotent and Idempotent elements 2.4 Ideals, Sum of two ideals, Examples, Simple Ring	08
Module - 3:	**Homomorphism and Imbedding of Ring** 3.1 Quotient Rings, Homomorphism 3.2 Kernel of Homomorphism 3.3 Isomorphism theorems, imbedding of Ring 3.4 Maximal Ideals, Prime ideal, Semi-Prime Ideal	07
Module - 4:	**Polynomial Ring and Unique Factorization Domain** 4.1 Polynomial Rings, Degree of Polynomial 4.2 Addition and multiplication of Polynomials and their properties 4.3 UFD, Gauss Lemma	08

Reference Books: -

1. Jonh B. Fraleigh, A First Course in Abstract Algebra Pearson Education, Seventh Edition (2014).
2. Herstein I. N, Topics in Algebra, Vikas publishing House,1979.

<table>
<tr><td colspan="2">3. Malik D. S. Moderson J. N. and Sen M. K., Fundamentals of Abstract Algebra, McGrew Hill,1997.
4. Surjeet Sing and Quazi Zameeruddin, Modern Algebra, Vikas Publishing House,1991.
5. N. Jacobson, Basic Algebra Vol. I&II, Freeman and Company, New York 1980.</td></tr>
<tr><td colspan="2">Evaluation Pattern:</td></tr>
<tr><td colspan="2">Total Marks: 50</td></tr>
<tr><td>Internal Continuous Evaluation (20 Marks):
• CCE - I: 10 Marks: Assignment/Class Tests,
• CCE - II: 10 Marks: Case study/ Seminar/ Field Work
• CCE – III: 10 Marks: Multiple Choice questions
(The Best of two will be considered for the final mark entry)</td><td>End Semester Examination (30 Marks):
• Q.1) Solve the following questions. [5X2=10]
• Q.2) Attempt any two questions. [2X10=20]
• Q.3) Attempt any four questions. [4X5=20]
Note: Conversion of 50 marks of ESE evaluation to 30 marks.</td></tr>
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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - V
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMT 353 Optimization Techniques

Course Objectives: By the end of the course, students should be able to……

1. explain the formulation and graphical resolution of linear programming models.
2. formulate and apply standard algorithms to find basic feasible solutions for transportation networks.
3. identify and analyze standard and unbalanced assignment models using structured mathematical approaches.
4. evaluate competitive decision-making strategies in zero-sum games using dominance principles.

Course Outcomes: By the end of the course, students will be able to……

1. construct and solve mathematical linear programming models from real-world scenarios.
2. calculate basic feasible solutions for transportation problems using standard minimization methods.
3. solve complex assignment routing problems by applying the Hungarian method.
4. determine optimal strategies for competitive games using saddle points and dominance principles.

Module	Title and Contents	Hrs
Module - 1:	**Linear Programming problems** 1.1 Introduction 1.2 Formulation of Linear Programming Problems, Graphical methods for Linear Programming Problems 1.3 General formulation of Linear Programming problems 1.4 Slack and surplus variables 1.5 Canonical form, Standard form of Linear Programming problems	08
Module - 2:	**Transportation** 2.1 Transportation problem: Introduction, Mathematical formulation, Matrix form of Transportation Problem 2.2 Feasible solution, Basic feasible solution and optimal solution 2.3 Balanced and unbalanced Transportation problems 2.4 Methods of Initial basic feasible solutions: North west corner rule [Steppingstone method], Lowest cost entry method [Matrix minima method], Vogel's Approximation method [Unit Cost Penalty method]	07
Module - 3:	**Assignment Problems** 3.1 Assignment Models: Introduction 3.2 Mathematical formulation of assignment problem 3.3 Hungarian method for assignment problem 3.4 Maximization assignment problem 3.5 Unbalanced assignment problem	08

Module - 4:	**Game Theory** 4.1 Game theory: Basic definitions, Minimax [Maximin] Criterion and optimal strategy 4.2 Saddle point, optimal strategy and value of game, Solution of games with saddle point 4.3 Fundamental theorem of game theory [Minimax theorem], Two by two (2 × 2) games without saddle point 4.4 Algebraic method of Two by two (2 × 2) games, Arithmetic method of Two by two (2 × 2) games 4.5 Principle of dominance	07

Reference Books: -

1. J. K. Sharma: Operation Research: Theory and Applications, Laxmi Publications, 2017.
2. Kanti Swarup, P. K. Gupta and Manmohan, Operation Research, S. Chand& Co.
3. Mittal, K. V. and Mohan, C., Optimization Methods in Operations, Research and Systems Analysis, New Age, 2003.
4. Mohan, C. and Deep, Kusum, Optimization Techniques, New Age, 2009.
5. Ravindran, A., Phillips, D. T and Solberg, J. J., Operations Research: Principles and Practice, John Willey and Sons, 2nd Edition, 2009.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Assignment/Class Tests, • CCE - II: 10 Marks: Case study/ Seminar/ Field Work • CCE – III: 10 Marks: Multiple Choice questions (The Best of two will be considered for the final mark entry)	• Q.1) Solve the following questions. [5X2=10] • Q.2) Attempt any two questions. [2X10=20] • Q.3) Attempt any four questions. [4X5=20] Note: Conversion of 50 marks of ESE evaluation to 30 marks.

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Programme: B. Sc.	**Semester** - V
Type: DSE	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMT 354 Numerical Methods I (E – I)

Course Objectives: By the end of the course, students should be able to……

1. solve non-linear equations using appropriate numerical methods.
2. determine approximate solutions to systems of linear equations.
3. compute ordinary differential equations using numerical approximation techniques.
4. estimate intermediate values in graphical or tabulated data using interpolation methods.

Course Outcomes: By the end of the course, students will be able to……

1. describe various methods to solve nonlinear equations.
2. illustrate direct methods to solve system of linear equations.
3. evaluate system of linear equations with iterative methods.
4. formulate power method for finding eigen value of greatest modulus.

Module	Title and Contents	Hrs
Module - 1:	**Non-Linear Equations** 1.1 Introduction: Polynomial equations, algebraic equations and their roots 1.2 Iterative methods, Bisection method, algorithm, examples 1.3 Secant method: iterative sequence of secant method, examples 1.4 Regula-Falsi method: algorithm, graphical representation, examples 1.5 Newton's method: algorithm, examples	08
Module - 2:	**System of Linear Equations: Exact Methods** 2.1 Introduction: System of linear equations as a vector equation $Ax = b$ 2.2 Augmented matrix Direct methods: (a) Gauss elimination method: Procedure, examples (b) Gauss-Jordan method: Procedure, examples (c) Iterative methods: General iterative rule	07
Module - 3:	**System of Linear Equations: Iterative Method** 3.1 Jacobi iteration scheme, examples 3.2 Gauss-Seidel method: Formula, Examples	07
Module - 4:	**Eigen Values and Eigen Vectors** 4.1 Eigen values and eigenvectors of a real matrix 4.2 Power method for finding an eigenvalue of greatest modulus 4.3 The case of matrix whose “dominant eigenvalue is not repeated”, examples 4.4 Method of exhaustion, examples 4.5 Method of reduction, examples 4.6 Shifting of the eigen value, examples	08

Reference Books: -

1. Burden, R. L., & Faires, J. D. Numerical Analysis Brooks/Cole, Cengage Learning, 2010 (9th Edition)
2. Chapra, S. C., & Canale, R. P. Numerical Methods for Engineers McGraw-Hill, 2015 (7th Edition)
3. Gerald, C. F., & Wheatley, P. O. Applied Numerical Analysis Pearson Education, 2003
4. Golub, G. H., & Van Loan, C. F. Matrix Computations Johns Hopkins University Press, 2013 (4th Edition)
5. Heath, M. T. Scientific Computing: An Introductory Survey McGraw-Hill, 2002 (2nd Edition)
6. Jain, M. K. Numerical Methods for Scientific and Engineering Computation New Age International, 2003
7. Saad, Y. Iterative Methods for Sparse Linear Systems SIAM, 2003 (2nd Edition)

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Assignment/Class Tests, • CCE - II: 10 Marks: Case study/ Seminar/ Field Work • CCE – III: 10 Marks: Multiple Choice questions (The Best of two will be considered for the final mark entry)	• Q.1) Solve the following questions. [5X2=10] • Q.2) Attempt any two questions. [2X10=20] • Q.3) Attempt any four questions. [4X5=20] Note: Conversion of 50 marks of ESE evaluation to 30 marks.

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - V
Type: DSE	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMT 355 Integral Transform (E – II)

Course Objectives: By the end of the course, students should be able to……

1. understand the concept of Laplace Transform.
2. learn properties of Laplace Transform to solve differential equations.
3. study relation between Laplace and Fourier Transform.
4. learn infinite and finite Fourier Transform.

Course Outcomes: By the end of the course, students will be able to……

1. define Laplace transform and describe its various properties.
2. use inverse Laplace transform to solve linear differential equations.
3. examine relationship between Fourier transform and Laplace transform.
4. evaluate Fourier sine and cosine integral.

Module	Title and Contents	Hrs
Module - 1:	**Laplace Transform** 1.1 Laplace Transform: Definitions; Piecewise continuity, Function of exponential order, Function of class A, Existence theorem of Laplace transform 1.2 Laplace transform of standard functions, First shifting theorem and Second shifting theorem and examples, change of scale property and examples 1.3 Laplace transform of derivatives and examples, Laplace transform of integrals and examples, Multiplication by power of t and examples, Division by t and examples 1.4 Laplace transform of periodic functions and examples. Laplace transform of Heaviside's unit step function.	08
Module - 2:	**Inverse Laplace Transform** 2.1 Inverse Laplace Transform: Definition, Standard results of inverse Laplace transform, Examples 2.2 First shifting theorem and Second shifting theorem and examples 2.3 Change of scale property and Inverse Laplace of derivatives, examples, The Convolution theorem and Multiplication by S, examples 2.4 Division by S, inverse Laplace by partial fractions, examples 2.5 Solving linear differential equations with constant coefficients by Laplace transform	07
Module - 3:	**System of Linear Equations: Iterative Method** 3.1 The infinite Fourier transform and inverse: Definition, examples, Infinite Fourier sine and cosine transform and examples 3.2 Definition: Infinite inverse Fourier sine and cosine transform and examples	07

	3.3 Relationship between Fourier transform and Laplace transform. Change of Scale Property and examples 3.4 Modulation theorem, The Derivative theorem 3.5 Extension theorem. Convolution theorem and examples	
Module - 4:	**Finite Fourier Transform** 4.1 Finite Fourier Transform and Inverse, Fourier Integrals, Finite Fourier sine and cosine transform with examples 4.2 Finite inverse Fourier sine and cosine transform with examples 4.3 Fourier integral theorem. Fourier sine and cosine integral (without proof) and examples	08

Reference Books: -

1. Brown, James W., & Churchill, Ruel V. Fourier Series and Boundary Value Problems McGraw-Hill, 2006 (7th Edition).
2. Churchill, R. V., & Brown, J. W. Fourier Series and Boundary Value Problems McGraw-Hill Education, 2006 (7th Edition)
3. Debnath, Lokenath, & Bhatta, Dambaru Integral Transforms and Their Applications CRC Press, 2014 (3rd Edition)
4. Glyn James Advanced Modern Engineering Mathematics Pearson Education, 2010 (4th Edition)
5. Kreyszig, Erwin Advanced Engineering Mathematics Wiley, 2011 (10th Edition)
6. Zill, Dennis G. Differential Equations with Boundary-Value Problems Cengage Learning, 2012 (8th Edition)

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Assignment/Class Tests, • CCE - II: 10 Marks: Case study/ Seminar/ Field Work • CCE – III: 10 Marks: Multiple Choice questions (The Best of two will be considered for the final mark entry)	• Q.1) Solve the following questions. [5X2=10] • Q.2) Attempt any two questions. [2X10=20] • Q.3) Attempt any four questions. [4X5=20] Note: Conversion of 50 marks of ESE evaluation to 30 marks.

- **Note:** For Theory course students have to choose one course from BMT 354 or BMT 355.

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Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - V
Type: DSC Practical	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMP 356 Practical Based on BMT 351, BMT 352 & BMT 353

Practical Batch: 12 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. demonstrate computational techniques to evaluate Riemann integrability.
2. analyze properties of abstract algebraic structures, including groups and rings.
3. evaluate linear programming and transportation models using optimization algorithms.
4. formulate strategic solutions for assignment models and competitive games.

Course Outcomes: By the end of the course, students will be able to……

1. calculate Darboux sums to verify the Riemann integrability of bounded functions.
2. analyze algebraic characteristics to identify subrings, ideals, and zero divisors.
3. evaluate transportation networks to determine optimal solutions using standard optimization methods.
4. construct optimal decision strategies for assignment problems and games without saddle points.

Practical No.	Content	Hrs
1.	Verification of Riemann integrability of a bounded function	60
2.	Calculation of lower and upper Darboux's sums.	
3.	Estimating Riemann integral using partitions.	
4.	Verification of integrability of piecewise functions.	
5.	Integration using fundamental theorem of calculus.	
6.	Group S_3 and dihedral group D_4.	
7.	Verifying ring properties	
8.	Identifying zero divisors, nilpotent, and idempotents.	
9.	Determining subrings and ring characteristics.	
10.	Ideals: sum, intersection, and testing maximality.	
11.	Simplex Method	
12.	Vogel's Approximation method	
13.	Modified Distribution Method	
14.	Assignment problem	
15.	Solution of games without saddle point using Principle of dominance	

Reference Books: -

1. HariKishan, "Real Analysis", Pragati Prakashan, Meerut, Fourth Edition 2012.
2. Kenneth. A. Ross, "Elementary Analysis: The Theory of Calculus, Second Edition", Undergraduate Texts in Mathematics, Springer, 2013.
3. R. G. Bartle and D. R. Sherbert, "Introduction to Real Analysis", Wiley India Pvt. Ltd., Fourth Edition 2016

4. J. K. Sharma: Operation Research: Theory and Applications, Laxmi Publications, 2017.
5. Kanti Swarup, P. K. Gupta and Manmohan, Operation Research, S. Chand& Co.
6. Jonh B. Fraleigh, A First Course in Abstract Algebra Pearson Education, Seventh Edition (2014).
7. Herstein I. N, Topics in Algebra, Vikas publishing House,1979.
8. Malik D. S. Moderson J. N. and Sen M. K., Fundamentals of Abstract Algebra, McGrew Hill,1997.
9. Surjeet Sing and Quazi Zameeruddin, Modern Algebra, Vikas Publishing House,1991.
10. N. Jacobson, Basic Algebra Vol. I&II, Freeman and Company, New York 1980.

Evaluation Pattern: (60:40)

Total Marks: 50

End Semester Examination:

Internal Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• Journal: 10 Marks • Viva: 05 Marks • Student Performance: 05 Marks	• Q.1) Answer the following questions. (Any Two) [2 X 10 = 20] • Q.2) Answer the following questions. (Any Two) [2 X 05 = 10]

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Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - V
Type: DSE Practical	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMP 357 Practical Based on BMT 354 (E – I)

Practical Batch: 12 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. explain the theoretical foundations of numerical methods for solving algebraic equations.
2. solve systems of linear equations using direct and iterative techniques.
3. implement numerical algorithms to compute eigenvalues and eigenvectors.
4. analyze mathematical problems using computational numerical analysis techniques.

Course Outcomes: By the end of the course, students will be able to……

1. apply Bisection, Secant, and Newton's methods to solve non-linear equations.
2. analyze the efficiency of direct and iterative methods when solving linear systems.
3. compute matrix eigenvalues using power, reduction, and exhaustion techniques.
4. evaluate the critical results of computational algorithms translated from mathematical procedures.

Practical No.	Content	Hrs
1.	Polynomial equations, Algebraic equations and their root	60
2.	Bisection method	
3.	Secant method	
4.	Regula-Falsi Method	
5.	Newton's method	
6.	System of Linear Equations	
7.	Gauss elimination method	
8.	Gauss-Jordan method	
9.	Jacobi iteration scheme	
10.	Gauss-Seidel method	
11.	Eigen values and Eigen vector of real matrix	
12.	Power method	
13.	Method of exhaustion	
14.	Method of reduction	
15.	Shifting of the eigen value	

Reference Books: -

1. B.S. Grewal, Numerical Methods in Engineering and Science, Khanna Publishers, 10th Edition, 2014.
2. M.K. Jain, S.R.K. Iyengar, and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, 6th Edition, 2012.
3. Richard L. Burden and J. Douglas Faires, Numerical Analysis, Cengage Learning, 9th Edition, 2010.
4. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Pvt. Ltd., 5th Edition, 2012.

Evaluation Pattern: (60:40)	
Total Marks: 50	
End Semester Examination:	
Internal Evaluation (20 Marks): • Journal: 10 Marks • Viva: 05 Marks • Student Performance: 05 Marks	**End Semester Examination (30 Marks):** • Q.1) Answer the following questions. (Any Two) [2 X 10 = 20] • Q.2) Answer the following questions. (Any Two) [2 X 05 = 10]

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - V
Type: DSE Practical	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMP 357 Practical Based on BMT 354 (E – II)

Practical Batch: 12 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. explain the fundamental concepts and properties of Laplace and Fourier transforms.
2. apply Laplace transforms to model physical systems and solve differential equations.
3. compute inverse Laplace transforms using partial fractions and the convolution theorem.
4. analyze functions and solve boundary value problems using Fourier transforms.

Course Outcomes: By the end of the course, students will be able to……

1. compute Laplace transforms of standard, periodic, and piecewise functions.
2. solve linear ordinary differential equations using Laplace transforms.
3. determine inverse Laplace transforms using standard techniques and convolution.
4. evaluate finite and infinite Fourier transforms to solve physical and engineering problems.

Practical No.	Content	Hrs
1.	Laplace transform of standard functions	60
2.	Laplace transform of derivatives	
3.	Laplace transform of periodic functions	
4.	Inverse Laplace Transform	
5.	First shifting theorem and Second shifting theorem	
6.	Change of scale property and Inverse Laplace of derivatives	
7.	Convolution theorem and Multiplication by S using Laplace Transform	
8.	Division by S	
9.	inverse Laplace by partial fractions	
10.	linear differential equations with constant coefficients by Laplace transform	
11.	infinite Fourier transform and inverse	
12.	Infinite inverse Fourier sine and cosine transform	
13.	Relationship between Fourier transform and Laplace transform	
14.	Application of Modulation theorem	
15.	Convolution theorem for Fourier Transform	

Reference Books: -

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd., 10th Edition, 2015.
3. H.K. Dass, Advanced Engineering Mathematics, S. Chand Publishing, Revised Edition, 2018.
4. M.D. Raisinghania, Advanced Differential Equations, S. Chand Publishing, 2001.

<table>
<tr><td colspan="2">5. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 3rd Edition, 2007.</td></tr>
<tr><td colspan="2">Evaluation Pattern: (60:40)</td></tr>
<tr><td colspan="2">Total Marks: 50</td></tr>
<tr><td colspan="2">End Semester Examination:</td></tr>
<tr><td>Internal Evaluation (20 Marks):
• Journal: 10 Marks
• Viva: 05 Marks
• Student Performance: 05 Marks</td><td>End Semester Examination (30 Marks):
• Q.1) Answer the following questions. (Any Two) [2 X 10 = 20]
• Q.2) Answer the following questions. (Any Two) [2 X 05 = 10]</td></tr>
</table>

<table>
<tr><td>• Note: The DSE Practical BMP 357 will be aligned with the elective theory course chosen by the students.</td></tr>
</table>

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - V
Type: VSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMPVSC III Optimization using MATLAB

Practical Batch: 12 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. understand various optimization techniques and their applications.
2. develop problem-solving skills using MATLAB.
3. implement optimization algorithms for linear, nonlinear, constrained, and unconstrained problems.
4. explore real-world applications of optimization in engineering and science.

Course Outcomes: By the end of the course, students will be able to……

1. identify appropriate optimization methods for different problems.
2. formulate and solve optimization models using MATLAB.
3. implement and analyze the performance of algorithms.
4. apply optimization techniques to real-life applications using MATLAB.

Practical No.	Content	Hrs
1.	Introduction to MATLAB environment and optimization toolbox.	60
2.	Solving single-variable optimization problems (Unconstrained).	
3.	Graphical method for solving linear programming problems.	
4.	Solving LPP using linprog.	
5.	Solving nonlinear unconstrained optimization problems using fminunc.	
6.	Solving nonlinear constrained optimization problems using fmincon.	
7.	Integer programming using intlinprog.	
8.	Multi-objective optimization using fgoalattain.	
9.	Genetic algorithms using ga.	
10.	Particle swarm optimization (using toolbox or code).	
11.	Simulated annealing using simulannealbnd.	
12.	Constrained nonlinear optimization with multiple constraints.	
13.	Curve fitting and data fitting as optimization problems.	
14.	Case study: Portfolio optimization using MATLAB.	
15.	Mini project: Select real-world problem and solve using MATLAB optimization tools.	

Reference Books: -

1. Chong, Edwin K. P., and Stanislaw H. Żak. 2013. An Introduction to Optimization. 4th ed. Hoboken, NJ: Wiley.
2. Deb, Kalyanmoy. 2001. Multi-Objective Optimization Using Evolutionary Algorithms. Chichester, UK: John Wiley & Sons.

3. Haupt, Randy L., and Sue Ellen Haupt. 2004. Practical Genetic Algorithms. 2nd ed. Hoboken, NJ: Wiley.
4. Mathews, John H., and Kurtis D. Fink. 2004. Numerical Methods Using MATLAB. 4th ed. Upper Saddle River, NJ: Pearson Prentice Hall.
5. Nocedal, Jorge, and Stephen J. Wright. 2006. Numerical Optimization. 2nd ed. New York: Springer.
6. Rao, Singiresu S. 2009. Engineering Optimization: Theory and Practice. 4th ed. Hoboken, NJ: Wiley.
7. The MathWorks, Inc. 2023. Optimization Toolbox™ User's Guide. Natick, MA: The MathWorks, Inc.
8. Official documentation of MATLAB's optimization toolbox. Available at: https://www.mathworks.com/help/optim/

Evaluation Pattern: (60:40)

Total Marks: 50

End Semester Examination:

Internal Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• Journal: 10 Marks • Viva: 05 Marks • Student Performance: 05 Marks	• Q.1) Answer the following questions. (Any Two) [2 X 10 = 20] • Q.2) Answer the following questions. (Any Two) [2 X 05 = 10]

Karmaveer Bhaurao Patil University, Satara

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - V
Type: OJT	**Marks:** 50
Credits: 4	**From:** A. Y. 2026-27

Name of the Course and Code: BMPOJT I On Job Training

Practical Batch: 12 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. explain how theoretical math and computational tools apply to real-world industries.
2. apply mathematical modeling and statistical techniques to solve organizational challenges.
3. analyze business data to improve efficiency and support decision-making.
4. formulate actionable business strategies by communicating complex mathematical insights.

Course Outcomes: By the end of the course, students will be able to……

1. apply mathematical theories and software tools to execute technical tasks.
2. analyze real-world datasets to identify trends and optimization opportunities.
3. evaluate mathematical models against organizational metrics and limitations.
4. design professional reports that translate quantitative findings into actionable business solutions.

Credits = 4	**Content**	**Hrs.**
4	OJT will provide the opportunities for internship with local/regional industries, business organization, health and allied areas, local government, etc. so that students may actively engaged with the employability opportunities. Students will undergo 4 credit work-based learning/OJT/internship. **Duration: 1 Months (1st November to 30th November)**	**120**

Evaluation Pattern: (60:40)

Total Marks: 100

End Semester Examination:

Internal Evaluation (40 Marks):	**End Semester Examination (60 Marks):**
• Appendix VII: Supervisor Evaluation of intern: 20 Marks • Attendence Diary / Logbook: 20 Marks	• Viva Voce / Presentation: 20 Marks • Depth of Knowledge and skill acquired: 20 Marks • Report: 20 Marks

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B.Sc.	**Semester:** V
Type: CEP	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course & Code: BMPCEP I Community Engagement Programme

Practical Batch: 20 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. understand the role and relevance of mathematics in community life and local issues.
2. apply mathematical concepts to address simple real-world community problems.
3. analyze community data and situations using appropriate mathematical tools and reasoning.
4. evaluate and create practical, evidence-based mathematical solutions for community needs.

Course Outcomes: By the end of the course, students will be able to……

1. explain the applications of mathematics in everyday life and community development.
2. apply mathematical knowledge to identify and address community-based problems.
3. analyze community information and data to support logical decision-making.
4. evaluate and develop practical mathematical solutions through community-based activities and projects.

Module Title	Module Content	Teaching/Learning/Methodology
Appreciation of Rural Society	Rural lifestyle, rural society, joint family, caste and gender relations, rural values with respect to community, rural culture nature and public resources, ponds and fisheries, elaboration of soul of India lies in villages' rural infrastructure,	Classroom discussions Field visit Individual /Group conference Report/journal submission & VIVA
Understanding rural and Local economy and livelihood	Understanding	Classroom discussions Field visit Individual /Group conference Report/journal submission & VIVA
Rural and local Institution	Traditional rural and community organization, self-help groups, decentralized planning, panchayat raj institutions, Gram panchayat, Nagarpalika and Municipalities, local Civil Society, Local administration, National rural, Livelihood Mission [NRLM], Mahatma Gandhi National Rural Employment. Guarantee [MGNREGA].	Classroom discussions Field visit Individual /Group conference Report/journal submission & VIVA
Rural and National development programmers	History of rural development and current National Programmes in India: Sarva Shiksha Abhiyan, Beti Bachao-Beti Padhao, Ayushman Bharat, eShram, Swachh Bharat, PM Awas yojana, Skill India, Digital, India, Start-Up India, Stand-Up India, Scheme of Fund for Regeneration of Traditional Industries (SFURTI), Jal Jeevan Mission, Mission Antyodaya, ATMANIRBHAR Bharat, etc.	Classroom discussions Field visit Individual /Group conference Report/journal submission & VIVA

Evaluation Pattern: (60:40)	
Total Marks: 50	
End Semester Examination:	
Internal Evaluation (20 Marks): • Attendance and Participation: 10 Marks • Field Diary / Logbook: 10 Marks	**End Semester Examination (30 Marks):** • Viva Voce / Presentation: 10 Marks • Scientific Activity / Demonstration: 10 Marks • Final Report: 10 Marks

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - VI
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMT 361 Metric Spaces

Course Objectives: By the end of the course, students should be able to……

1. acquire the knowledge of notion of metric space, open sets and closed sets.
2. study the properties of continuous functions on metric spaces.
3. understand the basic concepts of connectedness, completeness and compactness of metric spaces.
4. learn the process of abstraction of limits and continuity in metric spaces.

Course Outcomes: By the end of the course, students will be able to……

1. describe the Euclidean distance function on Rn and derivation of its properties.
2. demonstrate properties of homeomorphism associated to open and closed sets.
3. examine connectedness, completeness and compactness using examples.
4. derive properties of bounded function and uniform continuity.

Module	Title and Contents	Hrs
Module - 1:	**Limits and Metric Spaces** 1.1 Revision: Limits of a function on the real line. 1.2 Metric space, Limits in Metric space. 1.3 Convergent sequence. 1.4 Cauchy sequence.	08
Module - 2:	**Continuous Functions on Metric Spaces** 2.1 Continuity at a point on the real line. 2.2 Reformulation. 2.3 Functions continuous on a metric space. 2.4 Open Ball, Open Sets, Limit point, Closure of a set, Closed Sets. 2.5 Homeomorphism, dense subset of a metric space.	07
Module - 3:	**Connectedness, Completeness, And Compactness** 3.1 More about open sets, connected metric space, connected sets. 3.2 Bounded and totally bounded sets, dense set. 3.3 Complete metric space, contraction operator. 3.4 Compact metric spaces, Covering and open covering. 3.5 Heine Borel property, Finite intersection property	08
Module - 4:	**Some Properties of Continuous Functions on Metric Spaces** 4.1 Continuous functions on compact metric spaces. 4.2 Bounded function. 4.3 Uniform continuity.	07

Reference Books: -

1. D. Somasundaram, B. Choudhary, First Course in Mathematical Analysis, Narosa Publishing House, (2018).

2. J. N. Sharma, Mathematical Analysis-I, Krishna Prakashan Mandir, Meerut. (2014).
3. R. R. Goldberg, Methods of Real Analysis, Oxford and IBH Publishing House. (2017).
4. S. C. Malik, Savita Arrora, Mathematical Analysis, New age international ltd (2005).
5. Satish Shirali, H. L. Vasudeva, Mathematical Analysis, Narosa Publishing House. (2013)
6. T. M. Apostol, Mathematical Analysis, Narosa Publishing House. (2002)
7. W. Rudin, Principles of Mathematical Analysis, McGraw Hill Book Company (1976).

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Assignment/Class Tests, • CCE - II: 10 Marks: Case study/ Seminar/ Field Work • CCE – III: 10 Marks: Multiple Choice questions (The Best of two will be considered for the final mark entry)	• Q.1) Solve the following questions. [5X2=10] • Q.2) Attempt any two questions. [2X10=20] • Q.3) Attempt any four questions. [4X5=20] Note: Conversion of 50 marks of ESE evaluation to 30 marks.

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - VI
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMT 362 Linear Algebra

Course Objectives: By the end of the course, students should be able to……

1. understand the notion of vector space.
2. study algebra of linear transformations.
3. learn connection between linear transformation and matrices.
4. study eigen values, eigen vectors and its connection with real life situation.

Course Outcomes: By the end of the course, students will be able to……

1. explain the concepts of basis and dimension of a vector space.
2. apply Sylvester's law to find rank and nullity of linear transformation.
3. examine the relationship inner product spaces and vector spaces.
4. evaluate eigen values and eigen vectors for matrix associated with linear operator.

Module	Title and Contents	Hrs
Module - 1:	**Vector Spaces** 1.1 Vector space, Subspace, Sum of subspaces, direct sum, Quotient space 1.2 Homomorphism or Linear transformation, Kernel and Range of homomorphism 1.3 Fundamental Theorem of homomorphism, Isomorphism theorems 1.4 Linear Span, Finite dimensional vector space 1.5 Linear dependence and independence, basis, dimension of vector space and subspaces	07
Module - 2:	**Linear Transformations** 2.1 Linear Transformation, Rank and nullity of a linear transformation 2.2 Sylvester's Law, Algebra of Linear Transformations, Sum and scalar multiple of Linear Transformations 2.3 The vector space of homomorphism, Product (composition) of Linear Transformations 2.4 Linear operator, Linear functional, Invertible and non-singular Linear Transformation, Definition of Dual Space	08
Module - 3:	**Inner Product Spaces** 3.1 Inner product spaces: Norm of a vector 3.2 Cauchy-Schwarz inequality, Orthogonality 3.3 Pythagoras Theorem, orthonormal set 3.4 Gram-Schmidt orthogonalization process, Bessel's inequality	07
Module - 4:	**Eigen values and Eigen vectors** 4.1 Eigen values and Eigen vectors: Eigen space, Characteristic Polynomial of a matrix and remarks on it 4.2 Similar matrices, Characteristic Polynomial of a Linear operator 4.3 Examples on eigen values and eigen vectors	08

Reference Books: -

1. David Lay, Steven Lay, Judi McDonald, Linear Algebra and its Applications, Pearson Education Asia, Indian Reprint, 2016, 5th Edition
2. H. Anton & C. Rorres, Elementary Linear Algebra (with Supplemental Applications), Wiley India Pvt. Ltd (Wiley Student Edition), New Delhi, 2016, 11th Edition
3. Hoffman K. and Kunze R, Linear Algebra, Prentice Hall of India, 1978.
4. Lipschutz S, Linear Algebra, Schaum's Outline Series, McGraw Hill, Singapore, 1981
5. S. Friedberg, A. Insel, L. Spence, Linear Algebra, Prentice Hall of India, 2014, 4th Edition
6. Vijay K. Khanna, S.K. Bhambri, A Course in Abstract Algebra, Vikas publishing House Pvt. Ltd., New –Delhi-110014, Fifth Edition 2016

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Assignment/Class Tests, • CCE - II: 10 Marks: Case study/ Seminar/ Field Work • CCE – III: 10 Marks: Multiple Choice questions (The Best of two will be considered for the final mark entry)	• Q.1) Solve the following questions. [5X2=10] • Q.2) Attempt any two questions. [2X10=20] • Q.3) Attempt any four questions. [4X5=20] Note: Conversion of 50 marks of ESE evaluation to 30 marks.

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - VI
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMT 363 Complex Analysis

Course Objectives: By the end of the course, students should be able to……

1. learn concept of analytic functions.
2. introduce the complex integration.
3. study types of singularities.
4. acquire the application of residues to evaluate certain real integrals.

Course Outcomes: By the end of the course, students will be able to……

1. describe analytic function and its properties.
2. use Cauchy's integral formula and Cauchy's Residue theorem to solve complex integration.
3. examine singularities and distinguish between them.
4. evaluate problems using Mittag Leffler's expansion and Rouche's theorem.

Module	Title and Contents	Hrs
Module - 1:	**Analytic functions** 1.1 Limit and continuity of a function of a complex variable, complex valued function 1.2 Differentiability and continuity and elementary rules of Differentiation 1.3 Analytic function and Analytic function in domain, Necessary and sufficient condition for $F(z) = u + iv$ to be Analytic and examples 1.4 Limit of a sequence of complex numbers 1.5 Polar form of Cauchy- Riemann Equation, harmonic function, conjugate harmonic function 1.6 Construction of Analytic function, solved problems related to the test of analyticity of functions and construction of analytic function	08
Module - 2:	**Complex Integration** 2.1 Elementary Definitions, complex line integral, Integral along oriented curve and examples 2.2 Cauchy's integral theorem and its consequences 2.3 Cauchy's integral formula for multiply connected domain and its examples 2.4 Jordan curve, orientation of Jordan curve, simple connected and multiply connected domain, rectifiable curve and their properties 2.5 Higher order derivative of an analytic function	07
Module - 3:	**Singularities and Residues** 3.1 Development of an analytic function as a power series 3.2 Taylor's theorem for complex function, Examples on Taylor's and Laurent series	08

	3.3 Zeros of an analytic function, singular point, different types of singularity, poles and zeros, limiting point of zeros and poles 3.4 Residue theorem, residue at a pole and residue at infinity 3.5 Cauchy's residue theorem, computation of residue at a finite pole, Integration round unit circle 3.6 Jordan's lemma, Evaluation of Integrals $\int_{-\infty}^{\infty} f(z)$ when $f(z)$ has no poles on the real line and when poles on the real line	
Module - 4:	**Entire Meromorphic Functions** 4.1 Definition of entire and meromorphic functions, Evaluate Characterization of polynomials as entire functions 4.2 Characterization of rational functions as meromorphic functions 4.3 Mittag Leffler's expansion 4.4 Rouche's theorem and solved problems 4.5 Some theorems on poles and singularities	07

Reference Books: -

1. James Ward Brown and Ruel V. Churchill, Complex Variables and Applications, 8th Ed., McGraw – Hill Education (India) Edition, 2014. Eleventh reprint 2018.
2. Lars V Ahlfors, Complex Analysis, McGraw-Hill Education; 3 edition (January 1, 1979).
3. S. Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, Second Edition, 2005, Ninth reprint 2013.
4. Tristan Needham, Visual Complex Analysis: 25th Anniversary Edition, Oxford University Press, 2023.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Assignment/Class Tests, • CCE - II: 10 Marks: Case study/ Seminar/ Field Work • CCE – III: 10 Marks: Multiple Choice questions (The Best of two will be considered for the final mark entry)	• Q.1) Solve the following questions. [5X2=10] • Q.2) Attempt any two questions. [2X10=20] • Q.3) Attempt any four questions. [4X5=20] Note: Conversion of 50 marks of ESE evaluation to 30 marks.

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Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - VI
Type: DSE	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMT 364 Numerical Methods II (E – I)

Course Objectives: By the end of the course, students should be able to……

1. study the errors obtained in the numerical solution of problems.
2. understand the common numerical methods and how they are used to obtain approximate solutions.
3. learn numerical methods for various mathematical operations and tasks, such as interpolation, differentiation and integration.
4. demonstrate various methods to find solution of linear and nonlinear equations, and the solution of differential equations.

Course Outcomes: By the end of the course, students will be able to……

1. explain forward and backward interpolation in equal intervals.
2. solve examples to find divided difference of interpolating polynomials evaluate system of linear equations with iterative methods.
3. evaluate numerical differentiation and integration using various methods.
4. apply numerical methods to solve ordinary differential equations.

Module	Title and Contents	Hrs
Module - 1:	**Interpolation: Equal Intervals** 1.1 Forward interpolation: Newton's forward differences 1.2 Forward difference table Newton's forward form of interpolating polynomial (formula only), examples 1.3 Backward interpolation: Newton's backward differences 1.4 Backward difference table, Newton's backward form of interpolating polynomial (formula only), examples	08
Module - 2:	**Interpolation: Unequal Intervals** 2.1 Introduction 2.2 Lagrangian interpolating polynomial (formula only), examples 2.3 Divided difference interpolation: Newton's divided differences, divided difference table 2.4 Examples finding divided (differences of given data) 2.5 Newton's divided difference form of interpolating polynomial, examples	07
Module - 3:	**Numerical Differentiation and Integration** 3.1 Numerical differentiation based on interpolation polynomial 3.2 Numerical integration: Newton-Cotes formula (statement only) 3.3 Basic Trapezoidal rule (excluding the computation of error term), composite Trapezoidal rule, examples 3.4 Basic Simpson's 1/3rd rule (excluding the computation of error term), composite Simpson's 1/3rd rule, examples	07

	3.5 Basic Simpson's 3/8th rule (excluding the computation of error term), composite Simpson's 3/8th rule, examples	
Module - 4:	**Ordinary Differential Equations** 4.1 Euler's Method, Examples 4.2 Second order Runge-Kutta method (formula only), examples 4.3 Fourth order Runge-Kutta method (formula only), examples	08

Reference Books: -

1. Burden, Richard L., & Faires, J. Douglas Numerical Analysis Brooks/Cole, Cengage Learning, 2010 (9th Edition)
2. Butcher, J. C. Numerical Methods for Ordinary Differential Equations Wiley, 2003 (2nd Edition)
3. Chapra, Steven C., & Canale, Raymond P. Numerical Methods for Engineers McGraw-Hill Education, 2015 (7th Edition)
4. Gerald, Curtis F., & Wheatley, Patrick O. Applied Numerical Analysis Pearson Education, 2003 (7th Edition)
5. Grewal, B. S. Numerical Methods in Engineering and Science Khanna Publishers, 2014 (9th Edition)
6. Jain, M. K., Iyengar, S. R. K., & Jain, R. K. Numerical Methods for Scientific and Engineering Computation New Age International, 2012 (6th Edition)
7. Sastry, S. S. Introductory Methods of Numerical Analysis PHI Learning Pvt. Ltd., 2012 (5th Edition)

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Assignment/Class Tests, • CCE - II: 10 Marks: Case study/ Seminar/ Field Work • CCE – III: 10 Marks: Multiple Choice questions (The Best of two will be considered for the final mark entry)	• Q.1) Solve the following questions. [5X2=10] • Q.2) Attempt any two questions. [2X10=20] • Q.3) Attempt any four questions. [4X5=20] Note: Conversion of 50 marks of ESE evaluation to 30 marks.

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Programme: B. Sc.	**Semester** - VI
Type: DSE	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMT 365 Discrete Mathematics (E – II)

Course Objectives: By the end of the course, students should be able to……

1. explain classical logical notions, including proofs and quantifiers.
2. apply logical concepts across various branches of mathematics.
3. analyze elementary searching, sorting, and greedy algorithms alongside their complexities.
4. understand concepts of graph and trees to tackle real situations.

Course Outcomes: By the end of the course, students will be able to……

1. explain the notion of mathematical thinking, mathematical proofs and algorithmic thinking.
2. use rules of inference to test valid and invalid arguments.
3. examine graphs and circuits under isomorphism.
4. evaluate shortest path using Dijkstra's algorithm.

Module	Title and Contents	Hrs
Module - 1:	**Mathematical Logic** 1.1 The logic of compound statements: Statements, compound statements, truth values, logical equivalence, tautologies and contradictions 1.2 Conditional statements: Logical equivalences involving implication, negation 1.3 The contra positive of a conditional statement, converse, inverse of conditional statements, biconditional statements	08
Module - 2:	**Valid and Invalid Arguments** 2.1 Modus Ponens and modus Tollens 2.2 Additional valid argument forms, rules of inferences, contradictions and valid arguments 2.3 Number system: Addition and subtraction of Binary, decimal, quintal, octal, hexadecimal number systems and their conversions	07
Module - 3:	**Graphs** 3.1 Graphs: Definitions, basic properties, examples, special graphs, directed and undirected graphs, concept of degree 3.2 Trails, Paths and Circuits: connectedness 3.3 Euler circuits, Hamiltonian circuits 3.4 Matrix representation of graphs 3.5 Isomorphism of graphs, isomorphic invariants, graph isomorphism for simple graphs	07
Module - 4:	**Trees** 4.1 Definitions and examples of trees, rooted trees, binary trees and their properties, spanning trees	08

	4.2 Minimal spanning trees, Kruskal's algorithm 4.3 Prim's algorithm 4.4 Dijkstra's shortest path algorithm	

Reference Books: -

1. A. B. P. Rao and R. V. Inamdar, A Graduate Text in Computer Mathematics, SUMS [1991]
2. J. P. Tremblay and R. Manohar, Discrete Mathematical Structure with Applications, McGraw– Hill.
3. Kenneth H. Rosen, Discrete Mathematics and its Applications, McGraw Hill, 2002
4. Kolman, Busby Ross, Discrete Mathematical Structures, Prentice Hall International
5. R M Somasundaram, Discrete Mathematical Structures, (PHI) EEE Edition 7
6. Seymour Lipschutz and Marc Lipson, Discrete Mathematics, Schaum‟s Outlines Series, Tata McGraw – Hill
7. Susanna S. Epp, Discrete Mathematics with Applications, PWS Publishing Company, 1995. (Brooks/Cole, Cengage learning, 2011)

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• CCE - I: 10 Marks: Assignment/Class Tests, • CCE - II: 10 Marks: Case study/ Seminar/ Field Work • CCE – III: 10 Marks: Multiple Choice questions (The Best of two will be considered for the final mark entry)	• Q.1) Solve the following questions. [5X2=10] • Q.2) Attempt any two questions. [2X10=20] • Q.3) Attempt any four questions. [4X5=20] Note: Conversion of 50 marks of ESE evaluation to 30 marks.

- **Note:** For Theory course students have to choose one course from BMT 364 or BMT 365.

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - VI
Type: DSC Practical	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMP 366 Practical Based on BMT 361, BMT 362 & BMT 363

Practical Batch: 12 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. examine core topological properties of metric spaces, including convergence and continuity.
2. apply linear algebra techniques to determine vector dependence, rank, nullity, and orthogonal bases.
3. analyze complex-valued functions regarding differentiability, analyticity, and isolated singularities.
4. solve advanced mathematical problems using matrix spectral methods and complex contour integration.

Course Outcomes: By the end of the course, students will be able to……

1. determine the topological characteristics of sets and functions within metric spaces.
2. analyze vector spaces to compute eigenvalues, rank, nullity, and construct orthogonal bases.
3. evaluate complex integrals by classifying singularities and applying Cauchy's theorems.
4. construct analytic complex functions based on underlying differentiability and continuity conditions.

Practical No.	Content	Hrs
1.	Convergence and Cauchy sequences in $\mathbb{R}$ with standard metric.	60
2.	Continuity of functions in metric spaces.	
3.	Limit points, closures, and interiors.	
4.	Boundedness and total boundedness.	
5.	Uniform continuity of given functions.	
6.	Linear dependence and independence	
7.	Linear span of a set of vectors	
8.	Rank and Nullity Calculation using Sylvester's Law.	
9.	Gram-Schmidt orthogonalization process	
10.	Eigenvalues and eigenvectors of matrices	
11.	Differentiability and continuity of complex valued function.	
12.	Construction of Analytic function	
13.	Applications of Cauchy's Integral Formula.	
14.	Singularities of complex functions.	
15.	Calculation of residues at poles of complex functions	

Reference Books: -

1. J. N. Sharma, Mathematical Analysis-I, Krishna Prakashan Mandir, Meerut. (2014).
2. R. R. Goldberg, Methods of Real Analysis, Oxford and IBH Publishing House. (2017).
3. S. C. Malik, Savita Arrora, Mathematical Analysis, New age international ltd (2005).
4. David Lay, Steven Lay, Judi McDonald, Linear Algebra and its Applications, Pearson Education Asia, Indian Reprint, 2016, 5th Edition

5. H. Anton & C. Rorres, Elementary Linear Algebra (with Supplemental Applications), Wiley India Pvt. Ltd (Wiley Student Edition), New Delhi, 2016, 11th Edition
6. Hoffman K. and Kunze R, Linear Algebra, Prentice Hall of India, 1978.
7. James Ward Brown and Ruel V. Churchill, Complex Variables and Applications, 8th Ed., McGraw – Hill Education (India) Edition, 2014. Eleventh reprint 2018.
8. Lars V Ahlfors, Complex Analysis, McGraw-Hill Education; 3 edition (January 1, 1979).
9. S. Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, Second Edition, 2005, Ninth reprint 2013.

Evaluation Pattern: (60:40)	
Total Marks: 50	
End Semester Examination:	
Internal Evaluation (20 Marks): • Journal: 10 Marks • Viva: 05 Marks • Student Performance: 05 Marks	**End Semester Examination (30 Marks):** • Q.1) Answer the following questions. (Any Two) [2 X 10 = 20] • Q.2) Answer the following questions. (Any Two) [2 X 05 = 10]

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(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - VI
Type: DSE Practical	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMP 367 Practical Based on BMT 364 (E – I)

Practical Batch: 12 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. apply numerical techniques to solve nonlinear equations.
2. solve systems of linear equations using direct and iterative methods.
3. estimate unknown data values using numerical interpolation.
4. compute integrals and solve ordinary differential equations numerically.

Course Outcomes: By the end of the course, students will be able to……

1. solve nonlinear equations using Bisection, Secant, and Newton's methods.
2. implement Gauss elimination and iterative methods to solve linear systems.
3. apply Newton, Lagrange, and divided difference interpolation to estimate function values.
4. evaluate integrals and solve differential equations using Simpson's rules and Runge-Kutta methods.

Practical No.	Content	Hrs
1.	Newton's Forward and Backward Table Formulation	60
2.	Newton's Forward Interpolation	
3.	Newton's Backward Interpolation	
4.	Lagrangian Interpolation	
5.	Divided Difference Table Formulation	
6.	Divided Difference Interpolation	
7.	Newton's Divided Difference Interpolation	
8.	Numerical Differentiation Using Interpolating Polynomials	
9.	Newton-Cotes formula	
10.	Trapezoidal rule	
11.	Simpson's $(1/3)^{rd}$ rule	
12.	Simpson's $(3/8)^{th}$ rule	
13.	Euler's Method	
14.	Second order Runge-Kutta method	
15.	Fourth order Runge-Kutta method	

Reference Books: -

1. Burden, Richard L., & Faires, J. Douglas Numerical Analysis Cengage Learning, 2010 (9th Edition)
2. Chapra, Steven C., & Canale, Raymond P. Numerical Methods for Engineers McGraw-Hill Education, 2015 (7th Edition)
3. Grewal, B. S. Numerical Methods in Engineering and Science Khanna Publishers, 2014 (9th Edition)
4. Jain, M. K., Iyengar, S. R. K., & Jain, R. K. Numerical Methods for Scientific and Engineering Computation New Age International Publishers, 2012 (6th Edition)

5. Sastry, S. S. Introductory Methods of Numerical Analysis PHI Learning Pvt. Ltd., 2012 (5th Edition).	
Evaluation Pattern: (60:40)	
Total Marks: 50	
End Semester Examination:	
Internal Evaluation (20 Marks): • Journal: 10 Marks • Viva: 05 Marks • Student Performance: 05 Marks	**End Semester Examination (30 Marks):** • Q.1) Answer the following questions. (Any Two) [2 X 10 = 20] • Q.2) Answer the following questions. (Any Two) [2 X 05 = 10]

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - VI
Type: DSE Practical	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMP 367 Practical Based on BMT 365 (E – II)

Practical Batch: 12 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. explain propositional logic, equivalences, and argument validity using inference rules.
2. perform number system conversions and analyze basic graph structures.
3. construct matrix representations of graphs to explore structural properties.
4. apply standard graph algorithms (Kruskal's, Prim's, Dijkstra's) to solve network problems.

Course Outcomes: By the end of the course, students will be able to……

1. analyze logical propositions to test equivalence and validate arguments.
2. apply number system conversions effectively within computational contexts.
3. evaluate graph properties and matrices to find minimal spanning trees.
4. solve shortest-path and network optimization problems using appropriate algorithms.

Practical No.	Content	Hrs
1.	Logical equivalence	30
2.	Tautologies and Contradictions	
3.	Valid and Invalid Arguments	
4.	Rules of inferences	
5.	Number systems and their conversions	
6.	Addition and subtraction of Binary Numbers	
7.	Degree of vertices and Verification of Hand-Shaking Lemma	
8.	Graph Isomorphism	
9.	Matrix representation of graph: Adjacency and Incidence Matrix	
10.	Euler Path and Circuit	
11.	Minimal Spanning trees	
12.	Kruskal's Algorithm	
13.	Prims' Algorithm	
14.	Dijkstra's shortest path algorithm	
15.	Case Study on Real-Life Applications of Graph Theory	

Reference Books: -

1. C. L. Liu and D. P. Mohapatra, Elements of Discrete Mathematics, McGraw-Hill Education, 4th Edition, 2012.
2. J. P. Tremblay & R. Manohar, Discrete Mathematical Structures, Tata McGraw-Hill, Revised Edition, 2000.
3. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill Education, 7th Edition, 2011.

<table>
<tr><td colspan="2">4. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, Pearson, 2014 (5th Edition).
5. Richard Johnsonbaugh, Discrete Mathematics, Pearson, 2026 (8th Edition, current Pearson publication).</td></tr>
<tr><td colspan="2">Evaluation Pattern: (60:40)</td></tr>
<tr><td colspan="2">Total Marks: 50</td></tr>
<tr><td colspan="2">End Semester Examination:</td></tr>
<tr><td>Internal Evaluation (20 Marks):
• Journal: 10 Marks
• Viva: 05 Marks
• Student Performance: 05 Marks</td><td>End Semester Examination (30 Marks):
• Q.1) Answer the following questions. (Any Two) [2 X 10 = 20]
• Q.2) Answer the following questions. (Any Two) [2 X 05 = 10]</td></tr>
</table>

- **Note:** The DSE Practical BMP 367 will be aligned with the elective theory course chosen by the students.

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Faculty of Science and Technology

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Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - VI
Type: VSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMPVSC IV Linear Algebra with MATLAB

Practical Batch: 12 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. understand and implement core concepts of linear algebra using MATLAB.
2. solve systems of linear equations using various numerical methods.
3. apply matrix operations, eigenvalue problems, and vector space concepts in MATLAB.
4. develop skills for modeling and solving real-world problems involving linear algebra.

Course Outcomes: By the end of the course, students will be able to……

1. perform fundamental matrix operations and vector manipulations in MATLAB.
2. solve systems of equations using direct and iterative methods.
3. analyze matrix properties such as rank, determinant, and eigen structure.
4. apply linear algebra concepts in engineering, physics, and computer science applications.

Practical No.	Content	Hrs
1.	Introduction to MATLAB environment for linear algebra.	60
2.	Matrix operations: Addition, multiplication, transpose, inverse, rank.	
3.	Solving systems of linear equations using matrix inverse and rref.	
4.	LU Decomposition and its use in solving linear systems.	
5.	Gauss Elimination and Gauss-Jordan methods.	
6.	Determinant and trace of matrices.	
7.	Vector spaces: Linear dependence, span, and basis.	
8.	Eigenvalues and eigenvectors using MATLAB.	
9.	Diagonalization and similarity transformations.	
10.	Gram-Schmidt orthogonalization process.	
11.	QR Decomposition and least squares solutions.	
12.	Applications in computer graphics and transformations.	
13.	Markov chains and transition matrices.	
14.	Image processing using matrix representation in MATLAB.	
15.	Mini project: Real-world application using linear algebra and MATLAB.	

Reference Books: -

1. Butcher, John C. 2008. Numerical Methods for Ordinary Differential Equations. 2nd ed. Hoboken, NJ: Wiley.
2. Lay, David C., Steven R. Lay, and Judi J. McDonald. 2021. Linear Algebra and Its Applications. 6th ed. Boston: Pearson.
3. Leon, Steven J. 2015. Linear Algebra with Applications. 9th ed. Boston: Pearson.
4. Meyer, Carl D. 2000. Matrix Analysis and Applied Linear Algebra. Philadelphia: SIAM.

5. Moler, Cleve. 2010. Numerical Computing with MATLAB. Philadelphia: SIAM.
6. Strang, Gilbert. 2016. Introduction to Linear Algebra. 5th ed. Wellesley, MA: Wellesley-Cambridge Press.
7. The MathWorks, Inc. 2023. MATLAB Documentation – Linear Algebra. Natick, MA: The MathWorks, Inc.
8. Official documentation for matrix operations, decompositions, and applications in MATLAB. Available at: https://www.mathworks.com/help/matlab/linear-algebra.html

Evaluation Pattern: (60:40)

Total Marks: 50

End Semester Examination:

Internal Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• Journal: 10 Marks • Viva: 05 Marks • Student Performance: 05 Marks	• Q.1) Answer the following questions. (Any Two) [2 X 10 = 20] • Q.2) Answer the following questions. (Any Two) [2 X 05 = 10]

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Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - VI
Type: SEC	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMPSEC III Latex Software

Practical Batch: 12 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. get working knowledge of Latex typesetting language.
2. study the use of latex file to define document class and layout options.
3. write documents containing mathematical formulas.
4. prepare presentation using Latex.

Course Outcomes: By the end of the course, students will be able to……

1. use typesetting in Latex for finding and fixing the errors.
2. develop latex codes for writing equations, matrices and including images.
3. include images using graphic package and give captions.
4. make interactive presentations using Beamer.

Practical No.	Content	Hrs
1.	Introduction and Installation of Latex	60
2.	Latex Console and Basic Commands	
3.	Page Layout and Building a Latex document	
4.	Previewing first.tex and Addition of some text in the.tex file	
5.	Finding the error and fixing it	
6.	Type setting of mathematics and Writing equations	
7.	Typesetting of Textbook and Research Paper using Latex	
8.	Typesetting with a new chapter heading	
9.	Include images using graphic package(plots) and A caption for the plot	
10.	A centered graph with a caption and Two figures next to each other	
11.	Formation of table	
12.	Cross references	
13.	Citation and Bibliography	
14.	Introduction to Beamer and Beamer Console	
15.	Interactive Presentations using Beamer	

Reference Books: -

1. E. Krishnan, Latex Tutorials: A Primer, Indian TEX users group, Trivandrum, India, 2003.
2. Latex for Beginners, Workbook, 2014.
3. A. Diller, LaTeX: Line by Line: Tips and Techniques for Document Processing, Wiley publication, second Edition, ISBN No. 978-0-471-97918-0, 1999.
4. T. Oetiker, I. Hyna, E. Schlegl, Introduction to Latex, 2023.

<table>
<tr><td colspan="2">5. Patrick Daly, Natural Sciences Citations and References, 2006.
6. Michael Doenes. Short Math Guide for Latex, 2002.</td></tr>
<tr><td colspan="2">Evaluation Pattern: (60:40)</td></tr>
<tr><td colspan="2">Total Marks: 50</td></tr>
<tr><td colspan="2">End Semester Examination:</td></tr>
<tr><td>Internal Evaluation (20 Marks):
• Journal: 10 Marks
• Viva: 05 Marks
• Student Performance: 05 Marks</td><td>End Semester Examination (30 Marks):
• Q.1) Answer the following questions. (Any Two) [2 X 10 = 20]
• Q.2) Answer the following questions. (Any Two) [2 X 05 = 10]</td></tr>
</table>

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Board of Studies in Mathematics

Programme: B. Sc.	**Semester** - VI
Type: FP	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course and Code: BMPFP I Field Project

Practical Batch: 12 Students / Batch

Course Objectives: By the end of the course, students should be able to……

1. translate real-world observations into structured mathematical frameworks.
2. apply quantitative modeling and data collection in practical settings.
3. analyze field data using mathematical tools to uncover patterns.
4. create evidence-based reports that evaluate practical mathematical solutions.

Course Outcomes: By the end of the course, students will be able to……

1. apply mathematical concepts to investigate real-world problems.
2. analyze field data using statistical models to identify key trends.
3. evaluate mathematical findings to assess their real-world impact.
4. design and defend comprehensive project reports with actionable recommendations.

Credits = 2	**Content**	**Hrs.**
2	Field Project (FP) is an experiential learning component designed to connect theoretical knowledge of mathematics and statistics with real-world applications. In this activity, students are required to work individually or in groups to collect data from real-life situations such as local markets, educational institutions, environmental studies, or social and economic surveys. The collected data is then organized, analyzed, and interpreted using appropriate mathematical and statistical tools such as averages, dispersion measures, correlation, regression, interpolation, and graphical representation. The main purpose of FP is to develop students' analytical thinking, data handling skills, and problem-solving ability while also enhancing their understanding of practical applications of mathematics. It also promotes teamwork, research attitude, communication skills, and scientific report writing. Ultimately, FP helps students bridge the gap between classroom learning and practical implementation, preparing them for higher studies, research, and industry-oriented careers. Students will undergo 2 credit work-based learning/FP.	60

Evaluation Pattern: (60:40)

Total Marks: 50

End Semester Examination:

Internal Evaluation (20 Marks):	**End Semester Examination (30 Marks):**
• Demonstration: 10 Marks • Attendance: 10 Marks	• Viva: 10 Marks • Final Report: 20 Marks