KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ

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ಸಂ. KU/Aca(S&T)/OS-Gen/2026-27/ 1208 ದಿನಾಂಕ: 1 AUG 2026

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2026-27ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಸ್ನಾತಕ ಪದವಿ-1, 2ನೇ ಹಾಗೂ 5, 6ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಿಗೆ ಪಠ್ಯಕ್ರಮ ಅಳವಡಿಸಿರುವ ಕುರಿತು.

ಉಲ್ಲೇಖ:೧. ಎಲ್ಲ ನಿಕಾಯಗಳ ಸಭೆ ಜರುಗಿದ ದಿನಾಂಕ: 23 / 24 / 25.07.2026.
೨. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಅನುಮೋದನೆ ದಿನಾಂಕ: 30-07-2026.

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳಿಗೆ ಸಂಬಂಧಿಸಿದಂತೆ, ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಅನುಮೋದನೆ ಮೇರೆಗೆ, ಸನ್ 2026-27ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಸ್ನಾತಕ ಪದವಿಗಳಾದ BA / B.Com / B.Sc / BCA / BBA ಮತ್ತು ಇನ್ನಿತರ ವೃತ್ತಿಯೇತರ / ವೃತ್ತಿಪರ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್ ಹಾಗೂ 2026-27ನೇ ಸಾಲಿಗೆ 5 ಮತ್ತು 6ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಿಗೆ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸುವ ಕುರಿತು ಮುಂಬರುವ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಸ್ಥಿರೀಕರಣಕ್ಕೊಳಪಟ್ಟು (Pending approval of Academic Council) ಅಧಿಸೂಚನೆ ಪ್ರಕಟಿಸಿದೆ. ಅದರಂತೆ, ಪಠ್ಯಕ್ರಮವನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಬಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮವನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯ ಪ್ರವೃತ್ತರಾಗಲು ಸೂಚಿಸಲಾಗಿದೆ.

N. Ramu
ಕುಲಸಚಿವರು 31/7/26

ಅಡಕ: ಮೇಲಿನಂತೆ

ಗೆ,
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:
1. ನೋಡಲ್ ಅಧಿಕಾರಿಗಳು, UUCMS ಘಟಕ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ನಿರ್ದೇಶಕರು, ಐ.ಟಿ. ಶಾಖೆ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
6. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬAಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

KARNATAK UNIVERSITY, DHARWAD

Programme: B.Sc.

Course: MATHEMATICS

SYLLABUS FOR V & VI SEMESTER

(DSC, DSE, and SEC)

UNDER

Revised National Education Policy (R-NEP) 2024

Effect from 2026-27 onwards

KARNATAK UNIVERSITY, DHARWAD

Programme: B.Sc.

Course: MATHEMATICS

Effect from 2026-27 onwards

Semester	Type of Course	Theory /Practical	Course Code	Course Title	Instruction hours/week	Total hours of syllabus/Sem	Duration of Sem End Exam	Marks			Credits
								Formative Assessment	Summative Assessment	Total	
*V	**DSC – 5 (T5)**	**Theory**	**C5 MAT1T1**	Real Analysis – II	04	60	03	20	80	100	**03**
	DSC – 5 (P5)	**Practical**	**C5 MAT1P1**	Practical on Real Analysis – II	04	56	03	10	40	50	**02**
	DSE – 1 (T6) or DSE – 2 (T7)	**Theory**	**C5 MAT2T1 or C5 MAT2T2**	Algebra-III and Special Functions or Linear Algebra and Analytical Geometry	04	60	03	20	80	100	**03**
*VI	**DSC – 6 (T8)**	**Theory**	**C6 MAT1T1**	Numerical Analysis	04	60	03	20	80	100	**03**
	DSC – 6 (P6)	**Practical**	**C6 MAT1P1**	Practical on Numerical Analysis	04	56	03	10	40	50	**02**
	DSE – 3 (T9) or DSE – 4 (T10)	**Theory**	**C6 MAT2T1 or C6 MAT2T2**	Complex Analysis and Topology or Mechanics and Mathematical Modelling	04	60	03	20	80	100	**03**
**IV/ V/VI	**SEC**	**Practical**	**C0 MAT6 P1**	Programming with GNU Octave	04	56	03	10	40	50	**02**
***VI	**DSE-5 (PR) or DSE-6 (IN)**	**Practical**	**C6 MAT7PR or C6 MAT7IN**	Project Work / Internship	04	56	03	10	40	50	**02**

*Student shall study T5 & P5 compulsory and either T6 or T7 in 5th semester. Similarly, T8 & P6 compulsory and either T9 or T10 in 6th semester.

** Student shall study this Skill Enhancement Course (SEC) either in 4th / 5th / 6th but not in all the semesters.

*** Student shall opt Project Work/ Internship in any one of the major courses.

B.Sc. Semester – V

Subject: MATHEMATICS

Discipline Specific Core Course (DSC)

Course Title: Real Analysis – II

Course Code: C5MAT1T1 (Theory)

Compulsory Theory paper

Type of Course	Theory /Practical	credits	Instruction hours per week	Total No. of Lectures / Hours per Semester	Duration of Sem End Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
DSC – 5 (T5)	Theory	03	04	60 Hrs.	03 Hrs.	20	80	100

Course Outcomes (COs): After completion of the course (Theory), students will be able to:

CO1: Understand the concepts of Riemann integration and integrability.

CO2: Apply techniques of definite integration to solve problems.

CO3: Analyze and evaluate improper integrals using convergence tests.

CO4: Analyze Beta and Gamma functions, their properties, relations, and applications.

Unit	Title: Real Analysis – II	60 Hours / Sem
Unit - I	**Riemann Integration-I:**	15 Hrs.
	Definition and examples for partition of an interval, Refinement of a partition and common refinement, Upper and lower Darboux sums, Upper and lower integrals, Riemann integral, Criterion for integrability, Integrability of sum, difference, product, quotient and modulus of integrable functions. Integral as a limit of sum (Riemann sum) – Problems.	
Unit – II	**Riemann Integration-II**	15 Hrs.
	Integrability of continuous functions, Monotonic functions, Bounded functions with finite number of discontinuity, Fundamental theorem of Calculus – related problems, Change of variables, Integration by parts, First and second mean value theorems of integral calculus.	
Unit – III	**Improper Integrals:**	15 Hrs.

	Improper integrals of the first, second and third kind with examples, Improper integral as the limit of proper integral, Comparison test Abel's test and Dirichlet's test for the convergence of the integral of a product of two functions.	
Unit - IV	**Beta-Gamma Functions**:	15 Hrs.
	Definitions, Properties and examples, Relations between Beta and Gamma functions, Standard theorems, Duplication formula and related problems.	

Recommended Books:

1. Principles of Real Analysis, S. C. Malik, New Age International Publishers, 2021.
2. Mathematical Analysis, S. C. Malik and Savita Arora, New Age International (P) Ltd., 2021.
3. Real Analysis, N. P. Bali (Golden Maths Series), New Age International Publishers, 2023.
4. Integral Calculus, Shanti Narayan and P. K. Mittal, S. Chand Publications, 2005.
5. Integral Calculus, A. R. Vasishtha, R. Dangwal and R. Sharma, Krishna Prakashan, 2020.
6. A Course in B.Sc. Mathematics-V, S. S. Bhoosnurmath, C. S. Salimath and V. S. Shetiya (EBPB), 2018.

Formative Assessment for Theory	
Assessment Occasion / Type	**Marks**
Internal Assessment Test-1	05
Internal Assessment Test-2	05
Assignment	10
Total	**20Marks**
Formative Assessment as per guidelines	

B.Sc. Semester – V

Subject: MATHEMATICS

Discipline Specific Core Course (DSC)

Course Title: Practical on Real Analysis – II

Course Code: C5MAT1P1 (Practical)

Compulsory Practical

Type of Course	Theory /Practical	Credits	Instruction hours per week	Total No. of Lectures / Hours per Semester	Duration of Sem End Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
DSC – 5 (P5)	Practical	02	04	56 Hrs.	03 Hrs.	10	40	50

Course Outcomes (COs): After completion of course (Practical), students will be able to:

CO1: Learn **Python (FOSS)** for mathematical computing.

CO2: Apply Python to compute Riemann sums and test Riemann integrability.

CO3: Use Python to evaluate definite and improper integrals and verify their convergence.

CO4: Compute and verify Beta and Gamma functions using Python.

List of Experiments

[Each will have 4 Hrs. / Week (Minimum 12 experiments)]

1. Program to find upper and lower Riemann sums with respect to a given partition
2. Program to test Riemann Integrability.
3. Program to evaluate Riemann integral as a limit of sum.
4. Program to verify the First Mean Value Theorem of Integral Calculus.
5. Program to verify the Second Mean Value Theorem of Integral Calculus.
6. Program to verify the Fundamental Theorem of Calculus with suitable examples.
7. Program to verify the convergence of an improper integral of first kind.
8. Program to verify the convergence of an improper integral of second kind.
9. Program to illustrate Dirichlet's test and Abel's Test with suitable example.
10. Program to evaluate Beta and Gamma functions for different values.
11. Program to verify the Beta–Gamma relation with suitable examples.
12. Program to verify the recurrence relation and duplication formula of the Gamma function with suitable examples.

Recommended Books:

1. Automate the Boring Stuff with Python, A. Sweigart, No Starch Press, 2019.
2. Python Cookbook, D. Beazley and B. K. Jones, Shroff O'Reilly, 2013.
3. Basic Python Programming for Beginners, K. V. Rajkumar, M. Krishna, and J. Prakash, Bluerose Publishers Pvt. Ltd., 2021.
4. Python, J. Shovic and A. Simpson, For Dummies, 2024.
5. Learning Python, M. Lutz, Shroff O'Reilly, 2017.
6. Mathematical Analysis, S. C. Malik and Savita Arora, New Age International (P) Ltd., 2021.
7. Real Analysis, N. P. Bali (Golden Maths Series), New Age International Publishers, 2023.
8. Integral Calculus, Shanti Narayan and P. K. Mittal, S. Chand Publications, 2005.

General Instructions

Software to be used: PYTHON

Scheme of Practical Examination (Distribution of Marks)

Formative Assessment for Practical	
Assessment Occasion /Type	**Marks**
Program writing and problem solving (1 Program)	03
Program Execution	03
Viva	02
Journal	02
Total	**10 Marks**
Formative Assessment as per guidelines.	

Summative Assessment for Practical	
Assessment Occasion /Type	**Marks**
Program writing and problem solving (2 Programs)	(5+5)*2 = 20
Program Execution (Any 1 Program)	10
Viva	05
Journal	05
Total	**40 Marks**
Summative Assessment as per guidelines.	

B.Sc. Semester – V
Subject: MATHEMATICS
Discipline Specific Core Elective (DSE)
Course Title: Algebra-III and Special Functions
Course Code: C5MAT2T1 (Theory)

SPECIALIZATION – I

(Student shall select DSE –1 (T6) or DSE-2 (T7) for 03 credits only)

Type of Course	Theory /Practical	Credits	Instruction hours per week	Total No. of Lectures / Hours per Semester	Duration of Sem End Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
DSE – 1 (T6)	**Theory**	**03**	**04**	**60Hrs.**	**03 Hrs.**	**20**	**80**	**100**

Course Outcomes (COs): At the end of the course, students will be able to:

CO 1: Understand the concepts of Rings, Integral Domains, Fields
CO 2: Become familiar with the concepts of principal, prime and maximal ideals
CO 3: Apply the properties of polynomial rings, divisibility, and irreducibility of polynomials.
CO 4: Solve differential equations using Power series and Frobenius methods.
CO 5: Analyze Bessel functions, their recurrence relations, and generating functions.
CO 6: Apply the properties, recurrence relations, generating functions, and orthogonality of Legendre polynomials in solving mathematical problems.

Unit	Title: Algebra-III	60 Hours / Sem
Unit – I	**Rings-I, Integral Domains, Fields**	15 Hrs.
	Definition, examples. Abelian Ring. Ring with unity and without unity. Finite and infinite rings (Only definitions).Units in a ring. Zero divisors in a ring. Ring without zero divisor. Properties of ring. Division ring. Integral domain and field definitions. Theorems (i) A finite integral domain is a field (ii) Every field is an integral domain	
	Rings-II, Ideals	15 Hrs
	Subrings, Polynomial rings, Divisibility, Irreducible polynomials, Eisenstein Criterion of Irreducibility, Ideals: Definition, theorems, examples. Maximal Ideal, Prime Ideal.	.
Unit – III	**Bessel's Functions:**	15 Hrs
	Solution to differential equation - Ordinary, singular and regular points of second order linear differential equation, Power series solution when x=0 is an ordinary point, Frobenius method. Bessel's differential equation - Definition and discussion of its solutions; Bessel's function $J_n(x)$ - Definition, various recurrence relations for Bessel function (derivation),	.

	Generating function for $J_n(x)$ (derivation), value of $J_{1/2}(x)$ and expansions for J_0 and J_1 and related problems.	
Unit – IV	**Legendre's Functions:**	15 Hrs
	Legendre function- Discussion of solutions to Legendre's differential equation and Legendre polynomials $P_n(x)$ and $Q_n(x)$, Generating function for $P_n(x)$ (derivation), Rodrigue's formula, Various recurrence relations (derivations), Orthogonality of Legendre Polynomials.	.

Reference Books:

1. Topics in Algebra : I. N. Herstein, Wiley, 2006.
2. A First course in Abstract Algebra :Fraleigh J.B, Pearson, 2013.
3. Elements of Modern Algebra and Topology : Sampathkumar & K. S.Amur.
4. Modern Algebra : P.N Chatterjee, Anu Books, 2019.
5. Introduction to Mathematical Analysis: Shanti Narayan (S.Chand& Co.)
6. A Course in Abstract Algebra : Vijay K Khanna and Bambari, Vikash Publisher, 2017.
7. Modern Algebra : M. L Khanna, Jai Prakash Nath and Co., 2012.
8. A Course in B.Sc. Mathematics : Bhoosnurmath, C S Salimath & V S Shetiya
9. College Mathematics for B.Sc.: N. Rudraiah
10. A Text Book of B.Sc. Mathematics : G K Ranganath
11. Special Functions: G. E. Andrews, R. Askey and R. Roy, Cambridge University Press
12. Vistas of special functions: S. Kanemitsu and H. Tsukada, World Scientific 2010
13. Thomas Calculus: G. B. Thomas, Pearson publication,13th Edition, 2014
14. Higher Engineering Mathematics: B. S. Grewal, Khanna Publications,
15. Mathematical Methods for Physics and Engineering,: K. F. Riley, M. P. Hobson and S. J. Bence, Third Edition, Cambridge University Press, 3rd Edition 2006.

Formative Assessment for Theory	
Assessment Occasion / Type	**Marks**
Internal Assessment Test-1	05
Internal Assessment Test-2	05
Assignment	10
Total	**20Marks**
Formative Assessment as per guidelines	

B.Sc. Semester – V

Subject: MATHEMATICS

Discipline Specific Core Elective (DSE)

Course Title: Linear Algebra and Analytical Geometry

Course Code:C5MAT2T2 (Theory)

SPECIALIZATION – II

(Student shall select DSE – 1 (T6) or DSE – 2 (T7) for 03 credits only)

Type of Course	Theory /Practical	Credits	Instruction hours per week	Total No. of Lectures / Hours per Semester	Duration of Sem End Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
DSE – 2 (T7)	**Theory**	**03**	**04**	**60 Hrs.**	**03 Hrs.**	**20**	**80**	**100**

Course Outcomes (COs): After completion of the course (Theory), students will be able to:

CO1: Understand vector spaces, subspaces, and linear independence.
CO2: Apply linear transformations, matrices, and eigenvalues techniques.
CO3: Analyze the properties and equations of spheres.
CO4: Solve problems involving cones and cylinders.

Unit	Linear Algebra and Analytical Geometry	60 Hours / Sem
Unit-I	**Vector Space:**	15 Hrs.
	Introduction to Rings, Fields and Vector space with examples, properties, Vector, Subspace. Linear independence and dependence of vectors. Linear span of a set. Base for vector space and dimension.	
Unit-II	**Linear transformation:**	15 Hrs.
	Definition and examples, properties, range, null space, rank and nullity theorem, Linear maps as matrices-change of basic and effect of associated matrices, eigenvalues and eigenvectors of a linear transformation**.**	
Unit-III	**Sphere:**	15 Hrs.

	Equation of a Sphere. Equation of a sphere with two given points as the ends of diameter (Different forms), Intersection of two spheres, Section of a sphere by a plane. Equation of a Sphere through a circle. Tangent planes. Orthogonal spheres.	
Unit-IV	**Cone and Cylinder:**	15 Hrs.
	Equation of a cone, Quadric cone. Enveloping cone of a sphere, Right circular cone, Equation of a cylinder, Enveloping cylinder of a sphere, and Right circular cylinder.	

Recommended Books:

1. Elements of Analytical Solid Geometry, Shanti Narayan and P. K. Mittal, S. Chand & Co., 2007.
2. Analytical Geometry, A. R. Vasishtha and D. C. Agarwal, Krishna Prakashan Media, 2014.
3. Analytical Solid Geometry, B. P. Singh, Venus Books, 2015.
4. Mathematical Analysis: Shanti Narayan , 2013
5. College Mathematics for B.Sc, N Rudraiah and others.
6. First course in Real Analysis, M.K. Singhal and Asha Rani. 2003
7. Modern Algebra: M.L. Khanna, Jai Prakash Nath & Co. 2012
8. A Course in Abstract Algebra: Vijay K Khanna and S K Bhambri, Pearson 2013
9. Elements of Modern Algebra and Topology, Sampathkumar & K. S. Amur, 1994

Formative Assessment for Theory	
Assessment Occasion / Type	**Marks**
Internal Assessment Test-1	05
Internal Assessment Test-2	05
Assignment	10
Total	**20Marks**
Formative Assessment as per guidelines	

B.Sc. Semester – VI

Subject: MATHEMATICS

Discipline Specific Core Course (DSC)

Course Title: Numerical Analysis

Course Code: C6MAT1T1 (Theory)

Compulsory Theory paper

Type of Course	Theory /Practical	Credits	Instruction hours per week	Total No. of Lectures / Hours per Semester	Duration of Sem End Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
DSC – 6 (T8)	Theory	03	04	60 Hrs.	03 Hrs.	20	80	100

Course Outcomes (COs): After completion of the course (Theory), students will be able to:

CO 1: Understand the concept of errors.

CO 2: Find roots of equations using various iterative methods.

CO 3: Analyse system of linear equations using direct and iterative methods.

CO 4: Describe various operators such as difference operators, shift operators and so on.

CO 5: Apply numerical techniques in other areas of mathematics.

CO 6: Understand the application of finite differences in finding derivatives.

CO 7: Find the value of definite integrals using numerical methods.

Unit	Title: Numerical Analysis	60 Hours / Sem
Unit - I	**Algebraic and Transcendental Equations:**	15 Hrs.
	Errors: Significant digits, Absolute, Relative, Percentage errors, Rounding off and Truncation errors, Solutions of algebraic and transcendental equations: Bisection method, Regula-falsi method, Secant method, Newton-Raphson method and Fixed-point iterative method.	
Unit - II	**System of Linear Algebraic Equations:**	15 Hrs.

	Direct Methods: Gauss elimination method, Gauss-Jordan method and Triangularization method. Iterative methods: Gauss-Jacobi method, Gauss-Seidel method, Successive – Over Relaxation (SOR) method.	
Unit – III	**Finite Differences:**	**15 Hrs.**
	Finite differences, Forward, Backward and Shift Operators: Definitions, Properties and Problems; Polynomial Interpolation: Newton – Gregory forward and backward interpolation formulas, Lagrange's interpolation formula and problems.	
Unit - IV	**Numerical Differentiation and Integration:**	**15 Hrs.**
	Formula for derivatives (first and second order) based on Newton-Gregory forward and backward interpolations, General quadrature formula, Trapezoidal rule, Simpson's $(1/3)^{rd}$ rule, Simpson's $(3/8)^{th}$ rule (derivations), Weddle's rule (Statement only) and problems.	

Recommended Books:

1. Analysis of Numerical Methods, E.Isaacson and H.B.Keller,Dover Publications, 2012.
2. Introductory Methods of Numerical Analysis, S.S.Sastry, PHI Learning Pvt.Ltd., 2012.
3. Advanced Engineering Mathematics, E. Kreyszig,Wiley, 2006.
4. Numerical Methods for Scientists and Engineers, K. Sankara Rao, PHI Learning, 2018.
5. Numerical Methods for Scientists and Engineers, R. W. Hamming, Dover Publications, 1987.
6. Numerical Methods for Scientists and Engineers, J. D. Hoffman, CRC Press, 2001.
7. Numerical Methods in Engineering and Science, B.S.Grewal, Khanna Publishers, 2013.
8. Numerical Methods for Scientific and Engineering Computation, M.K.Jain, S.R.K. Iyengar and R K.Jain, New Age International Publishers, 2022.
9. Finite Differences and Numerical Analysis, H.C.Saxena, S.Chand Publication, 2010.
10. Numerical Analysis, B.D. Gupta, Konark Publishers Pvt.Ltd., 1990.
11. A Course in B.Sc. Mathematics-V, S. S. Bhoosnurmath, C.S. Salimath and V. S. Shetiya, EBPB, 2018.

Formative Assessment for Theory	
Assessment Occasion / Type	**Marks**
Internal Assessment Test-1	05
Internal Assessment Test-2	05
Assignment	10
Total	**20Marks**
Formative Assessment as per guidelines	

B.Sc. Semester – VI

Subject: MATHEMATICS

Discipline Specific Core Course (DSC)

Course Title: Practical on Numerical Analysis

Course Code:C6MAT1P1 (Practical)

Compulsory Practical

Type of Course	Theory /Practical	Credits	Instruction hours per week	Total No. of Lectures / Hours per Semester	Duration of Sem End Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
DSC – 6 (P6)	Practical	02	04	56 Hrs.	03 Hrs.	10	40	50

Course Outcomes (COs): After completion of course (Practical), students will be able to:

CO 1: Learn Free and Open Source software (FOSS) tools for computer programming.

CO 2: Solve problems on Numerical Analysis using Python language.

CO 3: Acquire knowledge of applications of numerical analysis.

CO 4: Find roots of equations using various numerical techniques.

CO 5: Solve system of equations using direct and iterative methods.

CO 6: Find the derivative and integral of a function using numerical methods.

List of Experiments

[Each will have 4 Hrs. / Week (Minimum 12 experiments)]

1. Program to find the root of an equation using Bisection and Regula-Falsi methods.
2. Program to find the root of an equation using Newton-Raphson and Secant methods.
3. Program to solve the system of algebraic equations using the Gauss-elimination method.
4. Program to solve the system of algebraic equations using the Gauss-Jordan method.
5. Program to solve the system of algebraic equations using the Gauss-Jacobi method.
6. Program to solve the system of algebraic equations using the Gauss-Seidel method.
7. Program to find the value of $y = f(x)$ for the given data using Newton–Gregory technique.
8. Program to find the polynomial equation from the given data using the Lagrange's interpolation formula for unequal intervals.
9. Program to find derivative of $y = f(x)$ at specified point using the Newton Gregory interpolation method
10. Program to evaluate integral using Trapezoidal rule.
11. Program to evaluate integral using Simpson's 1/3 rule.
12. Program to evaluate integral using Simpson's 3/8 rule.

Recommended Books:

1. Automate the Boring Stuff with Python, A. Sweigart, No Starch Press, 2019.
2. Python Cookbook, D. Beazley and B. K. Jones, Shroff O'Reilly, 2013.
3. Basic Python Programming for Beginners, K. V. Rajkumar, M. Krishna, and J. Prakash, Bluerose Publishers Pvt. Ltd., 2021.
4. Python, J. Shovic and A. Simpson, For Dummies, 2024.
5. Learning Python, M. Lutz, Shroff O'Reilly, 2017.
6. Analysis of Numerical Methods, E. Isaacs on and H.B.Keller, Dover Publications, 2012.
7. Introductory Methods of Numerical Analysis, S.S.Sastry, PHI Learning Pvt. Ltd., 2012.
8. Advanced Engineering Mathematics: E. Kreyszig,Wiley, 2006.
9. Numerical Methods for Scientists and Engineers, K. Sankara Rao, PHI Learning, 2018.
10. Finite Differences and Numerical Analysis,H.C.Saxena, S.Chand Publication, 2010.

General Instructions

Software to be used: **PYTHON**

Scheme of Practical Examination (Distribution of Marks)

Formative Assessment for Practical	
Assessment Occasion /Type	**Marks**
Program writing and problem solving (1 Program)	03
Program Execution	03
Viva	02
Journal	02
Total	**10Marks**
Formative Assessment as per guidelines.	

Summative Assessment for Practical	
Assessment Occasion /Type	**Marks**
Program writing and problem solving (2 Programs)	(5+5)*2 = 20
Program Execution (Any 1 Program)	10
Viva	05
Journal	05
Total	**40Marks**
Summative Assessment as per guidelines.	

B.Sc. Semester – VI

Subject: MATHEMATICS

Discipline Specific Core Elective (DSE)

Course Title: Complex Analysis and Topology

Course Code:C6MAT2T1 (Theory)

SPECIALIZATION – I

(Student shall select DSE – 3 (T9) or DSE – 4 (T10) for 03 credits only)

Type of Course	Theory /Practical	Credits	Instruction hours per week	Total No. of Lectures / Hours per Semester	Duration of Sem End Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
DSE – 3 (T9)	Theory	03	04	60 Hrs.	03 Hrs.	20	80	100

Course Outcomes (COs): After completion of the course (Theory), students will be able to:

CO 1: Understand the complex numbers and the concepts of analytic, harmonic and integral functions

CO 2: Verify Cauchy-Riemann equations in Cartesian and polar forms.

CO 3: Construct analytic functions using Milne-Thomson's method.

CO 4: Solve complex integrals using Residue Theorem

CO 5: Learn the concepts of closure, interior and boundary of a set.

CO 6: Understand the concepts of basis and sub-basis.

CO 7: Analyse T_0, T_1 and T_2 spaces.

Unit	Title: Complex Analysis and Topology	60 Hours /Sem
Unit-I	**Complex Numbers:**	15 Hrs
	Complex numbers in polar form; De Moivre's Theorem (statement only); n^{th} roots of a complex number; expansion of $sinn\theta, cosn\theta$ and $tann\theta$ in terms of $sin\theta$, $cos\theta$, and $tan\theta$ respectively; expansion of $sin^n\theta$, $cos^n\theta$, and $sin^m\theta\, cos^n\theta$ as a series of sines or cosines of multiples of θ; logarithm of complex numbers; summation of trigonometric series in **C+iS** form.	
Unit-II	**Functions of a Complex Variable:**	15 Hrs

	Limit, continuity, and differentiability of a complex function; Analytic functions; Cauchy–Riemann equations in Cartesian and polar forms; sufficient conditions for analyticity (Cartesian form); harmonic functions; properties of analytic functions; construction of analytic functions using the Milne–Thomson method.	
Unit-III	**Complex Integration:**	15 Hrs
	Complex line integrals; Cauchy's Integral Theorem; Taylor's series; Laurent's series; Residue Theorem; contour integration and related problems.	
Unit-IV	**Topology:**	
	Definition of topological space and examples, Closure, Neighbourhood, Limit points and Derived sets, Interior, Exterior and Boundary, Bases and sub-bases, Subspaces, T_0, T_1 and T_2 spaces	15 Hrs

Recommended Books:

1. Complex Variables, J.N. Sharma, Krishna Prakashan, 2014.
2. Complex Analysis, Goyal, Gupta and Pundir, Anu Books, 2019.
3. Complex Variables, Spiegel and Others, Schaum's Outline Series, 2009.
4. Complex Analysis, L. V. Ahlfors, McGraw Hill Education, 2017.
5. Complex Analysis, S. Lang, Springer, 2003.
6. Theory of Functions of a Complex Variable, Shanthi Narayan and P. K. Mittal, S.Chand Publishers, 2005.
7. Foundations of Complex Analysis, S. Ponnusamy, Narosa Publications, 2011.
8. A Course in B.Sc. Mathematics – VI, S. S. Bhoosnurmath, C. S. Salimath and V.S. Shetiya, EBPB, 2018
9. Topology, J.R. Munkres, Pearson,2021.
10. Topology, J.N. Sharma and J.P. Chauhan, Krishna Prakashan, Meerut,2014.
11. General Topology, S. Lipschutz, Schaum's Outlines Series,1965.
12. Elements of Modern Algebra and Topology, E. Sampathkumar and K.S. Amur, Vidya Vikas Publications, 1969.
13. General Topology, S.R. Malghan, Serial Publication, 2013.

Formative Assessment for Theory	
Assessment Occasion / Type	**Marks**
Internal Assessment Test-1	05
Internal Assessment Test-2	05
Assignment	10
Total	**20Marks**
Formative Assessment as per guidelines	

B.Sc. Semester – VI

Subject: MATHEMATICS

Discipline Specific Core Elective (DSE)

Course Title: Mechanics and Mathematical Modelling

Course Code: C6MAT2T2 (Theory)

SPECIALIZATION – II

(Student shall select DSE –1 (T6) OR DSE-2 (T7) for 03 credits only)

Type of Course	Theory /Practical	Credits	Instruction hours per week	Total No. of Lectures / Hours per Semester	Duration of Sem End Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
DSE – 4 (T10)	Theory	03	04	60 Hrs.	03 Hrs.	20	80	100

Course Outcomes (COs): After completion of the course (Theory), students will be able to:

CO 1: Analyse the concepts of couple and moment of couple.

CO 2: Solve problems on Radial and Transverse velocity as well as acceleration.

CO 3: Understand the concepts of direct and oblique impacts.

CO 4: Evaluate problems related to tangential and normal components of acceleration.

CO 5: Understand the need for Mathematical Modelling.

CO 6: Model problems in Algebra, Geometry, etc.

CO 7: Prepare a variety of growth and decay models.

Unit	Title: Mechanics and Mathematical Modelling	60 Hours / Sem
Unit – I	**Statics:**	15 Hrs.
	Couples, moment of a couple, Varignon's theorem. Resultant of coplanar couples. Resultant of a force and a couple. Resultant of a system of coplanar forces acting at different points of a rigid body. Catenary and common catenary.	
Unit – II	**Dynamics – I:**	15 Hrs.

	Velocity and acceleration of a particle along a plane curve. Radial and transverse components of velocity and acceleration. Tangential and Normal components of velocity and acceleration.	
Unit – III	**Dynamics – II:**	15 Hrs.
	Motion of a projectile in a non-resisting medium under gravity. Motion of a particle under a central force. Use of polar co-ordinates and pedal coordinates. Elastic impact-Direct and oblique impact of elastic bodies.	
Unit – IV	**Mathematical Modelling:**	15 Hrs.
	Need for mathematical Modelling, Brachistochrone problem with historical developments. Techniques and classification of mathematical models. Mathematical Modelling through Geometry, Algebra (Compound Interest Model), Trigonometry and Calculus. Mathematical Modelling through differential equations of first order. Growth and Decay models (linear). Prey and predator model.	

Recommended Books:

1. Statics, B. C. Das and B. N. Mukherjee, U. N. Dhar & Sons Pvt. Ltd., 2018.
2. Statics, H. Kishan, Atlantic Publishers, 2023.
3. Engineering Mechanics Statics, J. L. Meriam, L. G. Kraige and J. N. Bolton, Wiley, 2017.
4. The Elements of Statics and Dynamics, S. L. Loney, Arihant Publication, 2023.
5. Dynamics, H. Kishan, Atlantic Publishers, 2023.
6. Engineering Dynamics, M. R. Islam, A. K. M. Mazumder and M. Ahmed, CRC Press, 2022.
7. Engineering Mechanics, I. H. Shames and G. K. Mohana Rao, Pearson, 2005.
8. A Textbook on Dynamics, M. Ray and G. C. Sharma, S. Chand & Company, 2005.
9. Mechanics, B. Singh and S. K. Pundir, Pragati Prakashan, 2020.
10. Engineering Mechanics, A. Nelson, McGraw Hill Edu., 2017.
11. Mathematical Modelling, J.N. Kapur,New Age International Publishers, 2023.
12. Mathematical Modelling Techniques, R. Aris, Dover Publications, 2003.
13. Fundamental Mathematical Modelling, S. Jana, S. Rayachaudhuri and B. Pal, Santra Publication Pvt. Ltd., 2022.

Formative Assessment for Theory	
Assessment Occasion / Type	**Marks**
Internal Assessment Test-1	05
Internal Assessment Test-2	05
Assignment	10
Total	**20Marks**
Formative Assessment as per guidelines	

B.Sc. Semesters – IV/V/VI

Subject: MATHEMATICS

SKILL ENHANCEMENT COURSE (SEC)

(Student shall study this SEC in any one of the Semesters either in IV or V or VI semester and College shall decide to allot the students)

Course Title: Programming with GNU Octave
Course Code: C0MAT6P1 (Practical)

Type of Course	Theory /Practical	Credits	Instruction hours per week	Total No. of Lectures / Hours per Semester	Duration of Sem End Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC	**Practical**	**02**	**04**	**56 Hrs.**	**03 Hrs.**	**10**	**40**	**50**

Course Outcomes (COs): After completion of course (Practical), students will be able to:

CO 1: Learn GNU Octave Software (FOSS) for computer programming.

CO 2: Solve problems on Algebra, Calculus, Differential Equations, Laplace Transforms and Fourier series by using Octave software.

CO 3: Acquire knowledge of applications of abovementioned topics through Octave.

CO 4: Find angle between radius vector and tangent using FOSS.

CO 5: Verify the exactness of a differential equation.

CO 6: Calculate double integral with constant and variable limits.

List of Experiments
[Each will have 4 Hrs. / Week (Minimum 12 experiments)]

1. Program to compute addition and subtraction of matrices
2. Program to compute rank of matrix and row reduced echelon form.
3. Program to find the angle between the radius vector and tangent.
4. Program to find the n^{th} derivative of e^{ax} and trigonometric functions.
5. Program to construct Cayley table and test abelian for given finite set.
6. Programs to verify Lagrange's theorem (groups) with suitable example.
7. Program to evaluate the double and triple integrals with constant limits.
8. Program to verify the exactness of a differential equation.
9. Program to find the Complementary Function and Particular Integral of linear differential equations with constant coefficients.
10. Program to verify D'Alembert's and Raabe's tests with suitable examples.
11. Program to find the Laplace transforms of some standard and periodic functions.
12. Program to find sine and cosine Fourier transforms.

Recommended Books:

1. Introduction to Octave, N. Sandeep, APress, 2017.
2. Scientific Computing with Matlab and Octave, A. Quarteroni, Springer, 2010.
3. Essential Matlab and Octave, J. Rogel-Salazar, CRC Press, 2018.
4. GNU Octave by Example, A. Pajankar, APress, 2020.
5. Octave and Matlab for Engineering Applications, A. Stahel, Springer, 2022.
6. Differential Calculus, Shanti Narayan and P. K. Mittal, S. Chand & Company, New Delhi, 2022.
7. Modern Algebra, S. Singh and Q. Zameeruddin, Vikas Publishing House Pvt. Ltd., 2006.
8. Ordinary Differential Equations and Partial Differential Equations, M. D. Raisinghania, S. Chand & Company, New Delhi, 2020.
9. Laplace Transforms, M. R. Spiegel (Schaum's Series), McGraw-Hill International Ed.,2005.
10. Fourier Series and Integral Transforms, S. Sreenadh& Others, S. Chand & Company, 2014.

General Instructions
Software to be used: GNU OCTAVE
Scheme of Practical Examination (Distribution of Marks)

Formative Assessment for Practical	
Assessment Occasion /Type	**Marks**
Program writing and problem solving (1 Program)	03
Program Execution	03
Viva	02
Journal	02
Total	**10Marks**
Formative Assessment as per guidelines.	

Summative Assessment for Practical	
Assessment Occasion /Type	**Marks**
Program writing and problem solving (2 Programs)	(5+5)*2 = 20
Program Execution (Any 1 Program)	10
Viva	05
Journal	05
Total	**40Marks**
Summative Assessment as per guidelines.	

INTERNSHIP
Course Title: Project Work / Internship

Course Code: C6MAT7PR / C6MAT7IN

Type of Course	Theory /Practical	Credits	Instruction hours per week	Total No. of Lectures / Hours per Semester	Duration of Sem End Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Project Work/ Internship	**Practical**	**02**	**04**	**56 Hrs.**	**03 Hrs.**	**10**	**40**	**50**

Course Outcomes (COs): At the end of the course students will be able to:

CO1: Identify and formulate mathematical problems or real-world applications suitable for project work or internship.
CO2: Apply mathematical concepts, computational techniques, Artificial Intelligence (AI) tools, and appropriate software to solve project or internship-related problems.
CO3: Develop, analyse, and validate mathematical models, algorithms, computational methods, or data-driven solutions.
CO4: Interpret and evaluate the results obtained through project work or internship using mathematical reasoning and computational techniques.
CO5: Prepare a professional project/internship report and effectively present the outcomes through seminars, demonstrations, and viva-voce.
CO6: Demonstrate professional ethics, teamwork, communication, leadership, and time-management skills while carrying out project or internship activities.
CO7: Integrate mathematical knowledge, computational skills, AI tools, and practical experience to address real-world, industrial, research, or societal problems.

A. <u>Guidelines for Project Work Using Artificial Intelligence (AI)</u>

1. The Project Work shall be carried out under the guidance of a faculty member approved by the Department, using appropriate Artificial Intelligence (AI) tools.
2. The project may be undertaken within the college or at recognized educational institutions, universities, research laboratories, R & D organizations, industries, or other approved organizations, subject to the prior approval of the competent authority.
3. The project may involve one or more of the following:
    - Literature survey and review using AI-assisted research tools.
    - Mathematical modelling and problem-solving.
    - Development of mathematical algorithms and computational methods.
    - AI-assisted programming, data analysis, visualization, or simulation.
    - Applications of Artificial Intelligence in Mathematics and interdisciplinary domains.

- Preparation of educational content, technical reports, presentations, and mathematical documentation using AI tools with proper verification and appropriate citation, wherever applicable.

4. Students are encouraged to use suitable AI tools responsibly for ideation, literature review, coding assistance, data analysis, visualization, documentation, and presentation. The final project report and all submitted work shall reflect the student's own understanding, analysis, interpretation, and original contribution.
5. The project may be carried out individually or in groups, subject to the approval of the Department.
6. Students shall maintain a project diary/logbook documenting the progress of the work and submit a final project report in the prescribed format.
7. At the completion of the project, students shall present their work through a seminar and appear for a viva-voce examination before the evaluation committee.
8. The evaluation shall be based on the quality of the project work, effective use of appropriate mathematical techniques and AI tools, originality, report writing, seminar presentation, and performance in the viva-voce examination.

B. Guidelines for Internship

1. Internship is a discipline-specific experiential learning activity carried out under the guidance of an external mentor/supervisor and a faculty mentor.
2. The internship may be undertaken in educational institutions, universities, research laboratories, R&D organizations, industries, government organizations, local bodies, business organizations, start-ups, NGOs, IT companies, financial institutions, or any other organization approved by the Department.
3. The internship shall be of **45–60 hours (2 Credits)**. It may be undertaken either:
   - on a **full-time basis** for **1–2 weeks** immediately before the closure of the semester, or
   - on a **part-time basis** for **4 hours per week** during the academic session for **13–14 weeks**.

   The mode of implementation shall be decided by the college programme-wise and shall not be determined subject-wise.
4. One credit of internship shall be equivalent to **30 hours** of field/workplace engagement.
5. The faculty mentor shall guide, monitor, and evaluate the progress of the internship. The mentor's workload shall be as per the University norms.
6. Every student shall maintain an internship diary/logbook and submit an internship report in the prescribed format, duly certified by the organization and the faculty mentor.
7. At the completion of the internship, the student shall deliver a seminar presentation and appear for a viva-voce examination.
8. Evaluation shall be based on:
   - Performance during the internship.
   - Internship diary/logbook and final report.
   - Seminar presentation.
   - Viva-voce examination.
9. Students shall maintain professional ethics, discipline, punctuality, and confidentiality during the internship and comply with the rules and regulations of the host organization.

Formative Assessment for Practical	
Assessment Occasion /Type	**Marks**
Progress Report-1	05
Progress Report-2	05
Total	**10Marks**
Formative *Assessment as per guidelines.*	

Summative Assessment for Practical	
Assessment Occasion /Type	**Marks**
Project/Internship Report	20
Presentation	15
Viva	05
Total	**40Marks**
Summative Assessment as per guidelines.	

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B.Sc. Programme: 2026-27

GENERAL PATTERN OF THEORY QUESTION PAPER

FOR DSC/DSE

(80 marks for Semester-End Examination with 3 Hrs duration)

Part-A

1. Question Numbers 1-10 carry 2 marks each. : 20 marks

Part-B

2. Question Numbers 11- 18 carry 05 Marks each. Answer any 06 questions : 30 marks

Part-C

3. Question Numbers 19-22 carry10 Marks each. Answer any 03 questions : 30 marks
   (Minimum 1 question from each unit and 10 marks question may have sub-questions for 7+3 or 6+4 or 5+5 if necessary)

Total: **80 Marks**

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed

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