RANI CHANNAMMA UNIVERSITY BELAGAVI

THE COURSE STRUCTURE & SYLLABUS OF UNDER GRADUATE

BACHELOR OF SCIENCE

MATHEMATICS

1ST TO 6TH Semesters

w.e.f.

Academic Year 2020-21 and Onwards
Under

CHOICE BASED CREDIT SYSTEM [CBCS]
B.Sc. Program with Mathematics Optional Subject

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B.Sc.: Mathematics as one of the optional subject revised syllabus under CBCS (w.e.f. 2020-21 and onwards)								
Sem	Part	Paper Code	Title of Paper	Hours/ Week	Marks			Subject Credits
					IA	Exam	Total	
I	Part – 1 DSC	MATDSCT 1.1	Algebra–I and Calculus–I	4	20	80	100	3
		MATDSCP 1.1	Practicals-I	3	10	40	50	1
	Total : Hours / Credits			7			150	4
II	Part – 1 DSC	MATDSCT 2.1	Calculus–II and 3-Dimensional Geometry	4	20	80	100	3
		MATDSCP 2.1	Practicals-II	3	10	40	50	1
	Total : Hours / Credits			7			150	4

B.Sc.: Mathematics as one of the optional subject revised syllabus under CBCS (w.e.f. 2021-22 and onwards)								
Sem	Part	Paper Code	Title of Paper	Hours/ Week	Marks			Subject Credits
					IA	Exam	Total	
III	Part – 1 DSC	MATDSCT3.1	Algebra-II, Real analysis and Differential Equations	4	20	80	100	3
		MATDSCP 3.1	Practicals-III	3	10	40	50	1
	Part – 2 SEC	MATSECT 3.2	Set Theory and Theory of Equations	2	10	40	50	2
	Total : Hours / Credits			9			200	6
IV	Part – 1 DSC	MATDSCT 4.1	Vector Calculus, Infinite Series and Deferencial Equations	4	20	80	100	3
		MATDSCP 4.1	Practicals-IV	3	10	40	50	1
	Part – 2 SEC	MATSECT 4.2	Fourier Transforms	2	10	40	50	2
	Total : Hours / Credits			9			200	6

CHOICE BASED CREDIT SYSTEM [CBCS]

Sem	Part	Paper Code	Title of Paper	Hours/Week	Marks			Subject Credits
			B.Sc.: Mathematics as one of the optional subject revised syllabus under CBCS (w.e.f. 2022-23 and onwards)					
					IA	Exam	Total	
V	Part – 1 DSE	MATDSET 5.1	Real Analysis	4	20	80	100	3
		MATDSEP 5.1	Practicals-V	3	10	40	50	1
		MATDSET 5.2A (Elective-I)	Numerical Analysis and Difference Equations	4	20	80	100	3
		MATDSEP 5.2A (Elective-I)	Practicals	3	10	40	50	1
		MATDSET5.2B (Elective-II)	Dynamics and Calculus of Variation	4	20	80	100	3
		MATDSEP 5.2B (Elective-II)	Practicals	3	10	40	50	1
	Part – 2 SEC	MATSECT 5.3	Number theory	2	10	40	50	2
			Total : Hours / Credits	**16**			**350**	**10**
Note: Students have to choose either Elective-I or Elective-II								
VI	Part – 1 DSE	MATDSET 6.1	Complex Analysis and Ring Theory	4	20	80	100	3
		MATDSEP 6.1	Practicals	3	10	40	50	1
		MATDSET 6.2A (Elective-III)	Differential Equations	4	20	80	100	3
		MATDSEP 6.2A (Elective-III)	Practicals	3	10	40	50	1
		MATDSET6.2B (Elective-IV)	Topology and Laplace Transforms	4	20	80	100	3
		MATDSEP 6.2B (Elective-IV)	Practicals	3	10	40	50	1
	Part – 2 SEC	MATSECT 6.3	Graph Theory	2	10	40	50	2
			Total : Hours / Credits	**17**			**350**	**10**
Note: Students have to choose either Elective-III or Elective-IV								

B.Sc. Program with Mathematics Optional Subject

(T: Theory, P: Practical, CC/EA: Co-curricular/Extension Activities
AECC: Ability Enhancement Compulsory Course, DSC: Discipline Specific Course
DSE: Discipline Specific Elective, SEC: Skill Enhancement Course)

Note: Duration of examinations is 03 Hrs for 80 Marks theory and 02 hrs for 40 marks theory. For practical's duration of examination is 03 Hrs.

Paper Code: MATDSCT 1.1	Paper Title: Algebra–I and Calculus–I
Teaching Hours: 4 Hrs / Week	Marks: Theory-80+IA-20
Teaching Hours: 60Hrs	Credits: 03

UNIT-I
MATRICES AND DETERMINANTS
Recapitulation of Matrices, Symmetric matrices and Skew symmetric matrices, Elementary Transformations, Rank of a Matrix, Reduction to Normal forms, Inverse of matrix by elementary transformations, Solution of System of Linear equations.
Determinant: Expansion determent of fourth order, Reciprocal determinants Symmetric and Skew-Symmetric determinants. **12 Hours.**

UNIT-II
REAL NUMBER SYSTEM: Properties of real number system, Inequalities & absolute values, l.u.b, g.l.b and Archimedean properties of real numbers.

LIMITS AND CONTINUITY : Recapitulation of limits and continuity. Algebra of limits (with proofs). Properties of Continuous functions. Boundedness of continuous functions. **12 Hours**

UNIT-III
Intermediate value theorem, Borel Covering theorem (statement only). Uniform continuity. L-Hospital's rule (statement only). Indeterminate forms of $0/0$, ∞/∞, $0 \times \infty$, $\infty - \infty$, 0^0, 1^∞ and ∞^0. **12 Hours**

UNIT-IV
HIGHER ORDER DERIVATIVES
The nth derivative of $(ax + b)^n$, $1/ax+b$, $\log (ax+b)$, e^{ax+b}, $\sin(ax+b)$, $\cos(ax+b)$, $e^{ax} \sin (bx+c)$, $e^{ax}\cos (bx+c)$, Leibntz's Rule for n^{th} derivative of a product. **12 Hours**

UNIT-V
MEAN VALUE THEOREMS
Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem,
Taylor's Theorem (with Sclomilch and Rouche's form of reminder), Maclaurin's Series **12 Hours.**

Reference Books:
1. Deferential Calculus – Shantinarayan and Mittal
2. Mathematical Analysis-Shantinarayan
3. First Course in Real Analysis-M.k.Singal and Asha Rani
4. Text book of B.sc Mathematics- G.K. Raganath
5. Matrices and determinants- M.L. Khanna

B.Sc I Semester-Mathematics

Paper Code: MATDSCP 1.1	**Paper Title:** Practicals:1
Practical Hours: 3 Hrs / Week	**Marks:** Practical-40+IA-10
	Credits: 01

- Introduction to SciLab / Maxima and commands related to the topic.
1. Computation of Sum, Difference and Product of two Matrices.
2. Computation of trace and transpose of matrices.
3. Computation of rank of matrix and row reduced echelon form.
4. Computation of inverse of a matrix using Cayley – Hamilton theorem.
5. Solution of system of homogeneous and Non-homogeneous equations.
6. Finding n^{th} derivative of e^{ax}, trigonometric and hyperbolic functions.
7. Finding n^{th} derivative of algebraic functions and Logarithmic functions.
8. Finding n^{th} derivative of Finding n^{th} derivatives of $e^{ax}\sin(ax+b)$, $e^{ax}\cos(ax+b)$.
9. Examples on Rolle's theorem, Lagrange's and Cauchy's mean value theorem.
10. Taylor's and Mac Laurin's series expansion of a given function.

NOTE: Use the SciLab / MAXIMA Open – source Software to execute the practical problems.
SciLab: is an open-source software and it can be downloaded from http://www.scilab.org/download. Some materials for sciLab can be found on http://wiki.scilab.org/Tutorialsarchives.
MAXIMA: is an Open source Computer Algebra System for solving typical calculus problems. The latest version is available on http://maxim.source.forge,net/documentation.html

B.Sc II Semester-Mathematics

Paper Code: MATDSCT 2.1	Paper Title: Calculus–II and 3–Dimensional Geometry
Teaching Hours: 4 Hrs / Week	Marks: Theory-80+IA-20
Teaching Hours: 60Hrs	Credits: 03

UNIT-I

Polar coordinates of a point and polar curve. Angle between the radius vector and the tangent at a point on the curve. Angle of intersection of two curves. Polar and pedal equation of the curves. Polar sub-tangent and polar sub - normal.

12 hours

UNIT-II

Derivative of arc length, Curvature, Radius of curvature in Cartesian, Parametric, polar and pedal forms. Centre of curvature. Evolutes and Involutes.

12 hours

UNIT-III

Limits, continuity of functions of two variables. Partial derivatives, higher order partial derivatives, total derivatives and total differentials, Homogeneous functions, Euler's theorem on homogeneous functions.

12hours

UNIT-IV

Reduction formulae for integration of $\sin^n x$, $\cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\csc^n x$, $\sin^m x \cos^n x$, $x^n e^{ax}$, $x^m (\log x)^n$.

12 hours

UNIT-V

Sphere: Equation of a sphere, section of a sphere by a plane, Equation of a sphere through a circle, Equation of a sphere through two given points as ends of a diameter. Equation to a tangent plane of a sphere, Condition for tangency, Orthogonality of two spheres.

Cone: Equation of a cone, enveloping cone of a sphere, Right circular cone.

Cylinder: Equation of cylinder, enveloping cylinder of a sphere, Right circular cylinder.

12 hours

Books of reference:
1. Differential Calculus : Santinarayan and Dr. P.K. Mittal
2. Integral Calculus : Santinarayan and Dr. P.K. Mittal
3. Differential Calculus and integral Calculus : N.P. Bali
4. Text Book of B.Sc Mathematics: G. K. Ranganath
5. Differential Calculus and integral Calculus :P. N. Chatterji.
6. Analytical Solid geometry: Santinarayan and Dr. P.K. Mittal
7. Solid Geometry: N.P. Bali

Paper Code: MATDSCP 2.1	Paper Title: Practicals – 2
Practical Hours: 3 Hrs / Week	Marks: Practical-40+IA-10
	Credits: 01

1. Writing simple program to generate: sequence of first 20 i)oddnos, ii) even nos, iii) prime nos. write a program to find smallest and largest nos from given two numbers.

2. Tracing of Cartesian curves.

3. Tracing of parametric curves.

4. Tracing of polar curves.

5. Tracing of curves in 3D.

6. Computation of arc length of Cartesian, Parametric curves

7. Computation of arc length of Polar form

8. Computation of volume of Cartesian and Parametric curves.

9. Computation of volume of Polar form

10. Evaluation of definite integrals and Reduction formulae.

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http://www.scilab.org/download. Some materials for sciLab can be found on
http://wiki.scilab.org/Tutorialsarchives.
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B.Sc III Semester-Mathematics

and	**Paper Code:** MATDSCT3.1	**Paper Title:** Algebra-II, Real Analysis Differential Equations
	Teaching Hours: 4 Hrs / Week	**Marks:** Theory-80+IA-20
	Teaching Hours: 60Hrs	**Credits:** 03

UNIT-I

Real Analysis-I: Jacobians, Properties and examples, Lagrange's mean value theorem for functions of two variables. Taylor's (only statement) and Maclaurian's theorems for two variables. Maxima and Minima of two and three variables, Necessary and sufficient condition for extreme values of two variables.

12 Hours

UNIT-II

Sequences: Sequences, Limit of a sequences, Bounded and unbounded sequences, Convergent, Divergent, and Oscillatory sequences. Algebra of convergent sequences. Monotonic sequences. Theorems on monotonic sequences.

12 Hours

UNIT-III

Cauchy's sequences, Cauchy's first and second theorems on limits. Cauchy's criterion for convergence of sequences.

12 Hours

UNIT-IV

Group Theory-I: Groups, Abelian group, Standard examples of groups, Properties of groups, Semi groups, Subgroups and its properties, Permutation group. Cyclic groups & its properties, Cosets. Lagrange's theorem, Euler's theorem and Fermet's theorem.

12 Hours

UNIT-V

Differential equation-I: Bernoulli's form, Exact equations, Necessary and sufficient condition for the equation to be exact, solution of differential equation by finding a suitable integrating factor. Differential equations of the first order higher degree, Solvable for p, Solvable for x, Solvable for y, Clairaut's equations reducible to Clairaut's form.

12 Hours

Books for reference:
(1) Shanti Narayana and P K Mittal: Textbook of Mathematical analysis.
(2) Nisha Rani and Gupta: Textbook of real analysis.
(3) N P Bali: Real analysis(Golden Series)
(4) J N Sharma and A R Vasistha: Real analysis.
(5) G. K. Ranganath: A text book of College Mathematics.
(6) D. Murray: Introductory Course in Differential Equations.
(7) Ayres F: Differential Equations.
(8) Herstein I. N: Topics in Algebra.

Paper Code: MATDSCP 3.1	**Paper Title:** Practicals – 3
Practical Hours: 3 Hrs / Week	**Marks:** Practical-40+IA-10
	Credits: 01

1. Obtaining partial derivatives of some standard functions.

2. Verification of Euler's theorem, its extension and Jacobian.

3. Examining the convergence of sequences.

4. Example on $\lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n = e$.

5. Verification of binary operations

6. Computing the Identity and Inverse elements of a group.

7. Finding the order of elements of groups and the generators of a cyclic group.

8. Verification of Lagrange's theorem.

9. Solution of differential equations which are solvable for x, y,p.

10. To find the singular solutions by using Clairaut's form.

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http://www.scilab.org/download. Some materials for sciLab can be found on

http://wiki.scilab.org/Tutorialsarchives.

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B.Sc III Semester-Mathematics

Paper Code: MATSECT 3.2	Paper Title: Set theory and Theory of Equations
Teaching Hours: 2 Hrs	Marks: Theory-40+IA-10
Teaching Hours: 30 Hours	Credits: 01

UNIT-I

SET THEORY

Equivalence relations, Partition of a Set, Arbitrary unions and intersections. De Morgan'slaws, Countable and Uncountable sets.

15 Hours

UNIT-II

THEORY OF EQUATIONS :

Polynomial equation of nth degree in one variable, Euclidean algorithm, Reminder Theorem, Factor Theorem, Fundamental Theorem of Algebra, Relation between the roots andcoefficient of general polynomial equation in one variable, Synthetic division. If one of the root of an equation $a_0x^n+a_1x^{n-1}+\text{-------}+a_n$ has one of its rational root is $p|q$, then p is an exactdivisor of an and q is an exact divisor of a0.Solution of cubic and Bi- quadratic equations.

15 Hours

Books for reference:
1. Modern Algebra- D.C. Pavate
2. Algebra -Vasistha

B.Sc IV Semester-Mathematics

and	**Paper Code:** MATDSCT 4.1	**Paper Title:** Vector Calculus, Infinite Series Deferential Equations
	Teaching Hours: 4 Hrs / Week	**Marks:** Theory-80+IA-20
	Teaching Hours: 60Hrs	**Credits:**03

UNIT-I

Dot and cross product of vectors, Ordinary derivatives of vectors. Continuity and differentiability of a vector function. Derivatives of sum. Dot product, Cross product and Triple product of vectors. Constant vector functions, Partial differentiation of vector functions. The vector differential operator del. The gradient of a scalar point function, The directional derivative of function. Properties of gradient of vector function. Divergence and Curl of a vector point function. Properties of divergence and curl. Solenoidal and irrotational vectors.

12 Hours

UNIT-II

Infinite series I: Infinite series and examples. Convergent, Divergent and Oscillatory series. Partial sum of series. Series of non-negative terms, Necessary and sufficient condition for convergence, Cauchy's general principle of convergence. Geometric series. The P-series(Harmonic), Comparison tests (different forms).D'Alembert's ratio test, Raabe's test,

12 Hours

UNIT-III

Infinite series II: Cauchy's integral test and Root test. Absolute convergence and conditional convergence of series. Alternating series, Leibnitz theorem, Uniform convergence.

12 Hours

UNIT-IV

Differential Equations II: Linear differential equation of nth order with constant co-efficients. Particular integral when RHS is of the form e^{ax}, sinax, cosax,x^n,$e^{ax}v$and xv where v is function of x.

12 Hours

UNIT-V

Differential Equations III: Homogeneous linear differential equation of nth order and Equation reducible to the homogeneous linear form, higher order exact differential equations.

12 Hours

BOOKS FOR REFERENCE:

(1) N. P. Bali: Differential equations.
(2) Shanti Narayana: Mathematical Analysis.
(3) G. K. Ranganath: Textbook of B.Sc. Mathematics.
(4) N. Rudraiah and others: College Mathematics.
(5) Murray R. Spiegel: VECTOR ANALYSIS.
(6) WalterRudin: Principles of Mathematical analysis.
(7) N. P. Bali: Real Analysis.

Paper Cade: MATDSCP 4.1	Paper Title: Practicals – 4
Practical Hours: 3 Hrs / Week	Marks: Practical-40+IA-10
	Credits: 01

1. Verification of Homomorphism and Isomorphism of groups.

2. Verification of exponential series.

3. Verification of Logarithmic series.

4. Verification of Binomial series.

5. Examples on Cauchy's root test, Raabe's and Ratio test.

6. Examples on convergence of alternating series using Leibnitz's theorem.

7. Finding the C.F of linear differential equations with constant coefficients and plot the solutions.

8. Finding the C.F of homogeneous differential equations with constant coefficients and plot the solutions.

9. Finding the P.I of differential equations up to second order and plot the solutions.

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B.Sc IV Semester-Mathematics

Paper Code: MATSEC 4.2	**Paper Title:** Fourier Transforms
Teaching Hours: 02 Hrs / Week	**Marks:** Theory-40+IA-10
Teaching Hours: 30Hrs	**Credits:** 01

UNIT-I

Fourier series: Periodic functions,Fourier series of functions of period 2π and 2l. Fourier series of odd and even functions, half range sine and cosine series.

15 Hours

UNIT-II
Fourier transforms: Finite sine and Cosine transforms.

15 Hours

OOKS FOR REFERENCE:

1. Shanti Narayana: Mathematical Analysis.
2. G. K. Ranganath: Textbook of B.Sc. Mathematics.
3. N. Rudraiah and others: College Mathematics.

Paper Code: MATDSET 5.1	Paper Title: Real Analysis
Teaching Hours: 4 Hrs / Week	Marks: Theory-80+IA-20
Teaching Hours: 60Hrs	Credits: 03

UNIT-I

Riemann Integration I-: Partition of a set. The upper and lower sums. Necessary and sufficient conditions for integrability. Algebra of integrable functions (constant,sum, difference, product, quotient, and modulus)

12 Hours

UNIT – II

Riemann Integration II: Integrability of continuous functions, monotonic functions. Fundamental theorem of integral calculus, Change of variables, Integration by parts. The first and second mean value theorems (Bonnet & Weirstrass form) of integral calculus.

12 Hours

UNIT – III

Improper integrals: Improper integrals of first and second kind. Comparison tests.Abel's test and Dirichlet's test.

12 Hours

UNIT – IV

Beta and Gamma functions:.Properties, Relation between Beta & Gamma functions and their convergence and Duplication formula.

12 Hours

UNIT-V

Differentiation under integral sign(Leibnitz theorem), Double and triple integrals, areas and volumes (Cartesian coordinates).

12 Hours

BOOKS FOR REFERENCE:
1) Fundamental Real analysis – S. L. Gupta &Nisha Rani
2) Mathematical Analysis—Shantinarayan and P. K. Mittal
3) A Course of Mathematical Analysis—M D Raisinghania
4) Real Analysis- N.P.Bali
5) A text book of B.Sc. Mathematics- G.K.Ranganath

Paper Code: MATDSET 5.2A(Elective-I) Difference	Paper Title: Numerical Analysis and Equations
Teaching Hours: 4 Hrs / Week	Marks: Theory-80+IA-20
Teaching Hours: 60Hrs	Credits:03

UNIT-I

Solutions of Algebraic and transcendental equations: Bisection method, Iteration method, Newton-Raphson method.

Numerical solutions of non-homogeneous systems of linear algebraic equations by Jacobi Iteration Method and Gauss-Seidel Iteration method.

12 Hours

UNIT-II

Finite Differences: Operators Δ (Delta), ∇ (Del) & E (Shift), Definitions and their properties, n^{th} order difference of a polynomial,

Interpolation: Newton Gregory forward and backward difference interpolation formulae and examples. Lagrange's interpolation formula and examples.

12 Hours

UNIT-III

Numerical differentiation: Forward and backward difference formulae. Computation of first and second ordered derivatives.

Numerical integration: General Quadrature formula, Trapezoidal rule, Simpson $1/3^{rd}$ and $3/8^{th}$ rules.

12 Hours

UNIT-IV

Solution of initial value problems: by ordinary linear first order differential equations by Taylor's series, Euler's, Picard and Runge- Kutta method of order four.

12 Hours

UNIT-V

Difference equations: Basic definitions, order and degree, solution, formation of first and second linear difference equations with constant coefficients (simple examples).

12 Hours

BOOKS FOR REFERENCE:
1)Introductory method of numerical anaylsis- S.S.Shastri .
2)Calculus of finite differences – H.C,Saxena
3)Numerical methods for scientific and engineering computation- M.K.Jain, S.R.K.Iyengar, &R.K.Jain (New Age International Publications)
4)Text Book of Mathematics-G.K.Raganath
5) Numerical Analysis by G. Balaguruswamy

of	Paper Code: MATDSET5.2B(Elective-II)	Paper Title: Dynamics and Calculus Variation.
	Teaching Hours: 4 Hrs / Week	Marks: Theory-80+IA-20
	Teaching Hours: 60Hrs	Credits: 03

UNIT-I

Kinematics: 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.

12 Hours

UNIT-II

Central Orbits: Motion of a particle under a central force. Use of Polar and Pedal co-ordinates. Apse, Apsidal distance and Apsidal angle   **12 Hours**

UNIT-III

Motion of a projectile: in a non resting medium under gravity.
Elastic Impact: Direct and Oblique impact of elastic bodies.

12 Hours

UNIT- IV

Calculus of Variations: Variation of a function f = f(x,y,z), and functional, Variational problems Fundamental theorem of calculus of variation, Euler's equation.

12 Hours

UNIT- V

Calculus of Variations-(contd..): Geodesic on plane , on sphere, Brachistochrome problem , minimum surface of revolution, Isoperimetric problems.

12 Hours

BOOKS FOR REFERENCE:
1) Dynamics – M.Ray
2) Dynamics – P.N.Chatterji
3) Text Book of Mathematics-G.K.Raganath
4) Higher Engineering Mathematics by B. S.Grewal

B.Sc V Semester-Mathematics

Paper Code: MATDSEP 5.1	Paper Title: Practicals
Practical Hours: 3 Hrs / Week	Marks: Practical-40+IA-10
	Credits: 01

1. Verification of lower and upper Riemann sums.

2. Verification of Riemann integrals.

3. Verification of continuous functions.

4. Evaluation if $\Gamma(n)$ for n is integer.

5. Evaluation if $\Gamma(n)$ for n is non-integer.

6. Evaluation of $\beta(m,n) for\ any\ m\ and\ n > 0$.

7. Verification of given integral for its convergence.

8. Evaluation of double integral with constant limits over the region when the integrand is unity.

9. Evaluation of double integral with variable limits over the region when the integrand is unity.

10. Evaluation of triple integral with constant limits over the region when the integrand is unity.

NOTE: Use the SciLab / MAXIMA Open – source Software to execute the practical problems.

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B.Sc V Semester-Mathematics

Paper Code: MATDSEP 5.2A(Elective-II)	**Paper Title:** Practical
Practical Hours: 3 Hrs / Week	**Marks:** Practical-40+IA-10
	Credits: 02

1. Finding roots of an equation by Bisection method.

2. Finding roots of an equation by Newton – Raphson method.

3. Solution of system of equations by Jacobi iteration method.

4. Solution of system of equations by Gauss - Seidel method.

5. Interpolation using Newton – Gregory forward and backward interpolation formula.

6. Interpolation using Lagrange's interpolation formula.

7. Numerical integration by Trapezoidal rule.

8. Numerical integration by Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule.

9. Solution of initial value problem by modified Euler's method.

10. Solution of initial value problem byRunge – Kutta second and fourth order methods.

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B.Sc V Semester-Mathematics

Paper Code: MATSECT 5.3	Paper Title: Number Theory
Teaching Hours: 2 Hrs / Week	Marks: Theory-40+IA-10
Teaching Hours: 30Hrs	Credits: 01

UNIT-I

Number theory I: Divisibility of numbers and properties, division algorithm, properties of prime and composite numbers. Congruences and its properties, Fundamental theorem of arithmetic.

15 Hours

UNIT-II

Number theory II: Bracket function, properties, Euler's function, Fermat, Euler and Wilson's theorems.

15 Hours

BOOKS FOR REFERENCE:
1. Theory of Numbers Prakash Om (Golden series)
2. Higher Algebra- Bernard and Child

B.Sc VI Semester-Mathematics

Paper Code: MATDSET 6.1	**Paper Title:** Complex Analysis and Ring Theory
Teaching Hours: 4 Hrs / Week	**Marks:** Theory-80+IA-20
Teaching Hours: 60Hrs	**Credits:** 03

UNIT-I
Complex Analysis: Analytic function. Cauchy-Riemann equations, Harmonic function, Harmonic conjugate. Construction of analytic function using Milne-Thomson's method.

12 Hours

UNIT-II
Complex Integration: Cauchy's Theorem, Morera's Theorem , Cauchy's Integral formula, Cauchy's Integral formula for derivatives, Cauchy's inequality, Liouville's Theorem .

12 Hours

UNIT-III
Taylor's and Laurent's series, zeroes and singularities of analytic functions. Calculus of Residues.

12 Hours

UNIT-IV
Residue Theorem, Jordan's lemma and Contour Integration.

12 Hours

UNIT-V
Rings and Integral domains: Rings, Properties of rings, subrings, ideals, principle and maximal ideals in a commutative ring, quotient rings, homomorphism and isomorphism, and integral domains.

12 Hours

BOOKS FOR REFERENCE :
1. Theory of functions of a Complex variables- Shanti narayan and Mittal.
2. Complex Variables – B.S Tyagi
3. Complex Variables – J.N Sharma
4. Modern Algebra by A.R.Vasistha
5. Rings and Modules by C.S.Musli
6. A Text book of B.Sc. Mathematics by Dr. S.S. Bhusanoormath and others

B.Sc VI Semester-Mathematics

Paper Code: MATDSEP 6.1	**Paper Title:** Practical
Practical Hours: 3 Hrs / Week	**Marks:** Practicals -40+IA-10
	Credits: 01

1. Tracing of circles and straight lines.
2. Construction of analytic function when real part of f(z) is given.
3. Construction of analytic function when imaginary part of f(z) is given.
4. Construction of analytic function by Milne – Thomson method.
5. Verification of real and imaginary parts of analytic function being harmonic.
6. Evaluation of contour integral by Cauchy's integral formula and plot the solutions.
7. Evaluation of complex integrals when the point lie outside the contour and plot the solution.
8. Computation of residues with simple poles.
9. Computation of residues when the pole is order $m > 1$.
10. Evaluation of contour integral by using Cauchy Residue theorem.

NOTE: Use the SciLab / MAXIMA Open – source Software to execute the practical problems.

SciLab: is an open-source software and it can be downloaded from

http://www.scilab.org/download. Some materials for sciLab can be found on

http://wiki.scilab.org/Tutorialsarchives.

MAXIMA: is an Open source Computer Algebra System for solving typical calculus problems.

The latest version is available on http://maxim.source.forge,net/documentation.html

Paper Code: MATDSET 6.2A(Elective-III)	**Paper Title:** Differential Equations
Teaching Hours: 4 Hrs / Week	**Marks:** Theory-80+IA-20
Teaching Hours: 60Hrs	**Credits:** 03

UNIT-I

Differential Equations: Simultaneous differential equations with two and three variables. Total differential equation, Conditions of integrability and its solutions.

12 Hours

UNIT-II

Series Solutions of Ordinary Differential Equations: Basic definitions, Power series, ordinary and regular singular points. Power series solutions of ODEs. Frobeniusmethod.

12 Hours

UNIT-III

Legendre equation and functions: Solutions of Legendre's equations in series,Legendre's functions- first and second kind, Rodrigue's formula, Orthogonal properties. Legendre's polynomial, recurrence formulae.

12 Hours

UNIT-IV

Partial differential equations of 1ˢᵗorder:formation of partial differential equation by eliminating arbitrary constants and functions. Lagrange's linear partial differential equation $Pp+Qq = R$ and its solution. Non-linear differential equations of standard forms I,II,III and IV.

12 Hours

UNIT-V

a) Non-linear partial differential equations: Charpit's method.
b) Linear partial differential equations with constant coefficients.

12 Hours

BOOKS FOR REFERENCE:

1. Differential equations – D.A.Murray
2. Differential equations – Bhudev Sharma
3. Differential equations – J.N.Sharma and R.K.Gupta (Krishna PrakashanMandir Meerut)
4. Text book of Mathematics – G.K.Ranganath
5. Higher Engineering Mathematics by B. S.Grewal

B.Sc VI Semester-Mathematics

Paper Code: MATDSEP 6.2A(Elective-III)	**Paper Title:** Practicals
Practical Hours: 3 Hrs / Week	**Marks:** Practicals-40+IA-10
	Credits: 01

1. Verification of Cauchy – Euler differential equations.

2. Solution to the total and simultaneous differential equations and plot the solutions.

3. Verification of exactness of a differential equations.

4. Verification of linear partial differential equation of the form Pp + Qq = R.

5. Verifying first order non-linear partial differential equations (clairaut's form)

6. Verification of non-linear partial differential equations by Charpit's method.

7. Solutions to standard forms $f(p, q) = 0, f(p, q, z) = 0, f(x, p) = g(y, q)$.

8. Recurrence relation for Legendre's function.

9. Recurrence relation for Bessel's unction.

NOTE: Use the SciLab / MAXIMA Open – source Software to execute the practical problems. SciLab: is an open-source software and it can be downloaded from http://www.scilab.org/download. Some materials for sciLab can be found on http://wiki.scilab.org/Tutorialsarchives.

MAXIMA: is an Open source Computer Algebra System for solving typical calculus problems. The latest version is available on http://maxim.source.forge,net/documentation.html

Paper Code: MATDSET6.2B(Elective-IV)	Paper Title: Topology and Laplace Transforms
Teaching Hours: 4 Hrs / Week	Marks: Theory-80+IA-20
Teaching Hours: 60Hrs	Credits: 03

UNIT-I

Topology-I: Open set, closed set, closure of a set, neighbourhood, limit points derived sets, interior, exterior and boundary points of a set.

12 Hours

UNIT-II

Topology-II-: Base & sub-base, subspace, separation axioms. T_1 & T_2 spaces (properties and examples).

12   Hours

UNIT- III

Laplace transforms-I: Definition, basic properties. Laplace transforms of some common functions. First shifting theorem, change of scale property.

12 Hours

UNIT- IV

Laplace transforms--II: Laplace transforms of periodic functions, Laplace transforms of derivatives and integrals, inverse Laplace transforms

12 Hours

UNIT-V

Laplace transforms—III: Heaviside function, Dirac-delta function, unit step function, convolution theorem and Laplace transforms method of solving differential equation of first and second order with constant coefficients.

12 Hours

REFERENCES:
1. Modern algebra and Topology- E.Sampathkumar and K.S.Amur
2. Topology – J.N.Sharma (Krishna Prakashan Meerut)
3. Topology by R.S.Agrawal
4. Laplace Transform Theory – M.G.Smith
5. A Text Book Of Mathematics– G.K.Raganath

Paper Code: MATSECT 6.3	**Paper Title:** Graph Theorymax
Teaching Hours: 2 Hrs / Week	**Marks:** Theory-40+IA-10
Teaching Hours: 30Hrs	**Credits:** 01

UNIT-I

Basic Concepts of Graphs: Introduction, graphs, finite and null graphs, loops, multi graphs, pseudo graph, simple graph, degree of a vertex, isolated and pendent vertices, connectedness and complete graphs, regular and complementary graphs. Minimum and maximum degree, $\sum \deg(v_i) = 2q$. The number of vertices of odd degree is even. Isomorphism, line and total graphs.(Definitions and examples only).

15 Hours

UNIT-II

Sub – Graphs: Sub – graphs, spanning and induced sub-graphs, walk, trail, path, cycle, shortest path problems, bipartite graph. Characterisation of bipartite graphs in terms of its cycle.

15 Hours

BOOKS FOR REFERENCE:
1. **Graph theory – Frank Harary**
2. **Introduction to graph theory – Robin J Wilsoson, Longman**
3. **Graph theory and application – NarsingDeo**

RANI CHANNAMMA UNIVERSITY, BELAGAVI.
QUESTION PAPER PATTERN OF UG MATHEMATICS CBCS SYLLABUS
DSC1A TO DSC1D AND DSE1A TO DSE1D.

TIME: 3 HOURS.   MAX. MARKS: 80.

PART – A: ANSWER ANY TEN OUT OF TWELVE   10 X 2 = 20MARKS
Q.NO.: 1. a, b, c, d, e, f, g, h, i, j, k, l.

PART – B: ANSWER ANY FOUROUT OF SIX   4 X 5 = 20 MARKS
Q. NOS: 2, 3, 4, 5, 6, 7.

PART – C: ANSWER ANY FOUR FULL QUESTIONS OUT OF FIVE FULL

QUESTIONS.4 X 10 = 40 MARKS
Q. NOS: 8 a, 8b, 9a, 9b, 10a, 10b, 11a,11b, 12a, 12b.

NOTE:
1. PART – A: ATLEAST TWO QUESTIONS FROM EVERY UNIT.
2. PART – B: ATLEAST ONE QUESTION FROM EVERY UNIT.
3. PART – C: ONE FULL QUESTION FROM EVERY UNIT.

PATTERN FOR SEC 1 SEC 4

TIME: 2 HOURS.   MAX. MARKS: 40.

PART – A: ANWER ANY FIVE OUT OF SEVEN5 X 2 = 10 MARKS
Q. NO: 1a, b, c, d, e, f, g.

PART – B: ANWER ANY SIX OUT OF EIGHT6 X 5 = 30 MARKS
Q. NO: 2, 3, 4, 5, 6, 7, 8, 9.

NOTE:
1. PART – A: AT LEAST THREE QUESTIONS FROM EACH PART.
2. PART – B: FOUR QUESTIONS FROM EACH PART.