K.L.E Society's

Raja Lakhamagouda Science Institute (Autonomous),

Belagavi.

Department of Mathematics

CBCS Syllabus for B.Sc. Third Year (V& VI Semester)

2022-23

DEPARTMENRT OF MATHEMATICS
SEMESTER-V
DSC-Numerical analysis
Sub code: 20MA501

Course Outcome: On successful completion of the course, the students should be able to
CO1: Understand the Numerical methods to solve Algebraic and Transcendental equations which cannot be solved by traditional algebraic methods
CO2: Develop element characteristic equation and generation of global equation.
CO3: Students will be able to understand the Newton –Gregory forward and backward interpolation formulae.
CO4: Students will be able to understanding and ability to write code for Trapezoid rule, Simpson's rule, and Newton-Cotes.

Unit	**Title of the Topic**	**Total Teaching hours 60**
1.	**Numerical solutions of algebraic and Transcendental equations –** method of successive bisection - method of false position – Newton-Raphson method. Numerical solutions of non-Homogeneous system of linear algebraic equations in three variables by Jacobi's method and Gauss-Seidel method**.**	15
2.	**Finite differences –** Definition and properties of Δ, ∇ and E, the relation between them – The nth differences of a polynomial, Factorial notations, separation of symbols. Examples.	15
3.	**Interpolation Formulae:** Newton –Gregory forward and backward interpolation formulae, Lagrange's interpolation formulae for unequal intervals - Inverse interpolation. **Numerical Integration:** Quadrature formula – Trapezoidal rule - Simpon's 1/3 and 3/8 rule (without proofs) and problems.	15
4.	Solutions of initial value problems for ordinary linear first order differential equations by Picard's, Taylor's series, Euler's and Euler's modified method and Runge-Kutta 4th ordered method.	15

References:

1. Introductory method of Numerical Analysis -S.S.Shastri
2. Calculus of finite difference - H.C.Sexena
3. Numerical methods for scientific & Engineering Computation - M.K.Jain, S.R.K Iyenger
4. Text book of Mathematics -G.K.Ranganath
5. Numerical Analysis and Computational Procedures - S.A.Mollah.
6. Numerical Methods -S.Arumugum
7. Numerical Methods - S Kalavati

SEMESTER-V
Mathematics Practical-V

Course Code: 20MA503

1. Solving algebraic equation (Bisection method).
2. Solving algebraic equation (Regula-Falsiand Newton-Raphson methods).
3. Solving system of equations (Jacobi and Gauss-Seidel methods).
4. Scilab/Maxima programs on Interpolations with equal intervals.
5. Scilab/Maxima programs on Interpolations with unequal intervals.
6. Scilab/Maxima programs on Trapezoid form.
7. Scilab/Maxima programs to evaluate integrals using Simpson's 1/3 rule.
8. Scilab/Maxima programs to evaluate integrals using Simpson's 3/8 rule.
9. Solving for Largest Eigen value by Power method.
10. Solving ordinary differential equation by modified Euler's method.
11. Solving ordinary differential equation by Runge-Kutta method of 4th order.

Fifth Semester

Pattern of Question Paper
(Numerical analysis)

Duration: 3 hours **Max. Marks: 70**

Sl. No.	Topic	No. of question for 2 Marks	No. of question for 5 Marks	No.of question for 10 Marks	Total Marks
I	**Numerical solutions of algebraic and Transcendental equations**	1	1	2	27
II	**Finite differences**:	2	2	1	24
III	**Interpolation Formulae:**	2	2	1	24
IV	Solutions of initial value problems	2	3	1	29
	Total No. of Questions	**07**	**08**	**05**	**104**

DEPARTMENRT OF MATHEMATICS
SEMESTER-V
DSC-Calculus of variations and Dynamics
Course code: 20MA502

Course Outcome:

CO1: Students will be able to solved differential equations for stationary paths, subject to boundary conditions, in straightforward cases.

CO2: Students will be able to identify the basic relations between distance, time, velocity, and acceleration. Apply vector mechanics as a tool for solving kinematic problems.

CO3: Students will be able to understand the motion of particle under a central force (polar and pedal forms). Apse, Apisidal distance, and apisidal angle,

CO4: Students will be able to define projectile motion. Solve problems involving projectile motion

Unit	**Title of the Topic**	**Total Teaching hours 60**
1.	**Calculus of Variations:** Concept of calculus of variations, functionals, variation of a function f= f(x,y,z). Variational problems: Fundamental theorem of calculus of variations. **Eulers equation** Geodesic on a plane and a sphere. Brachistochrome problem. Minimum surface of variation, Isoperimetric problems.	15
2	**Dynamics: 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. Examples.	15
3.	**Central Orbits:** Motion of particle under a central force (polar and pedal forms). Apse, Apisidal distance, and apisidal angle, examples.	15
4.	**Motion of Projectile:** Concept of Projectile, its related definitions and derivations. Derivation of path of the projectile as a parabola. Examples Elastic Impact: Direct and oblique impact of elastic bodies. Examples.	15

References:

1. Dynamics - M.Ray
2. Dynamics - N.P.Bali
3. Text book of Mathematics - G.K.Ranganath (vol.7)
4. Dynamics - P.N.Chatarjee
5. Calculus of Variation – Pundir and Pundir

SEMESTER-V
Mathematics Practical-VI

Course Code: 20MA504

1. Example on Euler's equation in full form.
2. Example on particular forms of Euler's equation.
3. Examples on minimum surface of revolution and Brachistochrome problem.
4. Examples on Isoperimetric problems
5. Plot the orbit diagram for the quadratic map with a parameter a.
6. Evolution of a two-dimensional system that leads to a fractal.
7. Examples on Projectile.
8. Plot the Cylindrical cell in solids of revolutions
9. Plot the arc length of Curve.

Fifth Semester

Pattern of Question Paper
(Calculus of variations and Dynamics)

Duration: 3 hours **Max. Marks: 70**

Sl. No.	Topic	No. of question for 2 Marks	No. of question for 5 Marks	No.of question for 10 Marks	Total Marks
I	**Calculus of Variations**	1	1	2	27
II	**Dynamics: Kinematics**	2	2	1	24
III	**Central Orbits:**	2	2	1	24
IV	**Motion of Projectile**	2	3	1	29
	Total No. of Questions	**07**	**08**	**05**	**104**

DEPARTMENRT OF MATHEMATICS
SEMESTER-V
SEC-Number Theory
Course code: 20MA511

Course Outcome: On successful completion of the course, the students should be able to
CO1: Understand the Divisibility, division algorithm, congruence and its properties.
CO2: Solve the linear congruence for finite, infinite or no solution.
CO3: Understand the Euler's function and related theorems.

Unit	Title of the Topic	Total Teaching hours 40
1.	Divisibility, division algorithm, congruence and its properties. Fundamental theorem of Arithmetic, Elementary properties of integers.	15
2.	Solution of linear congruence, Solving linear congruence for finite, infinite or no solution. Bracket function. Euler's function and related theorems. Fermat's Little theorem and Wilson theorem.	15

Fifth Semester
Pattern of Question Paper
SEC-Number Theory
Sub code:

Duration: 2 hours **Max. Marks: 35**

Sl. No.	Topic	No. of question for 2 Marks	No. of question for 5 Marks	No.of question for 10 Marks	Total Marks
I	**Unit-I**	3	2	1	26
II	**Unit-II**	3	2	1	26
	Total No. of Questions	**06**	**04**	**02**	**52**

DEPARTMENRT OF MATHEMATICS
SEMESTER-VI
DSC-Complex Analysis, Improper integrals and Beta and Gamma Function
Course Code: 20MA601

Course learning Outcome:

CO1: Students will be able to understand the Harmonic functions on a disc and concerned results.

CO2: Identify curves and regions in the complex plane defined by simple expressions.

CO3: Students will be equipped with the understanding of the fundamental concepts of complex variable theory and skill of contour integration to evaluate complicated real integrals via residue calculus.

CO4: Evaluate an integral over a closed interval with an infinite discontinuity within the interval and understand the relation between beta and gamma function.

Unit	Title of the Topic	Total Teaching hours 60
1.	**Analytic functions:** Basic definitions Cauchy Reimann equations. Harmonic functions. Construction of analytic function using Milne Thomson's Method. Examples.	15
2.	**Complex Integration:** Cauchy's Theorem, Cauchy's integral formula, Cauchy's integral formula for derivative, Cauchy's inequality, Morera's theorem. Lioville's theorem. Taylor's and Laurent's series. Example.	15
3.	**Calculus of residues:** Zero's, singularities, poles, removable and isolated singularities (definition with example). Calculation of residue. Cauchy's residue theorem. Contour integration. Examples.	15
4.	**Improper integrals:** Improper integrals of first and second kind. Comparison test abel's test, Dirichlet's test examples. **Beta and Gamma Function:** Definition properties relation between beta and gamma function. Duplication formula examples	15

References:

1. Theory of functions of complex variables - Shanti Narayan
2. Complex Variable - B.S.Tyagi
3. Complex Variables - J.N.Sharma
4. Text book of MathematicS - G.K.Ranganath
5. Algebra -M K Singal And Asha Rani Singal
6. Modern Algebra – Sharma and Vashishtha
7. Modern Algebra – Surjit Singh and Bernal
8. Introduction to Mathematical Analysis – Apostol.T.M

9. Engineering Mathematics- B.S.Grewal
10. Engineering Mathematics – Dr. D. S. Chandrasekhar

SEMESTER-VI
Mathematics Practical-VII

Course Code: 20MA603

1. Fundamentals of Complex analysis using SciLab.
2. Plot the Complex functions by their images over concentric circles.
3. Scilab/Maxima programs to find the analytic function using C-R equation.
4. Scilab/Maxima programs to find the residue of singularities.
5. Scilab/Maxima programs on Improper integrals finite limit.
6. Scilab/Maxima programs on Improper integrals infinite limit.
7. Examples on Beta Function
8. Examples on Gamma function

Sixth Semester

Pattern of Question Paper
(Complex Analysis, Improper integrals and Beta and Gamma Function)

Duration: 3 hours **Max. Marks: 70**

Sl. No.	Topic	No. of question for 2 Marks	No. of question for 5 Marks	No.of question for 10 Marks	Total Marks
I	**Analytic functions:**	1	1	2	27
II	**Complex Integration:**	2	2	1	24
III	**Calculus of residues**	2	2	1	24
IV	**Improper integrals**	2	3	1	29
	Total No. of Questions	**07**	**08**	**05**	**104**

DEPARTMENRT OF MATHEMATICS

SEMESTER-VI

DSC-Topology and Laplace transformation

Course code: 20MA602

CO1: Students will be able to understanding of the concepts of metric spaces and topological spaces, and their role in mathematics.
CO2: Students will be able to understanding Induced topology. Hereditary Property and related theorems. T_1 and T_2 Spaces
CO3: Students will be able to understand the applications of Laplace transform.
CO4: : Students will be able to understand the Heaviside function and Dirac-delta function.

Unit	**Title of the Topic**	**Total Teaching hours 60**
1.	**Topological Space:** Basic concepts. Closure and neighborhood properties. Limit points and derived sets. Interior, exterior and boundary points of a set. Base and Sub base. Examples.	15
2.	Induced topology, Hereditary Property and related theorems. Examples. T_1 and T_2 Spaces .Theorems. Examples	15
3.	**Laplace Transforms:** Basic Properties. Laplace transforms of some common functions, periodic functions. Laplace transforms of derivative and integrals.	15
4.	Inverse Laplace transforms. Convolution theorem. Heaviside function and Dirac-delta function. Laplace transforms method of solving differential equations of first order and second order with constant coefficients.	15

References:

1. Modern algebra and Topology -E.Sampathkumar and K.S.Amur
2. Topology - J.N.Sharma (Krishna Prakshan Meerut)
3. Laplace Transform Theory - M.G.Smith
4. Text Book of Mathematics volume 3 - G.K.Ranganath
5. Introduction to topology - J.V.Deshpande
6. General Topology - K.D.Joshi

SEMESTER-VI
Mathematics Practical-VIII

Course Code: 20MA604

1. Examples on Topological space.
2. Finding the Closure and Interior of any subset of topological space
3. Finding the Exterior and Boundary of any subset of topological space
4. Finding the Limit point and Derived set of any subset of topological space
5. Finding the Laplace transforms of some standard and periodic functions.
6. Finding the inverse Laplace transform of simple functions
7. Verification of Convolution Theorem.
8. To solve ordinary linear differential equation using Laplace transform

Sixth Semester

Pattern of Question Paper
(Topology and Laplace transformation)

Duration: 3 hours **Max. Marks: 70**

Sl. No.	Topic	No. of question for 2 Marks	No. of question for 5 Marks	No.of question for 10 Marks	Total Marks
I	**Topological Space**	1	1	2	27
II	Induced topology	2	2	1	24
III	**Laplace Transforms**	2	2	1	24
IV	Inverse Laplace transforms	2	3	1	29
	Total No. of Questions	**07**	**08**	**05**	**104**

SEC-Graph theory
Course code: 20MA611

Course Outcome: On successful completion of the course, the students should be able to

CO1: Define the Different types of graphs
CO2: Draw the block graphs and cut-point graphs.
CO3: Understand the Eulerian graphs and Hamiltonian graphs.

Unit	Title of the Topic	Total Teaching hours 40
1.	**Basic Concepts:** Different types of graphs, subgraphs, walks and connectedness. Degree sequences, directed graphs, distances and self-complementary graphs.	15
2.	**Blocks:** Cut –points, bridges and blocks, block graphs and cut-point graphs. Tress and Connectivity: Characterization of Trees, Spanning Trees, Centers and Centroids, Connectivity, Edge connectivity. Partitions and Traversability: Eulerian graphs and Hamiltonian graphs.	15

References:

1.A Textbook of Graph Theory – R.Balakrishnan
2.Graph Theory – Frank Harari
3.Hand Book of Graph Theory – Panda U.N

Sixth Semester
Pattern of Question Paper
SEC- Graph theory
Sub code:

Duration: 2 hours **Max. Marks: 35**

Sl. No.	Topic	No. of question for 2 Marks	No. of question for 5 Marks	No.of question for 10 Marks	Total Marks
I	**Set Theory**	3	2	1	26
II	**Logic**	3	2	1	26
	Total No. of Questions	**06**	**04**	**02**	**52**