B.Sc Teaching Plan

Department : Mathematics

Class : I B.Sc

Title of the Course : Major Core I: Algebra & Trigonometry

Semester : I

Course Code : MU231CC1

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
MU231CC1	4	-	-	4	4	75	25	75	100

Learning Objectives

1. To understand the basic ideas on the theory of equations, Matrices.
2. To get the knowledge to find expansions of trigonometry functions, solve theoretical and applied problems

Course outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO - 1	Classify and solve reciprocal equations	PSO-5	**K2**
CO - 2	Find the sum of binomial, exponential and logarithmic series	PSO-3	**K1**
CO - 3	Find Eigen values, eigen vectors, verify Cayley — Hamilton theorem	PSO-2	**K1**
CO - 4	Expand the powers and multiples of trigonometric functions in terms of sine and cosine	PSO-4	**K2**
CO - 5	Determine relationship between circular and hyperbolic functions	PSO-1	**K3**

Total contact hours: 75 (Including instruction hours, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	Reciprocal Equations					
	1.	Reciprocal Equations- Standard form	3	K1 & K2	Brainstorming	MCQ
	2.	Increasing or decreasing the roots of a given equation.	2	K2	Lecture	Slip Test
	3.	Removal of terms.	2	K3	Lecture Discussion	Questioning
	4.	Approximate solutions of roots of polynomials by Horner's method	2	K1 & K3	Lecture	Questioning
	5.	Horner's method related problems.	3	K3	Problem Solving	Class test
II	Sumation of Series					
	1.	Binomial series	3	K1	Lecture with Illustration	Questioning
	2.	Exponential series	3	K2	Problem solving	Short summary
	3.	Logarithmic series (Theorems without proof)	3	K3	Brain storming	Concept definitions
	4.	Approximations - related problems.	3	K3	Lecture with Problem solving	Recall steps
III	Matrices					
	1.	Characteristic equation	2	K1 & K2	Brainstorming	Quiz
	2.	Eigen values, Eigen Vectors and Properties	3	K3	Lecture	Explain
	3.	Similar matrices	1	K3	Lecture Discussion	Slip Test
	4.	-Cayley — Hamilton Theorem (Statement only)	1	K3	Lecture	Questioning

	5.	Finding powers of square matrix	2	K3	Collaborative learning	Questioning
	6.	Inverse of a square matrix up to order 3 - related problems.	3	K5	Problem Solving	Concept explanations
IV	Expansions					
	1.	Expansions of $sinn\theta$, $cosn\theta$ in powers of $sin\theta$, $cos\theta$	3	K1 & K2	Brainstorming	Quiz
	2.	Expansion of $tann\theta$ in terms of $tan\theta$	3	K3	Lecture Discussion	Differentiate between various ideas
	3.	Expansions of $cos^n\theta$, $sin^n\theta,\ sin^n\theta cos^n\theta$,	3	K3	Integrative method	Explain
	4.	Expansions of tan $(\theta_1 + \theta_2 + \cdots \theta_n)$– related problems	3	K1 & K2	Collaborative learning	Slip Test
V	Hyperbolic functions					
	1.	Introduction	1	K1 & K2	Brainstorming	MCQ
	2.	Hyperbolic functions	3	K4	Lecture	Concept explanations
	3.	Relation between circular and hyperbolic functions	3	K1 & K2	Lecture Discussion	Questioning
	4.	Inverse hyperbolic functions	3	K4	Lecture	Recall steps
	5.	Logarithm of complex quantities Related problems.	2	K1 & K2	Collaborative learning	True/False

Course Focussing on Employability/ Entrepreneurship/ Skill Development: **Skill Development**

Activities (Em/ En/SD): **Group Discussion**

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues: -

Assignment:**Exercise Problems inLogarithm of complex quantities**

Sample questions (minimum one question from each unit)

Part A

1. The equation whose roots are 10 times those of $x^3 + 3x - 5 = 0$ is ------------

   a) $x^3 + 3x - 50 = 0$ b) $x^3 + 30x - 50 = 0$

   c) $x^3 + 30x - 500 = 0$ d) $x^3 + 300x - 5000 = 0$

2. One real root of $x^3 - 6x - 13 = 0$ lies between ----------

   a) 0 and 1 b) 1 and 2 c) 3 and 4 d) -1 and 0

3. The formula for $(1 + x)^{-1} = \cdots$ ... ...

4. State True or False

e is an irrational number

5. If the eigen value of a square matrix A are 1,2,3 then the eigen value of A^2 are.........

   a) 1, 4, 9 b) 2, 4, 6 c)-1,-4,-9 d) 3, 6, 9

6. The product of the eigen values of $\begin{pmatrix} -3 & 3 \\ -2 & 4 \end{pmatrix}$ is ....

   a) -6 b) 6 c)0 d)None

7. De Moivere's theorem states that $(cos\theta + isin\theta)^n = \cdots$ ... ...

8. State True or False: Expression for $cosn\theta = cos^n\theta - nC2cos^{n-2}\theta sin^2\theta + \cdots$

9. $cosh^2x - sinh^2x = \cdots$ ... ...

   a) 0 b) 1 c) 2 d) 3

10. Log 1=...........

   a) $2n\pi$ b) $n\pi$ c)$2n\pi i$ d)$3n\pi$

Part B

11a. Increase the roots of the equation $4x^5 - 2x^3 + 7x - 3 = 0$ by -2.

b) Diminish the roots of $2x^4 - x^3 - 2x^2 + 5x - 1 = 0$ by 3.

12a) Find the coefficient of x^n when $\frac{7+x}{(1+x)(1+x^2)}$ is expanded in ascending powers of x

b.) Show that $S = \frac{5}{1.2.3} + \frac{7}{3.4.5} + \frac{9}{5.6.7} + \cdots = 3\log 2 - 1$

13a) Find the characteristic equation of the matrix $A = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$

b) Show that the matrix $A = \begin{pmatrix} 2 & -3 & 1 \\ 3 & 1 & 3 \\ -5 & 2 & -4 \end{pmatrix}$ satisfies the equation

$A(A-I)(A+2I) = \mathbf{0}$.

14a) Prove that $tan\frac{2\pi}{7}tan\frac{4\pi}{7}tan\frac{6\pi}{7} = \sqrt{7}$

b) Prove that $2^5cos^6\theta = cos\ 6\theta + 6cos\ 4\theta + 15\ cos\ 2\theta + 10$.

15a) If cos(x + iy) = r (cos$\alpha + i\ sin\alpha$) prove that y = $\frac{1}{2}$log $\left(\frac{\sin(x-\alpha)}{\sin(x+\alpha)}\right)$

b) Find Log(1-i)

Part C

16a) Solve the equation$6x^5 - x^4 - 43x^3 + 43x^2 + x - 6 = 0$

b) Find the positive root of $x^3 - x - 3 = 0$ correct to two places of decimals by Horner's method.

17a) Find the sum to ∞ the series $\frac{3}{18} + \frac{3.7}{18.24} + \frac{3.7.11}{18.24.30} + \cdots$

b) Find $S = \sum_{n=1}^{\infty} \frac{n-1}{(n+2)n!} x^n$

18a) Using Cayley-Hamilton theorem find the inverse of the matrix $\begin{pmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{pmatrix}$.

b) Find the eigen values and eigen vectors of the matrix $A = \begin{pmatrix} 4 & -20 & -10 \\ -2 & 10 & 4 \\ 6 & -30 & -13 \end{pmatrix}$.

19a) Expand $sin\ 7\theta$ in the powers of $cos\theta$ and $sin\theta$. Hence prove that

$$\frac{sin\ 7\theta}{sin\ \theta} = 7 - 56sin^2\theta + 112sin^4\theta - 64sin^6\theta.$$

b) Expand $cos^5\theta sin^3\theta$ in a series of sines of multiples of θ.

20a) i) If Coshu = Sec θ show that u = log tan $(\frac{\pi}{4} + \frac{\theta}{2})$

ii) If tan(x+iy)=u+iv prove that $\frac{u}{v} = \frac{\sin 2x}{\sinh 2y}$

b) If log sin $(\theta + i\varphi)$=L+iB, prove that $2e^{2L} = \cosh 2\varphi - \cos 2\theta$

Head of the Department **Course Instructor**

Dr. T. Sheeba Helen **Dr. K. Jeya Daisy**

Department : Mathematics

Class : I B.Sc

Title of the Course :Major Core II: DIFFERENTIAL CALCULUS

Semester : I

Course Code : MU231CC2

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
MU231CC2	4	-	-	4	4	60	25	75	100

Learning Objectives

1. Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates, and solving relatedproblems.

2. The basic skills of differentiation, successive differentiation, and their applications.

Course Outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO - 1	recall the definitions and basic concepts of Differential Calculus	PSO - 2	K1
CO - 2	understand the concepts of Differentiation, Partial Differentiation, Envelope & Curvature	PSO - 2	K2

CO - 3	Determine Partial derivatives of a function of two variablesand use Lagrange's method of undetermined multipliers.	PSO - 1	K2
CO - 4	Distinguish between partial and ordinary differential equations.	PSO - 3	K3
CO - 5	Find the evolutes and involutes and to find the radius of curvature using polar co-ordinates.	PSO - 2	K3

Total contact hours: 60 (Including instruction hours, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**Successive Differentiation**					
	6.	Introduction (Review of basic concepts)	2	K1 & K2	Brainstorming	MCQ
	7.	The n^{th} derivative - Standard results & Corollaries on successive differentiation	2	K3	Lecture	Concept explanations
	8.	Finding n^{th} derivative of some functions of x	2	K3	Problem-solving, Peer tutoring	Questioning
	9.	Trigonometrical transformation –Basic formulas	1	K1 & K2	Brainstorming	Questioning
	10.	Finding n^{th} derivative of Trigonometric functions	2	K3	Collaborative learning	Concept explanations

	11.	Formation of equations involving derivatives	1	K1 & K2	Blended classroom	Evaluation through short test
	12.	Leibnitz formula for the nth derivative of a Product	2	K1 & K3	Lecture Discussion	Concept definitions
II	**Partial Differentiation**					
	5.	Basic concepts of Partial derivatives	3	K1	Brainstorming	True/False
	6.	Successive partial derivatives - Function of a function rule	3	K2	Flipped Classroom	Short Summary
	7.	Problems Based on Partial Differentiation	3	K3	Lecture Discussion	Concept definitions
	8.	Total differential coefficient	3	K3	Group Discussion	Recall steps
III	**Partial Differentiation (Continued)**					
	7.	Homogeneous functions – Euler's Theorem	3	K2	Lecture Discussion	Concept definitions
	8.	Problems on Homogeneous functions & Euler's Theorem	3	K3	Problem solving	Slip test
	9.	Partial derivatives of a function of two variables	2	K3	Lecture, Group discussion	Concept explanations
	10.	Problems on Partial derivatives of a function of	2	K3	Problem solving	Formative assessment

		two variables				
	11.	Lagrange's method of undetermined multipliers	2	K2, K3	Lecture Discussion	Concept definitions
IV	**Envelope**					
	5.	Method of finding the envelope	2	K1 & K2	Brainstorming	Quiz
	6.	Another definition of envelope	3	K2	Flipped Classroom	Differentiate between various ideas
	7.	Envelope of family of curves which are quadratic in the parameter	3	K3	Integrative method	Explain
	8.	Problems on Envelope	4	K3	Collaborative learning	Slip Test
V	**Curvature**					
	6.	Definition of Curvature	1	K1 & K2	Seminar Presentation	MCQ
	7.	Circle, Radius and Centre of Curvature	2	K2 & K3	Seminar Presentation	Concept explanations
	8.	Problems on Curvature	3	K3	Seminar Presentation	Questioning
	9.	Evolutes and Involutes - Radius of Curvature in Polar Co-ordinates	3	K3	Seminar Presentation	Recall steps
	10.	Problems on Evolutes and Involutes	3	K3	Seminar Presentation	True/False

Course Focussing on Employability/ Entrepreneurship/ Skill Development:**Skill Development**

Activities (Em/ En/SD):**Poster Presentation, Group Discussion**

Assignment:**Create Mathematics formula song.**

Sample questions

Part A

1. If $y = \frac{ax+b}{cx+d}$, then y_1 is ------------. (U)

   a) $\frac{ad-bc}{(cx+d)^2}$ b) $\frac{ad+bc}{(cx+d)^2}$ c) $\frac{ad-bc}{(cx-d)^2}$ d) $\frac{ad-bd}{(cx+d)^2}$

2. Say true or false: If $u = (x-y)(y-z)(z-x)$, then $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.
3. If $xy = c^2$ then y_1 is ------------.
4. Envelope of a family of curves can be defined as ___________ (U)
   a) A curve which touches 50% of the family of curves
   b) A curve which is a straight line
   c) A curve which touches each member of the family of curves
   d) A curve which surrounds the family of curves
5. What is the radius of curvature of the curve $x^4 + y^4 = 2$ at the point $(1,1)$?

Part B

1. Find the n^{th}differential coefficient of $\cos x . cos2x . cos3x$.
2. Illustrate the theorem that $\frac{\partial^2 u}{\partial x . \partial y} = \frac{\partial^2 u}{\partial y . \partial x}$ when u is equal to log $(\frac{x^2+y^2}{xy})$.
3. Verify Euler's Theorem when $u = x^3 + y^3 + z^3 + 3xyz$.
4. Find the envelope of the family of curve$(x-a)^2 + (y-a)^2 = 4a$.
5. Show that the radius of curvature at any point of the catenary $y = c \cosh \frac{x}{c}$ is equal

to the length of the portion of the normal intercepted between the curve and the axis

of$x$.

Part C

1. Find the n^{th}differential coefficient of$\cos^5 \theta \sin^7 \theta$.
2. If $u = \tan^{-1} \frac{x^3+y^3}{x-y}$, prove that $x \frac{(\partial u)}{\partial x} + y \frac{\partial u}{\partial y} = sin2u$.
3. A tent having the form of a cylinder surmounted by a cone is to contain a given

   volume. If the canvass required is minimum, show that the altitude of the cone is twice that of the cylinder.

4. Find the envelope of the circles which pass through the origin and whose centres lie on $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.
5. Find the radius of curvature of the cardioid $r = a(1 - cos\theta)$.

Head of the Department **Course Instructor**

Dr. T. Sheeba Helen **Dr.V. Sujin Flower**

Teaching Plan

Department :Chemistry/ Physics
Class : I B.Sc
Title of the Course :Allied Mathematics I: Algebra And Differential Equations
Semester : I
Course Code :MU231EC1

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
MU231EC1	5	1	-	5	6	90	25	75	100

Learning Objectives

1. To understand the simple concepts of the theory of equations
2. To find the roots of the equations by using techniques in various methods.

Course outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO-1	Recall the methods of finding the solutions of algebraic equations, Differential equations and various formulae of Laplace transform	PSO - 1	K1
CO-2	Understand thetheoryof algebraic equations, eigen values, differential equations and Laplace transform	PSO – 2	K2
CO-3	Simplify algebraic expressions using various methods,find eigen values, solve initial value problems for ODEs and	PSO - 2	K3

	find inverse Laplace Transform		
CO-4	Analyse various types of first-order ODEs, relate Laplacetransform and inverse Laplace transform and formulate algebraic equations from real world problems.	PSO - 3	K4

Total contact hours: 90 (Including instruction hours, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	Theory of Equations					
	13.	Theory of Equations – An Introduction	3	K1 &K2	Brainstorming	MCQ
	14.	Formation of Equations	2	K2	Lecture with illustrations	Slip Test
	15.	Problems on Formation of Equations	2	K3	Problem Solving	Questioning
	16.	Relation between roots and coefficients	4	K4	Lecture Discussion	Questioning
	17.	Reciprocal equations	2	K2	Collaborative learning	Concept explanations
	18.	Problems on Reciprocal equations	2	K3	Problem Solving	True/False
II	Transformationof Equations					
	9.	Transformationof Equation- An Introduction	2	K1 &K2	Brainstorming	True/False
	10.	Approximatesolutionsto equations	4	K2	Flipped Classroom	Short summary
	11.	Newton’s method	2	K2&K4	Lecture Discussion	Concept definitions
	12.	Problems on Newton’s method	2	K3	Problem Solving	Quiz
	13.	Horner’s method	2	K2&K4	Lecture with illustrations	Recall steps

	14.	Problems on Newton's method	3	K3	Group Discussion	Test
III	Matrices					
	12.	Matrices- An introduction	1	K1 &K2	Brainstorming	Quiz
	13.	Characteristicequationofam atrix	2	K2	Lecture with illustration	Explain
	14.	Eigen values and Eigen vectors	2	K2	Lecture Discussion	Slip Test
	15.	Problems onEigen values and Eigen vectors	3	K3	Problem Solving	Open book Test
	16.	Cayley Hamilton theorem	2	K2	Blended Learning	Questioning
	17.	Application of Cayley Hamilton theorem	3	K3& K4	Problem Solving	Concept Recalling
	18.	Simple Problems.	2	K3	Collaborative learning	Questioning
IV	Differential equation					
	9.	Differential equation- An introduction	1	K1 &K2	Brainstorming	Simple Questions
	10.	Differential equation of first order but of higher degree	2	K2	Blended Learning	Quiz
	11.	Equationssolvableforp,x,y	3	K3	Integrative method	Explain the concept
	12.	Partialdifferentialequations	2	K1 &K2	Collaborative learning	Slip Test
	13.	Partialdifferentialequations formations	2	K2 &K3	Lecture Discussion	Questioning
	14.	Partialdifferentialequations solutions	2	K3	Problem Solving	Concept explanations
	15.	Standard form Pp+Qq=R.	3	K3& K4	Problem Solving	Test
V	Laplace Transform					

	11.	Laplacetransformation–An introduction	1	K1 &K2	Flipped Classroom	MCQ
	12.	Properties of Laplacetransformation	3	K2	Lecture with illustration	Concept explanations
	13.	Problems based on Laplacetransformation	4	K2&K3	Problem Solving	Questioning
	14.	InverseLaplacetransform	2	K2	Group Discussion	Recall steps
	15.	Problems based on InverseLaplacetransform	3	K2&K3	Problem Solving	True/False
	16.	Relation between Laplacetransformation and InverseLaplacetransform	2	K4	Analytic Method	Evaluation through short test

Course Focussing on Employability/ Entrepreneurship/ Skill Development:**Skill Development**

Activities (Em/ En/SD):**Poster Presentation, Group Discussion**

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues: -

Assignment:**Unsolved Problems (From Reference books)**

Part A

1. Identify the real root of the equation $x^3 - 7x^2 + 14x - 8 = 0$

   (a) -2 (b) ½ (c) -1/2 (d) 2

2. Complete: One root of $x^4 - 3x + 1 = 0$ lies between ----------

   a) 2 and 3 b) 2 and 2.5 c) 2.5 and 3 d) 1 and 2

3. Find the eigen values of the matrix I_2

   $a) -1,1$ b) $-1,-1$ c) $1,-1$ d) $1,1$

4. What is the particular integral of $(D^2 + 3D + 2) = e^{-x}$?
5. State true or false: $L^{-1}\left[\frac{1}{s-a}\right] = e^{ax}$.

Part B

1. Form the equation with rational coefficients one of whose roots is $\sqrt{2} + \sqrt{3}$

2.Find correct to 2 places of decimals the root of the equation $x^3 - 3x + 1$ which lies between 1 and 2 by Newton's method.

3. Find the sum and product of the eigen values of the matrix $\begin{pmatrix} 3 & -4 & 4 \\ 1 & -2 & 4 \\ 1 & -1 & 3 \end{pmatrix}$ without actually finding the eigen values.

4. Solve $(D^2 + 2D + 5)\, y = xe^x$

5. Find $L\,(x\, e^{-x}\cos x)$

Part C

1. Show that the roots of the equation $px^3 + qx^2 + rx + s = 0$ are in arithmetic progression iff $2q^3 + 27p^2 s = 9pqr$
2. Find the positive root of $x^3 - x - 3 = 0$ correct to two places of decimals by Horner's method.
3. Find the inverse of the matrix $\begin{pmatrix} 3 & 3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{pmatrix}$ Using Cayley-Hamilton theorem.
4. Solve $x^2y'' - xy' + 4y = \cos(\log x) + \sin(\log x)$.
5. If L [f(x)] = F(s) and if $\lim_{x\to 0}\frac{f(x)}{x}$ exists, then prove that $L\left[\frac{f(x)}{x}\right] = \int_s^\infty F(s)ds$

Head of the Department **Course Instructor**

Dr. T. Sheeba Helen **Dr.S.Sujitha**

Teaching Plan

Department : Mathematics
Class : I UG
Title of the Course : SEC :Mathematics for Competitive Examinations I
Course Code: MU231SE1

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
MU231SE1	2	-	-	2	2	30	50	50	100

Objectives

1. To understand the problems asked in various competitive examinations and identify the method to solve them.
2. To develop numerical aptitude by practicing different types problems.

Course outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO - 1	Understand the problems and remember the methods to solve problems.	PSO - 2	K1 &K2
CO - 2	Grasp the simplest method to solve problems.	PSO - 2	K2
CO - 3	Apply suitable mathematical method and get solutions to simple real life problems.	PSO - 5	K3

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation

Teaching plan

Total Contact hours: 30 (Including lectures, assignments and tests)

I	**Simplification and Averages**					
	1.	Simplification	3	K1& K2	Problem Solving	Questioning
	2.	Averages	3	K2, K3	Flipped Class	Recall the Method
II	**Ratio and proportion**					
	1.	Comparison of two ratios and Compounded Ratio	2	K2	Interactive Method	Concept explanations
	2.	Mean, Third and Fourth Proportional	1	K2	Problem Solving	Slip Test
	3.	Real life problems	3	K2& K3	Lecture with Illustration	Solving Methods
III	**Percentages and Partnership**					
	1.	Percentage on numbers	1	K2	Lecture with Illustration	Quiz
	2.	Population	1	K2& K3	Brainstorming	Discussion
	3.	Depreciation	1	K2 & K3	Discussion Method	Questioning
	4.	Partnership	3	K3	Lecture with Illustration	Slip test
IV	**Profit and Loss**					
	1.	Gain and Loss	2	K1& K2	Experimental Method	Questioning
	2.	Selling Similar Items	2	K2	Lecture with Illustration	MCQ
	3.	Problems on trader professes to sell his goods	2	K3	Lecture with PPT	Recall steps
V	**Problems on numbers**					
	1.	Framing and solving equations involving	3	K1& K2	Blended Learning	Quiz

		unknown numbers				
	2.	Problems involving ratios and fractions	3	K3	Lecture with Illustration	Slip test

Course Focussing on Employability/ Entrepreneurship/ Skill Development:Skill Development and Employability

Activities (Em): Real life situation problem solving, Quiz, MCQ, Slip Test, Exercise Problem Solving

Course Focussing onCross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues: -

Assignment: Exercise Problems in Probability, Random Variable, Binomial, Poisson and Normal distribution

Sample questions

Part A

Unit I

1.Simplify$\frac{(6+6+6+6)+6}{4+4+4+4+4}$..

Unit II

1. If$7 : x = 17.5 : 22.5$,find the value of x.

Unit III

1**.**If A, B, C started a business by investing Rs. 120000, Rs. 135000 and Rs. 150000 respectively, find A’s share, out of an annual profit of Rs. 56700.

Unit IV

1.If C.P is Rs. 2516 and S.P is 2272, then find the loss percentage.

Unit V

1. If the sum of a rational number and its reciprocal is $\frac{13}{6}$, then find the number.

Part B

Unit I

1. The average of five consecutive numbers A , B , C , D and E is 48. What is the product of A and E?

Unit II

1. If $(2x + 3y):(3x + 5y) = 18:29$, what is the value of $x:y$.

Unit III

1. Mrs. Roy spent Rs. 44620 on Deepawali shopping, Rs.32764 on buying laptop and remaining 32% of the total amount she had as cash with her. What was her total amount?

Unit IV

1. Mansi purchased a car for Rs.2,50,000 and sold it for Rs. 3,48,000. What is the percent profit she made on the car?

Unit V

1. If the sum of two numbers is 42 and their product is 437, then find the absolute difference between the numbers.

Part C

Unit I

1. A man spends 2/5 of his salary on house rent, 3/10 of his salary on food and 1/8 of his salary on conveyance. If he has ₹1400 left with him, find his expenditure on food and conveyance.
2. The average score of girls in class X examination in a school is 73 and that of boys is 71. The average score in class X of the school is 71.8. Find the percentage of the number of girls and boys in class X of the school.

Unit II

1. Divide Rs. 6450 among A, B, C and D such that when A gets Rs. 9, B gets Rs. 8; when B gets Rs. 6, C gets Rs. 5 and when C gets Rs. 4, D gets Rs. 3.

Unit III

1.The price of petrol is increased by 25%. How much percent must a car owner reduce his consumption of petrol so as not to increase his expenditure on petrol?

Unit IV

1. A dishonest dealer sells the goods at $6\frac{1}{4}\%$ loss on the cost price but uses $12\frac{1}{2}\%$ loss weight. What is his percentage profit or loss?

Unit V

1.The ratio between a two digit number and the sum of the digits of that number is 4 : 1. If the digit in the unit's place is 3 more than the digit in ten's place, what is the number?

Head of the Department **Course Instructors**

Dr. T. Sheeba Helen **Dr. M. K. Angel Jebitha**

Dr. A. Anat Jaslin Jini

Department : Mathematics

Class : I B.Sc

Title of the Course : FOUNDATION COURSE - BRIDGE MATHEMATICS

Semester : I

Course Code : MU231FC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
MU231FC1	2	-	-		2	2	30	40	60	100

Learning Objectives:

1. To bridge the gap and facilitate transition from higher secondary to tertiary education.
2. To instill confidence among stakeholders and inculcate interest for Mathematics.

Course Outcomes

On the successful completion of the course, student will be able to**:**		
1.	Prove the binomial theorem and apply it to find the expansions of any $(x + y)^n$ and also, solve the related problems.	**K2 & K3**
2.	Find the various sequences and series and solve the problems related to them. Explain the principle of counting.	**K1 & K3**
3.	Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations.	**K2 & K3**
4.	Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and submultiple angles, etc. Also, they can solve the problems using the transformations.	**K2 & K3**
5.	Find the limit and derivative of a function at a point, the definite and	**K3**

	indefinite integral of a function. Find the points of min/max of a function.	

K1 - Remember **K2** - Understand **K3** - Apply

Total contact hours: 30 (Including instruction hours, assignments and tests)

Unit		**Module**	**Topic**	**Teaching Hours**	**Cognitive level**	**Pedagogy**	**Assessment/ Evaluation**
I		**Algebra**					MCQ
	1.	Binomial theorem		1	K1 & K2	Brainstorming	MCQ
	2.	Problems based on the Binomial theorem		2	K3	Lecture	Concept explanations
	3.	Problems based on the middle term		2	K3	Problem-solving, Peer tutoring	Questioning
	4.	Problems based on General term		1	K1 & K2	Brainstorming	Questioning
II		**Analysis**					
	15.	16.	Sequences and series (Progressions)	1	K1	Brainstorming	True/False
	17.	18.	Problems based on Sequences and series	2	K2	Flipped Classroom	Short Summary

	19.	20.	Problems based on Partial Fundamental principle of counting	2	K3	Lecture Discussion	Concept definitions
	21.	22.	Problems based on Factorial n	1	K3	Group Discussion	Recall steps
III		**Combinatorics**					
	19.	20.	Permutations and combinations	1	K2	Lecture Discussion	Concept definitions
	21.	22.	Derivation of formulae and their connections	1	K3	Problem solving	Slip test
	23.	24.	Simple applications	1	K3	Lecture, Group discussion	Concept explanations
	25.	26.	Combinations with repetitions	1	K3	Problem solving	Formative assessment
	27.	28.	Arrangements within groups, formation of groups	2	K2, K3	Lecture Discussion	Concept definitions
IV		**Trigonometry**					
	16.	17.	Introduction to trigonometric ratios	1	K1 & K2	Brainstorming	Quiz

	18.	19.	Proof of sin(A+B), cos(A+B), tan(A+B) formulae	2	K2	Flipped Classroom	Differentiate between various ideas
	20.	21.	Multiple and sub multiple angles, sin(2A), cos(2A), tan(2A) etc., Transformations sum into product and product into sum formulae	2	K3	Integrative method	Explain
	22.	23.	Inverse trigonometric functions, Sine rule and cosine rule	1	K3	Collaborative learning	Slip Test
V		**Calculus**					
	17.	18.	Limits, standard formulae and problems	1	K1 & K2	Seminar Presentation	MCQ
	19.	20.	differentiation, first principle	1	K2 & K3	Seminar Presentation	Concept explanations
	21.	22.	uv rule, u/v rule	1	K3	Seminar Presentation	Questioning
	23.	24.	Methods of	1	K3	Seminar	Recall steps

			differentiation, application of derivatives			Presentation	
	25.	26.	Integration - product rule and substitution method.	2	K3	Seminar Presentation	True/False

Course Focussing on Employability/ Entrepreneurship/ Skill Development:**Skill Development**

Activities (Em/ En/SD):**Poster Presentation, Group Discussion**

Assignment:**Create Mathematics formula song.**

Sample questions

Part A

1. $(x+y)^n$=…………..

2.nCr =…………..

3. Compute $\frac{7!}{5!}$.

4. Find the value of $\frac{31\pi}{3}$.

5. Find $\frac{dy}{dx}$ if $y = \frac{logx}{e^x}$.

Part B

1.Find the expansion of $(2x + 3)^5$

2. Find the middle term in the expansion of $(x + y)^6$

3. In how many ways can 5 girls and 3 boys be seated in a row so that no two boys are together?

4. Find the value of $tan^{-1}\left[tan\frac{2\pi}{3}\right]$.

5. Find $f'(x)$, if $f(x) = \cos^{-1}(4x^3 - 3x)$.

Part C

1.Evaluate $(98)^4$

2. Find the last two digits of the number $(7)^{400}$

3.Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements,

(i) do the words start with P
(ii) do all the vowels always occur together
(iii) do the vowels never occur together
(iv) do the words begin with I and end in P?

4. Find the value of $\tan^{-1}\left[tan\frac{5\pi}{6}\right] + \cos^{-1}\left[cos\frac{13\pi}{6}\right]$.

5. Differentiate $(2x + 1)^5(x^3 - x + 1)^4$.

Head of the Department **Course Instructors**

Dr. T. Sheeba Helen **Dr.V. Sujin Flower&**

K. Jeya Daisy

TEACHING PLAN

Department: Mathematics

Class: II B.Sc Mathematics

Title of the Course: Core III: Differential Equations and Vector Calculus

Semester: III

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
MC2031	4	-	-	4	6	90	25	75	100

Course Code: MC2031

Objectives:

1. To gain deeper knowledge in differential equations, differentiation, and integration of vector functions.

2. To apply the concepts in higher mathematics and physical sciences.

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO – 1	distinguish linear, nonlinear, ordinary, and partial differential equations	PSO - 4	K_3(A)
CO – 2	solve linear differential equations with constant and variable coefficients	PSO - 2	K_2(U)
CO – 3	explain the basic properties of Laplace Transforms and Inverse Laplace Transforms.	PSO - 1	K_2(U)
CO – 4	use the Laplace transform to find the solution of linear differential equations	PSO - 2	K_4(Ap)
CO – 5	learn methods of forming and solving partial differential equations	PSO - 3	K_2(U)
CO – 6	learn differentiation and integration of vector-valued functions	PSO - 4	K_2(U)
CO – 7	evaluate line and surface integrals using Green's theorem, Stoke's theorem, and Gauss divergence theorem	PSO - 2	K_4(Ap), K_5(E)
CO – 8	apply the concepts to solve problems in physical sciences and engineering	PSO - 3	K_4(Ap)

Teaching plan

Total Contact hours: 90 (Including lectures, assignments, and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation

I	1.	Linear differential equation with constant coefficients - Particular integrals of functions of form e^{ax}.	4	K_2(U)	Introductory session, Group Discussion. PPT.	Evaluation through short test,MCQ, True/False.
	2.	Particular integrals of functions of the formsin ax, cos ax.	2	K_3(Ap)	Lecture using Chalk and talk, Problem-solving, Group Discussion.	Simple definitions, Recall steps,
	3.	Particular integrals of functions of the formx^n.	2	K_3(Ap)	Lecture using Chalk and talk, Problem-solving, Group Discussion.	solve problems, and explain
	4.	Particular integrals of functions of the form $e^{ax}f(x)$, $x^n f(x)$.	3	K_4(An)	Lecture using Chalk and talk, Problem-solving, Group Discussion.	Problem-solving questions, Discussions.
	5.	Homogeneous Linear equations.	4	K_5(E)	Lecture using Chalk and talk, Problem-solving, PPT.	Concept explanations, Debating.
II	1.	Laplace Transformation - Properties	5	K_1(R)	Problem-solving, Demonstration.	Check knowledge in specific situations.
	2.	Inverse Laplace transform - Properties	5	K_2(U)	Problem-solving, Group Peer tutoring.	Evaluation through short tests.
	3.	Solving linear differential equations and simultaneous equations of first order using Laplace transform.	5	K_3(Ap)	Lectures using videos, Problem-solving.	Presentations
III	1.	Formation of partial differential equations -	3	K_2(U)	Lectures using videos.	Evaluation through short tests.
	2.	First order partial differential equation.	3	K_2(U)	Introductory session, Group Discussion.	MCQ, True/False.

	3.	Methods of solving the first order partial differential equations.	3	K_4(An)	PPT, Review.	Evaluation through short tests, Seminar.
	4.	Lagrange's Equation.	3	K_3(Ap)	Lecture using Chalk and talk, Problem-solving, Group Discussion.	Concept explanations.
	5.	Charpit's method.	3	K_3(Ap)	Lecture using Chalk and talk, Problem-solving, Group Discussion.	MCQ, True/False.
IV	1.	Vector differentiation - Gradient	3	K_1(R)	Peer tutoring, Lectures using videos.	Evaluation through short tests.
	2.	Equation of tangent plane and normal line - Unit normal	4	K_2(U)	Lecture using Chalk and talk, Problem-solving.	Concept definitions
	3.	divergence and curl	4	K_3(Ap)	Problem-solving, Group Discussion.	MCQ, True/False.
	4.	Solenoidal, irrotational and harmonic vectors.	4	K_4(An)	Lecture using Chalk and talk, Problem-solving, Group Discussion.	Concept definitions
V	1.	Vector integration - Line integrals & Surface integrals	5	K_2(U)	Peer tutoring, Lectures using videos.	Evaluation through short tests, Seminar.
	2.	Green's, Stoke's and Gauss divergence theorems	5	K_3(Ap)	Problem-solving, PPT.	Suggest idea/concept with examples, suggest formulae.
	3.	Verification of Green's, Stoke's and Gauss divergence theorems.	5	K_4(An)	Lecture using Chalk and talk, Problem-solving, Group Discussion.	Concept explanations.

Course Focussing on Employability/ Entrepreneurship/ Skill Development: (Mention)

Activities (Em/ En/SD):

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): (Mention)

Activities related to Cross Cutting Issues:

Assignment:Homogeneous Linear equations.(Online)

Seminar Topic: Exercise Questions (All Units)

Sample questions (minimum one question from each unit)

Unit I:

Part A: The Particular Integral of $(D^2 – 4) = \cos 2x$ is -------

Part B: Solve $(D^2 + 5D + 6)\, y = e^x$.

Part C: Solve the equation $(D^2 - 4D + 4)\, y = e^{2x} + \cos 2x$.

Unit II:

Part A: L(cos at) = ---------?

Part B: Find L $(t^2 + 2t + 3)$.

Part C: Find the inverse Laplace transformation for $\frac{s}{(s+2)^2}$; $\frac{s-3}{s2+4s+13}$.

Unit III:

Part A: Eliminate a and b from $z = (x + a)(y + b)$.

Part B: Form the partial differential equation by eliminating the arbitrary functions f and g in $Z = f(x^3 + 2y) + g(x^3 – 2y)$.

Part C: Solve p tanx + q tany = tanz.

Unit IV:

Part A: Gradient of a constant is --------

Part B: Find grad $\emptyset$, if $\emptyset = xyz$ at (1, 1, 1).

Part C: Show that the vector $2xy\,\bar{\imath} + (x^2 + 2yz)\,\bar{\jmath} + (y^2 + 1)\bar{k}$.

Unit V:

Part A: What is the expression for the total work done by a force $\bar{F}$ in displacing a particle along a curve C?

Part B: Find the work done by the force $\overline{F}$ = (2xy + z^3)$\overline{\imath}$ + $x^2\overline{\jmath}$ + 3xz^2 $\overline{k}$, when it moves a particle from (1, -2, 1) to (3, 1, 4).

Part C: Evaluate $\int_0^{\pi}(x\ logx)dx$.

Head of the Department: Dr.T. Sheeba Helen

Course Instructor: Mrs. J C Mahizha

Teaching Plan

Department : Mathematics
Class : II B.Sc Mathematics
Title of the Course : Major Core IV:Real Analysis I
Semester : III
Course Code: MC2032

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
MC2032	5	-	-	5	5	75	25	75	100

Objectives

1. To introduce the primary concepts of sequences and series of real numbers.

2. To develop problem solving skills.

Course outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO - 1	understand the basic concepts of real numbers	PSO - 1	K2
CO - 2	explain and analyse the primary concepts of sequences and series of real numbers	PSO – 1,2	K4

CO - 3	define convergence and divergence of sequences and series.	PSO - 1	K1
CO - 4	calculate the limit points, upper and lower limits of the sequences	PSO - 4	K3
CO - 5	evaluate the convergence of series using different types of tests	PSO –4,5	K5
CO - 6	develop the skill of analysing various sequence and series	PSO – 4,5	K6

Teaching plan

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**Mathematical Induction**					
	1.	Preliminaries – Mathematical Induction	5	K1	Lecture with PPT	Questioning
	2.	Finite and Infinite Sets	4	K1, K2	Lecture with Illustration	Slip Test
	3.	Theorems based on the Real Numbers and the algebraic and order properties of R	4	K1, K2	Disscussion	Quiz
	4.	Absolute value and the real line	3	K3	Interactive Method	Evaluation through discussions
II	**Real Numbers**					
	1.	The Real Numbers- The completeness property of R.	4	K2	Lecture with PPT	Concept explanations
	2.	Applications of the supremum property	3	K2, K3	Interactive Method	Solved Problem
	3.	Intervals	3	K2	Lecture with Illustration	Slip Test
III	**Sequences**					

	1.	Sequences-Definitions Range of Sequences	3	K1	Lecture with Illustration	Quiz
	2.	Limit of a Sequence	2	K2	Brainstorming	Discussion
	3.	Bounded Sequence	3	K2	Discussion Method	Recall the concept
	4.	Monotonic Sequence	3	K1, K2	Lecture with PPT	True or false
	5.	Convergent Sequence	3	K2	Lecture with Illustration	Slip test
	6.	Behavior of monotonic sequence	3	K4	Problem Solving	Quiz
IV	**Cauchy's Sequences**					
	1.	Subsequences	3	K1, K2	Lecture with PPT Illustration	Evaluation through discussions
	2.	Peak points	2	K2	Lecture with Illustration	Recall definition
	3.	Limit points	3	K2	Lecture with PPT	Recall concepts
	4.	Cauchy's sequences	3	K2, K3	Problem Solving	Discussion
	5.	Upper and lower limits of a sequence	3	K4	Group Discussion	Concept explanations, True or false
V	**Series**					
	1.	Series-Definition& Examples	2	K1, K2	Blended Learning	Evaluation through appreciative inquiry
	2.	Infinite series	1	K6	Lecture with Illustration	Slip test

	3.	Theorems and problems based on Comparison Test	4	K4, K5	Brainstorming	Questioning
	4.	Problems based on Kummer's Test	3	K4	Lecture with PPT	Recall steps
	5.	Problems based on Ratio Test	3	K5	Problem Solving	Recall theorems
	6.	Problems based on Root Test and Condensation Test	5	K5	Problem Solving	Recall steps

Total Contact hours: 75

(Including lectures, assignments and tests)

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Employability and Skill Development

Activities (Em): Quiz, MCQ, Slip Test, Exercise Problem Solving

Course Focussing onCross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues: -

Assignment: Solving Exercise problems

Sample questions (minimum one question from each unit)

Part A

Unit I

1. The set $\mathbb{N} \times \mathbb{N}$ is
   (a) countable
   (b) uncountable
   (c) denumerable
   (d) none of the above
2. Let $P(n)$ be a statement about n. Then the induction hypothesis is . . . .

Unit II

1. Suppose that A and B are subsets of $\mathbb{R}$ that satisfy the property: $a \leq b$ for all $a \in A$ and all $b \in B$.

   (a) $sup\ A\ \leq inf\ B$ (b)$sup\ A\ \geq inf\ B$

   (b) $sup\ A = inf\ B$ (d) None of the above

Unit III

1. The peak points of the sequence 1,1/2,1/3,-1,-1,-1,…… are
(a) 1,-1,0 (b) 1,1/2,1/3 (c)1,2,3 (d) no peak points

Unit IV

2. The value of $\lim_{n\to\infty} n^{\frac{1}{n}}$ is ---------------------

Unit V

1. $\sum (-1)^n \frac{1}{n}$ is ----------------------------.

Part B

Unit I

1. Show that $2^n \leq (n+1)!$
2. Define denumerable and give two examples of denumerable sets.

Unit II

1. State and prove Archimedean property.
2. If $S = \left\{\frac{1}{n} : n \in \mathbb{N}\right\}$, then prove that $inf S = 0$.

Unit III

1. Describe the boundedness of the sequence which is diverging to ∞.

Unit IV

1. Every bounded sequence has at least one limit point.

2. Any convergent sequence is a Cauchy sequence.

Unit V

1. Test the convergence of $\sum\left(1+\frac{1}{n}\right)^{-n}$

Part C

Unit I

1. Prove that the second version principle of mathematical induction is equivalent to principle of mathematical induction.
2. Show that the following statements are equivalent:
   (i) S is a countable set
   (ii) There exists a surjection of $\mathbb{N}$ onto S

(iii) There exists an injection of S into $\mathbb{N}$

Unit II

1. If $I_n = [a_n, b_n], n \in \mathbb{N}$ is a nested sequences of closed and bounded intervals such that the length $b_n - a_n$ of I_n satisfy $\inf\{b_n - a_n : n \in \mathbb{N}\} = 0$, then prove that the number ξ contained in I_n for all $n \in \mathbb{N}$ is unique.

Unit III

1. Discuss the behaviour of geometric sequence.

Unit IV

1. Prove that a sequence (a_n) converges to l if and only if (a_n) is bounded and l is the only limit point of the sequence.

Unit V

1. (i) Discuss the convergence of $\sum \frac{1^2 + 2^2 + \ldots\ldots n^2}{n^3 + 5n + 2}$

(ii) Show that $\sum \frac{4^n + 5^n}{6^n}$ converges

Head of the Department **Course Instructor**

Dr. T. Sheeba Helen **Dr. M. K. Angel Jebitha**

Teaching Plan

Department : Mathematics
Class :II B.Sc Mathematics
Title of the Course : Probability Theory and Distributions
Semester : III
Course Code: MA2031

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
CC2041	5	-	-	5	5	75	25	75	100

Objectives

1. To impart knowledge on the basic concepts of Probability theory and Probability distributions.
2. To apply the theory in real life situations.

Course outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO - 1	recall the definition of probability and set functions	PSO – 1	R
CO - 2	differentiate between probability and conditional probability and compute according to the requirement	PSO –2	An
CO - 3	understand the definition of random variables, their types and related concepts	PSO – 1	U
CO - 4	detect the different probability distributions which are widely used	PSO –3	An
CO - 5	apply the techniques to prove the properties of probability and related distributions	PSO –4	Ap
CO - 6	choose the suitable probability distribution corresponding to a given data	PSO – 5	E
CO - 7	test the validity of a given data	PSO - 5	E

Teaching plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**Probability**					
	1.	Probability, Experiment, Sample Space, Events and related problems	3	K1	Experimental Method	Questioning
	2.	Conditional Probability Definition, Properties and related problems	5	K2, K3	Blended Learning	Concept Explanations, Solved Problem
	3.	Independent EventDefinition, Properties and related problems	5	K2, K3	Demonstrative Method	Evaluation through appreciative inquiry
	4.	Baye's Theoremand related problems	4	K4	Lecture with Illustration	Slip test
II	**Random Variables**					
	5.	Random Variables, Discrete and continuous random variables	3	K2	Interactive Method	Concept explanations
	6.	Problems on Discrete and Continuous random variable	4	K5	Problem Solving	Solved Problem
	7.	Probability density function and related problems	4	K2, K3	Lecture with Illustration	Slip Test
	8.	Distribution function and related problems	3	K2, K3	Lecture with PPT	Recall steps
	9.	Mathematical expectations and related problems	2	K2, K3	Lecture with PPT	Short summary
III	**Moments, Poisson Distribution**					

	10.	Moment generating function Properties	2	K2	Lecture with Illustration	Quiz
	11.	Cumulant generating function	2	K2	Brainstorming	Discussion
	12.	Characteristic function	2	K4	Discussion Method	Questioning
	13.	Poisson distribution	2	K1, K2	Experimental Method	True or false
	14.	Recurrence formula for moments, Fitting of Poisson distribution	2	K4	Lecture with Illustration	Slip test
	15.	Problems on Poisson distribution	5	K3, K5	Problem Solving	Quiz
IV	**Binomial Distribution**					
	16.	Binomial distribution	2	K1, K2	Experimental Method	Concept explanations, True or false
	17.	Moments of Binomial Distribution	3	K2	Lecture with Illustration	Short summary
	18.	Mode and fitting of Binomial distribution	2	K4	Lecture with PPT	Recall steps
	19.	Problems on Binomial distribution	5	K3, K5	Problem Solving	Discussion
V	**Normal Distribution**					
	20.	Normal Distribution	2	K1, K2	Blended Learning	Evaluation through appreciative inquiry
	21.	Moments of Normal Distribution	3	K2	Lecture with Illustration	Slip test
	22.	Standard Normal distribution	3	K4	Brainstorming	Questioning
	23.	Fitting of Normal distribution by area	2	K4	Lecture with PPT	True or false

		method and ordinate method				
	24.	Problems on Normal distribution	5	K3, K5	Problem Solving	Quiz

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Employability

Activities (Em): Real life situation problem solving, Quiz, MCQ, Slip Test, Exercise Problem Solving

Course Focussing onCross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues: -

Assignment: Exercise Problems in Probability, Random Variable, Binomial, Poisson and Normal distribution

Sample questions (minimum one question from each unit)

Part A

Unit I

1. True or False: For any event $A, p(A) > 0$ for all $A \subseteq S$
2. Which implies which: pairwise independent event, mutually independent event

Unit II

1. Define space of random variable
2. True of False: In a discrete random variable, $F(x) = \sum p(X = x)$

Unit III

1. The limiting case of binomial distribution is called ....
2. Which distribution we use to find the number of telephone calls received in some unit of time
   (i) Binomial (ii) Poisson (iii) Normal (iv) Gamma

Unit IV

1. The mode of binomial distribution is
   (i) Unimodal (ii) Bimodal (iii) Trimodal (iv) None of these
2. Under what situation we use binomial distribution?

Unit V

2. What is the mean, median and mode of Normal distribution?
3. Variance of standard normal distribution is ....

Part B

Unit I

1. State and prove Baye's Theorem
2. The chance of X solving a particular problem is 2/3 and Y solving the problem is 3/4. What is the probability that the problem is solved if they try independently?

Unit II

1. A continuous random variable has the distribution function $(x) = \begin{cases} 0 \; if \; x \le 1 \\ 4k(x-1)^3 \; if \; 1 < x \le 3 \\ 1 \; if \; x > 3 \end{cases}$. Find (i) k

   (ii) the probability density function of f(x)
2. Let X have the p.d.f$f(x) = \begin{cases} \frac{x+1}{2} \; if -1 < x < 1 \\ 0 \; otherwise \end{cases}$. Find the mean and standard deviation of X

Unit III

1. Find the m.g.f of the random variable having the p.d.f$f(x) = \begin{cases} \frac{1}{3} if -1 < x < 2 \\ 0 \; otherwise \end{cases}$
2. If X has a Poisson distribution and $P(X = 0) = P(X = 1) = k$. Show that $k = 1/e$

Unit IV

1. Six dice are thrown 729 times. How many times do you expect at least 3 dice to show a five or a six.
2. Find the probability that in a family of 4 children there will be (i) at least 1 boy (ii) at least 1 boy and 1 girl. Assume that the probability of a boy child birth is 1/2

Unit V

1. Assume the mean height of soldiers to be 68.22 inches with variance of 10.8 inches. How many soldiers in a regiment of 2000 soldiers would you expect to be over six feet tall? Assume heights to be normally distributed.
2. Find the value of k, mean and variance of the following normal distribution $f(x) = ke^{-[(x^2/8)+x+2]}$

Part C

Unit I

3. One factory A produces 1000 articles, 20 of them being defective, second factory B produces 4000 articles, 40 of them being defective and third factory C produces 5000 articles, 50 of them being defective. All these articles are put in one stock pile. One of them is chosen and is found to be defective. What is the probability that it is from the factory A
4. The contents of 3 urns are as follows

   Urn I: 1 white + 2 black + 3 red balls

   Urn II: 2 white + 1 black + 1 red ball

   Urn III: 4 white + 5 black + 3 red ball

Unit II

1. Obtain the (i) mean (ii) median and (iii) mode for the following distriburion$f(x) = \begin{cases} 6(x - x^2)\ if\ 0 < x < 1 \\ 0\ elsewhere \end{cases}$
2. The probability distribution function of a continuous random variable X is given by $f(x) = \begin{cases} x\ if\ 0 < x \le 1 \\ 2 - x\ if\ 1 \le x \le 2 \\ 0\ if\ x \ge 2\ and\ x\ \le 0 \end{cases}$. Find the distribution function of X

Unit III

1. Assuming that one in 80 births is a case of twins calculate the probability of 2 or more births of twins on a day when 30 births occur using (i) binomial distribution (ii) poisson approximations
2. Show that the rth moment for the distribution $f(x) = ce^{-cx}$ where c is positive and $0 \le x < \infty$ is $\frac{r!}{c^r}$ and rthcumulant is $\frac{(r-1)!}{c^r}$

Unit IV

2. Find β and γ coefficients for the binomial distribution and discuss the results with special reference to skewness and kurtosis
3. If X has binomial distribution, then show that $\mu_{r+1} = pq[nr\mu_{r-1} + \frac{d\mu_r}{dp}]$

Unit V

1. A set of examination marks is approximately distributed with a mean 75 and standard deviation of 5. If the top 5% of students get grade A and the bottom 25% get grade B, then what mark is the lowest A and what mark is the highest B?
2. The marks of 1000 students in a university are found to be normally distributed with mean 70 and standard deviation 5. Estimate the number of students whose marks will be (i) between 60 and 75 (ii) more than 75 (iii) less than 68

Head of the Department **Course Instructor**

Dr. T. Sheeba Helen **Dr. A. Anat Jaslin Jini**

Department : Mathematics

Class : IIIB.ScMathematics

Title of the Course : Major Core VII- Linear Algebra

Semester : V

Course Code : MC2051

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
MC2051	6	-	-	5	6	90	25	75	100

Objectives:

1. To introduce the algebraic system of Vector Spaces, inner product spaces.

2. To use the related study in various physical applications.

Course Outcomes

CO	upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO-1	recall and define Groups, Fields, and their properties	PSO - 1	K1(R)
CO-2	cite examples of vector spaces, subspaces, and linear transformations	PSO - 1	K2(U)
CO-3	determine the concepts of linear independence, linear dependence, basis, and the dimension of vector spaces	PSO - 1	K2(U)
CO-4	correlate rank and nullity, Linear transformation, and matrix of a Linear transformation	PSO - 2	K3(Ap)
CO-5	examine whether a given space is an inner product space and the orthonormality of sets	PSO - 3	K4(An)

Total contact hours: 90 (Including lectures, assignments, quizzes, and tests)

Unit	Section	Topics	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**Vector spaces**					
	1.	Vector spaces -	4	K2(U)	Lecture using Chalk	Evaluation

		Definition			and talk ,Introductory session, Group Discussion, Mind mapping, Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	through slip test quiz, test
	2.	Vector spaces - Examples	4	K3(Ap)		
	3.	Subspaces	5	K4(An)		
	4.	Linear transformation.	5	K3(Ap)		
II	**The span of a Set**					
	1	Span of a Set	3	K2(U)	Lecture Illustration	Home Assignment
	2	Linear Independence	4	K4(An)	Lecture, Group discussion	Evaluation through slip test
	3	Basis and Dimension	3	K3(Ap)	Lecture using videos, Problem solving	Formative Assessment
	4	Rank and Nullity	4	K2(U)	Lecture using Chalk and talk ,Introductory session, Group Discussion	Online Quiz, Test
	5	Matrixof a Linear Transformation	4	K3(Ap)	Lecture Illustration	Online Assignment
III	**Cayley-Hamilton Theorem**					
	1	Characteristic Equation	4	K2(U)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping, Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	Evaluation through short test,MCQ, True/False, Short essays, Concept explanations
	2	Cayley-Hamilton Theorem	5	K4(An)		Simple definitions, MCQ, Recall steps, Concept definitions

	3	Eigenvalues and Eigen vectors	5	K3(Ap)		Suggest idea/concept with examples, Suggest formulae, Solve problems
	4	Properties of Eigenvalues.	4	K3(Ap)		Evaluation through short test,MCQ, True/False, Short essays, Concept explanations
IV	**Inner Product Spaces**					
	1	Inner Product Spaces - Definition	4	K2(U)	Lecture Illustration	Slip Test
	2	Inner Product Spaces - examples	4	K4(An)	Lecture, Group discussion	Home Assignment
	3	Orthogonality	5	K3(Ap)	Lecture using videos, Problem solving	quiz
	4	Orthogonal complement	5	K3(Ap)	Lecture using Chalk and talk ,Introductory session, Group Discussion	Formative Test, Online Quiz
V	**Bilinear forms**					
	1	Bilinear forms	3	K2(U)	Lecture Illustration	Class Test
	2	Quadratic forms	3	K2(U)	Lecture Illustration	Formative assessment
	3	Reduction of a quadratic form to the diagonal form	3	K4(An)	Lecture Illustration	Online Quiz
	4	Partially ordered set-	3	K3(Ap)	Lecture Illustration	Online

		Lattices				Assignment
	5	Distributive Lattices-Modular Lattices-	3	K3(Ap)	LectureIllustration	Class test
	6	Boolean Algebra.	3	K4(An)	Lecture Illustration	Slip test

Course Focussing on Skill Development

Activities (Em/ En/SD):Evaluation through short test, Seminar

Assignment :Inner Product Spaces **(**online Assignment**)**

Sample questions

Part A

1. Let $A = \{(a, 0,0)|a \in R\}$, $B = \{(0, b, 0)|b \in R\}$ Then
   (a) A is a subspace of R. (b) B is a subspace of R
   (c) A and B and subspaces of R^2. (d) A and B are subspaces of R^3.
2. Let $T: V \rightarrow W$ be a linear transformation then T is a monomorphism iff
   (a) Ker T = {0} b) Ker T = {1}
   (c) Ker T = {e} d) Ker T = {φ}

Part B

1. Prove that the intersection of two subspaces of a vector space is a subspace.
2. Verify the vectors { (1, 2, 3), (4, 1, 5), (- 4, 6, 2)} are linearly independent or linearly dependent.

Part C

1. State and prove fundamental theorem of homomorphism.
2. Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$

Head of the Department **Course Instructor**

Dr.T.Sheeba Helen **Dr. A. JancyVini**

Teaching Plan

Department : Mathematics
Class : III B.Sc Mathematics
Title of the Course :Real Analysis II
Semester :V

Course Code:MC2052

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
CC2041	6	-	-	5	6	90	25	75	100

Objectives

- To introduce Metric Spaces and the concepts of completeness, continuity, connectedness and compactness
- To use these concepts in higher studies

Course outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO - 1	understand the concepts of completeness, continuity and discontinuity of metric spaces	PSO - 1	U
CO - 2	apply the metric space theorems to real life situations	PSO - 4	Ap
CO - 3	distinguish between continuous functions and uniform continuous functions	PSO - 5	An
CO - 4	use basic concepts in the development of real analysis results	PSO - 1	C
CO - 5	Understand the concepts of metric space, connectedness and compactness of metric spaces	PSO - 3	U
CO - 6	Develop the ability to reflect on problems that are quite significant in the field of analysis	PSO -2	Ap

Teaching plan

Total Contact hours: 90 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**Metric Spaces**					
	1.	Metric Space Introduction – Definition, different types of metric spaces	5	K2	Lecture with Illustration	Questioning
	2.	Examples on Metric Space	3	K3	Problem Solving	Concept Explanations, Solved Problem
	3.	Bounded set,Open ball	3	K2	Lecture with Illustration	Evaluation through appreciative inquiry
	4.	Open sets in a Metric Space	5	K2, K4	Brainstorming	Evaluation through quizzes and discussions
	5.	Equivalent Metrics	2	K3	Interactive Method	Slip test
	6.	Subspace, Interior of a set	2	K2, K4	Inductive Learning	True or False
	7.	Closed set, Closure of a set	4	K2, K4	Heuristic Method	Quiz
	8.	Limit point, Dense set	4	K2, K5	Lecture with Illustration	MCQ
II	**Complete Metric Spaces and Contraction Mapping**					
	9.	Complete Metric Space – Introduction, convergence and limit of a sequence	2	K2	Lecture with PPT	Concept explanations

	10.	Cauchy sequence	1	K2	Lecture	True or False
	11.	Complete Metric Space	5	K3	Blended Learning	Slip test
	12.	Cantor's Intersection Theorem	2	K4	Lecture	Short summary
	13.	Baire's Category Theorem and problems	4	K4	Lecture with Illustration	Discussions
	14.	Contraction definition and contraction mapping theorem	2	K2, K3	Brainstorming	Evaluation through appreciative inquiry
III	**Continuity**					
	15.	Continuous Function – definition and characterisation for continuity of a function	4	K2	Discussion	Questioning
	16.	Problems on continuous function	3	K3, K6	Problem Solving	Problem-solving questions
	17.	Homeomorphism and Isometry	5	K3, K4	Interactive Method	Quiz
	18.	Uniform Continuity – Introduction	2	K3, K4	Brainstorming	True or false
	19.	Discontinuous Functions on $\mathbb{R}$	5	K2, K3	Heuristic Method	Slip test
IV	**Connectedness**					
	20.	Connected Space, characterization for connectedness	4	K2	Demonstration Method	Concept explanations, True or false
	21.	Closure of connected	2	K4	Interactive	Short summary

		space and union of connected space			Method	
	22.	Connectedness of $\mathbb{R}$	2	K4	Heuristic Method	Recall steps
	23.	Connectedness and continuity	2	K2	Lecture with PPT	Questioning
	24.	Problems on connected space	1	K3, K6	Problem Solving	MCQ
V	**Compactness**					
	25.	Compact space, Characterisation for compact space	4	K2	Lecture with Illustration	Evaluation through appreciative inquiry
	26.	Heine Borel Theorem	1	K2	Lecture	Slip test
	27.	Finite intersection property, characterisation of compact space using finite intersection property	2	K4	Lecture with PPT	Discussion
	28.	Totally bounded set	4	K5	Blended Learning	True or false
	29.	Sequentially compact space	2	K4	Brainstorming	Questioning
	30.	Compactness and continuity	3	K2	Discussion	MCQ

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Skill Development

Activities (SD): Quiz, MCQ, Slip Test, Debate, Problem Solving

Course Focussing onCross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues: -

Assignment: Exercise Problems in Metric Space, Complete Space, Continuous function, Connected, Compact spaces

Sample questions (minimum one question from each unit)

Part A

Unit I

1. The limit points of the set of integers is ……….
2. True or False: Every set can have a metric
3. Set A is closed if and only if
   (i) $A = \bar{A}$ (ii) $A = Int\ A$ (iii) $A = D(A)$ (iv) $|A| < k$
4. Which of the following subsets are open in $\mathbb{R}$?
   (i) $\mathbb{Q}$ (ii) $\mathbb{N}$ (iii) $\mathbb{Z}$ (iv) $(1, 2)$
5. If a subset A of M is dense in M, then only closed set which contains A is ………

Unit II

1. True or False: A subspace of complete metric space is complete
2. A subset A of M is said to be nowhere dense in M if and only if
   (i) $Int\ A = \emptyset$ (ii) $Int\ A = M$ (iii) $Int\bar{A} = \emptyset$ (iv) $Int\ \bar{A} = M$
3. Any complete metric space is of ……… category
4. In $\mathbb{R}$ with usual metric any finite subset A is
   (i) First category (ii) Second Category
   (ii) Everywhere dense (iv) Nowhere dense
5. True or False: Any metric space which is of second category is complete

Unit III

1. Which of the following spaces are homeomorphic

(i)[0, 1] and [0, 2] (ii) $(0, \infty)$ and $\mathbb{R}$ (iii) $[0, \infty]$ and $\mathbb{R}$ (iv) $(0, 1)$ and $(0, \infty)$

2. Which of the following statements are true

(i) f is continuous iff inverse image of open set is open

(ii) f is continuous iff inverse image of closed set is closed

(iii) f is continuous iff inverse image of closed set is open

(iv) f is continuous iff inverse image of open set is closed

3. True or False: $\mathbb{R}$ with usual metric is homeomorphic to $\mathbb{R}$ with discrete metric

4. Give an example of a function which is continuous but not uniformly continuous

5. What is the difference between continuous and uniformly continuous?

Unit IV

1. For what cardinality the discrete metric space will be connected?
2. The only sets which are both open and closed in connected space is ………
3. True or False: Union of connected space is connected
4. Which of the following are connected subsets of ℝ?
   (i) (a, b) (ii) (a, b] (iii) [a, b) (iv) [a, b]
5. If f is a non-constant real valued continuous function on ℝ, then the range of f is ………

Unit V

4. Define Heine Borel Theorem
5. Which implies which: compact space, totally bounded
6. Give an example of a complete metric space which is not compact
7. Does there exist a continuous function f from [a, b] onto (a, b)?. Comment your answer
8. The open cover for ℝ is ……….

Part B

Unit I

1. Let (M, d) be the discrete metric space. Then show that

$$B(a,r) = \begin{cases} M & if\ r < 1 \\ \{a\} & if\ r \geq 1 \end{cases}$$

2. Show that the function d defined as $d(x,y) = \begin{cases} 0\ if\ x = y \\ 1\ if\ x \neq y \end{cases}$ is metric on M
3. Show that the set of rational and irrational numbers are not open in ℝ
4. Let M be a metric space and M_1 be a subspace of M. Let $A_1 \subseteq M_1$. Then A_1 is open in M_1 if and only if there exists an open set A in M such that $A_1 = A \cap M_1$
5. Let (M, d) be a metric space. Let $A \subseteq M$. Then x is a limit point of A if and only if each open ball with centre x contains an infinite number of points of A.

Unit II

1. Let M be a metric space and $A \subseteq M$. Then $x \in \bar{A}$ if and only if there exists a sequence (x_n) in A such that $(x_n) \to x$
2. Show that any discrete metric space is complete
3. A subset of complete metric space is complete if and only if it is closed
4. Let A, B subsets of ℝ. Prove that $\overline{A \times B} = \bar{A} \times \bar{B}$
5. Prove that the union of a countable number of sets which are of first category is first category

Unit III

3. Show that there is no function $f: R \to R$ such that f is continuous at each rational number and discontinuous at each irrational number
4. Prove that isometry is a homeomorphism and show by an example that the converse need not be true
5. Prove that the function $f: (0,1) \to \mathbb{R}$ defined by $f(x) = 1/x$ is not uniformly continuous
6. Show that the metric spaces $(0,1)$ and $(0,\infty)$ are homeomorphic

7. Let D be the set of all points of discontinuities of a function $f: \mathbb{R} \to \mathbb{R}$. Then D is of type F_σ

Unit IV

1. State and prove intermediate value theorem
2. Prove that (0, 1) is not a connected subset of $\mathbb{R}$ with discrete metric
3. Prove that all the components of a metric space M forms a partition of M
4. Prove that any connected subset of R containing more than one point is uncountable
5. Prove that if $f: R \to R$ is a continuous function which assumes only rational values then f is a constant function

Unit V

1. Show that every totally bounded metric space is separable
2. Prove that the range of a continuous real valued function f on compact connected metric space M must be either single point or a closed and bounded interval
3. Show that any continuous function defined on a compact metric space M in to any other metric space is uniformly continuous on M
4. Verify whether the following metric spaces compact or not
   (i) $(0, 1)$ (ii) $[0, \infty]$ (iii) Infinite discrete metric space
5. Prove that any continuous real valued function f defined on a compact metric space is bounded and attains its bounds

Part C

Unit I

1. If d and ρ are metrics on M and if there exists $k > 1$ such that $\frac{1}{k}\rho(x,y) \leq d(x,y) \leq k\rho(x,y)$ for all $x, y \in M$. Prove that d and ρ are equivalent metrics.
2. Let M be a metric space and $A \subseteq M$. Then the following are equivalent
   (i) A is dense in M
   (ii) The only closed set which contains A is M
   (iii) The only open set disjoint from A is ∅
   (iv) A intersects every non-empty open set
   (v) A intersects every open ball
3. Let M be a metric space and $A \subseteq M$. Then $\bar{A} = A \cup D(A)$
4. Show that in a metric space every closed ball is a closed set
5. Let (M, d) be a metric space. Let $A, B \subseteq M$.
   (i) A is open iff A = Int A
   (ii) Int A = union of all open sets contained in A
   (iii) Int A is the largest open set contained in A
   (iv) $A \subseteq B \Rightarrow Int\ A \subseteq Int\ B$
   (v) $Int\ (A \cap B) = Int\ A \cap Int\ B$
   (vi) $Int\ (A \cup B) \supseteq IntA \cup Int\ B$

Unit II

1. State and prove the Baire's Category Theorem
2. Show that l_2 space is complete
3. Prove that a closed set A in a metric space M is nowhere dense if and only ifA^c is nowhere dense
4. State and prove Cantor's Intersection Theorem
5. Show that $\mathbb{C}$ with usual metric is complete

Unit III

1. Show that the function $f: R \to R$ defined by $f(x) = \begin{cases} 0 & if\ x\ is\ irrational \\ 1 & if\ x\ is\ rational \end{cases}$ is not continuous by each of the following methods

(i). By the usual ϵ, δ method

(ii). By exhibiting a sequence (x_n) such that $(x_n) \to x$ such that $(f(x_n))$ does not converge to $f(x)$

(iii). By exhibiting an open set G such that $f^{-}(G)$ is not open

(iv). By exhibiting an closed set F such that $f^{-}(F)$ is not closed

(v). By exhibiting a subset A of R such that $f(\bar{A})$ does not contained in $\overline{f(A)}$

2. A function $f: R \to R$ is continuous at $a \in \mathbb{R}$ if and only if $\omega(f, a) = 0$

3. Prove that f is continuous if and only if inverse image of open set is open

4. Show that a function f is continuous at a if and only if $(x_n) \to a \Rightarrow (f(x_n)) \to f(a)$

5. State and prove contraction mapping theorem

Unit IV

1. A subspace of R is connected if and only if it is an interval
2. A metric space M is connected if and only if there does not exist a continuous function f from M onto the discrete metric space {0, 1}
3. Prove that in a metric space M, the following are equivalent
   (i) M is connected
   (ii) M cannot be written as union of two disjoint non-empty closed sets
   (iii) M cannot be written as the union of two non-empty sets A and B such that $A \cap \bar{B} = \bar{A} \cap B = \emptyset$
   (iv) M and $\emptyset$ are the only sets which are both open and closed in M
4. If A and B are connected subsets of M and $A \cap B \neq \emptyset$, then $A \cup B$ is connected
5. Show that closure of a connected set is connected

Unit V

1. Show that every compact subset A of metric space M is closed and bounded
2. State and prove Heine Borel'sThoerem
3. A metric space M is compact if and only if any family of closed sets with finite intersection property has non-empty intersection
4. A metric space M is totally bounded if and only if every sequence in M has a Cauchy subsequence

5. Prove that in a metric space M the following are equivalen
   (i) M is compact
   (ii) Any infinite subset of M has a limit point
   (iii) M is sequentially compact
   (iv) M is totally bounded and complete

Head of the Department **Course Instructor**

Dr. T. Sheeba Helen **Dr. A. Anat Jaslin Jini**

Teaching Plan

Department: Mathematics Aided

Class: III B.Sc Mathematics

Title of the course: Computer Oriented Numerical Methods

Semester: IV

Course Code: MC2053

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
MC2053	4	-	-	4	90	90	25	75	100

Objectives:

1. To introduce the basic concept on elementary programming language and its structure
2. To apply computer programs for the solution of various numerical problems
3. Toprovide suitable and effective numerical methods, for computing approximate numerical values of certain raw data.

4.To lay foundation of programming techniques to solve mathematical problems.

COURSEOUTCOMES:

CO	**Upon completion of this course the students will be able to:**	**PSO addressed**	**CL**
CO - 1	understand the elementary programming language and its structure.	PSO - 4	U
CO - 2	develop computer programs for the solution of various numerical problems	PSO - 5	C
CO - 3	apply numerical methods to obtain approximate solutions to mathematical problems	PSO - 3	Ap
CO - 4	employ different methods of constructing a polynomial using various methods	PSO - 2	E
CO - 5	Understand the rate of convergence of different numerical formula and various numerical methods for the solution of algebraic and transcendental equations	PSO - 4	U
CO - 6	distinguish the advantages and disadvantages of various numerical methods	PSO - 4	An

Teaching Plan

Total Contact hours: 90 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/Evaluation
I						
	1.	Basic structure of C programs , Keywords and Identifiers, Constants and Variables	5	K1(R), K2(U)	Lecture using videos, PPT	Simple definitions, Recall basic concepts aboutcomputer education
	2.	Data Types, Operations and Expressions, Arithmetic Operators, Relational Operators.	5	K2(U)	Lecture using videos, PPT	Oral Test
	3.	Logical Operators, Assignment Operators, Increment and Decrement Operators.	5	K4(An)	Lecture using Chalk and talk, Peer tutoring	Suggest idea/concept, concept explanation with examples
	4.	Conditional Operators, Bitwise Operators, Special Operators.	5	K4(An)	Lecture using videos, PPT	Simple definitions and Questions
	5.	Managing Input and Output Operations	5	K3(Ap)	Lecture using videos, PPT, Group discussion	Differentiate between various ideas
	6.	Formatted Input, Formatted Output	5	K3(Ap)	Lecture using Chalk and talk, Peer tutoring	Evaluation through short test
II						

	1.	Decision making and Branching, Decision making with IF statement.	5	K2(U)	Hands on Training	Oral Test
	2	Simple IF statement, The IF…Else statements, Nesting of IF… Else statements.	5	K2(U), K3(Ap)	Lecture with videos	Slip test, Assignments
	3	The GOTTO statement, Decision making and Looping	5	K4(An)	Lecture using videos, PPT	Class test, Home work
	4	The WHILE statement, The DO statement	5	K2(U)	Lecture, Group discussion	Brain Storming
	5.	The FOR Statement	5	K2(U)	Lecture using videos, PPT	Formative Assessment
III						
	1.	Solution of algebraic and transcendental equations: Iteration method.	5	K2(U), K3(Ap)	Lecture using Chalk and talk, Problem solving, PPT	Brain Storming
	2.	Programs in C for Newton Raphson method	5	K3(Ap)	Hands on Training	Evaluation through output of the program
	3.	Interpolation, Newton's Interpolation formula, Programs in C for Newton's Forward Interpolation.	5	K3(Ap)	Lecture using Chalk and talk, Group Discussion, Problem solving, PPT, Hands on Training	Problem solving questions, Home work

	4.	Newton's Backward Interpolation, Lagrange' Interpolation formula	5	K3(Ap)	Problem Solving	Slip test, Assignments
IV						
	1.	Numerical differentiation, derivatives using Newton's forward difference formula	5	K2(U)	Lecture using Chalk and talk, Problem solving	Problem solving questions, Home work
	2.	Newton's backward difference formula	4	K2(U)	Group Discussion, Problem solving	Class Test, Home work
	3.	Numerical integration		K4(An)	Lecture using Chalk and talk, Problem solving	Problem Solving
	4.	Newton cote's, quadrature formula	5	K2(U), K3(Ap)	Problem Solving	Problem solving questions, Home work
	5.	Trapezoidal rule, *programs in C for Trapezoidal rule*	4	K3(Ap)	Hands on Training	Hands on Training
V						
	1.	Simpson's (1/3)rd rule, programs in C for Simpson's	5	K2(U)	Problem Solving	Evaluation through solving exercise problem
	2.	One - third rule-Simpson's (3/8)th rule	4	K3(Ap)	Lecture using Chalk and talk, Problem solving	Problem solving questions, Home work

	3.	Numerical solution of differential equation.	5	K4(An)	Problem Solving	Formative Assessment
	4.	Taylor’s series method	4	K2(U), K3(Ap)	Lecture using Chalk and talk, Problem solving	Slip test
	5.	Picard’s method	4	K2(U), K3(Ap)	Problem Solving	Class test, Problem solving questions, Home work

Course Focusing on Employability/Entrepreneurship/Skill Development : Employability

Activities(Em/En/SD):Evaluation through short test, Seminar

Assignment:Simple IF statement, The IF…Else statements, Nesting of IF… Else statements.

Seminar Topic:Newton Raphson method – Exercise Problems

Sample questions:

Part-A

1. Which one of the following is a string constant?

(a) ‘3‘ (b) “hello” (c) 30 (d) None

2. Loop is allowed for which of the following statements?

(a) while (b) for (c) do (d) all the above

3.The order of convergence of the Newton Raphson's method is

a) 1 b) at least 2 c) at least 1 d) at most 2

4. What is the other name of Newton's forward interpolation formula ?

a)Adam's – Bashforth formula b) Taylor's formula

c) Gregori- Newton formula d) Lagrange's formula

5. The general solution of a differential equation of the n^{th} order has ………arbitrary constants.10.

The error in Simpson's one-third rule is of order……………..

Part – B

6. Define variable. Summarize the rules for variable declaration

7. Explain FOR statement with an example

8. Prove the order of convergence of the Newton Raphson's method is at least 2.

9. Evaluate $\int_0^5 \frac{dx}{4x+5}$ by Trapezoidal rule using 11 coordinates.

10. Evaluate $\int_0^{\frac{\pi}{2}} \sin x dx$ by Simpson's one-third rule dividing the range into six equal parts.

Part – C

Answer all the questions:

11. Explain ASSIGNMENT, INCREMENT and DECREMENT operators.

12. Differentiate between WHILE and DO…..WHILE with syntax and example

13. Use Lagrange's interpolation formula to fit a polynomial to the data

x	0	1	3	4
y	-12	0	6	12

Find the value of y when $x = 2$.

14. Find $y'(x)$ for the given data.

x	0	1	2	3	4
y(x)	1	1	15	40	85

Hence find $y'(x)$ at x=0.5.

15. Using Picard's method solve $\frac{dy}{dx} = 1 + xy$ with $y(0) = 2$. Find $y(0.1)$, $y(0.2)$ and $y(0.3)$.

Head of the Department | **Course Instructor**

Dr. T. Sheeba Helen | **Dr. J. Befija Minnie**

Department : Mathematics

Class : III B. Sc

Title of the Course : Elective I: (a) Graph Theory

Semester : **V**

Course Code : **MC2055**

Course Code	**L**	**T**	**P**	**Credits**	**Inst. Hours**	**Total Hours**	**Marks**		
							CIA	**External**	**Total**
MC2055	5	-	-	4	5	75	25	75	100

Objectives:

1. To introduce graphs and the concepts of connectedness, matchings, planarity and domination.
2. To apply these concepts in research.

Course Outcomes

CO	**upon completion of this course, the students will be able to:**	**PSO addressed**	**Cognitive level**
CO-1	Understand the basic definitions to write the proofs of simple theorems.	PSO - 1	K2(U)
CO-2	Employ the definitions to write the proofs of simple theorems.	PSO - 2	K3(Ap)
CO-3	Relate real life situations with mathematical graphs.	PSO - 3	K3(Ap)
CO-4	Develop the ability to solve problems in graph theory.	PSO - 4	K4(An)
CO-5	Analyze real life problems using graph theory both quantitatively and qualitatively.	PSO - 4	K4(An)

Total Contact Hours: 75 (Including lectures, assignments, quizzes, and tests)

Unit	Section	Topics	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**Basics**					
	1.	Graphs - Pictorial representation - Subgraphs	2	K1, K2(U)	Demonstration, PPT	Questioning
	2.	Isomorphism and degrees Walks and connected graphs	2	K3(Ap)	Lecture with Illustration	Concept explanations
		Cycles in graphs	2	K1, K2(U)	Demonstration, PPT	Concept explanations
	3.	Theorems on cycles in graphs	3	K4(An)	Lecture with Discussion	MCQ
	4.	Cut-vertices and cut-edges	4	K1, K2(U)	Blended classroom, Lecture using videos	Slip Test
	5.	Theorems on cut-vertices and cut-edges	2	K3(Ap)	Lecture with Discussion	Concept explanations
II	**Eulerian and Hamiltonian Graphs, Bipartite Graphs**					
	1.	Eulerian graphs	3	K2(U)	Lecture with Illustration	Home Assignment
	2.	Fleury's algorithm	2	K4(An)	Lecture, Group Discussion	MCQ
	3.	Hamiltonian graphs - Weighted graphs - Chinese Post-man Problem - Travelling Sales-man Problem	4	K3(Ap)	Lecture using videos, Problem solving	Formative Assessment
	4.	Bipartite graphs	3	K2(U)	Lecture using Chalk and talk ,Introductory session, Group Discussion	MCQ

	5.	Trees	3	K3(Ap)	Lecture Illustration	Online Assignment
III	**Planar graphs and Colourings**					
	1.	Planar graphs - Euler formula	3	K2(U)	Lecture,Introductory session	MCQ
	2.	Platonic solids - Dual of a plane graph	3	K4(An)	Group Discussion	Concept explanations
	3.	Characterization of planar graphs	2	K3(Ap)	Lecture with Illustration	Slip Test
	4.	Colourings - Vertex colouring	4	K1, K2	Demonstration, PPT	Short summary
	5.	Edge colouring - An algorithm for vertex colouring	3	K3	Lecture using videos	Questioning
IV	**Directed Graphs**					
	1	Directed Graphs	2	K2(U)	Lecture with Illustration	Slip Test
	2	Connectivity in digraphs	3	K4(An)	Lecture, Group discussion	Home Assignment
	3	Strong orientation of graphs - Eulerian digraphs	4	K3(Ap)	Lecture using videos, Problem solving	quiz
	4	Tournaments	2	K3(Ap)	Introductory session, Group Discussion	Formative Test, Online Quiz
	5	Theorems on Tournaments	4	K3(Ap)	Lecture with Illustration	Concept explanations
V	**Theory of Domination in Graphs**					
	1	Theory of Domination in	4	K2(U)	Lecture with	Class Test

		Graphs - Dominating Sets			Illustration	
	2	Relationship between independent sets and dominating sets	3	K2(U)	Lecture with Illustration	Formative assessment
	3	Irredundant sets	4	K4(An)	Group Discussion	Online Quiz
	4	Upper Bounds and Lower Bounds for the Domination Number $\gamma(G)$.	4	K3(Ap)	Demonstration, PPT	Online Assignment

Course Focussing on Skill Development

Activities (Em/ En/SD): Evaluation through short test, Seminar

Assignment: Application of Graph Theory **(**online Assignment**)**

Sample questions

Part A

1. A graph G is regular provided ----------

a) $\delta(G) < \Delta(G)$ b) $\delta(G) > \Delta(G)$ c) $\delta(G) = \Delta(G)$ d) $\delta(G) \neq \Delta(G)$

2. **Say true or false:** Every Hamiltonian graph is Eulerian.

3. The chromatic number of $K_{n,n}$ is ----------

a) n b) n-1 c) 2n-1 d) 2

4. A digraph is weakly connected if ---------- (K-U, CO-1)

a) every pair of points are mutually reachable.

b) among two points one is reachable from the other.

c) the underlying graph is connected.

d) none of the above.

5. The domination number of the complete graph is ----------

Part B

1. Let G be a graph on at least 6 vertices, prove that G or $\bar{G}$ contains a triangle.
2. If G is a Hamiltonian graph, then ω(G-S) ≤ $|S|$, for every nonempty subset S of V(G).
3. Prove that for any graph G, χ(G)≤Δ(G)+1.
4. Prove that every tournament D contains a directed Hamiltonian path.
5. Prove that for any graph G, $\gamma(G) \leq \beta_0(G)$.

Part C

1. If q >$\frac{p^2}{4}$, then prove that every (p,q) – graph contains a triangle.
2. Prove that a (p, q)- graph G is bipartite graph iff it contains no odd cycles.
3. Prove that $\chi(G) = min\{\chi(G + (u, v)), \chi(G.uv)\}$, for any two non-adjacent vertices$u$&v.
4. Prove that a digraph D is strongly connected if and only if D contains a directed closed walk containing all its vertices.
5. Prove that $\gamma(T) = p - \Delta(T)$ if and only if T is a wounded spider for any tree T.

Head of the Department | **Course Instructor**

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