DEPARTMENT OF MATHEMATICS (S.F)

Vision

To empower women globally competent with human values and ethics acquiring academic and entrepreneurship skills through holistic education.

Mission

1. To create opportunities which will ensure academic excellence in critical thinking, humanistic and scientific inquiry.
2. To develop application oriented courses with the necessary input of values.
3. To create a possible environment for innovation, team spirit and entrepreneurial leadership.
4. To form young women of competence, commitment and compassion.

Programme Educational Objectives (PEO)

PEO 1	The graduates will apply appropriate theory and scientific knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise.
PEO 2	The graduates pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.
PEO 3	The graduates will demonstrate the ability to utilize effectively the variety of teaching techniques and class room strategies and develop confidence to appear for competitive examinations and occupy higher levels of academic and administrative fields.

Programme Outcomes (PO)

PO	**Upon completion of the B.Sc. Degree Programme, the graduates will be able to:**
PO - 1	equip students with hands on training through various courses to enhance entrepreneurship skills.
PO - 2	impart communicative skills and ethical values.
PO - 3	face challenging competitive examinations that offer rewarding careers in science and education.
PO - 4	apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.

Programme Specific Outcomes (PSO)

PSO	Upon completion of the B.Sc. Degree Programme, the graduates will be able to:	PO addressed
PSO - 1	acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models	PO 4
PSO - 2	apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence.	PO 3, 4
PSO - 3	develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society.	PO 1,2
PSO - 4	enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	PO 1
PSO - 5	pursue scientific research and develop new findings with global impact using latest technologies.	PO 4

UG
Teaching Plan

Department : Mathematics S.F.
Class : III B.Sc. Mathematics
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	4	2	-	5	6	90	25	75	100

Objectives

- To introduce the algebraic system of Vector Spaces, inner product spaces.
- 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	K5 (Ap)
CO - 5	examine whether a given space is an inner product space and the orthonormality of sets	PSO - 3	K5 (Ap)

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

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**Vector spaces**					
	1.	**Vector spaces** – Definition, Examples and theorems.	5	K2(U)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Problem solving, Lecture with PPT .	Recall basic definitions on Number theory, MCQ, Questioning and Solving problems
	2.	**Subspaces**- Definition, Examples, Problems and Theorems.	5	K1(R)	Lecture with Illustration, Group Discussion, Lecture using PPT and Peer teaching.	Simple definitions and examples, MCQ, Concept definitions, Questioning and Solving problems
	3.	**Linear transformation**- Definition, Examples, Problems and Theorems.	5	K1(R)	Lecture with Illustration, Group Discussion, Lecture using PPT and Peer teaching.	Class test, Simple definitions ,examples, MCQ, Recall steps, Concept definitions and Solving problems .
II	**The span of a Set**					
	1.	**Span of a set**- Definition, Examples, Problems and Theorems	4	K1(R), K4(An)	Lecture using PPT, Group Discussion and Problem solving.	Solving problems, Simple definitions, examples, MCQ, Recall

						steps, Questioning and Home Assignment
	2.	**Linear Independence-** Linearly independent and dependant definitions, examples, Problems and Theorems.	4	K1(R), K4(An)	Lecture with Illustration, Group Discussion, Lecture using PPT and Peer teaching	Simple definitions ,examples, Solving problems, MCQ, Recall steps, Questioning and Home Assignment
	3.	**Basis and Dimension-** Definition, Examples and Theorems.	4	K2(U) K4(An)	Lecture with Illustration, Group Discussion, Peer teaching.	Class test, Simple definitions, examples, MCQ, Recall steps, Questioning and Home Assignment
	4.	**Rank and Nullity -** Definition, Examples and Theorem.	2	K4(An), K5 (AP)	Lecture method, Group Discussion, Lecture using videos and Problem solving.	Evaluation through short test, Seminar, MCQ, Recall steps, Questioning and Home Assignment.
	5.	**Matrix of a Linear Transformation -** Definition, Examples and Theorems	3	K4(An), K5 (AP)	Lecture method, Group Discussion, Lecture using videos and Problem solving	Simple definitions, examples, MCQ, Recall steps, Questioning and Home Assignment
III	**Cayley-Hamilton Theorem**					
	1.	**Characteristic Equation and Cayley-Hamilton Theorem -** Definition, Examples and Theorems	5	K5 (AP)	Lecture method, Group Discussion, Lecture using videos and	Simple definitions, examples, MCQ, Recall steps, Questioning

					Problem solving.	and Home Assignment
	2.	**Eigenvalues and Eigen vectors –** Definition, Examples and Problems	4	K5 (AP)	Lecture with Illustration, Group Discussion, Lecture using PPT and Peer teaching	Evaluation through short test, Seminar, MCQ, Recall steps, Questioning and Home Assignment
	3.	**Properties and Problems of Eigenvalues**	5	K5 (AP)	Lecture with Illustration, Group Discussion and Peer teaching	Class test, Simple definitions ,examples, MCQ, Recall steps, Questioning and Home Assignment
IV	**Inner Product Spaces**					
	1.	**Inner Product Spaces** – Definition, Examples and Problems	3	K5 (AP)	Lecture with Illustration, Group Discussion and Peer teaching	Evaluation through short test, MCQ, True/False, Questioning and Home Assignment
	2.	**Orthogonality-** Definition, Examples, Theorems and Problems	4	K4(An), K5 (AP)	Lecture method, Group Discussion, Lecture using videos and Problem solving.	Evaluation through short test, MCQ, True/False, Questioning and Home Assignment
	3.	**Orthogonal Complement-** Definition, Examples, Theorems and Problems	4	K4(An), K5 (AP)	Lecture with Illustration, Group Discussion, Lecture using PPT and Peer teaching	Simple definitions ,examples, MCQ, Recall steps, Assignment, Questioning and Home Assignment
V	**Bilinear forms**					

	1.	**Bilinear forms-** Definition, Examples, Theorems, Matrix of a bilinear form and Problems	3	K3(E), K5 (AP)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Lecture using videos and Problem solving.	Simple definitions ,examples, MCQ, Recall steps, Assignment, Questioning and Home Assignment
	2.	**Quadratic forms-** Definition, Examples and Theorems	3	K5(E), K5 (AP)	Lecture method, Group Discussion, Lecture using PPT and Problem solving.	Simple definitions ,examples, MCQ, Recall steps, Assignment, Questioning and Home Assignment
	3.	**Reduction of a quadratic form to the diagonal form** – Definition and Problems	3	K5 (AP)	Lecture method, Group Discussion, Lecture using videos and Problem solving.	Evaluation through short test, Seminar, MCQ, Recall steps, Questioning and Home Assignment
	4.	**Partially ordered set, Lattices-** Definition, Examples and Problems	3	K5 (AP)	Lecture method, Group Discussion, and Problem solving.	Evaluation through short test, Peer teaching, MCQ, Recall steps, Questioning and Home Assignment
	5.	**Distributive Lattices, Modular Lattices-** Definition, Examples, Theorems and Problems	3	K5 (AP)	Lecture method, Group Discussion, Lecture using videos and Problem solving.	Evaluation through short test, Seminar, MCQ, Recall steps, Assignment , Questioning and Home Assignment

	6.	**Boolean Algebras-** Definition, Examples and Problems	3	K5 (AP)	Lecture method, Group Discussion, Lecture using videos and Problem solving..	Evaluation through short test, Seminar, MCQ, Recall steps, Questioning and Home Assignment

Course Focussing on - Employability

Activities: Assignment, Peer teaching, Online Quiz and Finding the eigen values and eigen vectors of the matrix.

Assignment: Subspaces problems, Problems for Basis and Dimensions and MCQ of every unit.

Seminar Topic: Problems on Vector space and Subspaces, Problems on Eigenvalues, Theorems on Modular Lattices and Theorems on Boolean Algebra

Sample questions

Part A

1.The trivial sub spaces of a vector space V are _______.

2. If (1, -1, k-1), (2, k, -4), (0, 2+k, -8) are linearly dependent vectors. Then the value of k = ______.

3. The characteristic polynomial of A=$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ is----------------

4.The norm of the vector $4x + 5y$ where $x = (1, -1, 0)$ and $y = (1,2,3)$ = ___________.

5. The matrix of the bilinear form $f(x, y) = x_1 y_2 - x_2 y_1$ with respect to the standard basis in $V_2(\boldsymbol{R})$ is _____________.

Part B

1. Verify R x R with usual addition and scalar multiplication defined by α(a,b)= (0, αb) is a vector space or not over R.
2. Prove that any set containing a linearly independent set is also linearly independent.
3. Find the sum of the squares of the eigen values of A=$\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$
4. . In any inner product space V, Show the following:

   (a) $\|x + y\|^2 + \|x - y\|^2 = 2(\|x\|^2 + \|y\|^2)$.

(b) $\|\alpha x + \beta y\|^2 = |\alpha|^2\|x\|^2 + \alpha\bar{\beta}\langle x, y\rangle + \bar{\alpha}\beta\langle y, x\rangle + |\beta|^2\|y\|^2$.

5. Reduce the quadratic form $x_1^2 + 4x_1x_2 + 4x_1x_3 + 4x_2^2 + 16x_2x_3 + 4x_3^2$ to the diagonal form.

Part C

1. If W is a subspace of a vector space V and define $/W = \{W + v / \ v \epsilon V\}$. Then prove that V/W is a vector space over F under the following operations.

   (i) $(W + v_1) + (W + v_2) = W + v_1 + v_2$

   (ii)$\alpha(W + v_1) = W + \alpha v_1$.

2. Let V be a vector space over a field F. Let S = {v_1, v_2, ...v_n} span V. Let S={w_1,w_2, …,w_m} be a linearly independent set of vectors in V. Then m ≤ n.

3. State and prove Cayley- Hamilton theorem

4. State and Prove the Schwartz's inequality and Triangle inequality.

5.The lattice of of normal subgroups of any group is a modular lattice.

Head of the Department : Dr.S.Kavitha **Course Instructor: Dr.S.Kavitha**

Teaching Plan

Department : Mathematics (S.F)

Class : III B.Sc Mathematics

Title of the Course : Major Core VIII – 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:

1. To introduce Metric Spaces and the concepts of completeness, continuity, connectedness andcompactness

2. To use these concepts in higher studies

Course Outcome :

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
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

Unit	Module	Topic	Teaching hours	Cognitive Level	Pedagogy	Assessment/ evaluation
I						
	1	Metric Space, definition and examples	3	K1(R)	Lecture with Chalk and talk,Introductory session	Evaluation through short test
	2	Bounded sets, Open ball, Open sets	3	K2(U)	Lecture with Chalk and talk	Recall the simple definition
	3	Subspace, Interior of a set, Closed sets	3	K3(An)	Lecture using videos	Evaluation through short test
	4	Closure,Limit point, Dense sets.	3	K4(Ap)	Lecture using PPT	Evaluation through seminar,
II						
	1	Complete metric space	3	K2(U)	Lecture with Chalk and talk	Evaluation through discussions.
	2	Cantor’s intersection theorem - Baire’s Category theorem	3	K4(Ap)	Lecture using PPT	Evaluation through short test
	3	Contraction mapping- Definition and examples- Contraction mapping theorem	3	K3(An)	Lecture with Chalk and talk	Formative Assessment Test

III						
	1	Continuity of functions	3	K2(U)	Lecture with illustration ,Group discussion	Evaluation through assignment
	2	Composition of continuous functions, Equivalent conditions for continuity	4	K3(An)	Lecture with PPT	Evaluation through quiz and discussions
	3	Homeomorphism, Uniform continuity	3	K2(U)	Peer teaching	Evaluation through open book assignment
	4	Discontinuous functions on R	3	K4(Ap)	Lecture with Chalk and talk	Evaluati on through short test
IV						
	1	Connectedness, Definition and examples	3	K2(U)	Lecture with PPT	Evaluation through discussions
	2	Connected subsets of R	3	K4(Ap)	Lecture using Videos	Evaluation through short test
	3	Connectedness and Continuity	3	K2(U)	Lecture with Chalk and talk	Formative Assessment Test
	4	Intermediate value theorem	2	K3(An)	Group Discussion	Evaluation through short test
V						
	1	Compactness, Compact space	3	K2(U)	Lecture with Illustration	Evaluation through quiz.

	2	Compact subsets ofR	3	K4(Ap)	Lecture and group discussion	Evaluation through Assignment
	3	Equivalent Characterization forCompactness	3	K3(An)	Lecture with chalk and talk	Evaluation through short test
	4	Compactness andcontinuity	4	K4(Ap)	Lecture with Illustration	Evaluation through short test

Course Focussing on Employability/ Entrepreneurship/ Skill Development : Employability

Activities (Em/ En/SD): Group Discussion, Peer teaching

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

Activities related to Cross Cutting Issues: Nil

Assignment : open ball in a metric space, Assignment

Seminar Topic: continuous , Homeomorphism

Sample questions

Part A

1, In R with usual metric ,then find B(-1,1) ___________

(i) (0,1) (ii)(0,2) (iii) [0,1] (iv)(-2,0)

2,True or False

R^n with usual metric is complete.

3, If f is continuous then the inverse image of every open set is-------------

4, Say True or False. R is not Connected

5,Any compact subset A of a metric space (M,d) is ___________

Part B

1,Prove that in any metric space (M,d) each open ball is an open set.

2,Let (M,d) be a metric space. Then any convergent sequence in M is a Cauchy sequence.

3, Let (M,d) be a metric space. Let $a \in M$. Show that the function $f : M \rightarrow R$ defined by

f(x) = d(x,a) is continuous.

4, If A and B are connected subsets of a metric space M and if $A \cap B \neq \phi$, Prove that $A \cup B$ is connected.

5, Any compact subset A of a metric space M is bounded

Part C

1, Let M be the set of all sequences in R. Let $x, y \in M$ and let x = (x_n) and y = (y_n). Define $d(x, y) = \sum_{n=1}^{\infty} \frac{|x_n - y_n|}{2^n (1 + |x_n - y_n|)}$. Then d is a metric on M.

2, C with usual metric is complete.

3, Let (M_1,d_1) and (M_2,d_2) be metric space $f : M_1 \rightarrow M_2$ is continuous iff $f^{-1}(G)$ is open in M_1 whenever G is open in M_2.

4, Prove that A subspace of R is connected if and only if it is an interval.

5, Continuous image of a compact metric space is compact.

Head of the Department — Course Instructor

(Dr.S.Kavitha) — (Ms.J.Anne Mary Leema)

Teaching Plan

Department: Mathematics S.F.
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	-	2	4	6	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.

Course Outcomes:

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	PSO - 4	U

	formula and various numerical methods for the solution of algebraic and transcendental equations		
CO - 6	distinguish the advantages and disadvantages of various numerical methods	PSO - 4	An

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	3	K1(R), K2(U)	Lecture using videos, PPT	Simple definitions, Recall basic concepts about computer education
	2.	Data Types, Operations and Expressions, Arithmetic Operators, Relational Operators.	3	K2(U)	Lecture using videos, PPT	Oral Test
	3.	Logical Operators, Assignment Operators, Increment and Decrement Operators.	2	K4(An)	Lecture using Chalk and talk, Peer tutoring	Suggest idea/concept, concept explanation with examples
	4.	Conditional Operators, Bitwise Operators, Special Operators.	2	K4(An)	Lecture using videos, PPT	Simple definitions and Questions
	5.	Managing Input and Output Operations	3	K3(Ap)	Lecture using videos, PPT, Group discussion	Differentiate between various ideas
	6.	Formatted Input, Formatted Output	2	K3(Ap)	Lecture using Chalk and talk, Peer tutoring	Evaluation through short test
II						
	1.	Decision making and Branching, Decision making with IF statement.	3	K2(U)	Hands on Training	Oral Test
	2	Simple IF statement, The IF…Else statements, Nesting of IF… Else statements.	3	K2(U), K3(Ap)	Lecture with videos	Slip test, Assignments
	3	The GOTTO statement,	3	K4(An)	Lecture using	Class test, Home work

		Decision making and Looping			videos, PPT	
	4	The WHILE statement, The DO statement	3	K2(U)	Lecture, Group discussion	Brain Storming
	5.	The FOR Statement	3	K2(U)	Lecture using videos, PPT	Formative Assessment
III						
	1.	Solution of algebraic and transcendental equations: Iteration method.	3	K2(U), K3(Ap)	Lecture using Chalk and talk, Problem solving, PPT	Brain Storming
	2.	Programs in C for Newton Raphson method	4	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.	3	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	4	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	2	K4(An)	Lecture using Chalk and talk, Problem solving	Problem Solving
	4.	Newton cote's, quadrature formula	3	K2(U), K3(Ap)	Problem Solving	Problem solving questions, Home work
	5.	Trapezoidal rule, programs in C for	2	K3(Ap)	Hands on Training	Hands on Training

		Trapezoidal rule				
V						
	1	Simpson's (1/3)rd rule, programs in C for Simpson's	3	K2(U)	Problem Solving	Evaluation through solving exercise problem
	2	One - third rule- Simpson's (3/8)th rule	3	K3(Ap)	Lecture using Chalk and talk, Problem solving	Problem solving questions, Home work
	3	Numerical solution of differential equation.	3	K4(An)	Problem Solving	Formative Assessment
	4	Taylor's series method	3	K2(U), K3(Ap)	Lecture using Chalk and talk, Problem solving	Slip test
	5	Picard's method	3	K2(U), K3(Ap)	Problem Solving	Class test, Problem solving questions, Home work

Course Focusing on: **Employability**

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

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

Activities related to Cross Cutting Issues: Nil

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
Dr.S.Kavitha

Course Instructor
Ms.Y.A.Shiny

Teaching Plan

Department : Mathematics S.F.
Class : III B.Sc Mathematics
Title of the Course : Elective I: 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(A)
CO - 3	Relate real life situations with mathematical graphs	PSO - 3	K3(A)
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 and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I						
	1.	Basics, Graphs, Pictorial representation,Subgraphs Examples ,definitions,theorems ,Isomorphism and degrees- examples and theorems	5	K2(U)	Lecture with Illustration	Evaluation throughMCQ,short test
	2.	Trail and Path-Examples, Cyclesin graphs – definitions and theorems, Theorems on limit points and examples, Theorems on connected graph	3	K3(A)	Lecture with Illustration	Suggest concept with examples, formula
	3.	Theorems on cycles in graph, complement graphs – definition and theorems, Digraph	3	K3(A)	Lecture with Examples	Suggest concept with examples, formula
	4.	Definitions and Theorems on cut vertices and cutedges	3	K2(U)	Discussion with Illustration	Evaluation throughMCQ,short test
	5	Trivial and non-Trivial Graphs – definitions and theorems products	3	K2(U)	Lecture with Illustration	Evaluation through Quiz
II						
	1	Eulerian Graphs-definitions and theorems, Theorems	3	K2(U)	Lecture with PPT	Evaluation throughM

		relatedto Eulerian trail using digraph				CQ,short test
	2	Fleury's Algorithm to construct a closed Eulerian trail	2	K3(A)	Lecture with illustration	Suggest concept with examples
	3	Hamiltonian Graphs – definitions andtheorems, Hamiltonian cycle and path .	2	K2(U)	Lecture using videos	Evaluation through Assessment Test
	4	Problem basedon weightedgraphs - Chinese Post-man Problem - Travelling Sales-man Problem Bipartite graphs	3	K5(E)	Group Discussion	Solve the problems
	5	Bipartite graphs- Definition and Theorems, Theorems on trees.	2	K2(U)	Lecture with Examples	Evaluation through Quiz
III						
	1	Definition and examples relatedto planar graphs,Euler's formula for planar graphs and related corollary	3	K2(U)	Lecture with PPT Illustration	Evaluation through Quiz
	2	Definition and theorems related to Platonic solids,Dual of a plane graph, Definitionand theorem related to characterization of planar graph	3	K3(A)	Lecture with Illustration	Suggest formulae with examples
	3	Definition and theorems on colouring, Theorem relatedto maximum colourings of a graph,triangle free graph in colouring	4	K4(An)	Lecture with examples	Check knowledge through Assignment

	4	Definition and theorems related to edge colouring,An algorithm for vertex colouring of a graph: Definitions,	2	K5(E)	Group Discussion	Formative Assessment Test
IV						
	1	Introduction, Definitions related to directed graph	3	K2(U)	Lecture with PPT Illustration	Evaluation through MCQ, Short test
	2	Strongly connected graph – definition and theorems	3	K2(U)	Lecture and group discussion	Evaluation through Quiz
	3	Definition and Theorems relatedto Strong orientation of graphs	2	K2(U)	Lecture with Illustration	Evaluation through class test
	4	Eulerian Digraph- definition and theorems, Tournaments	4	K3(A)	Lecture with Illustration	Suggest concepts with examples
V						
	1	Introduction and definition relatedto Dominating Sets with theorems	2	K2(U)	Lecture with PPT Illustration	Evaluation through Slip test
	2	Definition and theorems relate to Independent Sets and Irredundant sets	3	K2(U)	Lecture with Illustration	Evaluation through Assessment test
	3	Definition Examples and theorems related to Bounds-Upper Bound	4	K2(U)	Lecture with PPT Illustration	Evaluation through Slip test
	4	Theorems related to Lower Bounds	3	K4(A)	Lecture with PPT	Explain concept with examples

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Course Focussing on Employability/ Entrepreneurship/ Skill Development : Employability

Activities (Em/ En/SD): Proving theorems relating independent set and dominating set ,seminar

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

Activities related to Cross Cutting Issues: Nil

Assignment: Vertex colouring

Seminar Topic: Directed Graphs

Sample questions

PART –A

1. A connected (p,q) graph contains a cycle iff ----------------

2. Say True or False : A non trivial connected graph is Eularian iff it has no vertex of odd degree.

3. Euler's formula for plannar graphs is ---------------

4. The out –degree of a vertex in a digraph defined as ---------------

5. Say True or False : The domination number is the number of vertices in a smallest dominating set for G.

PART –B

1. Prove that if q$\geq p-1$, then (p,q) graph is either connected or contains a cycle.

2. Prove that every (p,q) - tree T (p≥ 2) contains atleast two vertices of degree one.

3. Prove that with usual notation $\chi(G) \leq \Delta(G)+1$

4. Define a digraph. When do you say a digraph is weakly connected, unilaterally connected and strongly connected ?

5. State and prove Ore Theorem.

PART-C

1. Prove that every non trivial graph contains at least two vertices which are not cut vertices.

2 .Prove that if G is a Hamiltonian graph , then $\omega(G - S) \leq |S|$, for every nonempty subset S of V(G).

3 .Prove that there are exactly five regular polyhedral.

4. Prove that every tournament D contains a vertex from which every other vertex is reahable by a path of length atmost 2.

5. A dominating set D is a minimal dominating set if and only if for each vertex vin D,one of the following condition holds.

a) v is an isolated vertex of D

b) there exists a vertex u in V – D such that N(u) $\cap D = \{v\}$

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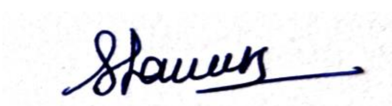

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