KSKV Kachchh University: BHUJ
B.Sc.: Semester: VI (SIX) SUBJECT: MATHEMATICS
PAPER: Ring Theory
PAPER Code: MAT MAT-601
(3 Credits)

Unit 1

Rings, Properties and examples of Rings. Introduction to Integral domains and fields, skew field, Subrings, Properties of subrings, subfields, Characteristic of a ring, Characteristics of Field, Left and right Ideals, Algebra of Ideals.

Unit 2

Principal Ideal, Principal ideal rings, Ring Homomorphisms, Kernal of Homomorphism, Ring Isomorphism, Quotient rings, Divisibility in an integral domain, Units and associates.

Unit 3

Polynomial rings, Degree of a polynomial, Polynomial over an integral domain, Division Algorithm for polynomials over a field, Euclidean Ring, Prime ideals and Maximal ideals.

❖ **Reference Books:**

1. Dr. I. H. Sheth, "Abstract Algebra", Published by Prentice Hall of India
2. Bhattacharya P.B., Jain S.K. and Nagpal S.R., "Basic Abstract Algebra", Foundation books, New Delhi.
3. Fraleigh J. B., "A First Course in Abstract Algebra", NarosaPublishing, New Delhi
4. Gallian J.A., "Contemporary Abstract Algebra", NarosaPublishing House, New Delhi.
5. Herstein I.N., "Topics in Algebra", Vikas Publishing, New Delhi

KSKV Kachchh University: BHUJ
B.Sc.: Semester: VI (SIX) SUBJECT: MATHEMATICS
PAPER: Ring Theory Practical
PAPER Code: MAT MAT-602-P
(1 Credit)

Practical

Practical No.	Description
1	C++ Program to Find the Length of a String.
2	C++ Program to Concatenate Two Strings.
3	C++ Program to Copy Strings.
4	C++ Program to Sort Elements in Lexicographical Order (Dictionary Order)
5	C++ Program to Store Information of a Student in a Structure.
6	C++ Program to Add Two Distances (in inch-feet) System Using Structures.
7	C++ Program to Calculate Difference Between Two Time Period.
8	C++ Program to Store and Display Information Using Structure

❖ **Reference Books and websites:**

1. C++ Primer (5th Edition)" by Stanley B. Lippman, Josée Lajoie, and Barbara E. Moo

Note: This list is demonstrative and institute can apply necessary changes in content and design of practical as per the availability of infrastructure and need of the students and requirement of skills in the region.

Preferable Infrastructure Requirement: A well-equipped computer lab with necessary software.

Human resource requirement: A lab in-charge with good computer knowledge preferably PGDCA, BCA required for computer lab.

KSKV Kachchh University: BHUJ
B.Sc.: Semester: VI (SIX) SUBJECT: MATHEMATICS
PAPER: Graph Theory
PAPER Code: MAT MAT-603
(3 Credits)

Unit 1 [15 Marks]

Definition and properties of a graph, the first theorem of graph theory, Hand sacking Lemma, graph isomorphism, Complete graph, Complete bipartite and bipartite graph, Regular graph, Cycle and Path graph, Subgraph of a graph, Self-complementary graph, Join of two graphs, Union and Intersection of two graphs, Wheel graph, Eccentricity of a vertex, radius and diameter of a graph, the adjacency and the incidence matrix of a graph.

Unit 2 [15 Marks]

Walk, trail and path in a graph, Eulerian graph and Konigsberg Bridge problem, Connected, disconnected graphs and components, Hamiltonian graph, Tree and Binary tree, Minimum spanning tree algorithm - Prims and Kruskal's.

Unit 3 [15 Marks]

Plane and planar graphs, Jordan curve, Kuratowski's first and second non-planner graph, Face of a graph, Euler's formula, Girth and circumference of a graph, Dual of a Plane Graph, Self-dual, Polyhedral graph, Platonic bodies.

❖ **Reference Books :**

1. Narsingh Deo, "Graph Theory with Applications to engineering and computer science", Prentice-Hall publications, 1974.
2. Robin J. Wilson, "Introduction to Graph Theory", Longman publications, 1985.
3. Bondy and Murty, "Graph Theory with Applications", Elsevier Science Publication, 2008.
4. Harary, "Graph theory", Wesley, Addison-Wesley publications, 1969.

KSKV Kachchh University: BHUJ
B.Sc.: Semester: VI (SIX) SUBJECT: MATHEMATICS
PAPER: Graph Theory Practical
PAPER Code: MAT MAT-604-P
(1 Credit)
Practical

Practical No.	Description
1	Drawing a graph from given vertices and edges in Python.
2	Drawing a graph from adjacency and the incidence matrix in Python.
3	Evaluate radius and diameter of a graph in Python.
4	Connectedness of graph in Python.
5	Find a pattern line from given data in Python.
6	Draw 2D graph from given data in Python.
7	Draw 2D graph from given data in Python.
8	Draw 2D graph from given data in Python.

❖ **Reference Books and websites:**

1. Sam Morley, "Applying Math with Python", Packt Publishing Ltd., 2020.

2. Amit Saha, Doing Math with Python, No Starch Press, 2015.

3. https://www.w3schools.com

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Preferable Infrastructure Requirement: A well-equipped computer lab with necessary software.

Human resource requirement: A lab in-charge with good computer knowledge preferably PGDCA, BCA required for computer lab.

KSKV Kachchh University: BHUJ
B.Sc.: Semester: VI (SIX) SUBJECT: MATHEMATICS
PAPER: OPERATIONS RESEARCH – III
PAPER Code: MAJ MAT-605
(3 Credits)

Unit 1

Dual of an LPP (Examples to find the dual of a given LPP), Examples of Dual Simplex Method

Unit 2

Introduction to Assignment Problems, Hungarian Method to solve Minimization and Maximization Assignment problems for equal number of sources and destinations.

Unit 3

Theory of Games: Introduction – Minimax (Maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – dominance principle – m x 2 & 2 x n games -graphical method.

❖ **Reference Books:**

1. Operations Research (Theory and Applications), J. K. Sharma, Third Edition, Published by MACMILLAN INDIA LTD.
2. Mathematical Models in Operation Research, J. K. Sharma-McGraw Hills
3. Linear Programming, G. Hadley- Narosa Publishing House.

KSKV Kachchh University: BHUJ
B.Sc.: Semester: VI (SIX) SUBJECT: MATHEMATICS
PAPER: OPERATIONS RESEARCH – III - PRACTICAL
PAPER Code: MAJ MAT-606 - P
(1 Credit)

In this paper, every student will get an opportunity to develop his talent and skill in a little different aspect. It can be like; a student should review one book and prepare a detailed presentation on the book. Student will submit its synopses at least one week before the presentation. The book may not be strictly related to mathematics, but should be of a significance.

This book review presentation must contain all qualitative data regarding the book.

Note: This book review presentation is aimed to make students read some external literature for his all-round development. However, an institute can apply necessary changes in content and design of practical like preparing a small dissertation on a topic related to Operations Research or preparing them for group discussion on suitable topics etc., as per the need of the students and requirement of skills in the region.

KSKV Kachchh University: BHUJ
B.Sc.: Semester: VI (SIX) SUBJECT: MATHEMATICS
PAPER: Complex Analysis
PAPER Code: MIN MAT-607
(3 Credits)

Unit 1 [15 Marks]

Definition and properties of a graph, the first theorem of graph theory, Hand sacking Lemma, graph isomorphism, Complete graph, Complete bipartite and bipartite graph, Regular graph, Cycle and Path graph, Subgraph of a graph, Self-complementary graph, Join of two graphs, Union and Intersection of two graphs, Wheel graph, Eccentricity of a vertex, radius and diameter of a graph, the adjacency and the incidence matrix of a graph.

Unit 2 [15 Marks]

Walk, trail and path in a graph, Eulerian graph and Konigsberg Bridge problem, Connected, disconnected graphs and components, Hamiltonian graph, Tree and Binary tree, Minimum spanning tree algorithm - Prims and Kruskal's.

Unit 3 [15 Marks]

Plane and planar graphs, Jordan curve, Kuratowski's first and second non-planner graph, Face of a graph, Euler's formula, Girth and circumference of a graph, Dual of a Plane Graph, Self-dual, Polyhedral graph, Platonic bodies.

❖ **Reference Books :**

5. Narsingh Deo, "Graph Theory with Applications to engineering and computer science", Prentice-Hall publications, 1974.
6. Robin J. Wilson, "Introduction to Graph Theory", Longman publications, 1985.
7. Bondy and Murty, "Graph Theory with Applications", Elsevier Science Publication, 2008.
8. Harary, "Graph theory", Wesley, Addison-Wesley publications, 1969.

KSKV Kachchh University: BHUJ
B.Sc.: Semester: VI (SIX) SUBJECT: MATHEMATICS
PAPER: Complex Analysis Practical
PAPER Code: MIN MAT-608-P
(1 Credit)

Practical

Practical No.	Description
1	Drawing a graph from given vertices and edges in Python.
2	Drawing a graph from adjacency and the incidence matrix in Python.
3	Evaluate radius and diameter of a graph in Python.
4	Connectedness of graph in Python.
5	Find a pattern line from given data in Python.
6	Draw 2D graph from given data in Python.
7	Draw 2D graph from given data in Python.
8	Draw 2D graph from given data in Python.

❖ **Reference Books and websites:**

1. Sam Morley, "Applying Math with Python", Packt Publishing Ltd., 2020.

2. Amit Saha, Doing Math with Python, No Starch Press, 2015.

3. https://www.w3schools.com

Note: This list is demonstrative and institute can apply necessary changes in content and design of practical as per the availability of infrastructure and need of the students and requirement of skills in the region.

Preferable Infrastructure Requirement: A well-equipped computer lab with necessary software.

Human resource requirement: A lab in-charge with good computer knowledge preferably PGDCA, BCA required for computer lab.

KSKV Kachchh University: BHUJ
B.Sc.: Semester: VI (SIX) SUBJECT: MATHEMATICS
PAPER: INTERNSHIP IN MATHEMATICS
PAPER Code: MIN MAT-609
(4 Credits)

Title	Credit
Includes Dissertation/Project work/Internship (other than self-institute)/ Review work/any other relevant	Total credit: 04

- The credit weightage is suggested to be sufficient enough as per the provisions described in the respective SOP of the university. The guidelines offer scope for providing hands on learning with classroom experience.

Evaluation:

- Internal evaluation will be 40% and External evaluation will be 60%.
- For internship, students must follow all the provisions described in the respective SOP of the university.

INTERNAL EVALUATION SCHEME :

❖ **Theory : 35 Marks**

1.	Internal Continuous and Comprehensive Evaluation (CCE) will be conducted by the department. The total internal theory marks will be 35 Marks.
2.	CCE Marking Scheme for Theory: For each paper, CCE may be further distributed as under. This list is not exhaustive and new parameters can be added : e) Unit Test / Internal Examination (MCQ or Descriptive) f) Seminar g) Assignments h) Attendance The Department Head will be final authority for finalizing the distribution of internal evaluation marks in every semester.

❖ **Practical : 15 Marks**

CCE Marking Scheme for Practical : Any one or more of the parameters from Lab Performance/ Lab attendance / Internal practical Test / Book Review synopsis / Journal / Viva or as per the requirement of the course can be used. The total internal practical marks will be 15 Marks.

➢ EXTERNAL (UNIVERSITY) EVALUATION SCHEME:

❖ Theory (All papers except MAJ MAT-605) : 40 Marks

There will be a written test of total 40 marks, having total 4 questions.

The Demonstrative Structure of the External Examination Question Paper

Question No.	Question type	Marks
1 (Unit 1)	Descriptive Questions (2 out of 3)	10
2 (Unit 2)	Descriptive Questions (2 out of 3)	10
3 (Unit 3)	Descriptive Questions (2 out of 3)	10
4 (Unit 1,2,3)	Descriptive question / Short questions	10

❖ Theory (MAJ MAT-605) : 40 Marks

There will be 5 big questions, each of 10 marks, without any sub-questions. Student has to write any four out the five.

- The above paper scheme is demonstrative but not exhaustive. An examiner may apply necessary changes if felt necessary.
- Types of questions may be varied: like: one descriptive question/one-line answers / two-line answers / definitions / reasoning / derivations of equations / derivations of sums / drawing small figures etc.

❖ Practical : 10 Marks

There will be a practical test of total 10 marks, having total 4 exercises.

The Demonstrative Structure of the External Examination Practical Paper

Exercises No.	Exercises	Marks
1	Exercise 1 (Based on syllabus)	3
2	Exercise 2 (Based on syllabus)	3
3	Viva Voice/MCQ Exercise	2
4	Journal	2

The above practical paper scheme is demonstrative but not exhaustive. An examiner may apply necessary changes if felt necessary.