"Education for Knowledge, Science and Culture"

... Shikshanmaharshi Dr. Bapuji Salunkhe

VIVEKANAND COLLEGE, KOLHAPUR

(EMPOWERED AUTONOMOUS)

DEPARTMENT OF MATHEMATICS

Three/Four- Years UG Programme

Department/Subject Specific Core or Major (DSC)

Curriculum, Teaching and Evaluation Structure

for

B.Sc.-II Mathematics

Semester-III & IV

(Implemented from academic year 2024-25 onwards)

Vivekanand College, Kolhapur (Empowered Autonomous)

Department of Mathematics

B.Sc. II

POs:

- To develop fundamental scientific knowledge.
- To develop basic scientific and mathematical skills.
- Students should progress their vertical mobility
- To develop required technical skills
- Develop moral, social and ethical values
- Able to survive in society

PSOs:

- Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.
- Acquire good knowledge and understanding advanced areas of mathematics chosen by students from given course.
- Students should be able to recall basic facts about mathematics and train the students to extract information, formulate and solve problems in systematic and logical manner.
- Students will learn numerical aptitude applying both qualitative and quantitative knowledge for their further career
- Students learn how to apply mathematical concepts to practical and real-life problems.

VIVEKANAND COLLEGE, KOLHAPUR (EMPOWERED AUTONOMOUS)

Department of Mathematics

Teaching and Evaluation Scheme

Three/Four- Years UG Programme

Department/Subject Specific Core or Major (DSC)

Second Year Semester-III & IV

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	ESE	CIE	PR	Marks	
Semester-III										
1	DSC-V	DSC03MAT31	Multivariable Calculus	2	-	40	10	-	50	2
2	DSC-VI	DSC03MAT32	Integral Calculus	2	-	40	10	-	50	2
3	MIN-V	MIN03MAT31	Calculus of Multiple Variables	2	-	40	10	-	50	2
4	MIN-VI	MIN03MAT32	Calculus of Integrable functions	2	-	40	10	-	50	2
5	VSC-PR-II	VSC03MAT39	Introduction to Python	-	4	-	-	25	25	2
6	DSC-PR-III	DSC03MAT39	DSC-Mathematics Lab-3	-	8	-	-	50	50	4
7	MIN-PR-III	MIN03MAT39	MIN-Mathematics Lab-3	-	4	-	-	25	25	2
Semester –III Total				**8**	**16**	**160**	**40**	**100**	**300**	**16**
Semester-IV										
1	DSC-VII	DSC03MAT41	Discrete Mathematics	2	-	40	10	-	50	2
2	DSC-VIII	DSC03MAT42	Integral Transform	2	-	40	10	-	50	2
3	MIN-VII	MIN03MAT41	Graph Theory and Recurrence Relations	2	-	40	10	-	50	2
4	MIN-VIII	MIN03MAT42	Laplace and Fourier Transformations	2	-	40	10	-	50	2
5	VSC-PR-III	VSC03MAT49	Numerical Methods Using Python	-	4	-	-	25	25	2
6	DSC-PR-IV	DSC03MAT49	DSC-Mathematics Lab-4	-	8	-	-	50	50	4
7	MIN-PR-IV	MIN03MAT49	MIN-Mathematics Lab-4	-	4	-	-	25	25	2
Semester –IV Total				**8**	**16**	**160**	**40**	**100**	**300**	**16**

B.Sc. Part – II Semester -III Mathematics

DSC-V: DSC03MAT31: Multivariable Calculus

Theory: 30 hrs.

Marks -50 (Credit :02)

Course Outcomes (COs):

On completion of the course, the students will be able to:

CO1: understand computation of Jacobians of several variables and their applications.

CO2: series expansion of two variable functions and applications of Lagrange's method to compute maxima/minima.

CO3: understand concept of vector differentiation and meaning of gradient, divergence and curl.

CO4: understand concept of vector integration to transform line integral to surface integral surface to volume integral and vice versa.

UNIT	Contents	Hours Allotted
1	**Jacobians:** 1.1 Definition of Jacobian 1.2 Properties of Jacobians. 1.3 Examples.	06
2	**Applications of Partial Differentiation:** 2.1 Taylor's and Maclaurin's theorem for functions of two variables (Statement Only) 2.2 Maxima and minima of functions of two variables 2.3 Lagrange's method of undetermined multipliers	08
3	**Vector Differential Calculus:** 3.1 General rules of vector differentiation 3.2 Scalar and vector fields: 3.2.1 Gradient, divergence and curl 3.2.2 Solenoidal and irrotational vector fields 3.3 Vector identities	08
4	**Vector Integral Calculus:** 4.1 Vector Integration 4.2 Line integral, surface integral and volume integral 4.3 Green's lemma, Gauss divergence theorem and Stokes Theorem (Without proof) 4.4 Examples	08

Recommended Book:

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publications, New Delhi.

Reference Books:

1. C. R. Wylie and L.C. Barrett, Advanced Engineering mathematics, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

B.Sc. Part – II Semester -III Mathematics

DSC-VI: DSC03MAT32: Integral Calculus

Theory: 30 hrs.

Marks -50 (Credit :02)

Course Outcomes:

On completion of the course, the students will be able to:

CO1: acquire the information about beta, gamma function and evaluate it in various problems

CO2: apply Leibnitz rule for differential under integral sign

CO3: learn definition of Fourier Series, Odd and Even Functions, Half range series.

CO4: use the knowledge of double and triple integrals for finding area and volume

UNIT	Contents	Hours Allotted
1	**Beta and Gamma Functions:** 1.1 Definition of Gamma function, Basic Properties of Gamma function Examples on Gamma functions 1.2 Definition of Beta function, Basic Properties of Beta function, Examples on Beta functions 1.3 Relation between Beta and Gamma function	08
2	**Differentiation under Integral Sign and error function:** 2.1 Case of constant limits of integration, Problem involving one parameter, problems involving two parameters, 2.2 Leibnitz rule for differential under integral sign and examples 2.3 Definition of error function, complementary error function. basic properties of error function.	08
3	**Multiple Integral** 3.1 Double Integration: Method of evaluation and related examples, (Cartesian, Polar Form) 3.2 Change of order of integration 3.3 Change of variable, 3.4 Examples of triple integral.	07
4	**Fourier Series:** 4.1 Periodic functions, Even and Odd functions 4.2 Fourier Series Expansion of elementary functions (Over the different ranges $[-\pi, \pi]$, $[0,2\pi]$, $[-c, c]$, $[0,2c]$) 4.3 Fourier Sine and Cosine series expansion 4.4 Half Range series expansion.	07

Recommended Book:

1. J.K.Goyal and K.P.Gupta, Laplace and Fourier Transforms, A Pragati Edition (2016)

Reference Book:

1. Shanti Narayan, Integral Calculus, S. Chand and Company, New Delhi.
2. G.V. Kumbhojkar and H.V. Kumbhojkar, Engineering Mathematics, Nirali Publication
3. Dr. S. Shrenadh, Integral Transform, S. Chand Prakashan
4. P. N. Wartikar and J. N. Wartikar, Elements of Applied Mathematics.
5. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd., Allahabad.

B.Sc. Part – II Semester -III Mathematics

MIN-V: MIN03MAT31: Calculus of Multiple Variables

Theory: 30 hrs.

Marks -50 (Credit :02)

Course Outcomes (COs):

On completion of the course, the students will be able to:

CO1: understand computation of Jacobians of several variables and their applications.

CO2: series expansion of two variable functions and applications of Lagrange's method to compute maxima/minima.

CO3: understand concept of vector differentiation and meaning of gradient, divergence and curl.

CO4: understand concept of vector integration to transform line integral to surface integral surface to volume integral and vice versa.

UNIT	Contents	Hours Allotted
1	**Jacobians:** 1.1 Definition of Jacobian 1.2 Properties of Jacobians. 1.3 Examples.	06
2	**Applications of Partial Differentiation:** 2.1 Taylor's and Maclaurin's theorem for functions of two variables (Statement Only) 2.2 Maxima and minima of functions of two variables 2.3 Lagrange's method of undetermined multipliers	08
3	**Vector Differential Calculus:** 3.1 General rules of vector differentiation 3.2 Scalar and vector fields: 3.2.1 Gradient, divergence and curl 3.2.2 Solenoidal and irrotational vector fields 3.3 Vector identities	08
4	**Vector Integral Calculus:** 4.1 Vector Integration 4.2 Line integral, surface integral and volume integral 4.3 Green's lemma, Gauss divergence theorem and Stokes Theorem (Without proof) 4.4 Examples	08

Recommended Book:

1. B. V. Ramana, Higher Engineering mathematics, Tata McGraw-Hill Publications, New Delhi.

Reference Books:

C. R. Wylie and L.C. Barrett, Advanced Engineering mathematics, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

B.Sc. Part – II Semester -III Mathematics

MIN-VI: MIN03MAT32: Calculus of Integrable functions

Theory: 30 hrs.

Marks -50 (Credit :02)

Course Outcomes:

On completion of the course, the students will be able to:

CO1: acquire the information about beta, gamma function and evaluate it in various problems

CO2: apply Leibnitz rule for differential under integral sign

CO3: learn definition of Fourier Series, Odd and Even Functions, Half range series.

CO4: use the knowledge of double and triple integrals for finding area and volume

UNIT	Contents	Hours Allotted
1	**Beta and Gamma Functions:** 1.1 Definition of Gamma function, Basic Properties of Gamma function Examples on Gamma functions 1.2 Definition of Beta function, Basic Properties of Beta function, Examples on Beta functions 1.3 Relation between Beta and Gamma function	08
2	**Differentiation under Integral Sign and error function:** 2.1 Case of constant limits of integration, Problem involving one parameter, problems involving two parameters, 2.2 Leibnitz rule for differential under integral sign and examples 2.3 Definition of error function, complementary error function. basic properties of error function.	08
3	**Multiple Integral** 3.1 Double Integration: Method of evaluation and related examples, (Cartesian, Polar Form) 3.2 Change of order of integration 3.3 Change of variable, 3.4 Examples of triple integral.	07
4	**Fourier Series:** 4.1 Periodic functions, Even and Odd functions 4.2 Fourier Series Expansion of elementary functions (Over the different ranges $[-\pi, \pi]$, $[0,2\pi]$, $[-c, c]$, $[0,2c]$) 4.3 Fourier Sine and Cosine series expansion 4.4 Half Range series expansion.	07

Recommended Book:

1. J.K.Goyal, K.P.Gupta, Laplace and Fourier Transforms, A Pragati Edition (2016)

Reference Book:

1. Shanti Narayan, Integral Calculus, S. Chand and Company, New Delhi.
2. G.V. Kumbhojkar and H.V. Kumbhojkar – Engineering Mathematics, Nirali Publication
3. Dr.S .Shrenadh, Integral Transform, S. Chand Prakashan
4. P. N. and J. N. Wartikar, Elements of Applied Mathematics.
5. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd., Allahabad.

DSC-PR -III : DSC03MAT39: DSC-Mathematics Lab-3

One Practical of Four Lectures of 60 minutes twice a week per batch

Marks-50 (Credits: 04)

Practical:

1) Examples of Jacobian with 2 variables.
2) Examples of Jacobian with 3 variables.
3) Examples of Jacobian with chain rule.
4) Examples of Taylor's and Maclaurin's Theorem
5) Examples on Maxima and Minima of Functions 2 variables.
6) Examples of Lagranage's Method of Undetermined Multipliers
7) Examples of Gradient, Divergence, and Curl of a vector
8) Examples of Solenoidal, and irrotational vectors field.
9) Examples on vector identities.
10) Examples on Line, Surface, and Volume Integral.
11) Examples on Green's Lemma and Gauss Divergence Theorem
12) Examples on Stoke's Theorem.
13) Examples of Gamma Functions.
14) Examples of Beta Functions.
15) Examples on relation between Gamma and Beta Functions.
16) Examples of D.U.I.S.
17) Examples on Double Integral
18) Examples on Triple Integral
19) Examples of Fourier Series
20) Examples on Fourier Series of Sine, Cosine Expansion

MIN-PR -III: MIN03MAT39: MIN-Mathematics Lab-3

Practical Four Lectures of 60 minutes per week per batch

Marks-25 (Credits: 02)

Practicals:

1) Examples of Jacobian
2) Examples of Taylor's And Maclaurin's Theorem
3) Examples of Lagranage's Method of Undetermined Multipliers
4) Examples of Gradient, Divergence, and Curl of a vector
5) Examples of Solenoidal, and irrotational vectors field.
6) Examples on Line, Surface, and Volume Integral.
7) Examples on Stoke's Theorem.
8) Examples of Gamma Functions.
9) Examples of Beta Functions.
10) Examples of D.U.I.S.
11) Examples on Double Integral
12) Examples of Fourier Series

VSC-PR-II VSC03MAT39**:** Introduction to Python

Practical Four Lectures of 60 minutes per week per batch

Marks-25 (Credits: 02)

Practicals

1) Introduction to Python
2) Expressions and Operators
3) Input Output Statements
4) Conditional Statements
5) Looping Statements
6) Functions
7) Modules and Packages
8) Math, cmath, random Modules and functions
9) Roots of Equations: Bisection Method, Newton-Raphson Method
10) Initial Value Problem-I: Euler's, Euler's Modified

B.Sc. Part – II Semester -IV Mathematics

DSC-VII: DSC03MAT41: Discrete Mathematics

Theory: 30 hrs.

Marks -50 (Credit :02)

Discrete Mathematics

Course Outcomes (COs):

On completion of the course, the students will be able to:

CO1: understand Recurrence Relation, generating functions and solving problems involving recurrence equations.

CO2: understand basic concept of graph theory to apply in various fields.

CO3: formulate Recurrence Relations to solve problems involving an unknown sequence.

CO4: familiarize with the types of graphs, types of paths and their properties.

UNIT	Contents	Hours Allotted
1	**Recurrence relation:** 1.1 Models of Recurrence Relations- Compound Interest, Tower of Hanoi, Bit Strings, Fibonacci Numbers (Counting Rabbits) 1.2 linear recurrence relation with constant coefficients. 1.3 Homogeneous solutions & examples 1.4 Particular solutions and total solutions, Examples.	08
2	**Generating functions:** 2.1 Generating functions 2.2 Basic properties of generating functions 2.3 Examples of generating function. 2.4 Application of generating function to recurrence relation	08
3	**Basics of Graph Theory:** 3.1 Graph-Vertices, Edges, Types of Edges- Simple, Parallel, Loop 3.2 Types of graphs, Degree of A vertex- Even and odd Vertex, Isolated, Pendant Vertex, Finite and Infinite Graphs, Adjacent vertices, 3.3 Undirected and Directed Graph/Digraph, In-degree and Out-degree of Vertex. 3.4 Handshaking Lemma.	06
4	**Paths and Circuits:** 4.1 Walks-open & close, length of walk, trail, Paths, simple path, length of path, Circuit, cycle, Wheel graph, tree 4.2 Subgraph-Spanning subgraph (Edge Disjoint, Vertex Disjoint) 4.3 Operations of graph: 4.3.1 Union of graphs, Intersection of graph, Complement, Ring Sum of graph 4.3.2 Connected and Disconnected Graphs, components, Isomorphic graph. 4.3 Matrix representation of a graph: Adjacency matrix, properties of adjacency Matrix, Incidency matrix, properties of incidency matrix.	08

Recommended Book:

1. Hari Kishan & Shiv Raj Pundir, Discrete Mathematics, Pragati Prakashan, 2013

Reference book:

1. Susanna S. Epp, Discrete Mathematics with Applications, PWS Publishing Company, 1995.
2. S. Lipschurtz, M. Lipson, Discrete Mathematics, Schaum's Outlines.

B.Sc. Part – II Semester -IV Mathematics

DSC-VIII: DSC03MAT42: Integral Transform

Theory: 30 hrs.

Marks -50 (Credit :02)

Course Outcomes:

On completion of the course, the students will be able to:

CO1: recognize the different methods of finding Laplace transforms and Fourier transforms of different functions.

CO2: explain the applications and the usefulness of these special functions.

CO3: determine Fourier transform, Relation between Laplace and Fourier Transform.

CO4: apply the knowledge of Laplace transforms, Fourier transforms and Finite Fourier transforms in finding the solutions of differential equations,

UNIT	Contents	Hours Allotted
1	**Laplace Transform.** 1.1 Laplace Transform: Definitions; Piecewise continuity, Function of exponential order, Function of class A 1.2 Existence theorem of Laplace transform. Laplace transforms of standard functions. First shifting theorem and Second shifting theorem and examples, 1.3 Change of scale property and examples, Laplace transform of derivatives and examples, Laplace transform of integrals and examples. 1.4 Multiplication by power of t and examples. Division by t and examples.	08
2	**Inverse Laplace Transform and application:** 2.1 Definition Standard results of inverse Laplace transform, Examples 2.2 First shifting theorem and Second shifting theorem and examples. Change of scale property and Inverse Laplace of derivatives, examples 2.3 The Convolution theorem and Multiplication by S, examples. Division by S, inverse Laplace by partial fractions, examples 2.4 Solving linear differential equations with constant coefficients by Laplace transform.	08
3	**Fourier Transform** 3.1 The infinite Fourier transform and inverse: Definition examples Infinite Fourier sine and cosine transform and examples 3.2 Definition: Infinite inverse Fourier sine and cosine transform and examples. 3.3 Relationship between Fourier transform and Laplace transform. Change of Scale Property and examples 3.4 Modulation theorem. The Derivative theorem. Extension theorem. Convolution theorem and examples.	07
4	**Finite Fourier Transform and Inverse, Fourier Integrals:** 4.1 Finite Fourier sine and cosine transform with examples 4.2 Finite inverse Fourier sine and cosine transform with examples. 4.3 Fourier integral theorem. Fourier sine and cosine integral (without proof) and examples.	07

Recommended Book:

1. J.K.Goyal, K.P.Gupta, Laplace and Fourier Transforms, A Pragati Edition (2016).

Reference Books:

1. Dr.S.Shrenadh, Integral Transform, S. Chand Prakashan.
2. B Davies, Integral Transforms and Their Applications, Springer Science Business Media LLC (2002) 3. Murray R. Spiegel, Laplace Transforms, Schaum's outlines

B.Sc. Part – II Semester -IV Mathematics

MIN-VII: MIN03MAT41: Graph Theory and Recurrence Relations

Theory: 30 hrs.

Marks -50 (Credit :02)

Course Outcomes (COs):

On completion of the course, the students will be able to:

CO1: understand Recurrence Relation, generating functions and solving problems involving recurrence equations.

CO2: understand basic concept of graph theory to apply in various fields.

CO3: formulate Recurrence Relations to solve problems involving an unknown sequence.

CO4: familiarize with the types of graphs, types of paths and their properties.

UNIT	Contents	Hours Allotted
1	**Recurrence relation:** 1.1 Models of Recurrence Relations- Compound Interest, Tower of Hanoi, Bit Strings, Fibonacci Numbers (Counting Rabbits) 1.2 linear recurrence relation with constant coefficients. 1.3 Homogeneous solutions & examples 1.4 Particular solutions and total solutions, Examples.	08
2	**Generating functions:** 2.1 Generating functions 2.2 Basic properties of generating functions 2.3 Examples of generating function. 2.4 Application of generating function to recurrence relation	08
3	**Basics of Graph Theory:** 3.1 Graph-Vertices, Edges, Types of Edges- Simple, Parallel, Loop 3.2 Types of graphs, Degree of A vertex- Even and odd Vertex, Isolated, Pendant Vertex, Finite and Infinite Graphs, Adjacent vertices, 3.3 Undirected and Directed Graph/Digraph, In-degree and Out-degree of Vertex. 3.4 Handshaking Lemma.	06
4	**Paths and Circuits:** 4.1 Walks-open & close, length of walk, trail, Paths, simple path, length of path, Circuit, cycle, Wheel graph, tree 4.2 Subgraph-Spanning subgraph (Edge Disjoint, Vertex Disjoint) 4.3 Operations of graph: 4.3.1 Union of graphs, Intersection of graph, Complement, Ring Sum of graph 4.3.2 Connected and Disconnected Graphs, components, Isomorphic graph. 4.3 Matrix representation of a graph: Adjacency matrix, properties of adjacency Matrix, Incidency matrix, properties of incidency matrix.	08

Recommended Book:

1. Hari Kishan & Shiv Raj Pundir, Discrete Mathematics, Pragati Prakashan, 2013

Reference Book:

1. Susanna S. Epp, Discrete Mathematics with Applications, PWS Publishing Company, 1995.
2. S. Lipschurtz, M. Lipson: Discrete Mathematics, Schaum's Outlines.

B.Sc. Part – II Semester -IV Mathematics

MIN-VIII: MIN03MAT42: Laplace and Fourier Transformations

Theory: 30 hrs.

Marks -50 (Credit :02)

Course Outcomes:

On completion of the course, the students will be able to:

CO1: recognize the different methods of finding Laplace transforms and Fourier transforms of different functions.

CO2: explain the applications and the usefulness of these special functions.

CO3: determine Fourier transform, Relation between Laplace and Fourier Transform.

CO4: apply the knowledge of Laplace transforms, Fourier transforms and Finite Fourier transforms in finding the solutions of differential equations,

UNIT	Contents	Hours Allotted
1	**Laplace Transform.** 1.1 Laplace Transform: Definitions; Piecewise continuity, Function of exponential order, Function of class A 1.2 Existence theorem of Laplace transform. Laplace transforms of standard functions. First shifting theorem and Second shifting theorem and examples, 1.3 Change of scale property and examples, Laplace transform of derivatives and examples, Laplace transform of integrals and examples. 1.4 Multiplication by power of t and examples. Division by t and examples.	08
2	**Inverse Laplace Transform and application:** 2.1 Definition Standard results of inverse Laplace transform, Examples 2.2 First shifting theorem and Second shifting theorem and examples. Change of scale property and Inverse Laplace of derivatives, examples 2.3 The Convolution theorem and Multiplication by S, examples. Division by S, inverse Laplace by partial fractions, examples 2.4 Solving linear differential equations with constant coefficients by Laplace transform.	08
3	**Fourier Transform** 3.1 The infinite Fourier transform and inverse: Definition examples Infinite Fourier sine and cosine transform and examples 3.2 Definition: Infinite inverse Fourier sine and cosine transform and examples. 3.3 Relationship between Fourier transform and Laplace transform. Change of Scale Property and examples 3.4 Modulation theorem. The Derivative theorem. Extension theorem. Convolution theorem and examples.	07
4	**Finite Fourier Transform and Inverse, Fourier Integrals:** 4.1 Finite Fourier sine and cosine transform with examples 4.2 Finite inverse Fourier sine and cosine transform with examples. 4.3 Fourier integral theorem. Fourier sine and cosine integral (without proof) and examples.	07

Recommended Book:

2. J.K.Goyal, K.P.Gupta, Laplace and Fourier Transforms, A Pragati Edition (2016).

Reference Books:

3. Dr.S.Shrenadh, Integral Transform, S. Chand Prakashan.

1. B Davies, Integral Transforms and Their Applications, Springer Science Business Media LLC(2002) 3. Murray R. Spiegel, Laplace Transforms, Schaum's outlines

DSC-PR -IV : DSC03MAT49: DSC-Mathematics Lab-4

One Practical of Four Lectures of 60 minutes twice a week per batch

Marks-50 (Credits: 04)

Practical:

1) Examples on formation of recurrence relation
2) Examples of Homogenous Solutions of Linear Recurrence relation with constant coefficient.
3) Examples of Total Solutions of Linear Recurrence relation with constant coefficient.
4) Examples on Generating function.
5) Examples on Application of Generating function to Recurrence relation
6) Examples on Path, Walk, and Cycle.
7) Examples on Subgraph and Spanning Subgraph
8) Examples on Operations of Graph (Union, Intersection, Complement)
9) Examples on Matrix representation of Graph
10) Examples on change of scale in Laplace Transforms.
11) Examples on multiplication of Power t of Laplace Transforms.
12) Examples of division by t of Laplace Transforms.
13) Examples of Properties of Inverse Laplace Transforms.
14) Examples of convolution theorem of Inverse Laplace Transforms.
15) Examples of multiplication and division by s of Inverse Laplace Transforms.
16) Solving L. D. E. with constant coefficient by Laplace Transformation.
17) Examples on Infinite Fourier Transforms
18) Examples on Infinite Fourier Sine and Cosine Transforms.
19) Examples on Finite Fourier Transforms
20) Examples on Finite Fourier Sine and Cosine Transforms.

MIN-PR -IV: MIN03MAT49: MIN-Mathematics Lab-4

Practical Four Lectures of 60 minutes per week per batch

Marks-25 (Credits: 02)

1) Examples on formation of recurrence relation
2) Examples of Total Solutions of Linear Recurrence relation with constant coefficient.
3) Examples on Generating function.
4) Examples on Path, Walk, and Cycles.
5) Examples on Operations of Graph (Union, Intersection, Complement)
6) Examples on Matrix representation of Graph
7) Examples on Properties of Laplace Transforms.
8) Examples of Properties of Inverse Laplace Transforms.
9) Examples of convolution theorem of Inverse Laplace Transforms.
10) Solving L. D. E. with constant coefficient by Laplace Transformation.
11) Examples on Infinite Fourier Transform
12) Examples on Finite Fourier Transform

VSC-PR-III VSC03MAT49**:** Introduction to Python

Practical Four Lectures of 60 minutes per week per batch

Marks-25 (Credits: 02)

Practicals:

1) File Handling
2) Python Data Structures – I: String, List and Tuples, and operations
3) Python Data Structures – II: Dictionary, Sets and their operations
4) Python Data Structures – III: Arrays and their Operations
5) System Of linear algebraic equations: Guassian Elimination, LU Decomposition
6) Initial Value Problem-II: RK-2, RK-4
7) Magic Square
8) Collatz Conjecture
9) Graph Theory: Networkx
10) Data Visualisation in Python