Department of Mathematics

Pavanatma College, Murickassery

Idukki-685604

Curriculum Framework

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Course – I Semester – I

FOUNDATION OF MATHEMATICS

1.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	MM1CRT01
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	72
9	Hours per Week	4
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

1.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Basic Logic	Chalk and talk,	20
2	Set theory	Chalk and talk	12
3	Relations	Chalk and talk, ICT	20
4	Theory of Equations	Chalk and talk	20

1.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

1.4 Course Outcome

CO-1	Apply mathematical logic to practical situations for drawing conclusions and to understand method of proofs.
CO-2	Understand the basic theory of sets and to Perform set operations
CO-3	Understand relations and their properties
CO-4	Understand basic ideas of theory of equations

1.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	3	0	3	1	0	0	0
CO-2	2	0	0	0	2	0	0	0	0	0
CO-3	0	0	0	1	0	0	0	0	0	0
CO-4	0	0	0	2	2	0	0	0	0	0

1.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	3	0
CO-2	3	0	3	0	3
CO-3	3	0	3	0	0
CO-4	2	0	0	2	0

Course – II Semester – II

ANALYTIC GEOMETRY, TRIGONOMETRY AND DIFFERENTIAL CALCULUS

2.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	MM2CRT02
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	72
9	Hours per Week	4
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

2.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Conic Sections	Chalk and talk	22
2	Polar Co-ordinates	Chalk and talk	15
3	Trigonometry	Chalk and talk	17
4	Differential Calculus	Chalk and talk	18

2.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

2.4 Course Outcome

CO-1	Solve problems in conic sections
CO-2	Solve problems polar coordinates
CO-3	Solve trigonometrical problems
CO-4	Find nth derivative of a function

2.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	2	0	0	3	0	0	0	0	0	0
CO-2	0	2	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	2

2.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	3	0
CO-2	3	0	3	0	3
CO-3	3	0	3	0	0
CO-4	2	0	0	2	0

Course – III Semester – III

CALCULUS

3.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	MM3CRT03
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

3.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Differential Calculus	Chalk and talk, ICT	27
2	Partial Differentiation	Chalk and talk ,ICT	18
3	Integral Calculus	Chalk and talk	20
4	Multiple Integrals	Chalk and talk	25

3.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

3.4 Course Outcome

CO-1	Solve problems using successive differentiation
CO-2	Solve problems using partial differentiation
CO-3	Integrate basic functions and find the area of a region
CO-4	Use multiple integration.

3.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	2	0	0	3	0	0	0	0	0	0
CO-2	0	2	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	2

3.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	3	0
CO-2	3	0	3	0	3
CO-3	3	0	3	0	0
CO-4	2	0	0	2	0

Course – IV Semester – IV

VECTOR CALCULUS, THEORY OF NUMBERS AND LAPLACE TRANSFORM

4.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	MM4CRT04
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

4.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Vector Differentiation	Chalk and talk, ICT	25
2	Vector Integration	Chalk and talk, ICT	30
3	Theory of Numbers	Chalk and talk, ICT	15
4	Laplace transforms	Chalk and talk	20

4.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

4.4 Course Outcome

CO-1	Solve problems using vector differentiation
CO-2	Solve problems using vector integration
CO-3	Understand and communicate the ideas of number theory
CO-4	Understand Laplace transform.

4.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	2	0	0	3	0	0	0	0	0	0
CO-2	0	2	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	2

4.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	3	0
CO-2	3	0	3	0	3
CO-3	3	0	3	0	0
CO-4	2	0	0	2	0

Course – V Semester – V

MATHEMATICAL ANALYSIS

5.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	MM5CRT05
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	108
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

5.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Real Numbers	Chalk and talk	30
2	Sequences	Chalk and talk	30
3	Series	Chalk and talk	24
4	Limits	Chalk and talk	24

5.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

5.4 Course Outcome

CO-1	Understand the arithmetical properties of Real Numbers
CO-2	Explain the concept of Sequences and their limits
CO-3	Explain the concept of Series and its convergence
CO-4	Demonstrate the concept of limits

5.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	3	0	0	0	0	0	0	0
CO-2	3	0	3	0	0	0	0	0	0	0
CO-3	3	0	3	0	0	0	0	0	0	0
CO-4	3	0	3	0	0	0	0	0	0	0

5.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	0	0
CO-2	3	2	3	0	0
CO-3	3	2	3	0	0
CO-4	3	2	3	0	0

Course – VI Semester – V

DIFFERENTIAL EQUATIONS

6.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	MM5CRT06
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	108
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

6.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	What is a differential equation	Chalk and talk	26
2	Second order linear equations	Chalk and talk	26
3	Power Series solutions and special functions	Chalk and talk	26
4	Partial Differential equations	Chalk and talk	30

6.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

6.4 Course Outcome

CO-1	Solve first order ordinary differential equations.
CO-2	Solve second order ordinary differential equations.
CO-3	Solve ordinary differential equation using power series method.
CO-4	Understand what is a partial differential equations.

6.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	2	0	0	3	0	0	0	0	0	0
CO-2	0	2	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	2

6.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	3	0
CO-2	3	0	3	0	3
CO-3	3	0	3	0	0
CO-4	2	0	0	2	0

Course – VII Semester – V

ABSTRACT ALGEBRA

7.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	MM5CRT07
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

7.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Introduction to Groups	Chalk and talk	25
2	Permutation Group	Chalk and talk	25
3	Homomorphisms and Factor groups	Chalk and talk	20
4	Rings and Fields	Chalk and talk	20

7.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

7.4 Course Outcome

CO-1	Understand the basic properties of Groups
CO-2	Explain the concept of Permutations
CO-3	Explain the concept of homomorphism
CO-4	Demonstrate the concept of rings and Fields

7.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	2	0	0	0	0	0	0	0
CO-2	3	0	2	0	0	0	0	0	0	0
CO-3	3	0	2	0	0	0	0	0	0	0
CO-4	3	0	2	0	0	0	0	0	0	0

7.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	0	0
CO-2	3	2	3	0	0
CO-3	3	2	3	0	0
CO-4	3	2	3	0	0

Course – VIII Semester – V

APPLICABLE MATHEMATICS

8.1 Course Overview

1	Course	Open Course
2	Course Type	Theory
3	Course Code	MM5GET02
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	72
9	Hours per Week	4
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

8.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Introduction to Numbers	Chalk and talk	18
2	Trigonometry	Chalk and talk, ICT	18
3	Simple Interest and Compound Interest	Chalk and talk, ICT	18
4	Introduction to Calculus	Chalk and talk, ICT	18

8.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

8.4 Course Outcome

CO-1	Understand basic mathematical concepts including HCF, LCM, fractions, percentage etc.
CO-2	Improve mathematical ability and problem solving skills
CO-3	Solve problems related to time and work , work and wages, time and distance etc. which often appears in competitive exams
CO-4	Learn shortcut methods to solve problems

8.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	1	0	0	3	0	0	0	0	0	0
CO-2	1	0	0	3	0	0	0	0	0	0
CO-3	1	0	0	3	0	0	0	0	0	0
CO-4	1	0	0	3	0	0	0	0	0	0

8.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	1	0	0	3	0
CO-2	1	0	0	3	0
CO-3	1	0	0	3	0
CO-4	1	0	0	3	0

Course – IX Semester – V

HUMAN RIGHTS AND MATHEMATICS FOR ENVIORNMENTAL STUDIES

9.1 Course Overview

1	Course	Environmental Maths
2	Course Type	Theory
3	Course Code	MM5CRT08
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	72
9	Hours per Week	4
10	Number of Modules	5
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

9.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Multidisciplinary nature of environmental studies	Chalk and talk, ICT	18
2	Biodiversity and its conservation	Chalk and talk, ICT	26
3	Fibonacci Numbers in nature	Chalk and talk, ICT	10
4	Golden Ratio	Chalk and talk, ICT	10
5	Human rights	Null	8

9.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

9.4 Course Outcome

CO-1	Acquire knowledge and skills to address various environmental issues and learn to appreciate and value nature
CO-2	understand Fibonacci numbers and their significance in nature and solve related problems
CO-3	Grasp deep knowledge about golden ratio and its pervasive appearance throughout nature
CO-4	Be aware about human rights and it strengthens their ability to contribute to the resolution of human rights issues and problems

9.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	3	0	3	0	0	0	2	0	0
CO-2	0	3	2	3	0	0	0	0	0	0
CO-3	0	3	2	3	0	0	0	0	0	0
CO-4	0	0	0	0	0	3	0	2	0	0

9.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	0	0
CO-2	3	2	3	0	0
CO-3	3	2	3	0	0
CO-4	3	2	3	0	0

Course – X Semester – VI

REAL ANALYSIS

10.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	MM6CRT09
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

10.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Continuous Functions	Chalk and talk	30
2	Differentiation	Chalk and talk	24
3	The Reimann Integral	Chalk and talk	24
4	Sequences and Series of Functions	Chalk and talk	24

10.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

10.4 Course Outcome

CO-1	Understand the basic properties of Continuous functions
CO-2	Explain the concept of differentiation
CO-3	Explain the concept of Riemann Integral
CO-4	Demonstrate the concept of sequence and series of functions

10.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	2	0	0	0	0	0	0	0
CO-2	3	0	2	0	0	0	0	0	0	0
CO-3	3	0	2	0	0	0	0	0	0	0
CO-4	3	0	2	0	0	0	0	0	0	0

10.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	0	0
CO-2	3	2	3	0	0
CO-3	3	2	3	0	0
CO-4	3	2	3	0	0

Course – XI Semester – VI

GRAPH THEORY AND METRIC SPACES

11.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	MM6CRT10
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	108
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

11.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Graph Theory	Chalk and talk,ICT	36
2	Graph Theory	Chalk and talk, ICT	30
3	Metric Spaces	Chalk and talk, ICT	24
4	Metric Spaces	Chalk and talk	18

11.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

11.4 Course Outcome

CO-1	Understand the basic properties of Analytic functions
CO-2	Explain the concept of complex integration
CO-3	Explain the concept of complex number series
CO-4	Demonstrate the concept of residues and poles

11.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	2	0	0	0	0	0	0	0
CO-2	3	0	2	0	0	0	0	0	0	0
CO-3	3	0	2	0	0	0	0	0	0	0
CO-4	3	0	2	0	0	0	0	0	0	0

11.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	3	0	0
CO-2	3	2	3	0	0
CO-3	3	2	3	0	0
CO-4	3	2	3	0	0

Course – XII Semester – VI

COMPLEX ANALYSIS

12.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	MM6CRT11
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

12.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Analytic functions	Chalk and talk	32
2	Integrals	Chalk and talk	25
3	Series	Chalk and talk	15
4	Residues and poles	Chalk and talk	18

12.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

12.4 Course Outcome

CO-1	Understand fundamentals of graph theory.
CO-2	Understand the ideas of Eulerian and Hamiltonian graphs.
CO-3	Understand fundamentals of Metric spaces.
CO-4	Understand fundamentals of Covergence and completeness.

12.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	0	3	0	0	1	0	0	3
CO-2	3	0	0	3	0	0	1	0	0	3
CO-3	3	0	0	3	0	0	1	0	0	3
CO-4	3	0	0	3	0	0	1	0	0	3

12.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	0	2	0	0
CO-2	3	0	2	0	0
CO-3	3	0	2	0	0
CO-4	3	0	2	0	0

Course – XIII Semester – VI

LINEAR ALGEBRA

13.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	MM6CRT12
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

13.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Introduction to Matrices	Chalk and talk	25
2	Vector Spaces	Chalk and talk	25
3	Null	Chalk and talk	20
4	Null	Chalk and talk	20

13.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

13.4 Course Outcome

CO-1	Understand and communicate algebraic techniques.
CO-2	Find inverse of a matrix and subspaces of a vector spaces.
CO-3	Use the idea of linear transformation ideas for solving a problem
CO-4	Find Eigen values of different matrices and solve eigen value problems.

13.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	2	0	0	3	0	0	0	0	0	0
CO-2	0	2	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	2

13.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	3	0
CO-2	3	0	3	0	3
CO-3	3	0	3	0	0
CO-4	2	0	0	2	0

Course – XIV Semester – VI

BASIC PYTHON PROGRAMMING AND TYPESETTING IN LATEX

14.1 Course Overview

1	Course	Choice Based Course
2	Course Type	Theory
3	Course Code	MM6CBT02
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	72
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

14.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Beginning Python Programming	Chalk and talk	16
2	Advanced features	Chalk and talk	20
3	Beginning typesetting with using LaTeX	Chalk and talk	16
4	Typesetting Mathematics	Chalk and talk	20

14.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

14.4 Course Outcome

CO-1	Understand Basics Python Programming.
CO-2	Understand advanced features of Python Programming.
CO-3	Learn Latex type setting.
CO-4	Learn Latex Math type setting .

14.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	0	0	0	0	1	0	0	3
CO-2	3	0	0	0	0	0	1	0	0	3
CO-3	3	0	0	0	0	0	1	0	0	3
CO-4	3	0	0	0	0	0	1	0	0	3

14.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	0	0	0	3	0
CO-2	0	0	0	3	0
CO-3	0	0	0	3	0
CO-4	0	0	0	3	0

Course – I Semester – I

LINEARPROGRAMMING

15.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM1CCT01
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	54
9	Hours per Week	3
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

15.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	MathematicalPreliminaries	Chalk and talk	15
2	General Problem of Mathematical Programming	Chalk and talk	12
3	Linear programming	Chalk and talk	10
4	Linear programming(Cont.)	Chalk and talk	17

15.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

15.4 Course Outcome

CO-1	Understand the abstract concept of Vector Space ,Matrix Operations, the basic theory convex sets
CO-2	Understand the concept of Quadratic forms
CO-3	Understand and apply Optimaztion problems
CO-4	Understand method of solving Optimaztion problems

15.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	2	2	3	0	0	0	0	0	0	0
CO-2	2	0	2	0	0	2	0	0	0	0
CO-3	3	3	0	2	0	0	0	0	0	0
CO-4	3	3	0	0	0	0	0	0	0	2

15.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	3	0
CO-2	3	0	0	3	0
CO-3	0	3	3	3	0
CO-4	2	0	0	3	0

Course – II Semester – II

DUALITY,TRANSPORTATION AND ASSIGN-

MENT PROBLEM

16.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM2CCT02
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	54
9	Hours per Week	3
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

16.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	LinearProgramming	Chalk and talk	15
2	TransportationProblems	Chalk and talk	10
3	LoopingTransportation	Chalk and talk	15
4	Assignment Problems	Chalk and talk	14

16.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

16.4 Course Outcome

CO-1	Find dual of an LPP and to solve an LPP
CO-2	Understand fundamentals of Transportation problem
CO-3	Solve transporatation problem
CO-4	Understand and solve assignment problem

16.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	2	0	2	0	0	0	0	0	2
CO-2	0	2	0	2	0	0	0	0	0	2
CO-3	0	2	0	2	0	0	0	0	0	2
CO-4	0	2	0	2	0	0	0	0	0	2

16.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	0	0	0	0	3
CO-2	0	0	0	0	3
CO-3	0	0	0	0	3
CO-4	0	0	0	0	3

Course – III Semester – III

QUEUEINGTHEORY

17.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM3CCT03
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	54
9	Hours per Week	3
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

17.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Theory of Games	Chalk and talk	16
2	Projec tManagement PERT and CPM	Chalk and talk	10
3	Project ManagementPERT and CPM(Cont.)	Chalk and talk	14
4	Queuing Theory	Chalk and talk	14

17.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

17.4 Course Outcome

CO-1	Realize the concept of game theory and learn different methods to solve a problem of it.
CO-2	Understand the fundamentals of Project Management
CO-3	Familiarize the methods of CPM and PERT
CO-4	Recognize basic ideas of Queuing Theory and know different models

17.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	2	0	2	0	0	0	0	0	2
CO-2	0	2	0	2	0	0	0	0	0	2
CO-3	0	2	0	2	0	0	0	0	0	2
CO-4	0	2	0	2	0	0	0	0	0	2

17.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	0	0	0	0	3
CO-2	0	0	0	0	3
CO-3	0	0	0	0	3
CO-4	0	0	0	0	3

Course – IV Semester – IV

NONLINEARPROGRAMMING

18.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM4CCT04
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	54
9	Hours per Week	3
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

18.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	IntegerProgramming	Chalk and talk	13
2	Branch and Bound Method	Chalk and talk	14
3	Kuhn-TuckerTheory and Non Linear Programming	Chalk and talk	15
4	Kuhn-TuckerTheoryandNonLinearProgramming(Cont.)	Chalk and talk	12

18.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

18.4 Course Outcome

CO-1	Realize the concept of game theory and learn different methods to solve a problem of it.
CO-2	Understand the fundamentals of Project Management
CO-3	Familiarize the methods of CPM and PERT
CO-4	Recognize basic ideas of Queuing Theory and know different models

18.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	2	0	2	0	0	0	0	0	2
CO-2	0	2	0	2	0	0	0	0	0	2
CO-3	0	2	0	2	0	0	0	0	0	2
CO-4	0	2	0	2	0	0	0	0	0	2

18.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	0	0	0	0	3
CO-2	0	0	0	0	3
CO-3	0	0	0	0	3
CO-4	0	0	0	0	3

Course – I Semester – I

PARTIALDIFFERENTIATION,MATRICES,T

AND NUMERICALMETHODS

19.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM1CMT01
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	72
9	Hours per Week	4
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

19.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	PartialDifferentiation	Chalk and talk	14
2	Matrices	Chalk and talk	21
3	Trigonometry	Chalk and talk	23
4	NumericalMethods	Chalk and talk	14

19.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

19.4 Course Outcome

CO-1	Find partial derivative
CO-2	Find rank of a matrix , eigen values and eigen vectors and to solve simultaneous system of equations.
CO-3	Understand basic ideas of trigonometry
CO-4	apply numerical methods to determine roots of an equation

19.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	2	0	0	0	0	0	0
CO-2	0	0	0	2	0	0	0	0	0	0
CO-3	0	0	0	2	0	0	0	0	0	0
CO-4	0	0	0	2	0	0	0	0	0	0

19.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	0	3	0	0	0
CO-2	0	0	3	0	0	0
CO-3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0

Course – II Semester – II

INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

20.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM2CMT02
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	72
9	Hours per Week	4
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

20.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Integral Calculus	Chalk and talk	15
2	Multiple Integrals	Chalk and talk	17
3	Ordinary Differential Equations	Chalk and talk	20
4	Partial Differential Equations	Chalk and talk	20

20.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

20.4 Course Outcome

CO-1	Find volume and surface area using integration
CO-2	Evaluate double and triple integrals and apply it for finding area and volume.
CO-3	Solve ordinary differential equation of first order and first degree.
CO-4	Solve partrial diffential equation

20.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	3	0	0	0	0	0	0
CO-2	0	0	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	0

20.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	0	3	0	0	0
CO-2	0	0	3	0	0	0
CO-3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0

Course – III Semester – III

VECTOR CALCULUS, ANALYTIC GEOMETRY AND ABSTRACT ALGEBRA

21.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM3CMT03
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

21.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Vector valued Functions	Chalk and talk	15
2	Integration in Vector Fields	Chalk and talk	25
3	Analytic Geometry	Chalk and talk	25
4	Abstract algebra	Chalk and talk	25

21.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

21.4 Course Outcome

CO-1	Demonstrate the idea of vector differentiation.
CO-2	Apply vector integration.
CO-3	Explain basic ideas of analytic geometry.
CO-4	Demonstrate the fundamentals of abstract algebra.

21.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	3	0	0	0	0	0	0
CO-2	0	0	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	0

21.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	0	3	0	0	0
CO-2	0	0	3	0	0	0
CO-3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0

Course – IV Semester – IV

FOURIER SERIES, LAPLACE TRANSFORM AND COMPLEX ANALYSIS

22.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM4CMT04
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

22.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Fourier Series and Legendre Polynomials	Chalk and talk	25
2	Laplace Transforms	Chalk and talk	20
3	Complex Numbers and Functions	Chalk and talk	25
4	Complex Integration	Chalk and talk	20

22.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

22.4 Course Outcome

CO-1	Find fourier series expansions
CO-2	Sove problems in Laplace Transform.
CO-3	Demonstrate the basics of complex numbers
CO-4	Apply complex integration.

22.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	3	0	0	0	0	0	0
CO-2	0	0	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	0

22.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	0	3	0	0	0
CO-2	0	0	3	0	0	0
CO-3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0

Course – I Semester – I

PARTIALDIFFERENTIATION,MATRICES,T

AND NUMERICALMETHODS

23.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM1CMT01
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 (2 × 5 = 10)

23.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	PartialDifferentiation	Chalk and talk	23
2	Matrices	Chalk and talk	21
3	Trigonometry	Chalk and talk	23
4	NumericalMethods	Chalk and talk	23

23.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

23.4 Course Outcome

CO-1	Find partial derivative
CO-2	Find rank of a matrix , eigen values and eigen vectors and to solve simultaneous system of equations.
CO-3	Understand basic ideas of trigonometry
CO-4	apply numerical methods to determine roots of an equation

23.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	2	0	0	0	0	0	0
CO-2	0	0	0	2	0	0	0	0	0	0
CO-3	0	0	0	2	0	0	0	0	0	0
CO-4	0	0	0	2	0	0	0	0	0	0

23.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	2	0	0	3	0
CO-2	0	2	0	0	3	0
CO-3	0	2	0	0	3	0
CO-4	0	2	0	0	3	0

Course – II Semester – II

INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

24.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM2CMT02
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

24.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Integral Calculus	Chalk and talk	18
2	Multiple Integrals	Chalk and talk	20
3	Ordinary Differential Equations	Chalk and talk	26
4	Partial Differential Equations	Chalk and talk	26

24.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

24.4 Course Outcome

CO-1	Find volume and surface area using integration
CO-2	Evaluate double and triple integrals and apply it for finding area and volume.
CO-3	Solve ordinary differential equation of first order and first degree.
CO-4	Solve partrial diffential equation

24.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	3	0	0	0	0	0	0
CO-2	0	0	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	0

24.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	2	0	0	3	0
CO-2	0	2	0	0	3	0
CO-3	0	2	0	0	3	0
CO-4	0	2	0	0	3	0

Course – III Semester – III

VECTOR CALCULUS, ANALYTIC GEOMETRY AND ABSTRACT ALGEBRA

25.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM3CMT03
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

25.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Vector valued Functions	Chalk and talk	15
2	Integration in Vector Fields	Chalk and talk	25
3	Analytic Geometry	Chalk and talk	25
4	Abstract algebra	Chalk and talk	25

25.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

25.4 Course Outcome

CO-1	Demonstrate the idea of vector differentiation.
CO-2	Apply vector integration.
CO-3	Explain basic ideas of analytic geometry.
CO-4	Demonstrate the fundamentals of abstract algebra.

25.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	3	0	0	0	0	0	0
CO-2	0	0	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	0

25.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	2	0	0	3	0
CO-2	0	2	0	0	3	0
CO-3	0	2	0	0	3	0
CO-4	0	2	0	0	3	0

Course – IV Semester – IV

FOURIER SERIES, LAPLACE TRANSFORM AND COMPLEX ANALYSIS

26.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM4CMT04
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

26.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Fourier Series and Legendre Polynomials	Chalk and talk	25
2	Laplace Transforms	Chalk and talk	20
3	Complex Numbers and Functions	Chalk and talk	25
4	Complex Integration	Chalk and talk	20

26.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

26.4 Course Outcome

CO-1	Find fourier series expansions
CO-2	Sove problems in Laplace Transform.
CO-3	Demonstrate the basics of complex numbers
CO-4	Apply complex integration.

26.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	3	0	0	0	0	0	0
CO-2	0	0	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	0

26.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	2	0	0	3	0
CO-2	0	2	0	0	3	0
CO-3	0	2	0	0	3	0
CO-4	0	2	0	0	3	0

Course – I Semester – I

PARTIALDIFFERENTIATION,MATRICES,T

AND NUMERICALMETHODS

27.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM1CMT01
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

27.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	PartialDifferentiation	Chalk and talk	23
2	Matrices	Chalk and talk	21
3	Trigonometry	Chalk and talk	23
4	NumericalMethods	Chalk and talk	23

27.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

27.4 Course Outcome

CO-1	Find partial derivative
CO-2	Find rank of a matrix , eigen values and eigen vectors and to solve simultaneous system of equations.
CO-3	Understand basic ideas of trigonometry
CO-4	apply numerical methods to determine roots of an equation

27.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	2	0	0	0	0	0	0
CO-2	0	0	0	2	0	0	0	0	0	0
CO-3	0	0	0	2	0	0	0	0	0	0
CO-4	0	0	0	2	0	0	0	0	0	0

27.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	0	3	0	0	0
CO-2	0	0	3	0	0	0
CO-3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0

Course – II Semester – II

INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

28.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM2CMT02
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

28.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Integral Calculus	Chalk and talk	18
2	Multiple Integrals	Chalk and talk	20
3	Ordinary Differential Equations	Chalk and talk	26
4	Partial Differential Equations	Chalk and talk	26

28.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

28.4 Course Outcome

CO-1	Find volume and surface area using integration
CO-2	Evaluate double and triple integrals and apply it for finding area and volume.
CO-3	Solve ordinary differential equation of first order and first degree.
CO-4	Solve partrial diffential equation

28.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	3	0	0	0	0	0	0
CO-2	0	0	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	0

28.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	0	3	0	0	0
CO-2	0	0	3	0	0	0
CO-3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0

Course – III Semester – III

VECTOR CALCULUS, ANALYTIC GEOMETRY AND ABSTRACT ALGEBRA

29.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM3CMT03
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

29.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Vector valued Functions	Chalk and talk	15
2	Integration in Vector Fields	Chalk and talk	25
3	Analytic Geometry	Chalk and talk	25
4	Abstract algebra	Chalk and talk	25

29.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

29.4 Course Outcome

CO-1	Demonstrate the idea of vector differentiation.
CO-2	Apply vector integration.
CO-3	Explain basic ideas of analytic geometry.
CO-4	Demonstrate the fundamentals of abstract algebra.

29.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	3	0	0	0	0	0	0
CO-2	0	0	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	0

29.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	0	3	0	0	0
CO-2	0	0	3	0	0	0
CO-3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0

Course – IV Semester – IV

FOURIER SERIES, LAPLACE TRANSFORM AND COMPLEX ANALYSIS

30.1 Course Overview

1	Course	Complementary
2	Course Type	Theory
3	Course Code	MM4CMT04
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	80
7	Internal Assessment	20
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	10 ($2 \times 5 = 10$)

30.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Fourier Series and Legendre Polynomials	Chalk and talk	25
2	Laplace Transforms	Chalk and talk	20
3	Complex Numbers and Functions	Chalk and talk	25
4	Complex Integration	Chalk and talk	20

30.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

30.4 Course Outcome

CO-1	Find fourier series expansions
CO-2	Sove problems in Laplace Transform.
CO-3	Demonstrate the basics of complex numbers
CO-4	Apply complex integration

30.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	3	0	0	0	0	0	0
CO-2	0	0	0	3	0	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	0	3	0	0	0	0	0	0

30.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	0	3	0	0	0
CO-2	0	0	3	0	0	0
CO-3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0

Course – I Semester – I

Abstract Algebra

31.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010101
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

31.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Groups	Chalk and talk	25
2	Sylow Theorems	Chalk and talk	25
3	Ring Of Polynomials	Chalk and talk	20
4	Factor Rings	Chalk and talk	20

31.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

31.4 Course Outcome

CO-1	Understand the basic concepts of abstract algebra deeply
CO-2	Be able to use algebraic theories practically to build problem solving skill
CO-3	Have strong foundation in field theory
CO-4	Be able to understand ring theory practically

31.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	0	0	0	0	3	0	0	0
CO-2	3	0	0	0	0	0	0	0	0	0
CO-3	3	0	3	0	0	0	3	0	0	0
CO-4	3	0	3	0	0	0	3	0	0	0

31.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	0	0
CO-2	3	3	0	0	0
CO-3	3	3	3	0	3
CO-4	3	3	3	2	3

Course – II Semester – I

Linear Algebra

32.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010102
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

32.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Vector Space	Chalk and talk	20
2	Linear Transformatios	Chalk and talk	25
3	Determinants	Chalk and talk	20
4	Diagonalization	Chalk and talk	25

32.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

32.4 Course Outcome

CO-1	Define basic definitions and examples.
CO-2	Study a system of linear equations or matrix algebra
CO-3	Solve the advanced problems in linear algebra and efficient to attend the competitive exams for further studies.
CO-4	Model the given problems and convey the ideas interms of linear algebra

32.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	0	0	0	0	0	0	0
CO-2	0	0	0	0	0	0	0	0	0	0
CO-3	1	0	0	0	0	0	0	0	0	0
CO-4	0	0	2	0	2	0	0	0	0	0

32.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	0	0	0	0
CO-2	0	0	0	0	0
CO-3	0	3	0	2	1
CO-4	0	0	0	0	0

Course – III Semester – I

Basic Topology

33.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010103
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 (0 × 0 = 0)

33.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Topological Spaces	Chalk and talk	25
2	Basic Concepts	Chalk and talk	25
3	Spaces With Special Properties	Chalk and talk	20
4	Spaces With Special Properties	Chalk and talk	20

33.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

33.4 Course Outcome

CO-1	understand basic definitions, examples and theorems in general topology.
CO-2	Do the exercises and complete simple proofs.
CO-3	Understand connected spaces,compact spaces and illustrate the concepts diagrammatically , relate the ideas with practical problems
CO-4	Understand separation axioms and refer appropriate text for further study .

33.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	0	0	0	0	0	0	0
CO-2	0	0	0	1	0	0	0	0	0	0
CO-3	0	0	0	0	0	0	0	0	0	0
CO-4	0	0	3	0	0	0	0	0	0	0

33.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	0	0	0	0
CO-2	3	3	0	0	0
CO-3	0	0	0	0	0
CO-4	0	2	0	1	0

Course – IV Semester – I

Real Analysis

34.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010104
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

34.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Functions of Boundede Variation And Rectifiable Curves	Chalk and talk	20
2	The Riemann Stieltjes Integral	Chalk and talk	20
3	Sequence And Series Of Functions	Chalk and talk	25
4	Weierstrass Aproximation And Some Special Functios	Chalk and talk	25

34.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

34.4 Course Outcome

CO-1	understand basic analytic concepts such as limit, convergence ,differentiation and integration.
CO-2	Think, analyse mathematical situations and solve problems in real analysis
CO-3	Have enough ideas for further research in integral calculus
CO-4	identify the applications of real analysis in other scientific branches

34.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	3	0	0	0	2	0	0	2
CO-2	3	2	3	3	0	0	2	0	0	0
CO-3	0	0	3	0	0	0	3	0	0	0
CO-4	0	3	0	0	0	0	0	0	0	0

34.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	1	3	2
CO-2	2	3	2	2	3
CO-3	1	2	0	3	3
CO-4	0	3	2	0	3

Course – V Semester – I

Graph Theory

35.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010105
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

35.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Graph Basic Concepts	Chalk and talk	20
2	Connectivity	Chalk and talk	25
3	Eulerian And Hamiltionian Graphs	Chalk and talk	20
4	Planarity	Chalk and talk	25

35.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

35.4 Course Outcome

CO-1	understand and transact fundamental concepts of a graph theory
CO-2	Enhancing knowledge to apply graph theory in solving practical problems
CO-3	Acquire efficiency in logical thinking and writing proofs
CO-4	connect graph theory with real life situations

35.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	2	2	0	0	0	0	0	0	2
CO-2	3	3	3	3	1	0	0	0	0	0
CO-3	3	0	3	0	0	0	2	0	0	3
CO-4	0	2	2	2	1	0	3	0	0	3

35.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	3	0
CO-2	2	3	1	2	2
CO-3	3	2	0	3	3
CO-4	0	2	3	0	2

Course – VI Semester – II

Advanced Abstract Algebra

36.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010201
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

36.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Extention Field	Chalk and talk	20
2	UFD	Chalk and talk	20
3	Automorphism Of Fields	Chalk and talk	25
4	Separable Extentions	Chalk and talk	25

36.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

36.4 Course Outcome

CO-1	Have strong foundation in the concepts of extension fields
CO-2	Be able to understand the importance of euclidean domains effectively
CO-3	Be able to understand the properties of extension fields through further clarifications and examples
CO-4	Build positive approach towards research by understanding the importance of Galois theory

36.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	3	0	0	0	3	0	0	0
CO-2	0	0	3	2	0	0	3	0	0	0
CO-3	0	0	3	3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0	3	0	0	0

36.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	0	3
CO-2	3	3	2	0	3
CO-3	3	3	3	0	3
CO-4	3	3	3	0	3

Course – VII Semester – II

Advanced Topology

37.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010202
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

37.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Seperation Axioms	Chalk and talk	20
2	Product And Coproduct	Chalk and talk	25
3	Embedding And Metrisation	Chalk and talk	25
4	Definition and Convergence of Nets	Chalk and talk	20

37.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

37.4 Course Outcome

CO-1	Understand advanced topics and prove well known theorems in topology
CO-2	Can workout given problems and develop proofs of required theorems
CO-3	Find out continuation in topics and develop new ideas for research
CO-4	Communicate the ideas and results effectively for the audience

37.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	2	2	0	0	0	0	0	0	2
CO-2	3	3	3	3	1	0	0	0	0	0
CO-3	3	-	3	0	0	0	2	0	0	3
CO-4	0	2	2	2	3	0	3	0	0	3

37.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	3	0
CO-2	2	3	1	2	2
CO-3	3	2	0	3	3
CO-4	0	2	3	0	1

Course – VIII Semester – II

Numerical Analysis with Python

38.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010203
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

38.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Basics of Python	Chalk and talk, ICT	20
2	Limit of Functions	Chalk and talk,ICT	25
3	Interpolation And Curve Fitting	Chalk and talk,ICT	25
4	Gauss Elimination Method	Chalk and talk,ICT	20

38.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

38.4 Course Outcome

CO-1	program the numerical methods using python codes that output the numerical solutions at the required degree and accuracy
CO-2	do python programming and understand its applications in modern mathematics streams
CO-3	Acquire interest and confidence in learning this new subject
CO-4	define python concepts, programs and perform research in conjunction with others as well as individually for each students

38.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	3	3	3	0	0	2	0	0	2
CO-2	3	0	2	2	0	0	0	0	0	2
CO-3	2	0	2	0	0	0	3	0	0	2
CO-4	0	0	3	2	0	0	3	0	0	3

38.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	3	3	2	2
CO-2	2	3	3	2	2
CO-3	0	2	2	1	2
CO-4	0	2	2	2	2

Course – IX Semester – II

Complex Analysis

39.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010204
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

39.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Spherica Representation Of Complex Numbers	Chalk and talk	25
2	Fundamental Theorems on Complex Integration	Chalk and talk	20
3	Higher Derivatives	Chalk and talk	20
4	The General Form Of Cauchy's Theorem	Chalk and talk	25

39.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

39.4 Course Outcome

CO-1	Understand the spherical properties and related concepts of complex numbers deeply
CO-2	Build strong Mathematical knowledge about arcs.
CO-3	Create problem solving skill by understanding the importance of higher derivatives.
CO-4	Be able to perform competitive exams and build positive approach towards research .

39.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	3	0	0	0	3	0	0	0
CO-2	0	0	3	2	0	0	3	0	0	0
CO-3	0	0	3	3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0	3	0	0	0

39.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	0	3
CO-2	3	3	2	0	3
CO-3	3	3	3	0	3
CO-4	3	3	3	0	3

Course – X Semester – II

Measure And Integration

40.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010205
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

40.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Lebsgue Measure	Chalk and talk	25
2	Lebesugue Integration	Chalk and talk	25
3	General Meeasure Space And Measurable Functios	Chalk and talk	20
4	Integration Over Genral Measure Space And Product Measures	Chalk and talk	20

40.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

40.4 Course Outcome

CO-1	Understand the evolution of measure and related concepts, basic definitions ,theorems and wellknown examples.
CO-2	Understand lebesgue integral and prove known theorems
CO-3	Understand abstract measure and concept of integration and solve related problems
CO-4	Prove celebrated theorems in general measure theory and find advanced concepts in measure theory.

40.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	0	0	0	0	0	0	0
CO-2	0	0	1	1	0	0	0	0	0	0
CO-3	0	0	0	2	0	0	0	0	0	0
CO-4	1	0	2	0	0	0	0	0	0	0

40.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	0	0	0
CO-2	0	0	0	0	0
CO-3	3	2	0	0	2
CO-4	0	0	0	2	0

Course – XI Semester – III

Advanced Complex Analysis

41.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010301
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

41.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Harmonic Function	Chalk and talk	20
2	Power Series Expansions	Chalk and talk	25
3	Riemann Zeta Function	Chalk and talk	25
4	The Riemann Mapping Theorem	Chalk and talk	20

41.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

41.4 Course Outcome

CO-1	Explain the fundamental concepts of complex analysis
CO-2	Explain the concepts, state and prove theorems from complex analysis.
CO-3	Acquire the ability to solve problems using complex analysis techniques.
CO-4	Apply complex analysis techniques to specific research areas.

41.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	0	3	3	0	0	0	0	0
CO-2	0	0	2	3	3	0	0	0	0	0
CO-3	0	0	0	3	0	0	0	0	0	0
CO-4	0	0	3	3	0	0	0	0	0	0

41.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	0	2	0
CO-2	3	3	0	3	2
CO-3	0	3	0	0	0
CO-4	0	0	0	0	3

Course – XII Semester – III

Partial Differential Equations

42.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010302
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

42.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Solutions Of Pde	Chalk and talk	20
2	Linear Equation Of First Order	Chalk and talk	25
3	Jacobi's Method	Chalk and talk	20
4	Separation Of Varibles	Chalk and talk	25

42.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

42.4 Course Outcome

CO-1	understand basic concepts of partial differntial equation
CO-2	identify different types of partial differntial equations and their methods of solving
CO-3	Acquire problem solving skills
CO-4	identify partial differntial equations in different branches of science and enhance positive attitudes towards researches in this field

42.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	2	0	3	3	0	0	3	0	0	0
CO-2	3	0	0	3	0	0	0	0	0	0
CO-3	2	0	0	3	0	0	0	0	0	0
CO-4	2	2	0	2	0	0	3	0	0	3

42.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	0	2	0	3	0
CO-2	2	2	0	3	2
CO-3	0	3	0	2	0
CO-4	3	3	3	3	3

Course – XIII Semester – III

Multivariate Calculus And Integral Transform

43.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010303
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

43.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Weirstrass Theorem	Chalk and talk	20
2	Multivariable Differential Calculus	Chalk and talk	22
3	Mixed Partial Derivatives	Chalk and talk	28
4	Intgration Of Differential Forms	Chalk and talk	20

43.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

43.4 Course Outcome

CO-1	Have much knowledge in integral theory to perform further researches.
CO-2	differentiate multivariable functions and have basic knowledge in multivariable differentiation to workout problems.
CO-3	Provewellknown theorems in differential calculus interms of multivariable functions .
CO-4	Know the basic concepts of multivariable integration.

43.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	2	0	0	0	0	0	0	0
CO-2	1	0	0	2	0	0	0	0	0	2
CO-3	0	0	0	0	0	0	0	0	0	0
CO-4	0	0	0	1	0	0	0	0	0	0

43.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	0	0	0	0	3
CO-2	3	2	0	0	0
CO-3	0	0	0	0	0
CO-4	0	0	0	2	2

Course – XIV Semester – III

Functional Analysis

44.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010304
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

44.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Completion Theorem	Chalk and talk	20
2	Linear Oeerators	Chalk and talk	25
3	Inner Product Spaces	Chalk and talk	25
4	Hilbert Space	Chalk and talk	20

44.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

44.4 Course Outcome

CO-1	Understand normed spaces and relative concepts effectively.
CO-2	Be familiar with linear operators Functionals and dual spaces .
CO-3	Be able to understand the importance of inner product space .
CO-4	Build problem solving skill by understanding adjoint operators .

44.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	3	0	0	0	3	0	0	0
CO-2	0	0	3	2	0	0	3	0	0	0
CO-3	0	0	3	3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0	3	0	0	0

44.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	0	3
CO-2	3	3	2	0	3
CO-3	3	3	3	0	3
CO-4	3	3	3	0	3

Course – XV Semester – III

Optmization Technique

45.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010305
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

45.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Linear Programming	Chalk and talk	25
2	Integer Programing	Chalk and talk	25
3	Goal Programming And Flow and Potential in Networks	Chalk and talk	15
4	Non-Linear Programing	Chalk and talk	25

45.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

45.4 Course Outcome

CO-1	Understand theory of optimization methods and algorithm
CO-2	Use the theory and algorithm for solvingvarious types of optimization problems
CO-3	Efficient in applying numerical techniques of optimization theory in practical problem
CO-4	Enhance research interest in applying optimization techniques in other branches of science and technology

45.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	2	2	0	0	0	0	0	0	2
CO-2	3	3	3	3	1	0	0	0	0	0
CO-3	3	0	3	0	0	0	2	0	0	3
CO-4	0	2	2	2	1	0	3	0	0	3

45.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	3	0
CO-2	2	3	1	2	2
CO-3	3	2	0	3	3
CO-4	0	2	3	0	2

Course – XVI Semester – IV

Spectral Theory

46.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010401
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

46.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Convergence Of Sequence Of Operators And Functionals	Chalk and talk	20
2	Banach Fixed Point Theorem	Chalk and talk	25
3	Banach algebra	Chalk and talk	25
4	Spectral Properties Of Self Adjoint Linear Operator	Chalk and talk	20

46.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

46.4 Course Outcome

CO-1	Understand the concepts of category theory and further applications of linear operators.
CO-2	Be familiar with spectrum and related concepts .
CO-3	Be able to understand Banach spaces deeply .
CO-4	Understand spectral properties of linear operators and projections effectively .

46.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	3	0	0	0	3	0	0	0
CO-2	0	0	3	2	0	0	3	0	0	0
CO-3	0	0	3	3	0	0	3	0	0	0
CO-4	0	0	3	0	0	0	3	0	0	0

46.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	0	3
CO-2	3	3	2	0	3
CO-3	3	3	3	0	3
CO-4	3	3	3	0	3

Course – XVII Semester – IV

Analytic Number Theory

47.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME010402
4	Credit	4
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

47.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Arithemetic Functions	Chalk and talk	30
2	Some Elementry Theorems On The Distribution Of Prime Numbers	Chalk and talk	15
3	Congruances	Chalk and talk	25
4	Quadratic Residues	Chalk and talk	20

47.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

47.4 Course Outcome

CO-1	Know some special functions and how they related each other
CO-2	Identify more special functions and distribution functions and applications
CO-3	Relate the number theoretic problems with algebra and prove complicated theorems
CO-4	Advanced ideas number theory and prove well known theorems

47.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	2	0	0	0	0	0	0	0
CO-2	0	0	0	2	0	0	0	0	0	0
CO-3	0	0	2	3	0	0	0	0	0	0
CO-4	0	0	0	0	0	0	0	0	0	0

47.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	0	0	0	0
CO-2	3	3	0	0	0
CO-3	0	3	0	0	3
CO-4	0	0	0	0	0

Course – XVIII Semester – IV

Differential Geometry

48.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME800401
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

48.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Graph And Level Set	Chalk and talk	20
2	Gauss Map	Chalk and talk	20
3	Weingartn Map	Chalk and talk	25
4	Curvature Of Surfaces	Chalk and talk	25

48.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

48.4 Course Outcome

CO-1	Understand the basic concepts of differential geometry and its role in modern mathematics.
CO-2	Analyse and solve complex problems using appropriate techniques from differential geometry.
CO-3	Apply problem solving with differential geometry in engineering ,physics or other mathematical situations
CO-4	Apply differential geometry techniques to specific research areas .

48.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	2	0	0	3	0	0	3	0	0	0
CO-2	2	0	0	0	0	0	3	0	0	3
CO-3	3	3	3	3	0	0	3	0	0	3
CO-4	2	0	3	0	0	0	3	0	0	3

48.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	0	0	3	0
CO-2	0	0	0	2	0
CO-3	0	3	2	2	3
CO-4	2	3	0	2	3

Course – XIX Semester – IV

Algorthmic Graph Theory

49.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME800402
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

49.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Introduction to Graph And Algorithms	Chalk and talk	24
2	Trees And Distances	Chalk and talk	22
3	Networks	Chalk and talk	22
4	Matchings And Factorization	Chalk and talk	22

49.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

49.4 Course Outcome

CO-1	Understand fundamentals of graphs and algorithms
CO-2	learn abot trees ,path and distances
CO-3	Understand networks and related theorems
CO-4	Understand matchings and factorizationms

49.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	0	0	3	3	0	0	1	0	0	0
CO-2	0	0	3	3	0	0	1	0	0	0
CO-3	0	0	3	3	0	0	1	0	0	0
CO-4	0	0	3	3	0	0	1	0	0	0

49.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	0	0
CO-2	3	3	0	3	0
CO-3	3	3	0	3	0
CO-4	3	3	0	0	0

Course – XX Semester – IV

Combinatorics

50.1 Course Overview

1	Course	Core
2	Course Type	Theory
3	Course Code	ME800403
4	Credit	3
5	Duration of External Examination	3 hours
6	External Assessment	150
7	Internal Assessment	25
8	Total hours	90
9	Hours per Week	5
10	Number of Modules	4
Distribution of Internal Marks		
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	0 ($0 \times 0 = 0$)

50.2 Curriculum Structure

Module	Module Title	Delivery Methods	Total hours
1	Permutations And Combinations	Chalk and talk	22
2	Pigeonhole Principle And Ramsey Number	Chalk and talk	18
3	The Principle of Inclution And Exclution	Chalk and talk	25
4	Generation Functions and Recurrence Relations	Chalk and talk	25

50.3 Evaluation Methods

No.	Assessment Methods	Evaluation Type
1	Assessment tests	Internal Assessment
2	Assignments	Internal Assessment
3	Seminar	Internal Assessment
4	University Examination	External Assessment

50.4 Course Outcome

CO-1	Understand difference between permutation and combination
CO-2	Solve different Ramsey Type problems
CO-3	Understand the principle of inclusion and exclusion
CO-4	Accure knowledge about generating functions and recurrence relations

50.5 CO – PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	0	0	3	0	0	0	0	0	0
CO-2	3	0	0	3	0	0	0	0	0	0
CO-3	3	0	0	3	0	0	0	0	0	0
CO-4	3	0	0	3	0	0	0	0	0	0

50.6 CO – PSO Mapping

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	2	0
CO-2	3	3	0	0	0
CO-3	3	3	0	0	0
CO-4	3	3	0	2	0

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