# 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 Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

Module	Module Title	Dolivory Mothoda	Total
Module	Module Title	Delivery Methods	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
CO-1	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

СО	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

СО	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	$10 (2 \times 5 = 10)$				

Module	Module Title	Dolizzawy Mothoda	Total
Module	Module Title	Delivery Methods	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

СО	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

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0 - 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 Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

Module	Module Title	Delivery Methods	Total
Module	Module Title	Denvery Methods	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.

СО	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

СО	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

# Semester - IV

# VECTOR CALCULUS, THEORY OF NUM-BERS 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	$10 (2 \times 5 = 10)$			

Module	Module Title	Dolivowy Mothoda	Total
Module	Module Title	Delivery Methods	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.

СО	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

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

	Course Overview	
L	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 Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

Module	Module Title	Delivery Methods	Total
2,200,0220	-1200010 21010		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

СО	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

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**

l	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
LO	Number of Modules	4
	Distribution of Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

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.
GO 9	Solve ordinary differential equation using power series
CO-3	method.
CO-4	Understand what is a partial differential equations.

СО	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	$\triangle$ 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

СО	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**

.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 Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

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

СО	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

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 Inter	rnal Marks		
11	Attendance	5		
12	Assignment/Seminar	5		
13	Assessment Test	$10 (2 \times 5 = 10)$		

Module	Modulo Titlo	Dolinger Mothoda	Total
Module	Module Title	Delivery Methods	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,
CO-1	LCM, fractions, percentage etc.
CO-2	Improve mathematical ability and problem solving skills
	Solve problems related to time and work, work and wages,
CO-3	time and distance etc. which often appears in competitive
	exams
CO-4	Learn shortcut methods to solve problems

#### 8.5 CO - PO Mapping

СО	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	<u> </u>	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

СО	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 Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

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

СО	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

СО	PSO-1	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	COLLEGI
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 Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

Module	Modulo Titlo	Dolinour Mothoda	Total
Module	Module Title	Delivery Methods	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	Chalk and talk	24
4	Functions	Chaik and taik	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

СО	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

CO	PSO-1	PSO-2	PSO-2 PSO-3 PSO-3		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 Inter	rnal Marks		
11	Attendance	5		
12	Assignment/Seminar	5		
13	Assessment Test	$10 (2 \times 5 = 10)$		

Module	Module Title	Dolivowy Mothodo	Total
Module	Wodule Title	Delivery Methods	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

СО	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

CO	PSO-1	PSO-2	PSO-2 PSO-3 PSO		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	COLLEGI
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 Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

Module	Module Title	Dolivowy Mothoda	Total
Module	Module Title	Delivery Methods	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.						

СО	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

СО	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 Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

Module	Module Title	Dolivory Mothoda	Total
Module	Module Title	Delivery Methods	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 2	Use the idea of linear transformation ideas for solving a
CO-3	problem
CO 4	Find Eigen values of different matrices and solve eigen value
CO-4	problems.

#### 13.5 CO - PO Mapping

СО	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	$\triangle$ 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

СО	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 Inter	nal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

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

СО	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	$\triangle$ 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

СО	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 Inter	rnal Marks		
11	Attendance	5		
12	Assignment/Seminar	5		
13	Assessment Test	$10 (2 \times 5 = 10)$		

Madala	Madala Mida	Dalinana Madhada	Total
Module	Module Title	Delivery Methods	hours
1	MathematicalPreliminaries	Chalk and talk	15
	General Problem of	A CO//	
2	Mathematical	Chalk and talk	12
	Programming		
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
00-1	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

СО	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	$\triangle$ 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

СО	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 Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

Module	Module Title	Dolivous Mothodo	Total
Module	Module Title	Delivery Methods	hours
1	LinearProgramming	Chalk and talk	15
2	TransportationProblems	Chalk and talk	10
3	${\it Looping Transportation}$	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

СО	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

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	0	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 Inter	nal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

Module	Module Title	Delivery Methods	Total
Wiodule	Module Title	Delivery Methods	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
00-1	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
CO-4	models

#### 17.5 CO - PO Mapping

СО	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	$\triangle$ 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

СО	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 Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

Module	Module Title	Delivery Methods	Total
	Module Title	Denvery Methods	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- TuckerTheoryandNonLinear	Chalk and talk Programming(Cont.)	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	
00-1	methods to solve a problem of it.	
CO-2	CO-2 Understand the fundamentals of Project Management	
CO-3 Familiarize the methods of CPM and PERT		
GO 4	Recognize basic ideas of Queuing Theory and know different	
CO-4	models	

#### 18.5 CO - PO Mapping

СО	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	<u> </u>	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

СО	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	$10 (2 \times 5 = 10)$				

Module	Module Title	Doliyawy Mathada	Total
Module	Wiodule Title	Delivery Methods	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		

СО	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

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 DIFFEREN-TIAL EQUATIONS

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	$10 (2 \times 5 = 10)$			

Module	Module Title	Delivery Methods	Total hours
			Hours
1	Integral Calculus	Chalk and talk	15
2	Multiple Integrals	Chalk and talk	17
3	Ordinary Differential Chalk and talk Equations		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
CO-2	area and volume.
CO 2	Solve ordinary differential equation of first order and first
CO-3	degree.
CO-4	Solve partrial diffential equation

### 20.5 CO - PO Mapping

СО	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	$\triangle$ 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

СО	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 GEOM-ETRY AND ABSTRACT ALGEBRA

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	$10 (2 \times 5 = 10)$				

Module	Module Title	Dolivous Mothodo	Total
Module	Module Title	Delivery Methods	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.			

СО	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 C	CO – PSO	Mappin	g	-6	EGE	
CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	0	0	3	4 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

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	$10 (2 \times 5 = 10)$			

Module	Module Title	Delivery Methods	Total
Module	Module Title	Delivery Methods	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

СО	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	$\triangle$ 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

СО	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

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 Inter	rnal Marks
11	Attendance	5
12	Assignment/Seminar	5
13	Assessment Test	$10 (2 \times 5 = 10)$

Module	Module Title	Dolivous Mothodo	Total
Module	Module Title	Delivery Methods	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

СО	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

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 DIFFEREN-TIAL EQUATIONS

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	$10 (2 \times 5 = 10)$				

Module	Module Title	Delivery Methods	Total
Module	Module Title	Denvery Methods	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
00-2	area and volume.
CO 2	Solve ordinary differential equation of first order and first
CO-3	degree.
CO-4	Solve partrial diffential equation

### 24.5 CO - PO Mapping

СО	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	$\triangle$ 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

СО	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 GEOM-ETRY AND ABSTRACT ALGEBRA

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	$10 (2 \times 5 = 10)$			

Module	Module Title	Doliyawy Mathada	Total
Module	Wiodule Title	Delivery Methods	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.

СО	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										

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

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	$10 (2 \times 5 = 10)$			

Madada	M. J. J. Midla	Dalinam Mathada	Total
Module	Module Title	Delivery Methods	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

СО	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	$\triangle$ 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

СО	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

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	$10 (2 \times 5 = 10)$				

Module	Module Title	Dolivous Mothodo	Total
Module	Module Title	Delivery Methods	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
GO 9	Find rank of a matrix, eigen values and eigen vectors and to
CO-2	solve simultaneous system of equations.
CO-3	Understand basic ideas of trigonometry
CO-4	apply numerical methods to determine roots of an equation

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 – I	PSO N	<b>Iapp</b> i	ing	A C	0/	LE	GE		

СО	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 DIFFEREN-TIAL EQUATIONS

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	$10 (2 \times 5 = 10)$			

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 9	Evaluate double and triple integrals and apply it for finding
CO-2	area and volume.
CO 9	Solve ordinary differential equation of first order and first
CO-3	degree.
CO-4	Solve partrial diffential equation

### 28.5 CO - PO Mapping

СО	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	$\triangle$ 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

СО	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 GEOM-ETRY AND ABSTRACT ALGEBRA

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	$10 (2 \times 5 = 10)$			

Module	Module Title	Dolivous Mothodo	Total
Module	Module Title	Delivery Methods	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.			

СО	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										

СО	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

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	$10 (2 \times 5 = 10)$			

Madala	M. J. J. Midla	Dalinam Mathada	Total
Module	Module Title	Delivery Methods	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

СО	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	$\triangle$ 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

СО	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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

Module	Module Title	Doliyawy Mathada	Total
Module	Wiodule Title	Delivery Methods	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
00.0	Be able to use algebraic theories practically to build problem
CO-2	solving skill
CO-3	Have strong foundation in field theory
CO-4	Be able to understand ring theory practically

СО	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

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

<b>32.1</b>	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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

Module	Module Title	Dolivous Mothoda	Total
Module	Module Title	Delivery Methods	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 2	Solve the advanced problems in linear algebra and efficient
CO-3	to attend the competitive exams for further studies.
CO. 4	Model the given problems and convey the ideas interms of
CO-4	linear algebra

### 32.5 CO - PO Mapping

СО	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	Δο	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

СО	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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

Module	Module Title	Doliyawy Mathada	Total
Module	Module Title	Delivery Methods	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
00-1	general topology.
CO-2	Do the exercises and complete simple proofs.
	Understand connected spaces,compact spaces and illustrate
CO-3	the concepts diagrammatically, relate the ideas with
	practical problems
GO 4	Understand separation axioms and refer appropriate text for
CO-4	further study.

# 33.5 CO - PO Mapping

СО	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

СО	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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

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,
00-1	convergence ,differentiation and integration.
CO-2	Think, analyse mathematical situations and solve problems
CO-2	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
CO-4	branches

# 34.5 CO - PO Mapping

СО	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

СО	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	KASSE	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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

Module	Module Title	Dolivony Mothodo	Total
Module	Wodule Title	Delivery Methods	hours
1	Graph Basic Concepts	Chalk and talk	20
2	Connectivity	Chalk and talk	25
3	Eulerian And Hamiltionian	Chalk and talk	20
· ·	Graphs	Chaix and taix	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
CO-1	theory
GO 9	Enhancing knowledge to apply graph theory in solving
CO-2	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

СО	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	<u>A</u> 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

СО	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

<b>36.1</b>	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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

Module	Module Title	Dolivous Mothodo	Total
Module	Module Title	Delivery Methods	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

СО	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	$\triangle$ 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

СО	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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

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
CO-1	in topology
CO 9	Can workout given problems and develop proofs of required
CO-2	theorems
CO 2	Find out continuation in topics and develop new ideas for
CO-3	research
CO. 4	Communicate the ideas and results effectively for the
CO-4	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

СО	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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

Module	Module Title	Dolivous Mothodo	Total
Module	Module Title	Delivery Methods	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

СО	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

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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

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

# 39.5 CO - PO Mapping

СО	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

					//
CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	KAOSE	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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

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,
00-1	basic definitions ,theorems and wellknown examples.
CO-2	Understand lebesgue integral and prove known theorems
CO 9	Understand abstract measure and concept of integration and
CO-3	solve related problems
CO 4	Prove celebrated theorems in general measure theory and
CO-4	find advanced concepts in measure theory.

# 40.5 CO - PO Mapping

СО	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

СО	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	2	KAOSE	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

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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

Module	Module Title	Dolivowy Mothoda	Total
Module	Module Title	Delivery Methods	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	Chalk and talk	20
4	Theorem	Oliaik allu taik	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
00-2	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

СО	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

СО	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	$0 (0 \times 0 = 0)$			

Module	Module Title	Dolivowy Mothoda	Total
Wiodule	Module Title	Delivery Methods	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
CO-2	their methods of solving
CO-3	Acquire problem solving skills
	identify partial differntial equations in different branches of
CO-4	science and enhance positive attitudes towards researches in
	this field

# 42.5 CO - PO Mapping

СО	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	$\triangle$ 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

СО	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	$0 (0 \times 0 = 0)$				

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
00-1	researches.
	differentiate multivariable functions and have basic
CO-2	knowledge in multivariable differentiation to workout
	problems.
GO 9	Provewellknown theorems in differential calculus interms of
CO-3	multivariable functions .
CO-4	Know the basic concepts of multivariable integration.

## 43.5 CO - PO Mapping

СО	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

СО	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 Inter	nal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

Module	Module Title	Delivery Methods	Total
Module	Wiodule Title	Denvery Methods	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

СО	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	<u> </u>	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

СО	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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 (0 \times 0 = 0)$

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

## 45.5 CO - PO Mapping

СО	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	<u>A</u> 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

СО	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	$0 (0 \times 0 = 0)$				

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			
CO-1	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			
CO-4	projections effectively .			

## 46.5 CO - PO Mapping

СО	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

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	0	0	3
CO-2	3	3	$\langle \mathbf{\hat{2}} \rangle$	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	$0 (0 \times 0 = 0)$				
12	Attendance Assignment/Seminar	0 0				

Madada	Na dele miale	Deliner Methoda	Total
Module	Module Title	Delivery Methods	hours
1	Arithemetic Functions	Chalk and talk	30
	Some Elementry Theorems	A CO/	
2	On The Distribution Of	Chalk and talk	15
	Prime Numbers		
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
001	other
CO-2	Identify more special functions and distribution functions
00-2	and applications
CO-3	Relate the number theoretic problems with algebra and
00-3	prove complicated theorems
CO 4	Advanced ideas number theory and prove well known
CO-4	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

СО	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	$0 (0 \times 0 = 0)$			

Module	Module Title	Doliyawy Mathada	Total
Module	Wiodule Title	Delivery Methods	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
CO-1	its role in modern mathematics.
CO-2	Analyse and solve complex problems using appropriate
CO-2	techniques from differential geometry.
GO 0	Apply problem solving with differential geometry in
CO-3	engineering ,physics or other mathematical situations
CO 4	Apply differential geometry techniques to specific research
CO-4	areas.

## 48.5 CO - PO Mapping

СО	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	Δο	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

СО	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	$0 (0 \times 0 = 0)$			

Madada	Madala Midla	Dalinana Madhada	Total
Module	Module Title	Delivery Methods	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

СО	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	$\triangle$ 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

СО	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**

<b>50.1</b>	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 Inter	rnal Marks
11	Attendance	0
12	Assignment/Seminar	0
13	Assessment Test	$0 \ (0 \times 0 = 0)$

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	B Understand the principle of inclusion and exclusion				
CO-4	Accure knowledge about generating functions and				
00-4	recurrence relations				

## 50.5 CO - PO Mapping

СО	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

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

