MAHENDRA ARTS & SCIENCE COLLEGE
(Autonomous)

Affiliated to Periyar University, Salem.
Accredited by NAAC with 'A' Grade & Recognized u/s 2(f) and 12(B) of the UGC Act 1956
Kalippatti – 637 501, Namakkal (Dt), Tamil Nadu.

DEPARTMENT OF MATHEMATICS

Number of Courses Focusing on Employability/ Entrepreneurship/ Skill Development

Programme: M. Sc. MATHEMATICS

S.No.	Year	Total No. of Courses	Employability (1)	Entrepreneurship (2)	Skill development (3)	Total No. of Courses (1+2+3)
1.	2020-2021	25	4	1	5	10
2.	2019-2020	13	4	2	4	10
3.	2018-2019	22	2	2	2	6
4.	2017-2018	22	2	2	2	6
5.	2016-2017	12	2	-	2	4

Head of the Department
Head of the Department of Mathematics
Mahendra Arts & Science College.
KALIPPATTI - 637 501.
Namakkal District.

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DEPARTMENT OF MATHEMATICS
List of Courses Focusing on Employability/ Entrepreneurship/ Skill Development
(Regulations – 2019)

Programme: M.Sc. MATHEMATICS

S. No.	Course Name	Course Code	Employability	Entrepreneurship	Skill development
1.	Algebra	M19PMA01	✓		
2.	Classical Mechanics	M19PMA03			✓
3.	Latex	M19PMASS01			✓
4.	Advanced Real Analysis	M19PMA06	✓		
5.	Graph Theory	M19PMA07			✓
6.	Topology	M19PMA09	✓		
7.	Scilab	M19PMASS02			✓
8.	Differential Geometry	M19PMA13	✓		
9.	Design Theory	M19PMAE10			✓
10.	Project	M19PMAPR1		✓	

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DEPARTMENT OF MATHEMATICS

List of Courses Focusing on Employability/ Entrepreneurship/ Skill Development (Regulations – 2019)

Programme: M.Sc. MATHEMATICS

S.No.	Name of the Course	Course Code	Employability/ Entrepreneurship/ Skill development	Year of introduction (during the last five years)
1.	Algebra	M19PMA01	Employability	2019 - 2020
2.	Classical Mechanics	M19PMA03	Skill development	2019 - 2020
3.	Latex	M19PMASS01	Skill development	2019 - 2020
4.	Advanced Real Analysis	M19PMA06	Employability	2019 - 2020
5.	Graph Theory	M19PMA07	Skill development	2019 - 2020
6.	Topology	M19PMA09	Employability	2020 - 2021
7.	Scilab	M19PMASS02	Skill development	2020 - 2021
8.	Differential Geometry	M19PMA13	Employability	2020 - 2021
9.	Design Theory	M19PMAE10	Skill development	2020 - 2021
10.	Project	M19PMAPR1	Entrepreneurship	2020 - 2021

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MASTER OF SCIENCE

SYLLABUS FOR M.Sc. MATHEMATICS

OUTCOME BASED EDUCATION - CHOICE BASED CREDIT SYSTEM

For the students admitted from the Academic Year 2019-2020 onwards

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MAHENDRA ARTS & SCIENCE COLLEGE

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(Affiliated to Periyar University)

Department of Mathematics

REGULATIONS FOR M.Sc. MATHEMATICS DEGREE COURSE WITH SEMESTER SYSTEM AND CBCS PATTERN (Effective from the academic year 2019-2020)

VISION:

1. To enrich the Mathematical and Analytical skill of the student

2. To produce quality Mathematical science researches

3. To emphasis the students to apply the theoretical Mathematics to bring out as Mathematical models

MISSION:

1. To inculcate moral values and ethical values.

2. To upgrade the students knowledge to meet the academic challenges.

3. To equip the students with the necessary mathematical tools to meet the competitive global environment.

I - PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1: Graduates are prepared to be creators of new knowledge leading to Innovation and entrepreneurship employable in various sectors such as private, government, and research organizations.

PEO2: Graduates are trained to evolve new technologies in their own Discipline.

PEO3: Exhibit continuous learning and research for the societal upliftment with human values and ethics.

PEO4: Graduates are groomed to engage in lifelong learning process by exploring their knowledge independently.

PEO5: Graduates are framed to design and conduct experiments / demos / create models to analyze and interpret data.

PEO6: Graduates ought to have the ability to communicate their findings effectively by incorporating the existing knowledge.

II - PROGRAMME OUTC

OMES /PROGRAMME SPECIFIC OUTCOMES:

PROGRAMME OUTCOMES:

PO1: Higher degree of technical skills in problem solving and application development.

PO2: Aptitude skills that will help to take up research in pure and applied Mathematics.

PO3: Reasoning skills required to learn advance mathematics and Probing attitude and a search for deeper knowledge in science.

PO4: The relevance and applications of Mathematics in scientific phenomenon Positive approach towards Higher Education in Mathematics.

PO5: Employability Skills that will enable the students to explore career in Teaching and Research in Mathematics.

PO6: Gaining the basic with strong background to contribute more in basic research.

PROGRAMME SPECIFIC OUTCOMES(PSO):

PSO 1: Provide a deeper knowledge of mathematical techniques and develop the ability to create their own research ideas.

PSO 2: Develop the ability to handle Mathematical software to develop the research articles in the future.

PSO 3: Inculcate the capacity to transfer the mathematical knowledge for their industrial career.

PSO 4: Induce the interest to communicate Mathematics effectively and precisely using technology.

III – REGULATIONS:

These regulations shall take effect from the academic year 2019-2020, i.e., for the students admitted to the first year of the programme during the academic year 2019-20 and thereafter.

1. **Objectives of the programme :**

   To develop the Post Graduates in Mathematics with strong knowledge of theoretical Mathematics who can be employed in research and development units of industries and academic institutions.

2. Eligibility for Admission:

Candidates who have passed B.Sc., Mathematics / B.Sc., Mathematics (Computer Applications) degree of this University or any of the above degree of any other University accepted by the Syndicate equivalent thereto, subject to such condition as may be prescribed therefore are eligible for admission to M.Sc., Degree Programme and shall be permitted to appear and qualify for the Master of Science (M.Sc.) Degree Examination in Mathematics of this University.

3. Duration of the Programme:

The candidates shall complete all the courses of the programme in 2 years from the date of admission. The programme of study shall consist of four semesters and a total period of two years with a minimum of 90 credits. The programme of study will comprise the courses according to the syllabus.

Candidate should complete the Programme at the maximum of n +3 years , where n denotes the duration of the programme in the same syllabi .

4. Programme of Study:

The programme of study for the PG degree programme of all branches shall consist of the following:

(i) Core courses
(ii) Electives courses
(iii) Skill Enhancement Courses
(iv) Extra Disciplinary Course
(v) Project
(vi) Enhancement Compulsory Courses.

5. Examinations:

The programme of study shall be based on semester pattern with Internal Assessment under Choice Based Credit System.

The examinations for all the papers consist of both Internal (Continuous Internal Assessment - CIA) and External (End Semester) theory examinations. The theory examinations shall be conducted for three hours duration at the end of each semester. The candidates failing in any subject(s) will be permitted to appear for the same in the subsequent semester examinations.

6. Structure of the Programme:

SEMESTER: I

Course Category	Title of the Course	Course Code	Hrs / Week		No. of Credits	Max. Mark		
			L	P		Int.	Ext.	Total
CORE COURSE-I	Algebra	M19PMA01	6	-	5	25	75	100
CORE COURSE-II	Real Analysis	M19PMA02	6	-	5	25	75	100
CORE COURSE-III	Classical Mechanics	M19PMA03	6	-	4	25	75	100
CORE COURSE-IV	Ordinary Differential Equations	M19PMA04	5	-	4	25	75	100
SOFT SKILLS-I	Latex	M19PMASS01	2	-	2	100	-	100
ELECTIVE COURSE-I	Elective-I		5	-	4	25	75	100
		Total	**30**	**-**	**24**	**225**	**375**	**600**

SEMESTER :II

Course Category	Title of the Course	Course Code	Hrs / Week		No. of Credits	Max. Mark		
			L	P		Int.	Ext.	Total
CORE COURSE-V	Advanced Algebra	M19PMA05	6	-	4	25	75	100
CORE COURSE-VI	Advanced Real Analysis	M19PMA06	6	-	4	25	75	100
CORE COURSE-VII	Graph Theory **	M19PMA07	6	-	4	25	75	100
ELECTIVE COURSE-II	Elective-II		5	-	4	25	75	100
EXTRA DECIPLINARY COURSE	EDC		5	-	4	25	75	100
ENHANCEMENT COMPULSORY COURSE	Human Rights	M19PHR01	2	-	2	25	75	100
Additional Credit for Online Courses-I (SWAYAM / MOOC)			-	-	-	-	-	-
COMPREHENSIVE EXAMINATION -I		M19PMAC01	-	-	1	100	-	100
		Total	**30**	**-**	**23**	**250**	**450**	**700**

**** - Open book examination.**

SEMESTER:III

Course Category	Title of the Course	Course Code	Hrs / Week		No. of Credits	Max. Mark		
			L	P		Int.	Ext.	Total
CORE COURSE-VIII	Partial Differential Equations	M19PMA08	5	-	4	25	75	100
CORE COURSE-IX	Topology	M19PMA09	6	-	5	25	75	100
CORE COURSE-X	Measure Theory and Integration	M19PMA10	6	-	5	25	75	100
CORE COURSE-XI	Complex Analysis	M19PMA11	6	-	5	25	75	100
SOFT SKILLS-II	SCILab	M19PMASS02	2	-	2	100	-	100
ELECTIVE COURSE-III	Elective-III		5	-	4	25	75	100
Additional Credit for Online Courses-II (SWAYAM / MOOC)			-	-	-	-	-	-
		Total	**30**	**-**	**25**	**225**	**375**	**600**

SEMESTER:IV

Course Category	Title of the Course	Course Code	Hrs / Week		No. of Credits	Max. Mark		
			L	P		Int.	Ext.	Total
CORE COURSE-XII	Functional Analysis	M19PMA12	6	-	5	25	75	100
CORE COURSE-XIII	Differential Geometry	M19PMA13	6	-	5	25	75	100
CORE COURSE-XIV	Mathematical Probability Theory **	M19PMA14	6	-	5	25	75	100
CORE PROJECT	Project	M19PMAPR1	6	-	3	40	60	100
ELECTIVE COURSE-IV	Elective-IV		6	-	4	25	75	100
COMPREHENSIVE EXAMINATION-II		M19PMAC02	-	-	1	100	-	100
		Total	**30**	**-**	**23**	**240**	**360**	**600**
		GRAND TOTAL	**120**	**-**	**95**	**940**	**1560**	**2500**

**** - Open book examination.**

Summary of Credits, Hours and Mark Distribution:

Course Category	Credits				Total Credits	Total Hours	No. of Courses	Max. Marks
	I	II	III	IV				
Core Course	18	12	19	15	64	82	14	1400
Elective Course	4	4	4	4	16	21	4	400
Soft skills	2	-	2	-	4	4	2	200
Extra Disciplinary Course	-	4	-	-	4	5	1	100
Core Project	-	-	-	3	3	6	1	100
Enhancement Compulsory Course	-	2	-	-	2	2	1	100
Comprehensive Exam	-	1	-	1	2	-	-	200
TOTAL	24	23	25	23	95	120	23	2500

ELECTIVE SUBJECTS FOR M.Sc. MATHEMATICS STUDENTS:
(Students can choose any one course from the given list)

Semester	ELECTIVE – I	
I	**Course Title**	**Course Code**
	Discrete Mathematics	M19PMAE01
	Number Theory	M19PMAE02
	Programming in C++	M19PMAE03
ELECTIVE – II		
II	**Course Title**	**Course Code**
	Numerical Analysis	M19PMAE04

	Fluid Dynamics	M19PMAE05
	Practical – C++ Lab	M19PMAE06
ELECTIVE – III		
III	**Course Title**	**Course Code**
	Calculus of Variation and Integral Equations	M19PMAE07
	Optimization Techniques	M19PMAE08
	Difference Equations	M19PMAE09
ELECTIVE – IV		
IV	**Course Title**	**Course Code**
	Design Theory	M19PMAE10
	Stochastic Process	M19PMAE11
	Fuzzy sets and Fuzzy logic	M19PMAE12

EXTRA DISCIPLINARY COURSES OFFERED FOR OTHER DEPARTMENT STUDENTS:

Semester	Course Title	Course Code
II	Quantitative Aptitude	M19EMA01
	Operation Research	M19EMA02

IV SCHEME OF EXAMINATION:

QUESTION PATTERN

1. Question Paper Pattern for Theory Papers:

Time: Three Hours Maximum Marks: 75

Part A: (10 x 1 = 10)

Answer ALL Questions

(Two Questions from Each Unit)

Part B: (5 x 2 = 10)

Answer ALL Questions

(One Question from Each Unit)

Part C: (5 x 5 = 25)
Answer ALL Questions
(One Question From Each Unit with internal choice)

Part D: (3 x 10 = 30)
Answer Any Three Questions out of Five Questions
(One Question from Each Unit)

2. Question Paper Pattern for Practical Papers:

EXTERNAL MARK: 60
INTERNAL MARK : 40

3. Distribution of Marks:

The following are the distribution of marks for external and internal for end Semester Examinations and continuous internal assessment and passing minimum marks for Theory/Practical / Project papers of PG programmes.

ESE	EA Total	Passing Minimum for EA	CIA Total	Passing Minimum for CIA	Total Marks Allotted	Passing Minimum (ESE)
Theory	75	38	25	12	100	50
Practical	60	30	40	20	100	50
Project	60	30	40	20	100	50

The following are the Distribution of marks for the Continuous Internal Assessment in Theory / Practical papers of PG programmes.

THEORY:

EVALUATION OF INTERNAL ASSESSMENT

Test : 10 Marks
Seminar : 05 Marks
Assignment : 05 Marks
Attendance : 05 Marks

Total : 25 Marks

PRACTICAL:

EVALUATION OF INTERNAL ASSESSMENT

Test 1	:	15 Marks
Test 2	:	15 Marks
Record	:	10 Marks
Total	:	40 Marks

PROJECT:

EVALUATION OF INTERNAL ASSESSMENT

Review 1	:	10 Marks
Review 2	:	10 Marks
Review 3	:	10 Marks
Pre-Viva	:	10 Marks
Total	:	40 Marks

4. Passing Minimum:

The Candidates shall be declared to have passed the examination if he/she secures not less than 50 marks in total (CIA mark + Theory Exam mark) with minimum of 38 marks in the End Semester Theory Examinations and 12 marks for theory and 20 marks for practical/project in CIA.

The Candidates shall be declared to have passed the examination if he/she secures not less than 50 marks in total (CIA mark + Practical Exam mark) with minimum of 30 marks in the End Semester Practical Examinations.

5. Submission of Record Note Books for Practical Examinations:

Candidates appearing for practical examinations should submit a bonafide record note books prescribed for practical examinations. The candidates failed to submit the record book shall not be permitted to appear for the practical examinations

6. Project:

The following guidelines to be followed for the Project with Viva-voce:

1. The project should be valued for 60 marks by an external examiner and 20 marks for the viva –voce /evaluated continuously by both internal/external however the Viva-Voce examination should be

conducted by both the external examiner appointed by the College and the internal examiner / guide/ teacher concerned.

2. The Project Report may consist a minimum of 30 pages and maximum of 60 pages.

3. The candidate has to submit the Project Report 20 days before the commencement of the IV Semester Examinations.

4. A candidate who fails in the Project/Dissertation or is absent may resubmit the report, on the same topic, with necessary modification / correction / improvements in the subsequent Even Semester Examinations for evaluation and shall undergo viva-voce Examination.

7. Note:

a) SWAYAM / MOOC – Free Online Education:

SWAYAM / MOOC is an instrument for self-actualisation providing opportunities for a life-long learning. Here the student can choose from hundreds of courses, virtually every course taught at the college level, offered by the best teachers in India and elsewhere.

The students can choose an online SWAYAM / MOOC course during their period of study which will earn an extra credit and it will be transferred to the academic records of the students.

b) Comprehensive Examination:

This examination is conducted at the end of every year. Mode of the examination is online. The questions are of objective type and they cover the entire year's syllabus.

c) Open Book Examination:

- Students can bring their own book material for examinations.
- Electronic gadgets are not allowed.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA01**		**Core Course – I- ALGEBRA**		
Batch **2019-2020**	Semester **I**	Hours / Week **6**	Total Hours **90**	Credits **5**

Course Objectives

This course introduces fundamental and advanced level concepts of Algebra. It covers concepts such as Sylows theorem, Direct product, Ideals and Quotient Rings, The field of Quotients of an Integral Domain, Euclidean Rings, Polynomial rings, Vector spaces, Dual spaces, Inner product spaces& modules. It provides technical skills to understand and develop various ideas about algebra.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the execution of various Characterizations in groups. Understand the concept of Sylows theorem.
K2	CO2	Understand the concepts of Direct product, Ideals and Quotient Rings,
K4	CO3	Analyze the field of Quotients of an Integral Domain, Euclidean Rings.
K3	CO4	Develop the Polynomial rings and its theorems.
K3	CO5	Apply the concepts to Vector spaces, Dual spaces, Inner product spaces& modules.

Unit I:

Another counting principle, Sylows theorem.

Unit II:

Direct product , finite abelian groups , Ideals and Quotient Rings, more Ideals and Quotient Rings.

Unit III:

The field of Quotients of an Integral Domain.Euclidean Rings, A particular Euclidean Ring.

Unit IV:

Polynomial rings – rings over rational field rings over commutative ring.

Unit V:

Vector spaces – Dual spaces – Inner product spaces & modules.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Topics in Algebra	I.N. Herstein	John Wiley and sons, Second Edition	1999

Chapter 2: Sections 2.11, 2.12, 2.13, 2.14.

Chapter 3: Sections 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11

Chapter 4: Sections 4.3 to 4.5)

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Algebra	S.Lang	3rd Edition, Addison Wesley	1993
2	A first course in abstract Algebra	John B.Fraleigh	Addison Wesley	1982
3	Algebra	M.Artin	Prentice Hall of India, NewDelhi.	1991

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	S	M	M	S	S
CO3	M	S	M	S	S
CO4	S	S	S	M	S
CO5	S	M	S	S	M

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA02**		**Core Course – II- REAL ANALYSIS**		
Batch **2019-2020**	Semester **I**	Hours / Week **6**	Total Hours **90**	Credits **5**

Course Objectives

This course introduces fundamental and advanced level concepts in Real Analysis. It covers concepts such as Basic Topology, Countable, Compact Sets, Perfect sets, Connected sets, Cauchy Sequences, Some special sequences, Numerical Series, Power series, Summation by Parts, Addition and Multiplication of series, Rearrangement Theorems, Continuity, Continuity and Compactness, Continuity and Connectedness, Differentiation, The Continuity of Derivatives, L'Hospital's Rule & Taylor's Theorem. It provides technical skills to understand and develop various ideas about analysis.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the execution of various Characterizations in Basic Topology, Countable, Compact Sets, Perfect sets, Connected sets.
K2	CO2	Understand the concepts of Cauchy Sequences and Some special sequences.
K3	CO3	Analyze the field of Numerical Series, Power series, Summation by Parts, Addition and Multiplication of series, Rearrangement Theorems.
K4	CO4	Develop the Continuity, Continuity and Compactness, Continuity and Connectedness.
K3	CO5	Apply the concepts to Differentiation, The Continuity of Derivatives, L'Hospital's Rule & Taylor's Theorem.

UNIT – I:

Basic Topology – Finite, countable, and Uncountable sets – Metric Spaces – Compact Sets –Perfect sets – connected sets.

UNIT –II:

Numerical Sequences – Convergent sequences – Cauchy Sequences – Upper and Lower Limits – Some special sequences.

UNIT-III:

Numerical Series – Series of nonnegative Terms – The Number e– The Root and Ratio Test –Power series – Summation by Parts – Absolute Convergence – Addition and Multiplication of series – Rearrangement Theorems.

UNIT-IV:

Continuity – Limits of Functions – Continuous Functions – Continuity and Compactness –Continuity and Connectedness.

UNIT-V:

Differentiation – The Derivative of a Real function – Mean Value Theorems – The Continuity of Derivatives – L'Hospital's Rule – Derivative of Higher Orders – Taylor's Theorem.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Principles of Mathematical Analysis, 3rd edition	Walter Rudin	MC Graw Hill Book Co., Kogaskusha	1976

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Mathematical Analysis	T.M. Apostol	Narosa Publ. House, New Delhi	1985
2	Real Analysis	H.L. Royden	Macmillan Publ. Co. Inc. 4th edition, New York	1993
3	Mathematical Analysis	V. Ganapathy Iyer	Tata McGraw Hill, New Delhi	1970

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	M	S
CO2	S	S	M	S	S
CO3	M	S	M	S	S
CO4	S	S	S	M	S
CO5	S	S	M	S	M

S- Strong; **M-**Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA03**		**Core Course – III- CLASSICAL MECHANICS**		
Batch **2019-2020**	Semester **I**	Hours / Week **6**	Total Hours **90**	Credits **4**

Course Objectives

This course introduces fundamental concepts in classical mechanics. It covers concepts such as Mechanical Systems, Lagrange's Equations, Hamilton's Equation, Hamilton – Jacobi Theory and Canonical Transformation. It provides technical skills to understand and develop various ideas about mechanics.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the execution of various Characterizations in Mechanical Systems.
K3	CO2	Analyze the Lagrange's Equation and its problems.
K2	CO3	Understand the concepts of Hamilton's Equation and its problems.
K4	CO4	Develop the Hamilton – Jacobi Theory and its problem.
K3	CO5	Apply the concepts Canonical Transformation and its characterization

Unit I: Mechanical Systems:

The Mechanical System – Generalized co–ordinates – Constraints – Virtual work – Energy and Momentum.

(Chapter 1 Sections 1.1 to 1.5)

Unit II: Lagrange's Equations:

Lagrange's Equation – Derivation of Lagrange's Equations – Examples – Integrals of motion.

(Chapter 2 Sections 2.1 to 2.3)

Unit III: Hamilton's Equation:

Hamilton's Equation – Hamiltons Principle – Hamilton's Equation – Other Variational Principle.

(Chapter 4 Sections 4.1 to 4.3)

Unit IV: Hamilton – Jacobi Theory:

Hamilton – Jacobi Theory – Hamilton Principle Function – Hamilton – Jacobi Equation – Separability.

(Chapter 5 Sections 5.1 to 5.3)

Unit V: Canonical Transformation:

Canonical Transformation – Differential forms and generating functions – Special Transformations – Lagrange and poisson brackets.

(Chapter 6 Sections 6.1 to 6.3)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Classical Dynamics	D. Greenwood	Prentice Hall of India, New Delhi	1985

REFERENCE BOOKS :

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Classical Mechanics	H.Goldstein	Narosa Publishing House, NewDelhi	2001
2	Principles of Mechanics	J.L. Synge and B.A. Griffth	McGraw Hill Book Co. New York	1970
3	Classical Mechanics	N.C. Rane and P.S.C. Joag	Tata McGraw Hill, New Delhi	1991

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	M	S	S	M	S
CO3	M	S	M	M	S
CO4	S	M	S	M	S
CO5	S	S	M	S	M

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA04**		**Core Course – IV- ORDINARY DIFFERENTIAL EQUATIONS**		
Batch **2019-2020**	Semester **I**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course introduces fundamental concepts in ordinary differential equation. It covers concepts such as Linear Equations with Constant Coefficients, Linear Equations with Variable Coefficients, Linear Equations with Regular Singular Points and First Order Equation – Existence and Uniqueness. It provides technical skills to understand and develop various ideas about differential equations.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the Linear Equations with Constant Coefficients and related problems.
K3	CO2	Analyze Linear Equations with Constant Coefficients and its characterization.
K4	CO3	Understand the concepts of Linear Equations with Variable Coefficients and its problems.
K4	CO4	Develop the Linear Equations with Regular Singular Points and its problem.
K3	CO5	Apply the concepts First Order Equation – Existence and Uniqueness and its characterization

Unit I: Linear Equations with Constant Coefficients:

Introduction – Second order homogeneous equations – Initial value problem – Linear dependence and independence – A formula for the Wronskian. (Chapter 2: Section 1 to 5)

Unit II: Linear Equations with Constant Coefficients (Contd.):

Non-homogeneous equations of order two – Homogeneous and non-homogeneous equations of order n – Initial value problem – Annihilator method to solve a non-homogeneous equation. (Chapter 2: Section 6 to 11)

Unit III: Linear Equations with Variable Coefficients:

Initial value problems for homogeneous equations – solutions of homogeneous equations- Wronskian and linear independence – Reduction of the order ofhomogeneous equation. (Chapter 3: Section 1 to 5)

Unit IV: Linear Equations with Regular Singular Points:

Linear equation with regular singular points – Euler equation – second order equations with regular singular points – solutions and properties of Legendre and Bessel's equation.

(Chapter 3: Section 8 & Chapter 4: Section 1 to 4 and 7 and 8)

Unit V: First Order Equation – Existence and Uniqueness:

Introduction – Existence and uniqueness of solutions of first order equations – Equations with variable separated – Exact equations – Method of successive approximations – Lipchitz Condition – Convergence of the successive approximations. (Chapter 5: Section 1 to 6)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1.	An Introduction to Ordinary Differential Equation	E.A.Coddington	Prentice Hall of India, New Delhi	1994

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1.	Ordinary and Partial differential Equations	M. D. Raisinghania	S Chand & Co. New Delhi	2012
2.	Essentials of Ordinary Differential Equation	R.P Agarwal and Ramesh C.Gupta	McGraw, Hill, New York	1991
3.	Ordinary Differential Equations	D.Somasundram	Narosa Publ.House, Chennai	2002

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	M	S
CO2	M	S	M	M	S
CO3	S	M	M	S	M
CO4	S	M	S	M	S
CO5	S	S	M	S	M

S- Strong; **M-**Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMASS01**		**Soft skills-I - LATEX**		
Batch **2019-2020**	Semester **I**	Hours / Week **2**	Total Hours **30**	Credits **2**

Course Objectives

This course introduces fundamental concepts in Latex theory. It covers concepts such as Basic LaTex , Sample document and Key Concepts, type style , environments , Lists , Contering , tables , verbatim , vertical and horizontal spacing, Typesetting Mathematics, Equation environments, Fonts, hats and underlining, braces, arrays and matrices, Math miscellaxy, Math Styles, Bold Math, Symbols for number sets, binomial coefficient, classes and the overall structure, titles for documents, Sectioning commands, Spacing, Accented characters , Dashes and hyphens, quotation marks , Pinpointing the error, common errors and warning messages. It provides technical skills to understand and develop various ideas about document preparation.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the Basic LaTex , Sample document and Key Concepts, type style , environments , Lists , Cantering , tables , verbatim , vertical and horizontal spacing
K3	CO2	Analyze the typesetting Mathematics, Equation environments, Fonts, hats and underlining, braces, arrays and matrices and its characterization.
K3	CO3	Understand the concepts of Math miscellany, Math Styles, Bold Math, Symbols for number sets, binomial coefficient, classes and the overall structure
K4	CO4	Develop the titles for documents, Sectioning commands, Spacing, Accented characters ,.
K3	CO5	Apply the concepts Dashes and hyphens, quotation marks , Pinpointing the error, common errors and warning messages

UNIT I:

Basic LaTex – Sample document and Key Concepts – type style – environments – Lists – Contering –tables – verbatim – vertical and horizontal spacing.
(Chapter 2 Sections 2.1. to 2.4.)

UNIT II:

Typesetting Mathematics – Examples – Equation environments – Fonts, hats and underlining – braces – arrays and matrices – Customized commands – theorems like environments.
(Chapter 3 Sections3.1. to 3.7.)

UNIT III:

Math miscellany – Math Styles – Bold Math – Symbols for number sets – binomial coefficient.
(Chapter 3 Sections 3.8)

UNIT IV:

Further essential LaTex – Document classes and the overall structure – titles for documents – Sectioning commands.
(Chapter 4 Sections 4.1. to 4.3.)

UNIT V:

Miscellaneous extras – Spacing – Accented characters – Dashes and hyphens – quotation marks – trouble shooting – Pinpointing the error – common errors – warning messages.
(Chapter 4 Sections4.4 to 4.5.)

TEXT BOOK:

David F Griffiths and Desmond J. Higham, Learning LaTex, SIAM (Society for Industrial and Applied Mathematics) Publishers, Phidel Phia, 1996.

REFERENCE BOOKS:

1. Martin J. Erickson and Donald Bindner, A Student's Guide to the Study, Practice, and Tools of Modern Mathematics, CRC Press, Boca Raton, FL, 2011.
2. L. Lamport. LATEX: A Document Preparation System, User's Guide and ReferenceManual. Addison-Wesley, New York, second edition, 1994.

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	M	M	S	S	M
CO3	S	S	M	S	M
CO4	S	S	S	M	S
CO5	S	M	S	S	M

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE01**		**Elective – I- DISCRETE MATHEMATICS**		
Batch **2019-2020**	Semester **I**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course focuses on discrete concepts and to develop a set theory application. It implements the concepts such as Theory of inference, Set Theory, Algebraic Structures, Lattices and Boolean algebra, Graph Theory. In addition, it also covers the methods to process the set construction.

Course Outcomes (CO)

K1	CO1	Define the Theory of inference concepts for building theory based applications.
K2	CO2	Illustrate the Set Theory and related results.
K3	CO3	Demonstrate the Algebraic Structures.
K3	CO4	Implement Lattices and Boolean algebra ideas.
K3	CO5	Apply the Graph Theory concept and its theorem.

Unit I: Theory of inference:

Consistency of premises validity using truth table – Consistency of premises – Predicates –Statement function, Variables and quantifiers – Predicate formulae – Free and bound variables – Theory of inference for the predicate calculus .

(Chapter 1: Sections 1- 4.1, 1 - 4.2, 1 - 5.1, 1 - 5.2,1 - 5.3, 1 - 5.4, 1 - 6.4)

Unit II: Set Theory:

Functions – Definition and introduction – Composition of functions – Inverse functions – Binary and n-ary Operations – Characteristic function of a set – Hashing functions – Peuno axioms and mathematical induction – Cardinality.

(Chapter 2: 2 - 4.1, 2 - 4.2, 2 – 4.3, 2 – 4.4,2 – 4.5, 2 – 4.6, 2 – 5.1, 2 – 5.2)

Unit III: Algebraic Structures:

Groups: Definition and Examples – Subgroups and homomorphism – Co-sets and Lagrange's Theorem – Normal subgroups – Algebraic systems with Two Binary Operations.

(Chapter 3 : Sections 3 – 5.1, 3 – 5.2, 3 – 5.3, 3 – 5.4, 3 – 5.5)

Unit IV: Lattices and Boolean algebra:

Lattices as Algebraic Systems – Sub lattices, direct product and homomorphism – Boolean Algebra Definition and examples – Sub Algebra. Direct Product and homomorphism – Boolean functions, Boolean forms and free Boolean Algebras – Values of Boolean expression and Boolean functions.

(Chapter 4: Sections 4 – 1.3, 4 – 1.4, 4 – 2.2, 4 – 3.4, 4 – 3.2)

Unit V: Graph Theory:

Basic definitions – Paths – Rechability and Connectedness – Matrix representation of Graphs – Trees – Finite state machine: Introductory special circuits – Equivalence of finite state machines.

(Chapter 5: 5 – 1.1, 5 - 1.2, 5 – 1.3, 5 – 1.4) and

(Chapter 4: Sections 4 – 6.1, 4 – 6.2)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Discrete Mathematical Structures applications to Computer Science	J.P. Trembley and R.Manohar	Tata McGraw Hills, New Delhi	1997

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Sets, Lattices and Boolean algebra	James C.Abbott	Allya and Bacon Boston	1969
2	Boolean Algebra and its applications	H.G.Flegg	John Wiley and Sons, Inc, NewYork	1974

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	M	S	M
CO3	M	S	M	S	S
CO4	S	S	S	M	M
CO5	S	M	S	M	S

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE02**		**Elective – I- NUMBER THEORY**		
Batch **2019-2020**	Semester **I**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course introduces fundamental concepts in number theory. It covers concepts such as divisibility and prime numbers, congruence's and congruence's with a prime power modulus, Euler's function and the group of units, quadratic residues and arithmetic function. It provides technical skills to understand and develop various ideas about number analysis.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the divisibility and prime numbers and related problems.
K3	CO2	Analyze congruence's and congruence's with a prime power modulus and its characterization.
K3	CO3	Understand the concepts of Euler's function and the group of units and its problems.
K4	CO4	Develop the quadratic residues and its problem.
K3	CO5	Apply the concepts arithmetic function and its characterization

UNIT I DIVISIBILITY AND PRIME NUMBERS:

Divisors – Bezouts identity – Least common multiples – Linear Diophantine equations – Prime numbers & Prime – Power Factorizations – Distribution of primes – Fermat and Mersenne primes – Primality – Testing and Factorization.Chapter 1: Sec: 1.1-1.4 & Chapter 2: Sec: 2.1-2.4.

UNIT II CONGRUENCES AND CONGRUENCES WITH A PRIME POWER MODULUS:

Modular arithmetic - Linear congruences – Simultaneous Linear congruences – Simultaneous non- linear congruences- An extension of the Chinese remainder theorem – The arithmetic of Z_p – Pseudoprimes & Carmichael numbers - Solving Congruences mod (P^e) .Chapter 3: Sec: 3.1-3.5 & Chapter 4: Sec: 4.1-4.3

UNIT III EULERS FUNCTION AND THE GROUP OF UNITS :

Units – Euler's function – Applications of Eulers function – The group U_n – Primitive roots – The group U_2^e - The existence of primitive roots – The algebraic structure of U_n - The universal exponent. Chapter 5: Sec: 5.1-5.3 & Chapter 6: Sec: 6.1-6.8.

UNIT IV QUADRATIC RESIDUES:

Quadratic congruence's – The group of quadratic residues – The Legendre symbol – Quadratic reciprocity – Quadratic residues for prime power moduli – Quadratic residues for arbitrary moduli. Chapter 7: Sec: 7.1-7.6.

UNIT V ARITHMETIC FUNCTION:

Definition & Examples – Perfect numbers –The mobius inversion formula - Properties of the mobius function – The Dirichlet product . Chapter 8: Sec: 8.1-8.6.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1.	Elementary Number Theory	Gaveth A. Jones & J.Mary Jones	Springer India Pvt Ltd	1998

REFERENCE BOOKS :

S.No	Title of the Book	Author	Publisher	Year of Publication
1.	Beginning Number Theory	Neville Robbins	Springer India Pvt Ltd	1998
2.	Number Theory	Burton		

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	M	S
CO2	M	M	S	M	S
CO3	S	M	M	S	M
CO4	S	S	S	M	S
CO5	S	S	M	M	S

S- Strong; **M-**Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE03**		**Elective – I- Programming in C++**		
Batch **2019-2020**	Semester **I**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

The course provides an introduction to object-oriented programming using C++ language. It provides the concepts such as data abstractions, classes, inheritance, method overloading and overriding, generic programming and standard template library. It enables the students to apply these features in program design and implementation.

Course Outcomes (CO)

K1	CO1	Define structure and object oriented problem solving approaches.
K2	CO2	Infer classes and objects for a given problem.
K2	CO3	Describe the constructors, destructors and type conversions for the problems .
K3	CO4	Illustrate the code reusability and extensibility by means of Inheritance and Polymorphism.
K3	CO5	Apply the concepts in file operations.

Unit I:

Software Evolution – Procedure oriented Programming – Object oriented programming paradigm – Basic concepts of object oriented programming – Benefits of oops – Object oriented Languages – Application of OOP – Beginning with C++ - what is C++ - Application of C++ - A simple C++ Program – More C++ Statements – An Example with class – Structure of C++ Program.

Unit II:

Token, Expressions and control structures: Tokens – Keywords – Identifiers and Constants – Basic Data types – User defined Data types – Derived data types – Symbolic Constants in C++ - Scope resolution operator – Manipulators – Type cost operator – Expressions and their types – Special assignment expressions – Implicit Conversions – Operator Overloading – Operator precedence – Control Structure.

Unit – III: Function in C++:

Main Function – function prototyping – Call by reference – Return by reference – Inline functions – default arguments – Const arguments – Function overloading – Friend and Virtual functions – Math library function.

Class and Objects:

Specifying a class – Defining member functions – A C++ program with class – Making an outside function inline – Nesting of member functions – Private member functions – Arrays within a class – Memory allocations for objects – Static data member – Static member functions – Array of the object – Object as function arguments – Friendly functions – Returning objects – Const member functions – Pointer to members – Local classes.

Unit IV: Constructors and Destructors:

Constructors – Parameterized Constructors in a Constructor – Multiple constructors in a class – Constructors with default arguments – Dynamic Initialization of objects – Copy constructors – Dynamic Constructors – Constructing Two-dimensional arrays – Const objects -– Destructors. Operator overloading and type conversions: Defining operator overloading – overloading unary operators – overloading binary operators - overloading binary operators using friends – Manipulation of strings using operators – Rules for overloading operators – Type conversions.

Unit V: Files:

Introduction – Class for file stream operations – opening and closing a file – detecting End-of file – More about open () File modes – File pointer and their manipulations – Sequential input and output operations. Exception Handling: Introduction – Basics of Exception Handling – Exception Handling Mechanism – Throwing Mechanism – Catching Mechanism – Rethrowing an Exception.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Object-Oriented Programming with C++ 2nd Edition	E.Balagrurusamy	Tata McGraw Hill Pub.	1999

REFERENCES BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	The Waite Group's Object Oriented Programming In Turbo C++	Robert Lafore	Galgotia Publication Pvt. Ltd	1998

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	S	S	M	S
CO3	S	M	S	S	S
CO4	S	S	M	S	S
CO5	M	S	S	M	M

S- Strong; **M-**Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA05**		**Core Course – V- ADVANCED ALGEBRA**		
Batch **2019-2020**	Semester **II**	Hours / Week **6**	Total Hours **90**	Credits **4**

Course Objectives

This course introduces fundamental and advanced level concepts of Algebra. It covers concepts such as Field theory, Galois Theory, Finite fields, Rings and Ring Homomorphism's, Noethorian rings and Artin rings . It provides technical skills to understand and develop various ideas about algebra.

Course Outcomes (CO)

K2	CO1	Understand the concepts of Field theory and its related results.
K2	CO2	Identify the logic behind the execution of Galois Theory and its results.
K4	CO3	Analyze the Finite fields an its theorems.
K3	CO4	Develop Rings and Ring Homomorphism's .
K3	CO5	Apply the concepts to Noethorian rings and Artin rings.

Unit I: Field theory:

Extension field – roots of polynomials.

(Chapter5 Sections 5.1, 5.3)

Unit II: Galois Theory:

More about roots-Elements of Galois theory.

(Chapter 5 Section 5.5, 5.6)

Unit III

Finite fields-Wedderburn's theorem on finite division rings-A Theorem of Fresenius. (Chapter 7 Section 7.1, 7.2&7.3)

Unit IV

Rings and Ring Homomorphism's –Extension and Contraction.

Unit V

Primary decomposition in Noethorian rings & Artin rings

TEXT BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Topics in Algebra 2nd Edition	I.N Herstein	John Wiley and Sons, Newyork	2003
2	Introduction to Commutative Algebra	M.F.Atiyah and I.G.Macdonald	Addison – Wesley Publication Company, Inc	1969

REFERENCES BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Algebra	S.Lang	3rd Edition, Addison Wesley	1993
2	A first course in abstract Algebra	John B.Fraleigh	Addison Wesley	1982
3	Algebra	M.Artin	Prentice Hall of India, NewDelhi	1991
4	Commutative Algebra	N.S. Gopalakrishnan	Oxonian Press Pvt. Ltd, New Delhi	1988

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	S	M	M	S	S
CO3	M	S	M	M	S
CO4	S	S	S	M	S
CO5	S	M	S	S	S

S- Strong; **M**-Medium;.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA06**		**Core Course – VI- ADVANCED REAL ANALYSIS**		
Batch **2019-2020**	Semester **II**	Hours / Week **6**	Total Hours **90**	Credits **4**

Course Objectives

This course introduces fundamental and advanced level concepts in Real Analysis. It covers concepts such as The Riemann – steiltjes integral, Existence of the integral, properties of integral, Sequences and series of functions, Uniform Convergence, Linear transformations, the contraction principle, the implicit function theorem, The Rank theorem, determinants, Integration of differential forms and simplex and chains. It provides technical skills to understand and develop various ideas about analysis.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the execution of The Riemann – steiltjes integral, Existence of the integral, properties of integral.
K3	CO2	Understand the concepts of Sequences and series of functions, Uniform Convergence.
K3	CO3	Analyze the field of Linear transformations, the contraction principle, the implicit function theorem..
K4	CO4	Develop THE Rank theorem, determinants.
K3	CO5	Apply the concepts to Integration of differential forms and simplex and chains.

Unit I:

The Riemann – steiltjes integral – Definition and Existence of the integral – properties of integral – integration and Differentiation – Rectifiable Curves .

Unit II:

Sequences and series of functions – Discussion of main problem – Uniform Convergence and Continuity – Uniform Convergence and Integration – Uniform Convergence and Differentiation – Equicontinuous Family of function – The Stone – Weierstrass theorem.

Unit III:

Linear transformations, Differentiation, the contraction principle, the inverse function theorem, the implicit function theorem.

Unit IV :

The Rank theorem, determinants, derivatives of higher order, differentiation of integrals.

Unit V:

Integration of differential forms- integration –primitive mappings –partitions of unity -change of variables –differential forms –simplex and chains - stock'ss theorem.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Principles of Mathematical Analysis, 3rd edition	Walter Rudin	MC Graw Hill Book Co., Kogaskusha	1976

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Mathematical Analysis	T.M. Apostol	Narosa Publ. House, New Delhi	1985
2	Real Analysis	H.L. Royden	Macmillan Publ. Co. Inc. 4th edition, New York	1993
3	Mathematical Analysis	V. Ganapathy Iyer	Tata McGraw Hill, New Delhi	1970

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	M	S
CO2	M	S	S	S	M
CO3	M	S	M	M	S
CO4	S	S	S	M	S
CO5	S	S	M	S	M

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA07**		**Core Course – VII- GRAPH THEORY** **		
Batch **2019-2020**	Semester **II**	Hours / Week **6**	Total Hours **90**	Credits **4**

**** - Open Book Examination**

Course Objectives

This course focuses on graph theory concepts and to develop a graph theory application. It implements the concepts such as Graphs and Sub graphs, Trees and Connectivity, Euler Tours and Matchings, Edge Colouring and Independent sets, Vertex Colorings and planar graphs . In addition, it also covers the methods to process the graph construction.

Course Outcomes (CO)

K1	CO1	Define the Graphs and Sub graphs and tree concepts for building theory based applications.
K2	CO2	Illustrate the Connectivity and Euler Tours.
K4	CO3	Demonstrate the Matchings and Edge Colouring.
K3	CO4	Implement method for Independent sets and Vertex Colorings.
K3	CO5	Apply planar graphs and its theorem.

Unit I: Graphs and Trees:

Graphs and simple graphs – Graph isomorphism – Incidence and Adjacency Matrices – Subgraphs – Vertex degrees – Paths and connection – Cycles – The shortest path problem. Trees – Cut edges and bonds – Cut vertices – Cayley's formula .

(Chapter 1 : Sections 1.1 to 1.7 and Chapter 2: Sections 2.1 to 2.4)

Unit II: Connectivity and Euler Tours:

Connectivity – Blocks - Euler Tours – Hamilton cycles

(Chapter 3: Sections 3.1 to 3.2 and Chapter 4: Sections 4.1 to 4.2)

Unit III: Matchings and Edge Colouring:

Matchings – Matching and coverings in Bipartite Graphs – Perfect Matchings - Edge Coloring – Edge Chromatic Number – Vizings Theorem .

(Chapter 5: Sections 5.1 to 5.3 and Chapter 6: Sections 6.1 to 6.2)

Unit IV: Independent sets and Vertex Colorings:

Ramsey's Theorem – Turan's Theorem- Vertex Colorings – Chromatic Number – Brook Theorem – Hajos conjecture – Chromatic Polynomials – Girth and Chromatic Number .

(Chapter 7: Sections 7.1 to 7.3 and Chapter 8 : Sections 8.1 to 8.5)

Unit V: Planar Graphs:

Plane and Planar Graphs –Dual graphs –Euler's graphs –bridges

(Chapter 9: Sections 9.1 to 9.4)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Graph Theory with Applications	J.A.Bondy and U.S.R. Murty	North Holland, New York	1982

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Graph Theory with Application to Engineering and Computer Science	Narasing Deo	Prentice Hall of India, New Delhi	2003
2	Graph Theory	F. Harary	Addison – Wesely Pub. Co. The Mass	1969
3	Graph Theory Application	L. R.. Foulds	Narosa Publ. House, Chennai	1933

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	M	S	M
CO3	M	S	M	S	S
CO4	S	S	S	M	M
CO5	S	M	S	S	S

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE04**		**Elective – II- NUMERICAL ANALYSIS**		
Batch **2019-2020**	Semester **II**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course introduces fundamental concepts in numerical analysis. It covers concepts such as Solving Nonlinear Equations ,Numerical Differentiation and Integration ,Numerical Solution of Ordinary Differential Equations ,Partial-Differential Equations . It provides technical skills to understand and develop various ideas about Applied Mathematics.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the execution of solving non linear equations.
K3	CO2	Analyze Numerical Differentiation and Integration and its problems.
K3	CO3	Understand the concepts of Numerical Solution in Ordinary Differential Equations and its problems.
K4	CO4	Develop the Numerical solutions to Ordinary differential equations and its problem.
K3	CO5	Apply the concepts of Numerical solutions to partial differential equations and its characterization

Unit I: Solving Nonlinear Equations:

Linear Interpolation Methods - Newton's Method - Muller's Method - Fixed-Point Iteration: **x** = g(x) Method - Multiple Roots -Nonlinear Systems .

(Chapter –1:Section 1.2 to 1.7)

Unit II : Numerical Differentiation and Integration:

Differentiation with a Computer -Numerical Integration-The Trapezoidal Rule -Simpson's Rules -An Application of Numerical Integration-Fourier Series and Fourier Transforms.

(Chapter –5:Section 5.1 to 5.4)

Unit III: Numerical Solution of Ordinary Differential Equations:

The Taylor-Series Method -The Euler Method and Its Modifications - Runge - Kutta Methods -Multistep Methods.
(Chapter –6:Section 6.1 to 6.4)

Unit IV:

Higher-Order Equations and Systems -Stiff Equations -Boundary-Value Problems -Characteristic-Value Problems .
(Chapter –6:Section 6.5 to 6.8)

Unit V:Partial-Differential Equations:

Elliptic Equations -Parabolic Equations -Hyperbolic Equations.
(Chapter –8:Section 8.1 to 8.3)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Applied Numerical Analysis	C.F. Gerald, and P.O. Wheathy	Seventh Edition, Addison Wesley	2004

REFERENCES BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Introductory methods of Numerical Analysis	S.S. Sastry	Printice of India	1995
2	Numerical Methods	V.N.Vedamurthy and Ch. S.N.Iyengar	Vikas Publishing House Pvt Ltd	1998
3	Numerical methods in Science and technology	M.K. Venkatraman	National Publichers Company	1992
4	Numerical Methods	P. Kandasamy, K. Thilagavathy, K. Gunavathy	S. Chand & Company	2003

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	M	S
CO2	S	M	S	M	S
CO3	M	S	M	S	S
CO4	S	M	S	M	S
CO5	S	S	M	S	M

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE05**		**Elective – II- FLUID DYNAMICS**		
Batch **2019-2020**	Semester **II**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course introduces fundamental concepts in fluid dynamics. It covers concepts such as Streamlines and path lines, Equation of continuity, Pressure at a point in a moving fluid, Some special two dimensional flows , Impulsive motion, Stokes stream function, Some special forms of the stream function for Axis symmetric irrotational motions, Stream function, Complex velocity potential for standard two-dimensional flows, Milne-Thomson circle theorem, Some hydro dynamical aspects of conformal transformation. It provides technical skills to understand and develop various ideas about mechanics.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the execution of Streamlines and path lines, Equation of continuity.
K3	CO2	Analyze the Pressure at a point in a moving fluid, Some special two dimensional flows.
K2	CO3	Understand the concepts of Impulsive motion, Stokes stream function.
K4	CO4	Develop the Some special forms of the stream function for Axis symmetric irrotational motions, Stream function.
K3	CO5	Apply the Complex velocity potential for standard two-dimensional flows, Milne-Thomson circle theorem, Some hydro dynamical aspects of conformal transformation.

UNIT I :

Real fluids and ideal fluids - Velocity of a fluid at a point - Streamlines and path lines - Steady and unsteady flows. Velocity potential - Vorticity vector - Local and particle rates of change - Equation of continuity - Worked examples - Acceleration of a point of a fluid.

UNIT II:

Pressure at a point in a fluid at rest - Pressure at a point in a moving fluid - Conditions at a boundary of two inviscid Immissible fluids - Euler's equations of motion - Bernoulli's equation – Worked examples - Some flows involving axial symmetry - Some special two dimensional flows – Impulsive motion.

UNIT III:

Some three dimensional flows - Sources, sinks and doublets - Images in a rigid infinite plane -Axis-symmetric flows - Stokes stream function - Some special forms of the stream function for Axissymmetric irrotational motions.

UNIT IV:

Two dimensional flow - Use of cylindrical polar coordinates - Stream function. Complex potential for two-dimensional irrotational - Incompressible flow - Complex velocity potential for standard two-dimensional flows - Uniform stream, line sources and line sinks, line doublets, line vortices - Worked examples.

UNIT V :

Two dimensional image systems – Milne-Thomson circle theorem - Some applications of the circle theorem - Extension of the circle theorem - Theorem of Blasius - Use of conformal transformation– Some hydro dynamical aspects of conformal transformation - Worked example.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Textbook of Fluid Dynamics	F. Chorlton	CBS Publication and Distribution	2004

UNIT I Chapter 2 Sections 2.1 to 2.9

UNIT II Chapter 3 Sections 3.1 to 3.6, 3.9 to 3.11

UNIT III Chapter 4 Sections 4.1 to 4.3, 4.5, 4.5.1

UNIT IV Chapter 5 Sections 5.1 to 5.6

UNIT V Chapter 5 Sections 5.7 to 5.10.2

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Fluid Dynamics	M.D. Raisinghania	S. Chand	1982
2	An Introduction to Fluid Mechanics	G.K. Batchelor	Foundation Books	1984

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	M	S
CO2	M	S	S	M	S
CO3	M	S	M	M	S
CO4	S	M	S	M	S
CO5	S	S	M	S	M

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE06**		**Elective – II- Practical- C++ Lab**		
Batch **2019-2020**	Semester **II**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course focuses on object oriented concepts and to develop an application. It implements the concepts such as inheritance, polymorphism, dynamic binding and generic structures to build reusable code. It enables the students to write programs using C++ features such as composition of objects, operator overloads, dynamic memory allocation, file I/O and exception handling. In addition, it also covers the methods to process the biological database.

Course Outcomes (CO)

K1	CO1	Define the object oriented concepts for building object based applications.
K2	CO2	Illustrate the different logic with suitable validation using control structures, classes and objects.
K3	CO3	Demonstrate the Constructor, Destructor and Inheritance.
K3	CO4	Implement method overloading and method overriding for different user specification.
K3	CO5	Apply programming skills to experiment Protein sequence.

Practical Problems:

1. Create two classes DM and DB, which store the value of distances. DM stores distances in meters and centimeters in DB in feet and inches. Write a program that can create the values for the class objects and add object DM with another object DB.
2. Create a class FLOAT that contains on float data member overload all the four arithmetic operators so that operates on the objects of FLOAT.
3. Design a class polar, which describes a part in a plane using polar coordinates radius and angle. A point in polar coordinates is as shown below. Use the overloads +operator to add two objects of polar. Note that we cannot add polar values of two points directly. The requires first the conversion points into rectangular coordinates and finally creating the result

into polar coordinates. [Where rectangle co-ordinates: x = r* cos(a); y = r* sin(a) Polar co-ordinates: a = atan (x/y) r = Sqrt (x*x + y*y)]

4. Create a class MAT of size m*m. Define all possible matrix operations for MAT type objects verify the identity. (A-B)^2+B^2-2*A*B.
5. Area computation using derived class.
6. Define a class for vector containing scalar values. Apply overloading concepts for vector additions, multiplication of a vector by a scalar quantity, replace the values in a position vector.
7. Integrate a function using Simson's 1/3 rule.
8. Solve the system of equations using Guass Sedel method.
9. Solve differential equations using Runge Kutta forth order method.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Object-Oriented Programming with C++ 2nd Edition	E.Balagrurusamy	Tata McGraw Hill Pub.	1999

REFERENCE BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	The Waite Group's Object Oriented Programming In Turbo C++	Robert Lafore	Galgotia Publication Pvt. Ltd	1998

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	M	S	S	M
CO3	M	S	M	S	S
CO4	S	S	S	M	S
CO5	S	S	S	S	S

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PHR01**		**ECC - HUMAN RIGHTS**		
Batch **2019-2020**	Semester **II**	Hours / Week **2**	Total Hours **30**	Credits **2**

Course Objective:

To impart the basic ideas about human rights at post graduation level. This paper provides different aspects of human rights which includes children and women. students can learn not only their basic rights but also can understand the duties to be carried out in the days to come.

UNIT I: Introduction to Human Rights:

Human rigths: Meaning- Definitions – Original and growth of Human rights in the world – Need and Types of Human rights – UNHRC (United Nations Human Rights Commission) – Human rights in india.

UNIT II: Classification of Human Rights:

Right to Liberty – Right to Life – Right to Equality – Right to Dignity – Right Against Exploitation – Educational Rights – Cultural Rights – Educational Rights – Economic Rights – Political Rights – Social Rights.

UNIT III: Rights of Women and Children:

Rights of Women– Female Feticide and infanticide and Selective abortion– Physical assault and Sexual Harassment– Domestic Violence- violence at work place – Remedial Measures.Rights Of Children-Protection Rights ,Survival Rights – Participation Rights – Development Rights – Role of UN on convention on Rights of Children.

UNIT IV: Multi-Dimensional aspects of Human Rights:

Labour Rights –Bodent Labour – Child Labour – Contract Labour – Mirgrant Labour – Domestic Woman Labour – Gender Equity – Rights of Ethnic Refugees – Problems and Remedies – Roles of Trade Union in Protecting the unorganized Labourers.

UNIT V: Grievance and Rederssal Mechanism:

Rederssal Mechanisms at national and international levels – Structure and Functions of national and State level Human rights commission - Constitutional Remedies and Directive principles of state p[olicy.

REFERENCE BOOKS:

1) Baradat sergio and Swaronjali ghosh**.** Teaching of Human Rights: Dominant Publishers and distributers, New Delhi ,2009.
2) Roy A. N Human Rights acchivements and Challengers : Vista International publishing house , Delhi, 2005.
3) Asish Kumar Das and Prasanth kumar Mohanty. Human Rights in India: Sarup and Sons . New Delhi,2007.
4) Bani borgohain. Human Rights social Justiece and political challenge. Kanishka publishers and distributers, new delhi,2007
5) Velan G. Human Rights and Development Issues: The Associated publishers, Ambala cantt ,2008.
6) Meena, P K Human Rights Theory and practice: Murali Lal and sons, New Delhi, 2008.
7) Bhavani Prasad panda. Human Rights Development and Environmental law: Accademic Excellence , Delhi, 2007.
8) Vishwanathan V.N. Human Rights – Twenty first century challenges : Kalpaz publications , New Delhi ,2008.
9) Ansari , M R Protecting Human Rights : Max ford Books, New delhi, 2006.
10) Rao, M.S.A Social movents in india – Social Movements and Social Transformations in india, Vol-I & II: Manohar publications. New Delhi,1978.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA08**		**Core Course –VIII- Partial Differential Equations**		
Batch **2019-2020**	Semester **III**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course introduces fundamental concepts in partial differential equation. It covers concepts such as Second order Partial Differential Equations, Elliptic Differential Equations, Parabolic Differential Equations, Hyperbolic Differential Equations and Integral Transform. It provides technical skills to understand and develop various ideas about partial differential equations.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the Second order Partial Differential Equations and related problems.
K3	CO2	Analyze Elliptic Differential Equations and its characterization.
K4	CO3	Understand the concepts of Parabolic Differential Equations and its problems.
K4	CO4	Develop the Hyperbolic Differential Equations and its problem.
K3	CO5	Apply the Integral Transform and its characterization

Unit I: Second order Partial Differential Equations:

Origin of second order partial differential equations – Linear differential equations with constant coefficients – Method of solving partial (linear) differential equation – Classification of second order partial differential equations – Canonical forms – Adjoint operators – Riemann method. (Chapter 2 : Sections 2.1 to 2.5)

Unit II: Elliptic Differential Equations:

Elliptic differential equations – Occurrence of Laplace and Poisson equations – Boundary value problems – Separation of variables method – Laplace equation in cylindrical – Spherical co-ordinates, Dirichlet and Neumann problems for circle – Sphere. (Chapter 3 : Sections 3.1 to 3.9)

Unit III: Parabolic Differential Equations:

Parabolic differential equations – Occurrence of the diffusion equation – Boundary condition – Separation of variable method – Diffusion equation in cylindrical – Spherical co-ordinates .(Chapter 4: Sections 4.1 to 4.5)

Unit IV: Hyperbolic Differential Equations:

Hyperbolic differential equations – Occurrence of wave equation – One dimensional wave equation – Reduction to canonical form – D'Alembertz solution – Separation of variable method – Periodic solutions – Cylindrical – Spherical co-ordinates – Duhamel principle for wave equations. (Chapter 5 : Sections 5.1 to 5.6 and 5.9)

Unit V: Integral Transform:

Laplace transforms – Solution of partial differential equation – Diffusion equation – Wave equation – Fourier transform – Application to partial differential equation – Diffusion equation – Wave equation – Laplace equation. (Chapter 6 : Sections 6.2 to 6.4)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Partial Differential Equation for Engineers and Scientist	J.N. Sharma and K.Singh	Narosa publ. House, Chennai	2001

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Ordinary and Partial differential Equations	M. D. Raisinghania	S Chand & Co. New Delhi	2012
2	Elemetns of Partial Differeential Equations	I.N.Snedden	McGraw Hill, New York	1964
3	Introduction to partial Differential Equations	K.Sankar Rao	Prentice Hall of India, New Delhi	1995

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	M	S
CO2	M	S	M	M	S
CO3	S	M	M	S	M
CO4	S	M	S	M	S
CO5	S	S	M	S	M

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA09**		**Core Course – IX- Topology**		
Batch **2019-2020**	Semester **III**	Hours / Week **6**	Total Hours **90**	Credits **5**

Course Objectives

This course introduces fundamental and advanced level concepts in Analysis. It covers concepts such as Topological spaces, product of spaces, Identification and Quotient spaces, Homotopy and Isotopy, Separation axioms, Compactness, Connectedness, Pathwise connectedness, Impedding theorems, Extension theorems , Compactifications, Hereditary Properties. It provides technical skills to understand and develop various ideas about topology.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the execution of Topological spaces, product of spaces.
K2	CO2	Understand the concepts of Identification and Quotient spaces, Homotopy and Isotopy.
K3	CO3	Analyze the Separation axioms, Compactness.
K4	CO4	Develop the Connectedness, Pathwise connectedness, Impedding theorems.
K3	CO5	Apply the concepts to Extension theorems , Compactifications, Hereditary Properties.

UNIT I:

Topological spaces – Sets in a space – Maps – Subspaces - Sum and product of spaces.

UNIT II:

Identification and Quotient spaces – Homotopy and Isotopy.

UNIT III:

Separation axioms and Compactness.

UNIT IV:

Connectedness – Pathwise connectedness –Imbedding theorems.

UNIT V:

Extension theorems – Compactifications – Hereditary Properties.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Introduction to topology	S.T.Hu	McGraw- Hill, New Delhi	1979

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Topology	J. Dugundji	Prentice Hall of India, New Delhi	1975
2	Introduction to Topology and Modern Analysis	G.F.Simmons	McGraw Hill Book Co, New York	1963
3	Elements of General Topology	S.T. Hu	Holden Day, Inc. New York	1965

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	M	S
CO2	S	S	M	S	S
CO3	M	S	M	S	S
CO4	S	S	S	M	S
CO5	S	S	M	S	M

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA10**		**Core Course – X- Measure Theory And Integration**		
Batch **2019-2020**	Semester **III**	Hours / Week **6**	Total Hours **90**	Credits **5**

Course Objectives

This course introduces fundamental and advanced level concepts in Analysis. It covers concepts such as Lebesgue Measure, Lebesgue integral, Differentiation and Integration, General Measure and Integration, Measure and Outer Measure. It provides technical skills to understand and develop various ideas about analysis.

Course Outcomes (CO)

K1	CO1	Find the logic behind the execution of Lebesgue Measure.
K4	CO2	Understand the concepts of Lebesgue integral and related problems.
K3	CO3	Analyze Differentiation and Integration.
K3	CO4	Develop the concept of General Measure and Integration.
K3	CO5	Apply the concepts to Measure and Outer Measure.

Unit I: Lebesgue Measure:

Lebesgue Measure – Introduction – Outer measure – Measurable sets and Lebesgue measure – Measurable functions – Little Woods' Three Principle.

(Chapter 3: Sections 1 to 3, 5 and 6)

Unit II: Lebesgue integral :

Lebesgue integral – The Riemann integral – Lebesgue integral of bounded functions over a set of finite measure – The integral of a nonnegative function – The general Lebesgue integral.

(Chapter 4: Sections 1 to 4)

Unit III: Differentiation and Integration :

Differentiation and Integration – Differentiation of monotone functions – Functions of bounded variation – Differentiation of an integral – Absolute continuity.

(Chapter 5: Sections 1 to 4)

Unit IV : General Measure and Integration :

General Measure and Integration – Measure spaces – Measurable functions – integration – Signed Measure – The Radon – Nikodym theorem.

(Chapter 11: Sections 1 to 3, 5 and 6)

Unit V: Measure and Outer Measure

Measure and outer measure – outer measure and measurability – The Extension theorem – Product measures.

(Chapter 12: Sections 1, 2 and 4)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Real Analysis	H.L.Royden	Mc Millian Publ. Co, New York	1993

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Measure Theory and Integration	G. de Barra	Wiley Eastern Ltd	1981
2	Lebesgue Measure and Integration	P.K. Jain and V.P. Gupta	New Age Int. (P) Ltd., NewDelhi	2000
3	Real and Complex Analysis	Walter Rudin	Tata McGraw Hill Publ. Co. Ltd., New Delhi	1966

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	M	S	S	M
CO3	M	S	M	S	S
CO4	S	S	S	M	S
CO5	S	M	S	S	M

S- Strong; **M-**Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA11**		**Core Course – XI- Complex Analysis**		
Batch **2019-2020**	Semester **III**	Hours / Week **6**	Total Hours **75**	Credits **5**

Course Objectives

This course introduces fundamental and advanced level concepts in complex Analysis. It covers concepts such as Complex Functions, Analytical Functions as Mappings, Complex Integration, Fundamental Theorems, Harmonic functions and Power series expansions. It provides technical skills to understand and develop various ideas about analysis.

Course Outcomes (CO)

K1	CO1	Find the logic behind the execution of Complex Functions and its properties.
K4	CO2	Understand the concepts of Analytical Functions as Mappings and related problems.
K3	CO3	Analyze Complex Integration, Fundamental Theorems.
K3	CO4	Develop the concept of complex integration.
K3	CO5	Apply the concepts to Harmonic functions and Power series expansions.

Unit I : Complex Functions:

Limits and continuity – Analytic Functions – Polynomials – Rational functions . Elementary theory of Power series : Sequences – Series – Uniform Convergence – Power series – Abel's limit Theorem.

(Chapter 2 : Sections 1 to 2)

Unit II : Analytical Functions as Mappings:

Conformality: Arcs and closed curves – Analytic functions in Regions – Conformal mapping – Length and area . Linear transformations : Linear group – Cross ratio – Symmetry –Oriented Circles –Families of circles . (Chapter 3 : Sections 2 to 3)

Unit III : Complex Integration Fundamental Theorems:

Line integrals –Rectifiable Arcs-Line Integrals as Arcs – Cauchy's Theorem for a Rectangle and in a disk. Cauchy's Integral Formula: Index of point with respect to a closed curve- The Integral formula – Higher order derivatives .Local properties of analytic functions: Taylor's Theorem – Zeros and Poles –Local mapping - Maximum Principle. (Chapter 4 : Sections 1 to 3)

Unit IV : Complex Integration (Contd.):

The general form of Cauchy's Theorem: Chains and Cycles – Simple connectivity – Homology – General statement of cauchy's theorem – Proof of Cauchy's theorem – Locally exact differentials – Multiply connected regions – Calculus of residues – Residue Theorem – Argument Principle-Evaluation of Definite Integrals. (Chapter 4 : Sections 4 and 5)

Unit V : Harmonic functions and Power series expansions:

Harmonic Functions: Definition and basic properties- Mean-Value Property-Poisson's formula's –Schwarz's Theorem . Reflection Principle : Weierstrass's theorem- Taylor's series –Laurent series. (Chapter 4 : Sections 6 and Chapter 5 : Sections 1)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Complex Analysis, 3rd edition	L.V Ahlfors	Mc Graw Hill Inter., Edition, New Delhi	1979

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Functions of one Complex variable	J.B Conway	Narosa Publ. House, New Delhi	1980
2	Foundations of Complex Analysis	S.Ponnusamy	Narosa Publ. House, New Delhi	2004
3	Complex-Analysis	S.Lang	Addison – Wesley Mass	1977

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	M	S	S	M
CO3	M	S	M	S	S
CO4	S	S	S	M	S
CO5	S	M	S	S	M

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMASS02**		**Soft Skills-II - Scilab**		
Batch **2019-2020**	Semester **III**	Hours / Week **2**	Total Hours **30**	Credits **2**

Course Objectives

This course introduces fundamental concepts in Scilab theory. It covers concepts such as Learning Scilab, Starting Scilab, Typing Commands, Basic Arithmetic, Complex Numbers, Help in Scilab, The Help Command, The Help Window , Help on the Web, Adding a Line, Hints for Good Graphs, Plot data as points, Choose a good scale, Solving Equations, Matrices and Vectors, Creating Matrices, Systems of Equations, Polynomials, Graphs Function Plotting, Printing Graphs, Component Arithmetic, Graphs in Reports, and Advanced Graphics. It provides technical skills to understand and develop various ideas about document preparation.

Course Outcomes (CO)

K1	CO1	Identify the logic behind Learning Scilab, Starting Scilab, Typing Commands
K3	CO2	Analyze basic Arithmetic, Complex Numbers, Help in Scilab, The Help Command, The Help Window , Help on the Web and its characterization.
K3	CO3	Understand the concepts of Adding a Line, Hints for Good Graphs, Plot data as points, Choose a good scale.
K4	CO4	Develop the Solving Equations, Matrices and Vectors, Creating Matrices, Systems of Equations, Polynomials.
K3	CO5	Apply the concepts Graphs Function Plotting, Printing Graphs, Component Arithmetic, Graphs in Reports, and Advanced Graphics.

Unit I:

Introduction – Learning Scilab – Further References – Starting Scilab – Typing Commands.

Unit II:

Simple calculations : Basic Arithmetic – Complex Numbers.
Help in Scilab : The Help Command – The Help Window – Help on the Web.

Unit III:

Adding a Line – Hints for Good Graphs – Plot data as points – Choose a good scale.

Unit IV:

Solving Equations - Matrices and Vectors – Creating Matrices – Systems of Equations – Polynomials.

Unit V:

Graphs – Function Plotting – Component Arithmetic – Printing Graphs – Graphs in Reports – Advanced Graphics.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Introduction to Scilab	Graeme Chandler	Stephen Roberts	2002

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	M	M	S	S	M
CO3	S	S	M	S	M
CO4	S	S	S	M	S
CO5	S	M	S	S	M

S- Strong; **M-**Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE07**		**Elective – III- Calculus Of Variation And Integral Equations**		
Batch **2019-2020**	Semester **III**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course focuses on integral equations concepts and to develop an application of integration. It implements the concepts such as Variational problems with fixed boundaries, Variational problems with moving boundaries, Integral Equation, Solution of Fredholm integral equation, Hilbert – Schmidt Theory. In addition, it also covers the methods to process the calculus of variation and integral equations.

Course Outcomes (CO)

K1	CO1	Define Variational problems with fixed boundaries.
K2	CO2	Illustrate the Variational problems with moving boundaries.
K3	CO3	Demonstrate Integral Equation.
K3	CO4	Implement method for Solution of Fredholm integral equation.
K3	CO5	Apply Hilbert – Schmidt Theory.

Unit I: Variational problems with fixed boundaries:

The concept of variation and its properties – Euler's equation- Variational problems for Functionals – Functionals dependent on higher order derivatives – Functions of several independent variables . (Chapter 1: Sections 1.1 to 1.5) of [1]

Unit II: Variational problems with moving boundaries:

Movable boundary for a functional dependent on two functions – one-side variations – Reflectionand Refraction of extermals – Diffraction of light rays. (Chapter 2: Sections 2.1 to 2.5) of [1]

Unit III: Integral Equation:

Introduction – Types of Kernels – Eigen Values and Eigen functions – Differentiation the Sign Integration - Connection with differential equation – Solution of an integral equation – Initial value problems – Boundary value problems. (Chapter 1: Section 1.1 to 1.8) of [2]

Unit IV: Solution of Fredholm integral equation:

Second kind with separable kernel – Orthogonality and reality eigen function – Fredholm Integral equation with separable kernel – Solution of Fredholm integral equation by successive substitution – Successive approximation – Volterra Integral equation – Solution by successive substitution. (Chapter 2: Sections 2.1 to 2.3 and Chapter 4 Sections 4.1 to 4.5) of [2]

Unit V: Hilbert – Schmidt Theory:

Complex Hilbert space – Orthogonal system of functions- Gram Schmit orthogonlization process – Hilbert – Schmit theorems – Solutions of Fredholm integral equation of first kind. (Chapter 3: Section 3.1 to 3.4 and 3.8 to 3.9) of [2]

TEXT BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Calculus of Variations with Application	A.S Gupta	Prentice Hall of India, New Delhi	2005
2	Integral Equations and Boundary Value Problems	Sudir K.Pundir and Rimple Pundir	Pragati Prakasam, Meerut	2005

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Methods of Applied Mathematics, Prentice	F.B. Hildebrand	Hall of India Pvt. New Delhi	1968
2	Linear Integral Equations Theory and Techniques	R. P. Kanwal	Academic Press, New York	1971
3	Differential Equations and Calculus of Variations	L. Elsgolts	Mir Publishers, Moscow	1973

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	S	S	M
CO3	M	S	M	M	S
CO4	S	S	S	M	M
CO5	S	M	S	S	S

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE08**		**Core Course – III- Optimization Techniques**		
Batch **2019-2020**	Semester **III**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course introduces fundamental and advanced level concepts in operation research. It covers concepts such as Integer linear programming, Deterministic dynamic programming, Decision analysis and games, Simulation modeling, Non-linear programming algorithms. It provides technical skills to understand and develop various ideas about real life problems.

Course Outcomes (CO)

K1	CO1	Find the logic behind the execution of Integer linear programming.
K4	CO2	Understand the concepts of Deterministic dynamic programming and related results.
K2	CO3	Analyze Decision analysis and games and its theorems.
K3	CO4	Develop the concept of Simulation modeling.
K3	CO5	Apply the concepts to Non-linear programming algorithms.

Unit I: Integer linear programming:

Introduction – Illustrative applications integer programming solution algorithms: Branch and Bound (B & B) algorithm – zero – One implicit enumeration algorithm – Cutting plane Algorithm. (Sections 9.1,9.2,9.3.1.,9.3.2,9.3.3)

Unit II: Deterministic dynamic programming:

Introduction – Recursive nature of computations in DP – Forward and backward recursion – Selected DP applications cargo – Loading model – Work force size model – Equipment replacement model – Investment model – Inventorymodels.

(Sections10.1,10.2,10.3,10.4.1,10.4.2,10.4.3, 10.4.4, 10.4.5)

Unit III: Decision analysis and games:

Decision environment – Decision making under certainty (Analytical Hierarchy approach) Decision making under risk – Expected value criterion – Variations of the expected value criterion – Decision under uncertainty Game theory – optimal solution of two – Person Zero – Sum games – Solution of mixed strategy games.(Sections 14.1,14.2,114.3.1,14.3.2,14.4,14.5.1,14.5.2)

Unit IV: Simulation modeling:

What is simulation – Monte carlo simulation – Types of simulation – Elements of discrete event simulation – Generic definition of events – Sampling from probability distributions. Methods for gathering statistical observations – Sub interval method – Replication method – Regenerative (Cycle) method – Simulation languages. (Sections 18.1,18.2,18.3, 18.4.1,18.4.2,18.5,18.6,18.7.1,18.7.2,18.7.3,18.8)

Unit V: Non-linear programming algorithms:

Unconstrained non- linear algorithms – Direct search method – Gradient method Constrained algorithms: Separable programming – Quadratic programming – Geometric programming – Stochastic programming – Linear combinations method – SUMT algorithm.(Sections : 21.1.1, 21.1.2, 21.2.1, 21.2.2, 21.2.3, 21.2.4, 21.2.5, 21.2.6)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Operations Research an Introduction 6th Edison	Hamdy A. Taha	University of Arkansas Fayetteville	2002

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Introduction to Operation Research 4th edition	F.S. Hillier and G.J. Lieberman	Mc Graw Hill Book Company, New York	1989
2	Operations research	B.E.Gillett	A Computer Oriented Algorithmic Approach,TMH Edition, New Delhi	1976

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	S	S	M
CO3	S	M	M	S	M
CO4	S	S	S	M	S
CO5	S	M	S	S	M

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE09**		**Core Course – III- Difference Equations**		
Batch **2019-2020**	Semester **III**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course focuses on difference equations concepts and to develop an application in differential equation. It implements the concepts such as Difference Calculus, Linear Difference Equations, Initial value problems for linear systems, Stability of linear systems, Asymptotic analysis of sums. In addition, it also covers the methods to process the applications of difference equations.

Course Outcomes (CO)

K1	CO1	Define the theory of Difference Calculus for building applications.
K2	CO2	Illustrate the theory of Linear Difference Equations and its related results.
K4	CO3	Demonstrate the Linear Difference Equations and properties of difference equation.
K3	CO4	Implement method for Initial value problems for linear systems, Stability of linear systems.
K3	CO5	Apply Asymptotic analysis of sums and its applications.

Unit I: Difference Calculus:

Difference operator – Summation – Generating function – Approximate summation. (Chapter 2 Sections 2.1 to 2.3)

Unit II: Linear Difference Equations:

First order equations – General results for linear equations.
(Chapter 3 Sections 3.1 to 3.2)

Unit III: Linear Difference Equations(Contd.):

Equations with constant coefficients – Equations with variable coefficients – z – transform. (Chapter 3 Sections 3.3,3.5 and 3.7)

Unit IV:

Initial value problems for linear systems – Stability of linear systems.
(Chapter 4 Sections 4.1 to 4.3)

Unit V:

Asymptotic analysis of sums – Linear equations
(Chapter 5 Sections 5.1 to 5.3)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Difference Equations	W.G.Kelley and A.C.Peterson	Academic press, New York	1991

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	An Introduction to Difference Equations	S.N.Elaydi	Springer – Verleg, NewYork	1990
2	Difference Equations	R.Mickens	Van Nostrand Reinhold, New York	1990
3	Difference Equations and Inequalities	R.P.Agarwal	Marcelm Dekker, New York	1992

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	M	S	S	M	M
CO3	M	S	M	S	S
CO4	S	M	S	M	S
CO5	S	S	M	S	S

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA12**		**Core Course – XII- Functional Analysis**		
Batch **2019-2020**	Semester **IV**	Hours / Week **6**	Total Hours **90**	Credits **5**

Course Objectives

This course introduces fundamental and advanced level concepts in functional Analysis. It covers concepts such as Banach Spaces, Banach Spaces and Hilbert Spaces, Hilbert Spaces, Operations on Hilbert Spaces, Banach Algebras. It provides technical skills to understand and develop various ideas about analysis.

Course Outcomes (CO)

K1	CO1	Find the logic behind the execution of Banach Spaces and its properties.
K4	CO2	Understand the concepts of Banach Spaces and Hilbert Spaces and related results.
K3	CO3	Analyze Hilbert Spaces and its theorems.
K3	CO4	Develop the concept of Operations on Hilbert Spaces.
K3	CO5	Apply the concepts to Banach Algebras.

Unit I: Banach Spaces:

Banach Spaces – Definition and examples – Continuous linear transformations – Hahn Banach theorem. (Chapter 9 : Sections 46 to 48)

Unit II: Banach Spaces and Hilbert Spaces:

The natural embedding of N in N** - Open mapping theorem – Conjugate of an operator – Hilbert space – Definition and properties. (Chapter 9 : Sections 49 to 51, Chapter 10 : Sections 52)

Unit III: Hilbert Spaces:

Orthogonal complements – Orthonormal sets – Conjugate space H* - Adjust of an operator. (Chapter 10 : Sections 53 to 56)

Unit IV: Operations on Hilbert Spaces:

Self adjoint operator – Normal and Unitary operators – Projections. (Chapter 10: Sections 57 to 59)

Unit V: Banach Algebras:

Banach Algebras – Definition and examples – Regular and simple elements – Topological divisors of zero – Spectrum – The formula for the spectral radius – The radical and semi simplicity. (Chapter 12 : Sections 64 to 69)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Introduction to Topology and Modern Analysis	G.F.Simmons	McGraw Hill Inter. Book Co, New York	1963

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Functional Analysis	W. Rudin	Tata McGraw Hill Publ. Co, New Delhi	1973
2	Functional Analysis	D. Somasundaram	S. Viswanathan Pvt.Ltd., Chennai	1994

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	S	S	M
CO3	M	S	M	S	S
CO4	S	S	S	M	S
CO5	S	M	S	S	M

S- Strong; **M-**Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA13**		**Core Course – XIII- Differential Geometry**		
Batch **2019-2020**	Semester **IV**	Hours / Week **6**	Total Hours **90**	Credits **5**

Course Objectives

This course focuses on differential geometry concepts and to develop an application in space science. It implements the concepts such as theory of Space curves, Local Intrinsic properties of surface, Local Intrinsic properties of surface and geodesic on a surface, Geodesic on a surface. In addition, it also covers the methods to process the space science technology.

Course Outcomes (CO)

K1	CO1	Define the theory of Space curves for building differential calculus based applications.
K2	CO2	Illustrate the theory of Space curves and its related results.
K3	CO3	Demonstrate the Local Intrinsic properties of surface.
K3	CO4	Implement method for Local Intrinsic properties of surface.
K3	CO5	Apply Geodesic on a surface and its applications.

Unit-I Theory of Space Curves:

Theory of space curves – Representation of space curves – Unique parametric representation of a space curve – Arc-length – Tangent and osculating plane – Principle normal and binormal – Curvature and torsion – Behaviour of a curve near one of its points – The curvature and torsion of a curve as the intersection of two surfaces. (Chapter 1 : Sections 1.1 to 1.9)

Unit II: Theory of Space Curves (Contd.):

Contact between curves and surfaces – Osculating circle and osculating sphere – Locus of centre of spherical curvature – Tangent surfaces – Involutes and Evolutes – Intrinsic equations of space curves – Fundamental Existence Theorem – Helices. (Chapter 1 : Sections 1.10 to 1.13 and 1.16 to 1.18)

Unit III: Local Intrinsic properties of surface:

Definition of a surface – Nature of points on a surface – Representation of a surface – Curves on surfaces – Tangent plane and surface normal – The general surfaces of revolution – Helicoids – Metric on a surface – Direction coefficients on a surface. (Chapter 2 : Sections 2.1 to 2.10)

Unit IV: Local Intrinsic properties of surface and geodesic on a surface:

Families of curves – Orthogonal trajectories – Double family of curves – Isometric correspondence – Intrinsic properties – Geodesics and their differential equations – Canonical geodesic equations – Geodesics on surface of revolution. (Chapter 2: Sections 2.11 to 2.15 and Chapter 3: Sections 3.1 to 3.4)

Unit V: Geodesic on a surface:

Normal property of Geodesics – Differential equations of geodesics using normal property – Existence theorems – Geodesic parallels – Geodesic curvature – Gauss Bonnet Theorems – Gaussian curvature – Surface of constant curvature. (Chapter 3: Sections 3.5 to 3.8 and Sections 3.10 to 3.13)

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Differential Geometry	D. Somasundaram	Narosa publ. House, Chennai	2005

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	An Introduction to Differential Geometry	T. Willmore	Clarendan Press, Oxford	1959
2	Lectures on Classical Differential Geometry	D.T Struik	Addison – Wesely- Mass	1950
3	Elementary Topics in Differential Geometry	J.A. Thorpe	Springer – Verlag, New York	1979

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	M	S	S	M
CO3	M	S	M	S	S
CO4	S	M	S	M	S
CO5	S	S	M	S	S

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMA14**		**Core Course – XIV- Mathematical Probability Theory****		
Batch **2019-2020**	Semester **IV**	Hours / Week **6**	Total Hours **90**	Credits **5**

**** - Open Book Examination**

Course Objectives

This course introduces fundamental and advanced level concepts in probability theory. It covers concepts such as Random Events and Random Variables, A parameters of the Distribution, Characteristic functions, Some probability distributions, Limit Theorems. It provides technical skills to understand and develop various ideas about probability theory.

Course Outcomes (CO)

K1	CO1	Find the logic behind the execution of Random Events and Random Variables.
K4	CO2	Understand the concepts of A parameters of the Distribution and related results.
K3	CO3	Analyze Characteristic functions and its theorems.
K3	CO4	Develop the concept of Some probability distributions.
K3	CO5	Apply the concepts to Limit Theorems.

Unit I: Random Events:

Random events – Probability axioms – Combinatorial formulae – conditional probability – Bayes Theorem – Independent events.

Random Variables:

Distribution Function – Joint Distribution – Marginal Distribution – Conditional Distribution – Independent random variables – Functions of Multi-Dimensionalrandom variables. Chapter 1: Sections 1.1 to 1.7, Chapter 2: Sections 2.1 to 2.9 .

Unit II: arameters of the Distribution:

Expectation- Moments – The Chebyshev Inequality – Absolute moments – Order parameters – Moments of random vectors – Regression of the first and second types. Chapter 3: Sections 3.1 to 3.8

Unit III: Characteristic functions:

Properties of characteristic functions – Characteristic functions and moments – Semi-invariants – characteristic function of the sum of the independent random Variables – Determination of distribution function by the Characteristic function.Chapter 4: Sections 4.1 to 4.5

Unit IV: Some probability distributions:

One point , two point , Binomial – Polya – Hypergeometric – Poisson (discrete) distributions – Uniform – normal- gamma – Beta – Cauchy and Laplace (continuous) distributions. Chapter 5: Section 5.1 to 5.10

Unit V: Limit Theorems:

Stochastic convergence – Bernoulli law of large numbers – Convergence of sequence of distribution functions – Levy-Cramer Theorems – De Moivre-Laplace Theorem – Poisson, Chebyshev, Khintchine Weak law of large numbers – Lindeberg Theorem – Lapunov Theroem. Chapter 6: Sections 6.1 to 6.4, 6.6 to 6.9, 6.11 and 6.12.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Probability Theory and Mathematical Statistics	M. Fisz	John Wiley and Sons, New York	1963

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Probability Theory and Mathematical Statistics	M. Fisz	John Wiley and Sons, New York	1963
2	Real Analysis and Probability	R.B. Ash	Academic Press, New York	1972
3	A course in Probability	K.L.Chung	Academic Press, New York	1974
4	Probability Theory (2nd Edition)	Y.S.Chow and H.Teicher	Springer Verlag. Berlin	1988
5	Probability (2nd Edition)	R.Durrett	Duxbury Press, New York	1996
6	An Introduction to Probability Theory and Mathematical Statistics(3rd Print)	V.K.Rohatgi	Wiley Eastern Ltd., New Delhi	1988
7	A Probability Path	S.I.Resnick	Birhauser, Berlin	1999
8	Modern Probability Theory (3rd Edition)	B.R.Bhat	New Age International (P)Ltd, New Delhi	1999
9	Counter Examples in Probability and Statistics	J.P. Romano and A.F. Siegel	Wadsworth and Brooks / Cole Advanced Books and Software, California	1968

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	S	S	M
CO3	S	S	M	S	S
CO4	S	S	S	M	S
CO5	S	M	S	S	M

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE10**		**Elective – IX- Design Theory**		
Batch **2019-2020**	Semester **IV**	Hours / Week **6**	Total Hours **90**	Credits **4**

Course Objectives

This course focuses on design theory concepts and to develop an graph theory application. It implements the concepts such as Steiner triple system, λ- fold triple system, Quasigroup identities & graph decompositions & Kirkman triple systems, Maximum packings & Minimum coverings, Mutually Orthogonal Latin Squares. In addition, it also covers the methods to process the frame construction.

Course Outcomes (CO)

K1	CO1	Define the Steiner triple system concepts for building design based applications.
K2	CO2	Illustrate the λ- fold triple system.
K3	CO3	Demonstrate the Quasigroup identities & graph decompositions & Kirkman triple systems.
K3	CO4	Implement method Maximum packings & Minimum coverings.
K3	CO5	Apply Mutually Orthogonal Latin Squares.

UNIT I: STEINER TRIPLE SYSTEM:

The existence problem- $\gamma \equiv 1 \pmod 6$: The Skolem construction -$\gamma \equiv 5 \pmod 6$: The 6n+5 construction_ Quasi groups with holes and steiner triple systems – The wilson constructium – Cyclic Steiner triple systems.

Chapter: 1 Sec: 1.1 – 1.7.

UNIT II: λ- FOLD TRIPLE SYSTEM:

Triple systems of index $\lambda > 1$ – The existence of idempotent latin squares -2-Fold triple systems – Mendelsohn triple systems – $\lambda = 3$ and 6-λ – Fold Triple systems in general.

Chapter: 2 Sec: 2.1 – 2.6

UNIT III: QUASIGROUP IDENTITIES & GRAPH DECOMPOSITIONS & KIRKMAN TRIPLE SYSTEMS:

Quasi group identities – Mendel sohn triple systems revisited – Steiner triple systems revisited –A recursive construction – Constructing pairwise balanced designs.

Chapter: 3 Sec: 3.1 – 3.3 & Chapter:5:Sec: 5.1 – 5.2.

UNIT IV: MAXIMUM PACKINGS & MINIMUM COVERINGS:

The general problem – Maximum packings – Minimum coverings. Chapter: 4 Sec: 4.1 – 4.3

UNIT V: MUTUALLY ORTHOGONAL LATIN SQUARES:

Introduction – The Euler and MacNeish conjectures – Desproof of the MacNeish conjecture – Desproof of the Euler conjective – Orthogonal latin squares of order n≡ 2 (mod 4).

Chapter: 6 Sec: 6.1 – 6.5.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Design Theory, second edition	C.A. Rodger and Charles C.Lindner	CRC Press	1997

REFERENCE BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Design Theory	Pascal Le Masson – Benoit Weil Armand Hatchuel	Springer	2017

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	S	S	M
CO3	M	S	M	S	S
CO4	S	S	S	M	M
CO5	S	M	S	S	S

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE11**		**Elective-IV - Stochastic Process**		
Batch **2019-2020**	Semester **IV**	Hours / Week **6**	Total Hours **90**	Credits **4**

Course Objectives

This course introduces fundamental concepts in stochastic process. It covers concepts such as Stochastic Process, Markov Chains, classification of states and chains, Stability of Markov chain, Poisson process, Markov chain with discrete state space, Renewal process, Renewal process in continuous time , Markov Renewal and semi-markov processes. It provides technical skills to understand and develop various ideas about analysis.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the execution of Stochastic Process, Markov Chains, classification of states and chains.
K2	CO2	Understand the concepts of Stability of Markov chain, Poisson process
K3	CO3	Analyze the Markov chain with discrete state space.
K4	CO4	Develop Renewal process, Renewal process in continuous time.
K3	CO5	Apply the concepts to Markov Renewal and semi- markov processes.

Unit I:

Stochastic Process: Introduction – Specification of Stochastic Processes, Stationary processes, Martingales, Markov Chains: Definitions and Examples, Higher transition probabilities, classification of states and chains.

Unit II:

Stability of Markov chain, Markov chains with denumerable number of states, Poisson process.

Unit III:

Poisson process and related distributions – Markov chain with discrete state space.

Unit IV:

Renewal process: Renewal process-Renewal process in continuous time – Renewal equation – Stopping time: Wald's equation – Renewal theorems.

Unit V:

Markov Renewal and semi-markov processes: Introduction – Definitions and Preliminaries results – Markov renewal equations – Limiting behaviours.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Stochastic Processes 4th Edition	Prof. J. Medhi	New age International (P) Ltd,new delhi	2017

Unit I: Chapter2: 2.1 to 2.4; Chapter3: 3.1, 3.2, 3.4 (3.3 is not included)
Unit II: Chapter3: 3.6, 3.8, 4.1 (pages 157-169)
Unit III: Chapter4: 4.2 to 4.5 (pages 170-206)
Unit IV: Chapter6: 6.1 to 6.5 (pages 242 – 272)
Unit V: Chapter7: 7.1 to 7.4 (pages 313 – 331) (example problems only)

REFERENCE BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Stochastic Processes	T.Veerarajan	McGraw Hill	2008

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	M	S	M	S	M
CO3	M	S	M	S	S
CO4	S	S	M	M	S
CO5	S	S	M	S	M

S- Strong; **M-**Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19PMAE12**		**Elective-IV - Fuzzy sets and Fuzzy logic**		
Batch **2019-2020**	Semester **IV**	Hours / Week **6**	Total Hours **90**	Credits **4**

Course Objectives

This course introduces fundamental concepts in Fuzzy sets and Fuzzy logic. It covers concepts such as Form classical sets to fuzzy sets; Fuzzy sets versus crisp sets, Operations on fuzzy sets, Fuzzy arithmetic, Fuzzy relations and Fuzzy Logic. It provides technical skills to understand and develop various ideas about analysis.

Course Outcomes (CO)

K1	CO1	Identify the logic behind the execution of the form classical sets to fuzzy sets; Fuzzy sets versus crisp sets
K2	CO2	Understand the concepts of an operations on fuzzy sets.
K3	CO3	Analyze the concept of fuzzy arithmetic
K4	CO4	Develop the idea about the fuzzy relations.
K3	CO5	Apply the concepts to the fuzzy logic and its related theorems.

Unit I: Form classical sets to fuzzy sets, Fuzzy sets versus crisp sets

Introduction – Crisp sets – Fuzzy sets – Characteristics and significance of the paradigm shift – Additional properties of α – cuts – Representation of fuzzy sets – Extension principal for fuzzy sets.

Unit II: Operations on fuzzy sets

Types of operations – Fuzzy complements – Fuzzy intersections: t- norms – fuzzy unions: t – conorms – Combinations of operations – Aggregation operations.

Unit III: Fuzzy arithmetic

Fuzzy numbers – Linguistic variables – Arithmetic operations on intervals – Arithmetic operations on fuzzy numbers – fuzzy equations.

Unit IV: Fuzzy relations

Crisp versus Fuzzy relation - projections and cylindric extensions - binary fuzzy relations - Binary Relations on a single set - Fuzzy compatibility relations - Fuzzy ordering Relations - Furry Morphisms - Sup-I compositions of Fuzzy Relations - Info compositions of Fuzzy Relations

Unit V: Fuzzy Logic

Classical Logic- Multivalued Logic – Fuzzy propositions –Fuzzy propositions – Fuzzy Quantifiers –Linguistic Hedges – Inference form conditional fuzzy propositions – Inference from conditional and qualified propositions – Inference form quantified propositions.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	**Fuzzy sets and Fuzzy logic Theory and Applications**	George J, Klir Bo Yuvan	PHI learning pvt.ltd	2009

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	S	S	M
CO3	S	M	M	S	M
CO4	M	S	S	M	S
CO5	S	M	S	S	M

S- Strong; **M**-Medium.

Extra Disciplinary Course (EDC):

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19EMA01**		**EDC - Quantitative Aptitude**		
Batch **2019-2020**	Semester **IV**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course introduces fundamental concepts such as Numbers, system in Quantitative aptitude. It covers concepts such as Numbers, H.C.F. and L.C.M. of numbers,Simplification , Square roots and Cube Roots , Average, Problems on numbers , problems on Ages, Percentage , Profit and Loss, Ratio and Proportion , Partnership. It provides technical skills to understand and develop various department examinations like Group Exams, TNPSC, RRB, SSC & IBPS.

Course Outcomes (CO)

K1	CO1	Identify the logic behind Numbers, H.C.F. and L.C.M. of numbers and its problem.
K2	CO2	Understand the concepts of Simplification, Square roots and Cube Roots , Average and its problem.
K2	CO3	Analyze the problems on Problems on numbers , problems on Ages, and its problem.
K2	CO4	Develop the Percentage, Profit and Loss and its problem. .
K3	CO5	Apply the concepts to solve a problem for Ratio and Proportion , Partnership.

Unit I:

Numbers, H.C.F. and L.C.M. of numbers .(Section-I:1,2)

Unit II:

Simplification , Square roots and Cube Roots , Average.

(Section-I:4,5,6)

Unit III:

Problems on numbers , problems on Ages. (Section-I:7,8)

Unit IV:

Percentage , Profit and Loss. (Section-I:10,11)

Unit V:

Ratio and Proportion , Partnership. (Section-I:12,13)

TEXT BOOK:

S.No	Tiltle of the Book	Author	Publishing Company	Year of Publication
1.	Quantitative Aptitude for competitive Examination	R.S.Aggarwal.	S.Chand& company Ltd,152,Anna salai,Chennai.	2014

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	M	M
CO2	S	M	S	M	S
CO3	M	M	M	S	M
CO4	S	M	S	M	M
CO5	S	M	M	S	S

S- Strong; **M**-Medium.

Programme Code : **PMA**		**M.Sc. MATHEMATICS**		
Course Code: **M19EMA02**		**EDC - Operation Research**		
Batch **2019-2020**	Semester **IV**	Hours / Week **5**	Total Hours **75**	Credits **4**

Course Objectives

This course introduces fundamental concepts of Operation Research. It covers concepts linear Programming, Simplex Method, Big M method, Transportation Problem, Assignment problem, PERT / CPM. It provides technical skills to understand the concepts in applied mathematics.

Course Outcomes (CO)

K1	CO1	Acquiring knowledge of basic idea of the linear programming.
K2	CO2	Understand the Solution of the Big M method.
K4	CO3	Demonstrate understanding of the importance of the Transportation Problem.
K3	CO4	Develop the idea about the Assignment problem.
K4	CO5	Understanding the concept of PERT / CPM.

Unit I:

Introduction - Definition of O.R. – Scope , phases and Limitations of O.R. – Linear Programming Problem – Definitions – Mathematical Formulation – Characteristic of a LPP – Matrix form of LPP – Graphical Method – Definitions of bounded , unbounded and optimal solutions – procedure of solving LPP by graphical method – problems – Simplex technique - Definitions of Basic , non basic variables – basic solutions – slack variables and optimal solution , simplex procedure of solving LPP – problems.

Unit II:

Introduction – Big – M method – Definitions of Big – M method , surplus variables and artificial variables – Procedure of solving an LPP by Big – M method – Pseudo optimal solution – Problems – Two – Phase Simplex method – Procedure of solving an LPP by two – phase simplex method – problems.

Unit III:

Introduction – Balanced and unbalanced T.P , Feasible solution – Basic feasible solution – Optimum solution – Degeneracy in a T.P. – Mathematical formulation – North – West Corner rule – Vogel's approximation method (unit penalty method) - Method of Matrix minima (Least cost Method) – problems – Algorithm of Optimality test (Modi Method) – Problems .

Unit IV:

Assignment problem – Definition – Mathematical formulation of the Assignment problem – Test for optimality by using Hungarian method - Unbalanced Assignment problem – Degeneracy in Assignment problem - Maximization case in Assignment problem – Restrictions on Assignment problem – Variations in Assignment problem –problems .

Unit V:

Introduction – Definition of network, event, activity, optimistic time, pessimistic time, the most likely time, critical path, total float and free float – Difference between slack and float – Phases of critical path in a PERT network – difference between CPM and PERT – Problems.

TEXT BOOK:

S.No	Title of the Book	Author	Publishing Company	Year of Publication
1.	Operations Research, Ninth Edition	P.K.Gupta, Man Mohan and Kanti Swarup	Sultan Chand and Sons, New Delhi	2001

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publishing Company	Year of Publication
1.	Operations Research, Second Edition	S.Kalavathy	Vikas Publishing House, New Delhi	2002
2.	Operations Research, Second Edition	P.K.Gupta and D.S.Hira	S.Chand & Co, NewDelhi	2004
3.	Operations Research	Nita Hshah Ravi M. Gor Hardiksoni	PHI, P,Ltd,	2010

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	M	M	S	S	M
CO3	S	S	S	M	S
CO4	M	M	M	M	S
CO5	S	S	M	M	S

S- Strong; **M**-Medium.

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DEPARTMENT OF SOCIAL WORK

List of Courses Focusing on Employability/ Entrepreneurship/ Skill Development (Regulations – 2016)

Programme : Master of Social Work

S.No.	Course Name	Course Code	Employability	Entrepreneurship	Skill development
1.	**Core I: Introduction to social work**	M16PSW01	✓	-	-
2.	**Core II:** Working with Individuals	M16PSW02	✓	-	-
3.	**Core III:** Working with Groups	M16PSW03	✓	-	-
4.	**Core IV:** Indian social structure and social problems	M16PSW04	-	-	✓
5.	**Core V:**Human Growth and Personality development	M16PSW05	✓	-	-
6.	**Practicum - I** Field work-Rural camp	M16PSWP01	-	-	✓
7.	**EDC** - Life skill management	M16PSWED1	-	-	✓
8.	**EDC** - Corporate Social Responsibility	M16PSWED2	✓	-	-
9.	Human Rights	M16PHR01	✓	-	-
10.	**Core VI:** Community organization and social action	M16PSW06	✓	-	-
11.	**Core VII:**Social work research and social statistics	M16PSW07	-	-	✓
12.	**Core VIII:** Social welfare administration and social legislations	M16PSW08	✓	-	-
13.	**Elective - I :** Labour welfare	M16PSWE01	-	-	✓
14.	**Elective - I :** Health and hygiene	M16PSWE02	-	-	✓

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S.No.	Course Name	Course Code	Employability	Entrepreneurship	Skill development
15.	**Elective - I :** Youth welfare	M16PSWE03		✓	
16.	**Practicum II :** Concurrent field work	M16PSWP02	✓	-	-
17.	**EDC** - Fundamental of computers and communications	M16PECS01	-	-	✓
18.	Human Rights	M16PHR01	✓	-	-
19.	**Elective - II :** Human resource management	M16PSWE04	✓	-	-
20.	**Elective - II :** Hospital Administration	M16PSWE05	✓	-	-
21.	**Elective - II :** Social Development	M16PSWE06	✓	-	-
22.	**Elective - III :** Industrial relations	M16PSWE07	-	-	✓
23.	**Elective - III :** Introduction to Psychiatry	M16PSWE08	-	-	✓
24.	**Elective - III :** Management of non - profit organisation	M16PSWE09	-	✓	-
25.	**Core - IX :** Counseling skills for contemporary social work	M16PSW09	-	-	✓
26.	**Practicum III :** Concurrent field work	M16PSWP03	-	-	✓
27.	**Elective - IV :**Human Resource Development	M16PSWE10	✓	-	-
28.	**Elective - IV :** Medical Social Work	M16PSWE11	✓	-	-
29.	**Elective - IV :** Rural Community	M16PSWE12	✓	-	-
30.	**Elective - V :** Organisation Behaviour	M16PSWE13	-	-	✓
31.	**Elective - V :** Psychiatric Social work	M16PSWE14	✓	-	✓
32.	**Elective - V :** Rural Community development	M16PSWE15	✓	-	-
33.	**Practicum - IV :** Concurrent field work	M16PSWP04	-	-	-
34.	**Practicum - V :** Block Placement	M16PSWP05	✓	-	-
35.	**Project - I** Dissertation Project	M16PSWPR1	-	-	✓

Head of the Department

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MAHENDRA ARTS & SCIENCE COLLE
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Kalippatti – 637 501, Namakkal (Dt), Tamil Nadu.

DEPARTMENT OF SOCIAL WORK

List of Courses Focusing on Employability/ Entrepreneurship/ Skill Development (Regulations – 2016)

Programme : Master of Social Work

S.No.	Course Name	Course Code	Employability/ Entrepreneurship/ Skill development	Year of introduction (during the last five years)
1.	**Core I: Introduction to social work**	M16PSW01	Employability	2016 - 2017
2.	**Core II:** Working with Individuals	M16PSW02	Employability	2016 - 2017
3.	**Core III:** Working with Groups	M16PSW03	Employability	2016 - 2017
4.	**Core IV:** Indian social structure and social problems	M16PSW04	Skill development	2016 - 2017
5.	**Core V:**Human Growth and Personality development	M16PSW05	Employability	2016 - 2017
6.	**Practicum - I** Field work-Rural camp	M16PSWP01	Skill development	2016 - 2017
7.	**Core VI:** Community organization and social action	M16PSW06	Employability	2016 - 2017
8.	**Core VII:** Social work research and social statistics	M16PSW07	Skill development	2016 - 2017
9.	**Core VIII:** Social welfare administration and social legislations	M16PSW08	Employability	2016 - 2017
10.	**Elective - I :** Labour welfare	M16PSWE01	Skill development	2016 - 2017
11.	**Elective - I :** Health and hygiene	M16PSWE02	Skill development	2016 - 2017
12.	**Elective - I :** Youth welfare	M16PSWE03	Entrepreneurship	2016 - 2017
13.	**Practicum II :** Concurrent field work	M16PSWP02	Employability	2016 - 2017
14.	**EDC** - Life skill management	M16PSWED1	Skill development	2016 - 2017
15.	**EDC** - Corporate Social Responsibility	M16PSWED2	Employability	2016 - 2017

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S.No.	Course Name	Course Code	Employability/ Entrepreneurship/ Skill development	Year of introduction (during the last five years)
16.	Human Rights	M16PHR01	Employability	2016 - 2017
17.	**Elective - II :** Human resource management	M16PSWE04	Skill development	2016 - 2017
18.	**Elective - II :** Hospital Administration	M16PSWE05	Employability	2016 - 2017
19.	**Elective - II :** Social Development	M16PSWE06	Employability	2016 - 2017
20.	**Elective - III :** Industrial relations	M16PSWE07	Skill development	2016 - 2017
21.	**Elective - III :** Introduction to Psychiatry	M16PSWE08	Skill development	2016 - 2017
22.	**Elective - III :** Management of non - profit organisation	M16PSWE09	Entrepreneurship	2016 - 2017
23.	**Core - IX :** Counseling skills for contemporary social work	M16PSW09	Skill development	2016 - 2017
24.	**Practicum III :** Concurrent field work	M16PSWP03	Skill development	2016 - 2017
25.	**Elective - IV :**Human Resource Development	M16PSWE10	Employability	2016 - 2017
26.	**Elective - IV :** Medical Social Work	M16PSWE11	Employability	2016 - 2017
27.	**Elective - IV :** Rural Community	M16PSWE12	Employability	2016 - 2017
28.	**Elective - V :** Organisation Behaviour	M16PSWE13	Skill Development	2016 - 2017
29.	**Elective - V :** Psychiatric Social work	M16PSWE14	Employability	2016 - 2017
30.	**Elective - V :** Rural Community development	M16PSWE15	Employability	2016 - 2017
31.	**Practicum - IV :** Concurrent field work	M16PSWP04	Skill Development	2016 - 2017
32.	**Practicum - V :** Block Placement	M16PSWP05	Employability	2016 - 2017
33.	**Project - I** Dissertation Project	M16PSWPR1	Skill Development	2016 - 2017

Head of the Department

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MASTER OF SOCIAL WORK

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR MSW

PRINCIPAL
MAHENDRA ARTS & SCIENCE COLLEGE
(Autonomous)
Kalippatti (PO) - 637 501. Namakkal (DT)

For the students admitted from the Academic Year 2016-2017 onwards

MAHENDRA ARTS & SCIENCE COLLEGE

(Autonomous)

KALIPPATTI, NAMAKKAL (Dt) – 637501.

REGULATIONS FOR M.Sc. MATHEMATICS DEGREE COURSE

with Semester System and CBCS Pattern

(Effective from the academic year 2016-2017)

1. OBJECTIVE OF THE COURSE

To develop the Post Graduates in Mathematics with strong knowledge of theoretical Mathematics subjects who can be employed in research and development units of industries and academic institutions.

2. ELIGIBILITY FOR ADMISSION

A candidate who has passed B.Sc., Mathematics degree of any University accepted by the College Academic Council as equivalent there to subject to such conditions as may be prescribed therefore shall be permitted to appear and qualify for the **M.Sc. Mathematics** degree examination of after a course of study of two academic years.

3. DURATION OF THE COURSE

The course for the degree of **Master of Science in Mathematics** shall consist of two academic years divided into four semesters. Each semester consist of 90 working days.

4. COURSE OF STUDY

The course of study shall comprise instructions in Core and Elective subjects according to the syllabus and books prescribed from time to time. This syllabus for various subjects shall be clearly demarcated into five viable UNITs in each paper / subject.

5. EXAMINATIONS

The Theory examination shall be three hours duration to each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination. The practical examinations for PG course should be conducted at the end of the every semester.

6. a) SUBMISSION OF RECORD NOTE BOOKS FOR PRACTICAL EXAMINATIONS

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned

Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

7. REVISION OF REGULATIONS AND CURRICULUM

The college may revise / amend / change the Regulations and Scheme of Examinations, if found necessary.

8. PASSING MINIMUM

a) THEORY

The candidate shall be declared to have passed the examination if the candidate secure not less than 50 marks out of 100(CIA – 12 marks out of 25 and EA – 38 marks out of 75) in the examination in each theory paper.

b) PRACTICAL

The candidate shall be declared to have passed the examination if the candidate secure not less than 50 marks put together out of 100(CIA – 20 marks out of 40 and EA – 30 marks out of 60) in the examination in each practical paper.

9. EVALUATION PATTERN

Theory: Internal [CIA]: 25 Marks & External [EA]: 75 Marks Max. Marks: 100

Internal Marks Distribution [CIA] (Total Marks: 25)

- Attendance : 5 Marks
- Assignment : 5 Marks
- Seminar : 5 Marks
- Internal Examinations : 10 Marks

External Marks Distribution [EA] (Total Marks: 75)

Practical: Internal [CIA]: 40 Marks & External [EA]: 60 Marks Marks: 100

Internal Marks Distribution Practical / Software Development Lab [CIA]

(Total Marks: 40)

- Preparation of Record & Submission : 15 Marks
- Internal Practical Examinations : 25 Marks

The components for continuous internal assessment are:

- Attendance : 5 Marks
- Model Practical Examinations : 20 Marks
-

External Marks Distribution Practical [EA] (Total Marks: 60)

For each Practical question the marks should be awarded as follows (External):

(i) Algorithm / Flowchart - 20%

(ii) Writing the program in the main answer book - 30%

(iii) Test and debug the programs - 30%

(iv) Printing the correct output - 20%

(Marks may be proportionately reduced for the errors committed in each of the above)

PROJECT DISSERTATION (Max. 100 Marks)

Internal : 25 Marks

Evaluation (External) : 25 Marks

Viva -Voce (Joint) : 50 Marks

10. QUESTION PAPER PATTERN

Theory: Time: 3 Hours Max.Marks: 75

PART-A (5 x 5 = 25)

Answer all the questions (Either or type from each unit)

PART-B (5 x 10 = 50)

Answer all the questions (Either or type from each unit)

Practical: Time: 3 Hours Max.Marks: 60

1. One compulsory question from the given list of objectives : 30 Marks

2. One either / OR type question from the given list of objectives : 30 Marks

11. REGULATIONS OF PROJECT WORK

- Students should do their five months [December to April] Project work in Company / Institutions
- The candidate should submit the filled in format as given in **Annexure – I** to the department for approval during the first week of January in their project semester
- Each internal guide shall have maximum of 4 Students
- Periodically the project should be reviewed minimum three times by the advisory committee
- The students should prepare three copies of the dissertation and submit the same to the college in the month of April for the evaluation by examiners. After evaluation one copy is to be retained in the college library and the student can hold one copy.
- A sample format of the dissertation is enclosed in **Annexure – II**
- Format of the Title page and certificate are enclosed in **Annexure – III**
- The Students should use Power Point Presentation during their Project Viva-voce Examinations.

12. CLASSIFICATION OF SUCCESSFUL CANDIDATES

- FIRST CLASS WITH DISTINCTION – 75% and above at the first appearance
- FIRST CLASS - 60% and above
- SECOND CLASS - 50% to 59%

13. COMMENCEMENT OF REGULATION

These regulations shall take effect from the academic year 2016 – 2017, i.e. for students who are to be admitted to the first year of the course during the academic year 2016 – 17.

ANNEXURE – I

College Name :

Course :

Student Name :

Register Number :

Title of the Project :

Address of Organization / Institution :

Name of the Guide :

Qualification :

Teaching Experience :

Place:

Date:

Signature of Guide

HEAD OF THE DEPARTMENT

ANNEXURE II

Dissertation & Mini Project:

(a) Topic:

The topic of the dissertation shall be assigned to the candidate before the beginning of third semester and a copy of the same should be submitted to the University for approval

(b) No. of copies project / dissertation:

The students should prepare **Three** copies of dissertation and submit the same for the evaluation by Examiners. After evaluation one copy is to be retained in the college library and one copy is to be submitted to the COE and one copy can be held by the student.

Format to be followed: The formats / certificate for project / dissertation to be submitted by the students is given below:

Format for the preparation of project work:

(a) Title page

(b) Bonafide Certificate

(c) Acknowledgement

(d) Table of contents

CONTENTS **Chapter No.**	**Title**	**Page No.**
1.	Introduction	
2.	Review of Literature	
3.	Results	
4.	Summary	
5.	References	

ANNEXURE III

1) Format of the Title page

TITLE OF THE DISSERTATION

A Dissertation submitted in partial fulfillment of

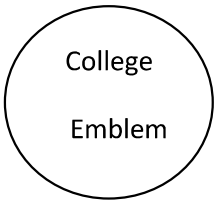
the requirements for the degree of

Master of Science in Mathematics

by

STUDENT NAME

Reg.No:



DEPARTMENT OF MATHEMATICS

MAHENDRA ARTS & SCIENCE COLLEGE

(Autonomous)

KALIPPATTI – 637 501.

MONTH – YEAR

2) Format of the Certificate

MAHENDRA ARTS & SCIENCE COLLEGE

(Autonomous)

KALIPPATTI – 637 501.

MONTH – YEAR

PROJECT WORK TITLE OF THE DISSERTATION

Bonafide Work done by

STUDENT NAME

REG. NO

A Dissertation submitted in partial

fulfillment of the requirements for the degree of

Master of Science in Mathematics

INTERNAL GUIDE **HEAD OF THE DEPARTMENT**

Submitted for the Viva-Voce Examination held on _____

Internal Examiner **External Examiner**

14. STRUCTURE OF THE PROGRAMME:

MAHENDRA ARTS & SCIENCE COLLEGE
(AUTONOMOUS)
DEPARTMENT OF MATHEMATICS
M.Sc MATHEMATICS – SYLLABUS :- 2016-2017

SEM	COURSE CODE	COURSE	COURSE TITLE	HRS / WEEK	CREDIT	CIA MARKS	SE MARKS	TOTAL MARKS
I	M16PMA01	CORE I	Advanced Algebra-I	6	5	25	75	100
	M16PMA02	CORE II	Advanced Real Analysis-I	6	5	25	75	100
	M16PMA03	CORE III	Ordinary Differential Equations	6	4	25	75	100
	M16PMA04	CORE IV	Classical Mechanics	6	5	25	75	100
		ELECTIVE- I	Elective from Group-I	6	4	25	75	100
Total				**30**	**23**	**125**	**375**	**500**
II	M16PMA05	CORE V	Advanced Algebra-II	6	5	25	75	100
	M16PMA06	CORE VI	Advanced Real Analysis-II	6	5	25	75	100
	M16PMA07	CORE VII	Partial Differential Equations	6	4	25	75	100
		ELECTIVE II	Elective from Group-II	5	4	25	75	100
		EDC	-	5	4	25	75	100
	M16PHR01		Human Rights	2	2		100	100
			Mini Project	-	1	100	-	100
Total				**30**	**25**	**225**	**475**	**700**
III	M16PMA08	CORE VIII	Topology	6	5	25	75	100
	M16PMA09	CORE I X	Complex Analysis	6	5	25	75	100
	M16PMA10	CORE X	Measure Theory and Integration	6	5	25	75	100
	M16PMA11	CORE XI	Differential Geometry	6	5	25	75	100
		ELECTIVE- III	Elective from Group-III	6	4	25	75	100
Total				**30**	**24**	**125**	**375**	**500**
IV	M16PMA12	CORE XII	Functional Analysis	6	5	25	75	100
	M16PMA13	CORE XIII	Graph Theory	6	5	25	75	100
	M16PMA14	CORE XIV	Calculus of Variation & Integral Equations	6	4	25	75	100
		ELECTIVE-IV	Elective from Group-IV	6	4	40	60	100
	M16PMAPR01	PROJECT WORK	-	6	4	25	75	100
		Total		**30**	**22**	**115**	**385**	**500**
		Grand total		**120**	**94**	**590**	**1610**	**2200**

Core Based Elective:

GROUP	PAPER CODE	CORE BASED ELECTIVE
I	M16PMAE01	Numerical Analysis
	M16PMAE02	Probability Theory
II	M16PMAE03	Fluid Dynamics
	M16PMAE04	Stochastic Process
III	M16PMAE05	Discrete Mathematics
	M16PMAE06	Difference Equations
	M16PMAE07	Combinatorial Mathematics
IV	M16PMAE08	Number Theory
	M16PMAE09	Optimization Techniques
	M16PMAE10	Fuzzy Set And Logic

COURSE OFFERED BY OTHER DEPARTMENTS:

Extra Disciplinary Course (EDC):

SEMESTER	COURSE	PAPER CODE	PAPER NAME
II	COURSE-I	M16PMAED01	Quantitative Aptitude
	COURSE-II	M16PMAED02	Operation Research

VALUE ADDED COURSE FOR COMPUTER SCIENCE:

SEMESTER	PAPER CODE	PAPER NAME
I	M16PMAV01	Soft Skills

SEMESTER-I

Core Paper-I Advanced Algebra-I

Paper Code: M16PMA01

Unit I:

Another counting principle, Sylows theorem,

Unit II:

Direct product , finite abelian groups , Ideals and Quotient Rings, more Ideals and Quotient Rings,

Unit III:

The field of Quotients of an Integral Domain.Euclidean Rings,

A particular Euclidean Ring.

Unit IV:

Polynomial rings – rings over rational field rings over commutative ring

Unit V:

Vector spaces – Dual spaces – Inner product spaces& modules.

Text Book:

Topics in Algebra by I.N. Herstein, Second Edition, John Wiley and sons, 1999.

Chapter 2: Sections 2.11, 2.12, 2.13, 2.14.

Chapter 3: Sections 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11

Chapter 4: Sections 4.3 to 4.5)

Reference:

1.S.Lang Algebra, 3rd Edition, Addison Wesley, Mass 1993.

2. John B.Fraleigh – A first course in abstract Algebra, Addison Wesley, Mass 1982.

3. M.Artin, Algebra, Prentice Hall of India, NewDelhi, 1991.

Core Paper-II Advanced Real Analysis –I

Paper Code: M16PMA02

UNIT – I:

Basic Topology – Finite, countable, and Uncountable sets – Metric Spaces – Compact Sets –Perfect sets – connected sets.

UNIT –II :

Numerical Sequences – Convergent sequences – Cauchy Sequences – Upper and Lower Limits – Some special sequences.

UNIT-III:

Numerical Series – Series of nonnegative Terms – The Number e– The Root and Ratio Test –Power series – Summation by Parts – Absolute Convergence – Addition and Multiplication of series – Rearrangement Theorems.

UNIT-IV:

Continuity – Limits of Functions – Continuous Functions – Continuity and Compactness –Continuity and Connectedness.

UNIT-V:

Differentiation – The Derivative of a Real function – Mean Value Theorems – The Continuity of Derivatives – L'Hospital's Rule – Derivative of Higher Orders – Taylor's Theorem.

TEXT BOOK:

Principles of Mathematical analysis (Third edition) by Walter Rudin, Chapters 2, 3, 4, and 5.

Reference:

1. T.M. Apostol, Mathematical Analysis, Narosa Publ. House, New Delhi, 1985.

2. H.L. Royden, Real Analysis, Macmillan Publ. Co. Inc. 4th edition, New York, 1993.

3. V. Ganapathy Iyer, Mathematical Analysis, Tata McGraw Hill, New Delhi, 1970.

Core Paper-III ORDINARY DIFFERENTIAL EQUATIONS

Paper Code: M16PMA03

Unit I:

Linear Equations with Constant Coefficients:

Introduction – Second order homogeneous equations – Initial value problem – Linear dependence and independence – A formula for the Wornskian.

(Chapter 2: Section 1 to 5)

Unit II:

Linear Equations with Constant Coefficients (Contd.):

Non-homogeneous equations of order two – Homogenous and non-homogeneous equations of order n – Initial value problem – Annihilater method to solve a non-homogeneous equation. (Chapter 2: Section 6 to 11)

Unit III:

Linear Equations with Variable Coefficients:

Initial value problems for homogeneous equations – solutions of homogeneous equations- Wronskian and linear independence – Reduction of the order of homogeneous equation. (Chapter 3: Section 1 to 5)

Unit IV:

Linear Equations with Regular Singular Points:

Linear equation with regular singular points – Euler equation – second order equations with regular singular points – solutions and properties of Legendre and Bessels equation.

(Chapter 3: Section 8 & Chapter 4: Section 1 to 4 and 7 and 8)

Unit V:

First Order Equation – Existence and Uniqueness:

Introduction – Existence and uniqueness of solutions of first order equations – Equations with variable separated – Exact equations – Method of successive approximations – Lipschitz Condition – Convergence of the successive approximations. (Chapter 5: Section 1 to 6)

Text Book:

E.A.Codington, An Introduction to Ordinary Differential Equation, Prentice Hall of India, New Delhi, 1994.

Reference:

1. R.P Agarwal and Ramesh C.Gupta, Essentials of Ordinary Differential Equation. McGraw, Hill, New York, 1991.

2. D.Somasundram, Ordinary Differential Equations, Narosa Publ.House, Chennai – 2002.

Core Paper-IV Classical Mechanics

Paper Code: M16PMA04

Unit I:

Mechanical Systems:

The Mechanical System – Generalized co–ordinates – Constraints – Virtual work – Energy and Momentum.

(Chapter 1 Sections 1.1 to 1.5)

Unit II:

Lagrange's Equations:

Lagrange's Equation – Derivation of Lagrange's Equations – Examples – Integrals of motion.

(Chapter 2 Sections 2.1 to 2.3)

Unit III:

Hamilton's Equation:

Hamilton's Equation – Hamiltons Principle – Hamilton's Equation – Other Variational Principle.

(Chapter 4 Sections 4.1 to 4.3)

Unit IV:

Hamilton – Jacobi Theory:

Hamilton – Jacobi Theory – Hamilton Principle Function – Hamilton – Jacobi Equation – Separability.

(Chapter 5 Sections 5.1 to 5.3)

Unit V:

Canonical Transformation:

Canonical Transformation – Differential forms and generating functions – Special Transformations – Lagrange and poisson brackets.

(Chapter 6 Sections 6.1 to 6.3)

Text Book:

D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985.

Reference :

1. H.Goldstein, Classical Mechanics, Narosa Publishing House, NewDelhi, 2001.

2. J.L. Synge and B.A. Griffth, Principles of Mechanics, McGraw Hill Book Co. New York,1970.

3. N.C. Rane and P.S.C. Joag, Classical Mechanics, Tata McGraw Hill, New Delhi, 1991.

ELECTIVE GROUP-I

Core Elective :I NUMERICAL ANALYSIS

Paper Code: M16PMAE01

Unit I :

Numerical solutions to ordinary differential equation:

Numerical solutions to ordinary differential equation – Power series solution – Pointwise method – Solution by Taylor's series – Taylor's series method for simultaneous first order differential equations – Taylor's series method for Higher order Differential equations –

(Chapter 11: Sections 11.1 to 11.6)

Unit II :

Picard and Euler Methods:

Picard's Method of successive approximations – Picard's method for simultaneous first order differential equations – Picard's method for simultaneous second order differential equations – Euler's Method – Improved Euler's method – Modified Euler's Method.

(Chapter 11: Sections 11.7 to 11.12)

Unit III :

Runge – Kutta Method:

Runge's method – Runge-Kutta methods – Higher order Runge-Kutta methods- Runge-Kutta methods for simultaneous first order differential equations – Runge-Kutta methods for simultaneous second order differential equations -Predictor – Corrector methods – Milne's method – Adam – Bashforth method

(Chapter 11: Sections 11.13 to 11.20)

Unit IV :

Numerical solutions to partial differential equations:

Introduction Difference Quotients – Geometrical representation of partial differential quotients – Classifications of partial differential equations – Elliptic equation – Solution to Laplace's equation by Liebmann's iteration process.

(Chapter 12: Sections 12.1 to 12.6)

Unit V :

Numerical Solutions to partial differential equations (contd.)

Poisson equation – its solution – Parabolic equations – Bender – Schmidt method – Crank – Nicholson method – Hyperbolic equation – Solution to partial differential equation by Relaxation method.

(Chapter 12: Sections 12.7 to 12.10)

Text Book:

V.N Vedamurthy and **Ch. S.N.Iyengar;** Numerical Methods, Vikas Publishing House Pvt Ltd., 1998.

References:

1. S.S. Sastry, Introductory methods of Numerical Analysis, Printice of India, 1995

2. C.F. Gerald, and P.O. Wheathy, Applied Numerical Analysis, Fifth Edition, Addison Wesley, 1998.

3. M.K. Venkatraman, Numerical methods in Science and technology, National Publichers Company, 1992. 4. P. Kandasamy, K. Thilagavathy, K. Gunavathy, Numerical Methods, S. Chand & Company, 2003.

[OR]

Core Elective :II PROBABILITY THEORY

Paper Code: M16PMAE02

Unit I:

Random Events and Random Variables - Random events – Probability axioms – Combinatorial formulae – conditional probability – Bayes Theorem – Independent events – Random Variables – Distribution Function – Joint Distribution – Marginal Distribution – Conditional Distribution – Independent random variables – Functions of random variables.

Chapter 1: Sections 1.1 to 1.7, Chapter 2: Sections 2.1 to 2.9

Unit II:

Parameters of the Distribution - Expectation- Moments – The Chebyshev Inequality – Absolute moments – Order parameters – Moments of random vectors – Regression of the first and second types.

Chapter 3: Sections 3.1 to 3.8

Unit III:

Characteristic functions - Properties of characteristic functions – Characteristic functions and moments – semi-invariants – characteristic function of the sum of the independent random variables – Determination of distribution function by the Characteristic function – Characteristic function of multidimensional random vectors – Probability generating functions.

Chapter 4: Sections 4.1 to 4.7 24

Unit IV:

Some probability distributions - One point , two point , Binomial – Polya – Hypergeometric – Poisson (discrete) distributions – Uniform – normal gamma – Beta – Cauchy and Laplace (continuous) distributions.

Chapter 5: Section 5.1 to 5.10 (Omit Section 5.11)

Unit V:

Limit Theorems - Stochastic convergence – Bernaulli law of large numbers – Convergence of sequence of distribution functions – Levy-Cramer Theorems – De Moivre-Laplace Theorem – Poisson, Chebyshev, Khintchine Weak law of large numbers – Lindberg Theorem – Lyapunov Theroem – Borel-Cantelli Lemma - Kolmogorov Inequality and Kolmogorov Strong Law of large numbers.

Chapter 6: Sections 6.1 to 6.4, 6.6 to 6.9, 6.11 and 6.12. (Omit Sections 6.5, 6.10, 6.13 to 6.15)

Text Book:

M. Fisz, Probability Theory and Mathematical Statistics, John Wiley and Sons, New York, 1963.

References:

1. R.B. Ash, Real Analysis and Probability, Academic Press, New York, 1972

2. K.L.Chung, A course in Probability, Academic Press, New York, 1974.

3. Y.S.Chow and H.Teicher, Probability Theory, Springer Verlag. Berlin, 1988 (2nd Edition)

4. R.Durrett, Probability : Theory and Examples, (2nd Edition) Duxbury Press, New York, 1996.

5. V.K.Rohatgi, An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi, 1988(3rd Print).

6. S.I.Resnick, A Probability Path, Birhauser, Berlin, 1999.

7. B.R.Bhat, Modern Probability Theory (3rd Edition), New Age International (P)Ltd, New Delhi, 1999.

8. J.P. Romano and A.F. Siegel, Counter Examples in Probability and Statistics, Wadsworth and Brooks / Cole Advanced Books and Software, California, 1968.

Semester-II

Core Paper: V Advanced Algebra-II

Paper Code: M16PMA05

Unit I:

Field theory:

Extension field – roots of polynomials - more about roots

(Chapter5 Sections 5.1, 5.3 and 5 .5)

Unit II:

Galois Theory:

Elements of Galois theory – Solvability by radicals

(Chapter 5 Section 5.6, 5.7)

Unit III

Rings and ring homomorphism's –Extension and Contraction – exact sequences

Unit IV

Chain conditions – Primary decomposition in Noethorian rings

Unit V

Artin rings – Discrete valuation rings – Dedekind domains – Fractional ideals

Text book:

1.I.N Herstein : Topics in Algebra, 2nd Edition, John Wiley and Sons, Newyork, 2003.

[UNIT-I&II]

2. Introduction to Commutative Algebra, by M.F.Atiyah and I.G.Macdonald, Addison – Wesley Publication Company, Inc, 1969.

[UNIT-III,IV&V]

Reference:

1.S.Lang Algebra, 3rd Edition, Addison Wesley, Mass 1993.

2. John B.Fraleigh – A first course in abstract Algebra, Addison Wesley, Mass 1982.

3. M.Artin, Algebra, Prentice Hall of India, NewDelhi, 1991.

4. N.S. Gopalakrishnan, Commutative Algebra, Oxonian Press Pvt. Ltd, New Delhi, 1988

5. F.W. Andeson and K.R. Fuller, Rings and Categories of Modules, 2nd Edition, Graduate Text in Mathematics Vol. 13, Springer-Verlag, New York, 1992

6. H.Matsumura, Commutative ring theory, Cambridge University Press, 1986.

Core Paper: VI ADVANCED REAL ANALYSIS-II

Paper Code: M16PMA06

Unit I:

The Riemann – steiltjes integral – Definition and Existence of the integral – properties of integral – integration and Differentiation – Rectifiable Curves .

Unit II:

Sequences and series of functions – Discussion of main problem – Uniform Convergence and Continuity – Uniform Convergence and Integration – Uniform Convergence and Differentiation – Equicontinuous Family of function – The Stone – Weierstrass theorem

Unit III:

Some special Functions – Power series – the Exponential and Logarithmic series – The Trigonometric Function – The Algebraic Completeness of the Complex Field – Fourier series – The Gamma Functions .

Unit IV :

Linear transformations, Differentiation, the contraction principle, the inverse function theorem, the implicit function theorem.

Unit V:

The Rank theorem, determinants, derivatives of higher order, differentiation of integrals.

Text Books

1. Walter Rudin – Principles of Mathematical Analysis, 3rd edition, MC Graw Hill Book Co., Kogaskusha, 1976.

Reference:

1. H.L. Royden, Real Analysis, Macmillan Publ. Co. INC., 4th edition, New York, 1993.
2. V. Ganapathy Iyer, Mathematical Analysis, Tata MC Graw Hill, New Delhi, 1970.
3. T.M. Apostol – Mathematical Analysis, 2nd edition, Narosa Publ. House, New Delhi, 1985.

Core Paper: VII PARTIAL DIFFERENTIAL EQUATIONS

Paper Code: M16PMA07

Unit I:

second order Partial Differential Equations:

Origin of second order partial differential equations – Linear differential equations with constant coefficients – Method of solving partial (linear) differential equation – Classification of second order partial differential equations – Canonical forms – Adjoint operators – Riemann method.

(Chapter 2 : Sections 2.1 to 2.5)

Unit II:

Elliptic Differential Equations:

Elliptic differential equations – Occurrence of Laplace and Poisson equations – Boundary value problems – Separation of variables method – Laplace equation in cylindrical – Spherical co-ordinates, Dirichlet and Neumann problems for circle – Sphere.

(Chapter 3 : Sections 3.1 to 3.9)

Unit III:

Parabolic Differential Equations:

Parabolic differential equations – Occurrence of the diffusion equation – Boundary condition – Separation of variable method – Diffusion equation in cylindrical – Spherical co-ordinates

(Chapter 4: Sections 4.1 to 4.5)

Unit IV:

Hyperbolic Differential Equations:

Hyperbolic differential equations – Occurrence of wave equation – One dimensional wave equation – Reduction to canonical form – D'Alembertz solution – Separation of variable method – Periodic solutions – Cylindrical – Spherical co-ordinates – Duhamel principle for wave equations.

(Chapter 5 : Sections 5.1 to 5.6 and 5.9)

Unit V:

Integral Transform:

Laplace transforms – Solution of partial differential equation – Diffusion equation – Wave equation – Fourier transform – Application to partial differential equation – Diffusion equation – Wave equation – Laplace equation.

(Chapter 6 : Sections 6.2 to 6.4)

Text Book:

J.N. Sharma and **K.Singh**,

Partial Differential Equation for Engineers and Scientist, Narosa publ. House, Chennai, 2001.

Reference:

1. I.N.Snedden, Elemetns of Partial Differeential Equations, McGraw Hill, New York 1964.

2. K.Sankar Rao, Introduction to partial Differential Equations, Prentice Hall of India, New Delhi, 1995.

3. S.J. Farlow, Partial Differential Equations for Scientists and Engineers, John Wiley sons, New York, 1982.

ELECTIVE GROUP-II

Core Elective :III FLUID DYNAMICS

Paper Code: M16PMAE03

UNIT I :

Real fluids and ideal fluids - Velocity of a fluid at a point - Streamlines and pathlines - Steady and unsteady flows. Velocity potential - Vorticity vector - Local and particle rates of change - Equation of continuity - Worked examples - Acceleration of a point of a fluid.

UNIT II:

Pressure at a point in a fluid at rest - Pressure at a point in a moving fluid - Conditions at a boundary of two inviscid Immissible fluids - Euler's equations of motion - Bernoulli's equation – Worked examples - Some flows involving axial symmetry - Some special two dimensional flows – Impulsive motion.

UNIT III:

Some three dimensional flows - Sources, sinks and doublets - Images in a rigid infinite plane -Axis-symmetric flows - Stokes stream function - Some special forms of the stream function for Axissymmetric irrotational motions.

UNIT IV:

Two dimensional flow - Use of cylindrical polar coordinates - Stream function. Complex potential for two-dimensional irrotational - Incompressible flow - Complex velocity potential for standard two-dimensional flows - Uniform stream, line sources and line sinks, line doublets, line vortices - Worked examples.

UNIT V :

Two dimensional image systems – Milne-Thomson circle theorem - Some applications of the circle theorem - Extension of the circle theorem - Theorem of Blasius - Use of conformal transformation– Some hydro dynamical aspects of conformal transformation - Worked example.

Text Book:

1.F. Chorlton, Textbook of Fluid Dynamics, CBS Publication and Distribution (2004).

UNIT I Chapter 2 Sections 2.1 to 2.9

UNIT II Chapter 3 Sections 3.1 to 3.6, 3.9 to 3.11

UNIT III Chapter 4 Sections 4.1 to 4.3, 4.5, 4.5.1

UNIT IV Chapter 5 Sections 5.1 to 5.6

UNIT V Chapter 5 Sections 5.7 to 5.10.2

Reference Book:

1. M.D. Raisinghania, Fluid Dynamics, S. Chand, (2008).

2. G.K. Batchelor, An Introduction to Fluid Mechanics, Foundation Books, (1984).

OR

Core Elective :IV Stochastic Process

Paper Code: M16PMAE04

Unit I:
Stochastics Process: Introduction – Specification of Stochastic Processes, Stationary processes, Martingales, Markov Chains: Definitions and Examples, Higher transition probabilities, classification of states and chains.

Unit II:
Stability of Markov chain, Markov chains with denumerable number of states, Poisson process.

Unit III:
Poisson process and related distributions – Markov chain with discrete state space.

Unit IV:
Renewal process: Renewal process-Renewal process in continuous time – Renewal equation – Stopping time: Wald's equation – Renewal theorems
.

Unit V:
Markov Renewal and semi-markov processes: Introduction – Definitions and Preliminaries results – Markov renewal equations – Limiting behaviours.

Text Book:
" Stochastic Processes", Prof. J. Medhi

Unit I: Chapter2: 2.1 to 2.4; Chapter3: 3.1, 3.2, 3.4 (3.3 is not included)

Unit II: Chapter3: 3.6, 3.8, 4.1 (pages 157-169)

Unit III: Chapter4: 4.2 to 4.5 (pages 170-206)

Unit IV: Chapter6: 6.1 to 6.5 (pages 242 – 272)

Unit V: Chapter7: 7.1 to 7.4 (pages 313 – 331) (example problems only)

Reference:

" Stochastic Processes", T.Veerarajan.

Semester-III

Core Paper: VIII TOPOLOGY

Paper Code: M16PMA08

UNIT-I

Topological spaces- Basis for a topology- the order topology-the product to topology -the sub space topology- closed sets and limit points

UNIT-II

Continuous functions-the product topology- the metric topology-the metric topology (cont)

UNIT-III

Connected spaces- connected sets in the real line-component and path components

UNIT-IV

Compact spaces- compact sets in the real line-limit point-compactness

UNIT-V

The countability axioms- the separation axioms-the Urysohn lemma-the Urysohn metrization theorem- The Tietze extension theorem..

TEXT BOOK:

TOPOLOGY-A.FIRSR COURSE by JAMES R.MUNKRES (P.H.I) 3rd EDITION

UNIT-1 SECTIONS 12,13,14,15,16,17

UNIT-2 SECTIONS 18,19,20,21

UNIT-3 SECTIONS 23,24,25

UNIT-4 SECTIONS 27,28,29

UNIT-5 SECTIONS 31,32,33,34,35.

References:

1. J. Dugundji, Topology, Prentice Hall of India, New Delhi,1975.

2. G.F.Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Book Co, New York, 1963.

3. S.T. Hu, Elements of General Topology, Holden Day, Inc. New York, 1965.

Core Paper:I X COMPLEX ANALYSIS

Paper Code: M16PMA09

Unit I :

Complex Functions

Spherical representation of complex numbers – Analytic function – Limits and continuity – Analytic Functions – Polynomials – Rational functions – Elementary theory of Power series – Sequences – Series – Uniform Convergence – Power series – Abel's limit theorem – Exponential and Trigonometric functions – Exponential - Trigonometric functions – Periodicity – The Logarithm.

(Chapter 1 : Sections 2.4 and Chapter 2 : Sections 1 to 3)

Unit II :

Analytical Functions as Mappings

Analytical Functions as Mappings – Conformality - Arcs and closed curves – Analytic functions in Regions – Conformal mapping – Length and area – Linear transformations – Linear group – Cross ratio – Symmetry –Oriented Circles –Families of circles –Elementary conformal mappings –Use of level curves – Survey of Elementary mappings – Elementary Riemann surfaces. (Chapter 3 : Sections 2 to 4)

Unit III :

Complex Integration

Complex Integration – Fundamental Theorems – Line integrals –Rectifiable Arcs-Line Integrals as Arcs – Cauchy's Theorem for a Rectangle and in a disk – Cauchy's Integral Formula – Index of point with respect to a closed curve- The Integral formula – Higher order derivatives – Local properties of analytic functions – Taylor's Theorem – Zeros and Poles – Local mapping - Maximum Principle.

(Chapter 4 : Sections 1 to 3)

Unit IV :

Complex Integration (Conted)

The general form of Cauchy's Theorem – Chains and Cycles – Simple connectivity – Homology – General statement of cauchy's theorem – Proof of Cauchy's theorem – Locally exact differentials – Multiply connected regions – Calculus of residues – Residue Theorem – Argument Principle-Evaluation of Definite Integrals

(Chapter 4 : Sections 4 and 5)

Unit V :

Harmonic functions and Power series expansions

Harmonic Functions – Definition and basic properties- Mean-Value Property-Poisson's formula's –Schwarz's Theorem – Reflection Principle- Weierstrass's theorem- Taylor's series –Laurent series.

(Chapter 4 : Sections 6 and Chapter 5 : Sections 1)

Text Books:

L.V Ahifors, Complex Analysis, 3rd edition, Mc Graw Hill Inter., Edition, New Delhi,1979.

Reference Books:

1. J.B Conway, Functions of one Complex variable, Narosa Publ. House, New Delhi,1980

2. S.Ponnusamy, Foundations of Complex Analysis, Narosa Publ. House, New Delhi,2004.

3. S.Lang, Complex-Analysis, Addison – Wesley Mass,1977.

Core Paper: X MEASURE THEORY & INTEGRATION

Paper Code: M16PMA10

Unit I:

Lebesgue Measure:

Lebesgue Measure – Introduction – Outer measure – Measurable sets and Lebesgue measure – Measurable functions – Little Woods' Three Principle.

(Chapter 3: Sections 1 to 3, 5 and 6)

Unit II:

Lebesgue integral :

Lebesgue integral – The Riemann integral – Lebesgue integral of bounded functions over a set of finite measure – The integral of a nonnegative function – The general Lebesgue integral. (Chapter 4: Sections 1 to 4)

Unit III:

Differentiation and Integration :

Differentiation and Integration – Differentiation of monotone functions – Functions of bounded variation – Differentiation of an integral – Absolute continuity.

(Chapter 5: Sections 1 to 4)

Unit IV :

General Measure and Integration :

General Measure and Integration – Measure spaces – Measurable functions – integration – Signed Measure – The Radon – Nikodym theorem.

(Chapter 11: Sections 1 to 3, 5 and 6)

Unit V:

Measure and Outer Measure

Measure and outer measure – outer measure and measurability – The Extension theorem – Product measures.

(Chapter 12: Sections 1, 2 and 4)

Text Book:

H.L.Royden, Real Analysis, Mc Millian Publ. Co, New York, 1993.

Reference:

1. G. de Barra, Measure Theory and integration, Wiley Eastern Ltd, 1981.

2. P.K. Jain and V.P. Gupta, Lebesgue Measure and Integration, New Age Int. (P) Ltd., NewDelhi, 2000.

3. Walter Rudin, Real and Complex Analysis, Tata McGraw Hill Publ. Co. Ltd., New Delhi, 1966.

Core Paper: XI DIFFERENTIAL GEOMETORY

Paper Code: M16PMA11

Unit-I

Theory of Space Curves:

Theory of space curves – Representation of space curves – Unique parametric representation of a space curve – Arc-length – Tangent and osculating plane – Principle normal and binormal – Curvature and torsion – Behaviour of a curve near one of its points – The curvature and torsion of a curve as the intersection of two surfaces.

(Chapter 1 : Sections 1.1 to 1.9)

Unit II:

Theory of Space Curves (Contd.):

Contact between curves and surfaces – Osculating circle and osculating sphere – Locus of centre of spherical curvature – Tangent surfaces – Involutes and Evolutes – Intrinsic equations of space curves – Fundamental Existence Theorem – Helices.

(Chapter 1 : Sections 1.10 to 1.13 and 1.16 to 1.18)

Unit III:

Local Intrinsic properties of surface:

Definition of a surface – Nature of points on a surface – Representation of a surface – Curves on surfaces – Tangent plane and surface normal – The general surfaces of revolution – Helicoids – Metric on a surface – Direction coefficients on a surface

(Chapter 2 : Sections 2.1 to 2.10)

Unit IV:

Local Intrinsic properties of surface and geodesic on a surface:

Families of curves – Orthogonal trajectories – Double family of curves – Isometric correspondence – Intrinsic properties – Geodesics and their differential equations – Canonical geodesic equations – Geodesics on surface of revolution.

(Chapter 2: Sections 2.11 to 2.15 and Chapter 3: Sections 3.1 to 3.4)

Unit V:

Geodesic on a surface:

Normal property of Geodesics – Differential equations of geodesics using normal property – Existence theorems – Geodesic parallels – Geodesic curvature – Gauss Bonnet Theorems – Gaussian curvature – Surface of constant curvature

(Chapter 3: Sections 3.5 to 3.8 and Sections 3.10 to 3.13)

Text Book:

D. Somasundaram, Differential Geometry, Narosa Publ. House, Chennai, 2005 .

References:

1. T. Willmore, An Introduction to Differential Geometry, Clarendan Press, Oxford, 1959.

2. D.T Struik, Lectures on Classical Differential Geometry, Addison – Wesely, Mass. 1950.

3. J.A. Thorpe, Elementary Topics in Differential Geometry, Springer – Verlag, New York, 1979.

ELECTIVE GROUP -III

Core Elective V: DISCRETE MATHEMATICS

Paper Code: M16PMAE05

Unit I:

Theory of inference:

Consistency of premises validity using truth table – Consistency of premises – Predicates – 15e statement function, Variables and quantifiers – Predicate formulae – Free and bound variables – Theory of inference for the predicate calculus .

(Chapter 1: Sections 1- 4.1, 1 - 4.2, 1 - 5.1, 1 - 5.2,1 - 5.3, 1 - 5.4, 1 - 6.4)

Unit II:

Set Theory:

Functions – Definition and introduction – Composition of functions – Inverse functions – Binary and n-ary Operations – Characteristic function of a set – Hashing functions – Peuno axioms and mathematical induction – Cardinality.

(Chapter 2: 2 - 4.1, 2 - 4.2, 2 – 4.3, 2 – 4.4,2 – 4.5, 2 – 4.6, 2 – 5.1, 2 – 5.2)

Unit III:

Algebraic Structures:

Groups: Definition and Examples – Subgroups and homomorphism - Cosets and Lagrange's Theorem – Normal subgroups – Algebraic systems with Two Binary Operations.

(Chapter 3 : Sections 3 – 5.1, 3 – 5.2, 3 – 5.3, 3 – 5.4, 3 – 5.5)

Unit IV:

Lattices and Boolean algebra:

Lattices as Algebraic Systems – Sub lattices, direct product and homomorphism – Boolean Algebra Definition and examples – Sub Algebra. Direct Product and homomorphism – Boolean functions, Boolean forms and free Boolean Algebras – Values of Boolean expression and Boolean functions.

(Chapter 4: Sections 4 – 1.3, 4 – 1.4, 4 – 2.2, 4 – 3.4, 4 – 3.2)

Unit V:

Graph Theory:

Basic definitions – Paths – Rechability and Connectedness – Matrix representation of Graphs – Trees – Finite state machine: Introductory special circuits – Equivalence of finite state machines.

(Chapter 5: 5 – 1.1, 5 - 1.2, 5 – 1.3, 5 – 1.4)(Chapter 4: Sections 4 – 6.1, 4 – 6.2)

Text Book:

J.P. Trembley and **R.Manohar**, Discrete Mathematical Structures applications to Computer Science, Tata McGraw Hills, New Delhi, 1997.

References:

1. James C.Abbott, Sets, Lattices and Boolean algebra, Allya and Bacon Boston, 1969. 2. H.G.Flegg Boolean Algebra and its applications, John Wiley and Sons, Inc, NewYork, 1974.

[OR]

Core Elective VI: DIFFERENCE EQUATIONS

Paper Code :M16PMAE06

Unit I:

Difference Calculus:

Difference operator – Summation – Generating function – Approximate summation.
(Chapter 2 Sections 2.1 to 2.3)

Unit II:

Linear Difference Equations:

First order equations – General results for linear equations.
(Chapter 3 Sections 3.1 to 3.2)

Unit III:

Linear Difference Equations(Contd.):

Equations with constant coefficients – Equations with variable coefficients – z – transform. (Chapter 3 Sections 3.3,3.5 and 3.7)

Unit IV:

Initial value problems for linear systems – Stability of linear systems.
(Chapter 4 Sections 4.1 to 4.3)

Unit V:

Asymptotic analysis of sums – Linear equations
(Chapter 5 Sections 5.1 to 5.3)

Text Book:

W.G.Kelley and A.C.Peterson, Difference Equations, Academic press, New York,1991.

Reference:

1. S.N.Elaydi, An Introduction to Difference Equations, Springer – Verleg, NewYork,1990

2. R.Mickens, Difference Equations, Van Nostrand Reinhold, New York, 1990.

3. R.P.Agarwal, Difference Equations and Inequalities Marcelm Dekker, New York,1992.

[OR]

Core Elective VII: COMBINATORIAL MATHEMATICS

Paper Code :M16PMAE07

Unit –I

Permutations and combinations.

Unit – II

Generating functions.

Unit – III

Recurrence relations.

Unit – IV

Principle of inclusion and exclusion.

Unit –V

Polya's theory of counting.

Text Book:

C.L.Liu, Introduction to Combinatorial Mathematics, Tata McGraw Hill, Book Co., New York, 1968. (Chapters: 1 to 5.)

Reference Books:

1. C.L. Liu, M. Eddberg, Solutions to problems in Introducyion to Combinatorial mathematics, MC Grow-Hill Book & Co., New York, 1968.
2. J.H. Van Lint, R.M. Wilson, A Course in Combinatorics, 2nd Edition, Cambridge University Press, Cambridge, 2001.
3. R.P. Stanley, Enumerative Combinatorics, Volume I, Cambridge Studies in Advanced Mathematics, Volume 49, Cambridge University Press, 1997.
4. P.J. Cameron, Combinatorics: Topics, Techniques, Algorithms, Cambridge University Press, Cambridge, 1998

Semester-IV

Core Paper: XII FUNCTIONAL ANALYSIS

Paper Code: M16PMA12

Unit I:

Banach Spaces:

Banach Spaces – Definition and examples – Continuous linear transformations – Hahn Banach theorem

(Chapter 9 : Sections 46 to 48)

Unit II:

Banach Spaces and Hilbert Spaces:

The natural embedding of N in N** - Open mapping theorem – Conjugate of an operator – Hilbert space – Definition and properties.

(Chapter 9 : Sections 49 to 51, Chapter 10 : Sections 52)

Unit III:

Hilbert Spaces:

Orthogonal complements – Orthonormal sets – Conjugate space H* - Adjust of an operator

(Chapter 10 : Sections 53 to 56)

Unit IV:

Operations on Hilbert Spaces:

Self adjoint operator – Normal and Unitary operators – Projections.

(Chapter 10: Sections 57 to 59)

Unit V:

Banach Algebras:

Banach Algebras – Definition and examples – Regular and simple elements – Topological divisors of zero – Spectrum – The formula for the spectral radius – The radical and semi simplicity.

(Chapter 12 : Sections 64 to 69)

Text Book:

G.F.Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Inter. Book Co, New York, 1963.

References:

1. W. Rudin, Functional Analysis, Tata McGraw Hill Publ. Co, New Delhi, 1973.

2. H.C. Goffman and G.Fedrick, First Course in Functional Analysis, Prentice Hall of India , New Delhi, 1987.

3. D. Somasundaram, Functional Analysis S. Viswanathan Pvt.Ltd., Chennai,1994.

4.B.V.Limaye, Functional Analysis.

Core Paper: XIII GRAPH THEORY

Paper Code: M16PMA13

Unit I:

Graphs and Subgraphs:

Graphs and simple graphs – Graph isomorphism – Incidence and Adjacency Matrices – Subgraphs – Vertex degrees – Paths and connection – Cycles – Application – The shortest path problem.

(Chapter 1 : Sections 1.1 to 1.8)

Unit II:

Trees and Connectivity:

Trees – Cut edges and bonds – Cut vertices – Cayley's formula - Application – Connector problem – Connectivity – Blocks – Application – Reliable Communication Networks.

(Chapter 2: Sections 2.1 to 2.5 and Chapter 3: Sections 3.1 to 3.3)

Unit III:

Euler Tours and Matchings:

Euler Tours – Hamilton cycles – Application – Chinese Postman Problem – Traveling salesman problem - Matchings – Matching and coverings in Bipartite Graphs – Perfect Matchings – Applications – Personal Assignment Problem – Optimal Assignment Problem.

(Chapter 4: Sections 4.1 to 4.4 and Chapter 5: Sections 5.1 to 5.5)

Unit IV:

Edge Colouring and Independent sets:

Edge Colouring – Edge Chromatic Number – Vizings Theorem – Application – Timetabling Problem – Independents sets – Ramsey's Theorem – Turan's Theorem.

(Chapter 6: Sections 6.1 to 6.3 and Chapter 7: Sections 7.1 to 7.3)

Unit V:

Vertex Colourings:

vertex Colourings – Chromatic Number – Brook Theorem – Hajos conjecture – Chromatic Polynomials – Girth and Chromatic Number – A storage problem.

(Chapter 8 : Sections 8.1 to 8.6)

Text Book:

J.A.Bondy and **U.S.R. Murty**, Graph Theory with Applications, North Holland, New York, 1982.

References:

1. Narasing Deo, Graph Theory with Application to Engineering and Computer Science, Prentice Hall of India, New Delhi. 2003.

2. F. Harary, Graph Theory, Addison – Wesely Pub. Co. The Mass. 1969.

3. L. R.. Foulds, Graph Theory Application, Narosa Publ. House, Chennai, 1933.

Core Paper: XIV

CALCULUS OF VARIATION AND INTEGRAL EQUATIONS

Paper Code: M16PMA14

Unit I:

Variational problems with fixed boundaries:

The concept of variation and its properties – Euler's equation- Variational problems for Functionals – Functionals dependent on higher order derivatives – Functions of several independent variables – Some applications to problems of Mechanics

(Chapter 1: Sections 1.1 to 1.7) of [1]

Unit II:

Variational problems with moving boundaries:

Movable boundary for a functional dependent on two functions – one-side variations – Reflection and Refraction of extermals – Diffraction of light rays.

(Chapter 2: Sections 2.1 to 2.5) of [1]

Unit III:

Integral Equation:

Introduction – Types of Kernels – Eigen Values and Eigen functions – Connection with differential equation – Solution of an integral equation – Initial value problems – Boundary value problems.

(Chapter 1: Section 1.1 to 1.3 and 1.5 to 1.8) of [2]

Unit IV:

Solution of Fredholm integral equation:

Second kind with separable kernel – Orthogonality and reality eigen function – Fredholm Integral equation with separable kernel – Solution of Fredholm integral equation by successive substitution – Successive approximation – Volterra Integral equation – Solution by successive substitution.

(Chapter 2: Sections 2.1 to 2.3 and Chapter 4 Sections 4.1 to 4.5) of [2]

Unit V:

Hilbert – Schmidt Theory:

Complex Hilbert space – Orthogonal system of functions- Gram Schmit orthogonlization process – Hilbert – Schmit theorems – Solutions of Fredholm integral equation of first kind.

(Chapter 3: Section 3.1 to 3.4 and 3.8 to 3.9) of [2]

Text Books:

1. **A.S Gupta**, Calculus of Variations with Application, Prentice Hall of India, New Delhi, 2005.

2. **Sudir K.Pundir** and **Rimple Pundir**, Integral Equations and Boundary Value Problems, Pragati Prakasam, Meerut, 2005.

References:

1. F.B. Hildebrand, Methods of Applied Mathematics, Prentice – Hall of India Pvt. New Delhi, 1968.

2. R. P. Kanwal, Linear Integral Equations, Theory and Techniques, Academic Press, New York, 1971.

3. L. Elsgolts, Differential Equations and Calculus of Variations, Mir Publishers, Moscow, 1973.

ELECTIVE GROUP -IV

Core Elective VIII: NUMBER THEORY

Paper Code: M16PMAE08

Unit : I

Divisibility_ greatest common divisor_ prime numbers_ The fundamental theorem of arithmetic _The series of reciprocals of the primes _The Euclidean algorithm _ The greatest common divisor of more than two numbers _The Mobius function_ The Euler totient function _A relation connecting Mobius and Euler totient _A product formula for Mobius function

Unit : II

The Dirichlet product of arithmetical functions _ Dirichlet inverses and the Mobius inversion formula _ The Mangoldt function _ Multiplicative functions _ Multiplicative functions and Dirichlet multiplication _ The inverse of a completely Multiplicative functions_ Liouville's function _ The divisor functions_ generalized convolutions _Formal power series _ The Bell series of an arithmetical function _Bell series and Dirichlet multiplication _ Derivatives of arithmetical functions _ The Selberg identity

Unit : III

The big oh notation,Asymptotic equality of functions _ Euler's summation formula _ some elementary asymptotic formulas _The average order of d(n) _ The average order of the divisor functions_ the average order of Euler totient function _ An application to the distribution of lattice points visible from the origin _the average order of Mobius function and Mangoldt function_The partial sums of a Dirichlet product _Applications to Mobius functions and Mangoldt function_ Another identity for the partial sum of a Dirichlet product _ Chebyshev's functions.

Unit : IV

Definition and basic properties of congruences _Residue classes amd complete residue systems_ linear congruences _Reduced residue systems and the Euler-Fermat theorem-Polynomial congruences_ Modulo of Lagrange's theorem _ Applications of Lagrange's theorem _ simultaneous linear congruences _The Chinese remainder theorem _ Applications of the Chinese remainder theorem _ Polynomial congruences with prime power Moduli

Unit : V

Quadratic residues _ Legendre's symbol and its properties _ Evaluation of (-1/p) and (2/p) _ Gauss lemma _ The quadratic reciprocity law _The Applications of the reciprocity law_ The Jacobi symbol _ Applications to Diophantine equations.

Text Books:

Introduction to Analytic Number theory by T.M.Apostol

CONTENTS:

Unit :-I

Chapter :1 – Section :1.1 to 1.8

Chapter :2 – Section :2.1 to 2.5

Unit :-II

Chapter :2 – Section :2.6 to 2.19

Unit :-III

Chapter :3 – Section :3.1 to 3.12

Chapter :4 – Section :4.1 and 4.2

Unit :-IV

Chapter :5 – Section :5.1 to 5.9

Unit :-V

Chapter :9 – Section :9.1 to 9.8

REFERENCE BOOKS:

1.Beginning Number Theory by Neville Robbins

2.Number Theory by Burton

[OR]

Core Elective IX: OPTIMIZATION TECHNIQUES

Paper Code: M16PMAE09

Unit I:

Integer linear programming: Introduction – Illustrative applications integer programming solution algorithms: Branch and Bound (B & B) algorithm – zero – One implicit enumeration algorithm – Cutting plane Algorithm.

(Sections 9.1,9.2,9.3.1.,9.3.2,9.3.3)

Unit II:

Deterministic dynamic programming: Introduction – Recursive nature of computations in DP – Forward and backward recursion – Selected DP applications cargo – Loading model – Work force size model – Equipment replacement model – Investment model – Inventory models. (Sections 10.1,10.2,10.3,10.4.1,10.4.2,10.4.3,10.4.4,10.4.5)

Unit III:

Decision analysis and games: Decision environment – Decision making under certainty (Analytical Hierarchy approach) Decision making under risk – Expected value criterion – Variations of the expected value criterion – Decision under uncertainty Game theory – optimal solution of two – Person Zero – Sum games – Solution of mixed strategy games

(Sections 14.1,14.2,114.3.1,14.3.2,14.4,14.5.1,14.5.2)

Unit IV:

Simulation modeling: What is simulation – Monte carlo simulation – Types of simulation – Elements of discrete event simulation – Generic definition of events – Sampling from probability distributions. Methods for gathering statistical observations – Sub interval method – Replication method – Regenerative (Cycle) method – Simulation languages

(Sections 18.1,18.2,18.3,18.4.1,18.4.2,18.5,18.6,18.7.1,18.7.2,18.7.3,18.8)

Unit V:

Nonlinear programming algorithms: Unconstrained non linear algorithms – Direct search method – Gradient method Constrained algorithms: Separable programming – Quadratic programming – Geometric programming – Stochastic programming – Linear combinations method – SUMT algorithm

(Sections : 21.1.1, 21.1.2, 21.2.1, 21.2.2, 21.2.3, 21.2.4, 21.2.5, 21.2.6)

Text Book:

Operations Research an Introduction 6th Edison by Hamdy A. Taha, University of Arkansas Fayetteville.

Reference:

1. F.S. Hillier and G.J. Lieberman Introduction to Operation Research 4th edition, Mc Graw Hill Book Company, New York, 1989.

2. Philips D.T.Ravindra A. and Solbery.J. Operations Research, Principles and Practice John Wiley and Sons, New York.

3. B.E.Gillett, Operations research – A Computer Oriented Algorithmic Approach,TMH Edition, New Delhi, 1976.

[OR]

Core Elective X: FUZZY SETS & LOGIC

Paper Code: M16PMAE10

Unit –I

Basic Types, Basic Concepts, Additional properties of α-cuts, Reprentations of fuzzy sets

Unit –II

Extension Prinsiple for fuzzy sets, Types of operations, fuzzy Compliments.

Unit –III

Fuzzy numbers-Linguistic Variables-Arithmatic operations on intervals-Arithmatic operations on Fuzzy numbers.

Unit –IV

Crisp versus fuzzy relations – Projections and Cylindric extensions - Binary fuzzy relations –Binary relations on a single set - Fuzzy equivalence relation - Fuzzy Compatibility relations-Fuzzyordering relations .

Unit -V

Classical Logic: An Overview-Mulivalued logic–Fuzzy Proposistion-Fuzzy Quantifiers-Linguistic Hedges-Inference from conditional fuzzy propositions-Inference conditional and qualifiedpropositions-Inference from quanified propositions .

Text Book:

George J.Klir/Bo Yuan - Fuzzy sets and fuzzy logic-2008 Prentic-Hall of India Pvt Ltd.

Extra Disciplinary Course (EDC):

COURSE-I

Paper Name :Quantitative Aptitude

Paper Code :M16PMAED01

Unit I

Numbers, H.C.F. and L.C.M. of numbers .

Unit II

Simplification , Square roots and Cube Roots , Average.

Unit III

Problems on numbers , problems on Ages.

Unit IV

Percentage , Profit and Loss.

Unit V

Ratio and Proportion , Partnership.

Text Books:-

S.No	Tiltle of the Book	Author	Publishing Company	Year of Publication
1.	Quantitative Aptitude for competitive Examination	R.S.Aggarwal.	S.Chand and company Ltd,152,Anna salai,Chennai.	2001
2.	Quantitative Aptitude and Reasoning	Praveen	PHI P.Ltd	.

COURSE-II

Paper Name: Operation Research

Paper Code :M16PMAED02

Unit : I

Introduction - Definition of O.R. – Scope , phases and Limitations of O.R. – Linear Programming Problem – Definitions – Mathematical Formulation – Characteristic of a LPP – Matrix form of LPP – Graphical Method – Definitions of bounded , unbounded and optimal solutions – procedure of solving LPP by graphical method – problems – Simplex technique - Definitions of Basic , non basic variables – basic solutions – slack variables and optimal solution , simplex procedure of solving LPP – problems.

Unit : II

Introduction – Big – M method – Definitions of Big – M method , surplus variables and artificial variables – Procedure of solving an LPP by Big – M method – Pseudo optimal solution – Problems – Two – Phase Simplex method – Procedure of solving an LPP by two – phase simplex method – problems.

Unit : III

Introduction – Balanced and unbalanced T.P , Feasible solution – Basic feasible solution – Optimum solution – Degeneracy in a T.P. – Mathematical formulation – North – West Corner rule – Vogel's approximation method (unit penalty method) - Method of Matrix minima (Least cost Method) – problems – Algorithm of Optimality test (Modi Method) – Problems .

Unit : IV

Assignment problem – Definition – Mathematical formulation of the Assignment problem – Test for optimality by using Hungarian method - Unbalanced Assignment problem – Degeneracy in Assignment problem - Maximization case in Assignment problem – Restrictions on Assignment problem – Variations in Assignment problem –problems .

Unit : V

Introduction – Definition of network, event, activity, optimistic time, pessimistic time, the most likely time, critical path, total float and free float – Difference between slack and float – Phases of critical path in a PERT network – difference between CPM and PERT – Problems.

Text Book:-

S.No	**Title of the Book**	**Author**	**Publishing Company**	**Year of Publication**
1.	Operations Research, Ninth Edition	P.K.Gupta, Man Mohan and Kanti Swarup	Sultan Chand and Sons, New Delhi	2001

Reference Books:-

S.No	Title of the Book	Author	Publishing Company	Year of Publication
1.	Operations Research, Second Edition	S.Kalavathy	Vikas Publishing House, New Delhi	2002
2.	Operations Research, Second Edition	P.K.Gupta and D.S.Hira	S.Chand & Co, NewDelhi	2004
3.	Operations Research	Hamdy Taha	Prentice Hall Publications, NewDelhi	1996
4.	Operations Research	Nita Hshah Ravi M. Gor Hardiksoni	PHI, P,Ltd,	2010

Value Added Course

For M.Sc Computer Science Students admitted on 2016-2017 onwards.

Subject Name: Soft Skills

Subject Code: M16PMAV01 **MARKS : 75 Marks**

Unit: I

Profit & Loss – Partnership.

Unit: II

Chain rule - Time & Work.

Unit: III

Time and Distance – Clocks.

Unit: IV

Problems on trains – Boats & Streams.

Unit: V

Races & Games of skills – Calendar.

Text Book:

Quantitative Apptitude, Dr. R.S.Aggarwal,S.Chand & Company Ltd, New Delhi.

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