FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with "A" Grade by NAAC (3rd Cycle)
74th Rank in India Ranking 2020 (NIRF) by MHRD
Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT : MATHEMATICS

NAME OF THE PROGRAMME : M.Sc. MATHEMATICS

PROGRAMME CODE : PSMA

ACADEMIC YEAR : 2022 - 2023

COLLEGE PROFILE

Fatima College (Autonomous), Mary Land, Madurai, is a Post Graduate and Research Institution for Women affiliated to Madurai Kamaraj University. It is a Catholic Minority institution established and run by St. Joseph's Society of Madurai (of the Congregation of the Sisters of St. Joseph of Lyons, France). This institution came into existence through the tireless efforts of the missionary sisters of St. Joseph of Lyons and the zeal and heroic sacrifice of Rev. Sr. Rose Benedicta, the Foundress of the College.

The College was started in St. Joseph's Campus Madurai as a Second Grade College with 63 students in 1953. It was upgraded into a Post Graduate College in 1964; Autonomous in 1990 and a Research Institute in 2004. The College now offers 21 Undergraduate Programmes, 13 Postgraduate Programmes, 2 Professional Programme, 5 M.Phil. Programmes and 6 Departments have become Research Centres. It has strength of 4134 Students, 206 Teaching Staff and 100 Non-Teaching Staff.

The comprehensive assessment by NAAC in 1999 placed Fatima College in Five Star Status of merit. The college strives to sustain excellence, quality and relevance while equipping the students to meet the demands of higher education in India. In 2004 UGC conferred on Fatima College the status of College with Potential for Excellence. In 2006 and 2013 NAAC Re-Accredited the College with 'A' Grade. The College was ranked 94th in the All India NIRF Ranking in 2019 by MHRD.

VISION

WOMEN'S EMPOWERMENT THROUGH EDUCATION

The vision of the college is to empower women by developing human capabilities through quality education based on Christian values, making them responsible citizens who can work for the advancement of the society and promote communal harmony in the multi-religious and multi-cultural reality of India eventually evolving into women of communion.

MISSION

- To enhance quality of life through the development of individuals.
- To enable women to become contributors in the economic, social and political development of India.
- To equip the students with 21st century skill-sets with a focus on problem-solving abilities
- To motivate them to work for social justice
- To give preference to the rural economically backward and first-generation learners
- To enable students to be employed in the technology oriented competitive market

VISION OF THE DEPARTMENT

To enhance quality of life through Mathematical skills and its applications

MISSION OF THE DEPARTMENT

To empower the students to contribute to the world of Mathematics by their inventions

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

A graduate of M.Sc. Mathematics programme after five years will be

PEO 1	Our graduates will be academic, digital and information literates, creative, inquisitive, innovative and committed researchers who would be desirous for the “more” in all aspects
PEO 2	They will be efficient individual and team performers who would deliver excellent professional service exhibiting progress, flexibility, transparency, accountability and in taking up initiatives in their professional work
PEO 3	The graduates will be effective managers of all sorts of real – life and professional circumstances, making ethical decisions, pursuing excellence within the time framework and demonstrating apt leadership skills
PEO 4	They will engage locally and globally evincing social and environmental stewardship demonstrating civic responsibilities and employing right skills at the right moment.

GRADUATE ATTRIBUTES (GA)

Fatima College empowers her women graduates holistically. A Fatimite achieves all-round empowerment by acquiring Social, Professional and Ethical competencies. A graduate would sustain and nurture the following attributes:

I. SOCIAL COMPETENCE	
GA 1	Deep disciplinary expertise with a wide range of academic and digital literacy
GA 2	Hone creativity, passion for innovation and aspire excellence
GA 3	Enthusiasm towards emancipation and empowerment of humanity
GA 4	Potentials of being independent
GA 5	Intellectual competence and inquisitiveness with problem solving abilities befitting the field of research
GA 6	Effectiveness in different forms of communications to be employed in personal and professional environments through varied platforms
GA 7	Communicative competence with civic, professional and cyber dignity and decorum
GA 8	Integrity respecting the diversity and pluralism in societies, cultures and religions
GA 9	All – inclusive skill sets to interpret, analyse and solve social and environmental issues in diverse environments
GA 10	Self awareness that would enable them to recognise their uniqueness through continuous self-assessment

	in order to face and make changes building on their strengths and improving their weaknesses
GA 11	Finesse to co-operate exhibiting team-spirit while working in groups to achieve goals
GA 12	Dexterity in self-management to control their selves in attaining the kind of life that they dream for
GA 13	Resilience to rise up instantly from their intimidating setbacks
GA 14	Virtuosity to use their personal and intellectual autonomy in being life-long learners
GA 15	Digital learning and research attributes
GA 16	Cyber security competence reflecting compassion, care and concern towards the marginalised
GA 17	Rectitude to use digital technology reflecting civic and social responsibilities in local, national and global scenario
II. **PROFESSIONAL COMPETENCE**	
GA 18	Optimism, flexibility and diligence that would make them professionally competent
GA 19	Prowess to be successful entrepreuners and become employees of trans-national societies
GA 20	Excellence in Local and Global Job Markets
GA 21	Effectiveness in Time Management
GA 22	Efficiency in taking up Initiatives
GA 23	Eagerness to deliver excellent service
GA 24	Managerial Skills to Identify, Commend and tap Potentials
III. **ETHICAL COMPETENCE**	

GA 25	Integrity and be disciplined in bringing stability leading a systematic life promoting good human behaviour to build better society
GA 26	Honesty in words and deeds
GA 27	Transparency revealing one's own character as well as self-esteem to lead a genuine and authentic life
GA 28	Social and Environmental Stewardship
GA 29	Readiness to make ethical decisions consistently from the galore of conflicting choices paying heed to their conscience
GA 30	Right life skills at the right moment

PROGRAMME OUTCOMES (PO)

On completion (after years) of M. Sc Programme, the graduates would be able to

PO 1	**Acquire advanced research skills by utilising their Mathematical knowledge**
PO 2	**Develop analytical ability and carry out complex activities with an application approach**
PO 3	**Access the effective computability using Mathematical models**

PROGRAMME SPECIFIC OUTCOMES (PSO)

On completion (after two years) of M.Sc. Mathematics programme, the graduates would be able to

PSO 1	Develop proficiency in the analysis of complex mathematical problems and the use of Mathematical or other appropriate techniques to solve them.
PSO 2	Provide a systematic understanding of core mathematical concepts, principles and theories along with their applications.
PSO 3	Demonstrate the ability to conduct Research independently and pursue higher studies towards the Ph. D degree in Mathematics and computing.
PSO 4	Understand the fundamental axioms in Mathematics and develop Mathematical ideas based on them.
PSO 5	Provide advanced knowledge on topics in Pure Mathematics, empowering the students to pursue higher studies.

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

DEPARTMENT OF MATHEMATICS

For those who joined in June 2019 onwards

PROGRAMME CODE: PSMA

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
SEMESTER - I						
19PG1M1	Algebra	6	4	40	60	100
19PG1M2	Real Analysis	6	4	40	60	100
19PG1M3	Number Theory	6	4	40	60	100
19PG1M4	Classical Mechanics	6	4	40	60	100
19M1EDC	Optimization Methods	3	3	40	60	100
	Library	3	-	-	-	-
Total		**30**	**19**			
SEMESTER - II						
19PG2M5	Advanced Algebra	6	4	40	60	100
22PG2M6	Advanced Real Analysis	6	4	40	60	100
19PG2M7	Differential Equations	6	4	40	60	100
19PG2M8	Graph Theory	6	4	40	60	100
19M2EDC	Optimization Methods	3	3	40	60	100
	Library	3	-			
Total		**30**	**19**			
SEMESTER - III						

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
22PG3M9	Measure and Integration	6	4	50	50	100
19PG3M10	Optimization Techniques	6	4	40	60	100
19PG3M11	Combinatorics	6	4	40	60	100
19PG3M12	Topology	6	6	40	60	100
21PG3ME1	Fuzzy sets and Applications	4	4	40	60	100
19PG3ME2	Numerical Analysis	4	4	40	60	100
	Library/Seminar	2	-	-	-	-
Total		**30**	**22**			
SEMESTER - IV						
19PG4M13	Complex Analysis	6	5	40	60	100
19PG4M14	Statistics	6	5	40	60	100
19PG4M15	Methods of Applied Mathematics	6	5	40	60	100
19PG4M16	Functional Analysis	6	5	40	60	100
19PG4ME3/19PG4ME4	Formal Languages/ Algebraic Graph Theory	4	4	40	60	100
19PG4MPR	Project*& Viva Voce	-	3	40	60	100
	Library/Seminar	2	-	-	-	-
Total		**30**	**30**			
	Total	**120**	**90**			

OFF-CLASS PROGRAMME

ADD-ON COURSES

Course Code	Courses	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ESE Mks	Total Marks
	SOFT SKILLS	40	4	I	40	60	100
	COMPUTER APPLICATIONS - LaTex	40	4	II	40	60	100
	MOOC COURSES (Department Specific Courses/any other courses) * Students can opt other than the listed course from UGC-SWAYAM /UGC /CEC	-	Minimum 2 Credits	-	-	-	
	COMPREHENSIVE VIVA (Question bank to be prepared for all the papers by the respective course teachers)	-	2	I-IV	-	-	100
	READING CULTURE	15/ Semester	1	I-IV	-	-	-
	TOTAL		13 +				

EXTRA CREDIT COURSE

Course Code	Courses	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ESE Mks	Total Marks
19PGSLM1	**PROBLEMS IN ADVANCED MATHEMATICS**	-	4	III & IV	40	60	100

- **Summer Internship:**
  - Duration-1 month (2nd Week of May to 2nd week of June-before college reopens)
- **Project:**
  - Off class
  - Evaluation components-Report writing + Viva Voce (Internal marks-50) + External marks 50

- **EDC:**
  - Syllabus should be offered for two different batches of students from other than the parent department in Sem-I & Sem-II

I M.Sc. Mathematics

SEMESTER –I

For those who joined in 2019 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG1M1	Algebra	PG Core	6	4

COURSE DESCRIPTION

This course is designed to emphasis the study of Algebra.

COURSE OBJECTIVES

To enable the students learn Counting principle, Sylow's theorem, Euclidean rings and Solvable groups.

UNITS

UNIT –I COUNTING PRINCIPLE (20 HRS.)

Group Theory: A Counting Principle, **Homomorphisms, Cayley's theorem (self study),** Another Counting Principle.

UNIT –II SYLOW'S THEOREM (20 HRS.)

Sylow's theorem, Direct Products, Finite Abelian Groups.

UNIT –III EUCLIDEAN RINGS (20 HRS.)

The field of Quotients of an Integral Domain, **Euclidean Rings, A Particular Euclidean Ring (self study)**.

UNIT –IV POLYNOMIAL RINGS (15 HRS.)

Polynomial Rings, Polynomials over the Rational Field, Polynomial Rings over Commutative Rings

UNIT –V SOLVABLE GROUPS (15 HRS.)

Solvable groups and Jordan Holder theorem**.**

TEXT BOOKS:

1. Herstein I. N., *Topics in algebra*, John Wiley & Sons, Second Edition, 2002.

2. Surjeet Singh and Qazi Zameeruddin, *Modern algebra*, Vikas Publishing House Pvt.

TEXT BOOK I

UNIT I Chapter 2 : 2.5, 2.7, 2.9, 2.11

UNIT II Chapter 2 : 2.12, 2.13, 2.14

UNIT III Chapter 3 : 3.6, 3.7, 3.8

UNIT IV Chapter 3 : 3.9, 3.10, 3.11

TEXT BOOK II

UNIT V Chapter 5

REFERENCES:

1. Micheal Artin, *Algebra,* Prentice Hall of India, 1991.

2. David M.Fraleigh, *A first course in Modern Algebra* Seventh Edition, Addison Wesley Publishing House, 2006.

3. Serge Lang, *Algebra*, Addison Wesley Publishing House, 1990.

4. Fraleigh J. B., *A first course in Abstract algebra,* , Pearson Education Ltd, 2005.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**COUNTING PRINCIPLE**			
1.1	Group Theory	5	Chalk & Talk	Black Board
1.2	A Counting Principle	4	Chalk & Talk	Black Board
1.3	Homomorphisms	**2**	Discussion, Seminar	Black Board
1.4	Cayley's theorem	**3**	Discussion, Seminar	Black Board
1.5	Another Counting Principle	6	Chalk & Talk	Black Board
UNIT -2	**SYLOW'S THEOREM**			
2.1	Sylow's theorem	7	Chalk & Talk	Black Board
2.2	Direct Products	7	Chalk & Talk	Black Board
2.3	Finite Abelian Groups	6	Chalk & Talk	Black Board
UNIT -3	**EUCLIDEAN RINGS**			
3.1	The field of Quotients of an Integral Domain	7	Chalk & Talk	Black Board
3.2	Euclidean Rings	**7**	Discussion, Seminar	Black Board
3.3	A Particular Euclidean Ring	**6**	Discussion, Seminar	Black Board
UNIT -4	**POLYNOMIAL RINGS**			

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.1	Polynomial Rings	5	Discussion	Black Board
4.2	Polynomials over the Rational Field	5	Discussion	Black Board
4.3	Polynomial Rings over Commutative Rings	5	Discussion	Black Board
UNIT -5 SOLVABLE GROUPS				
5.1	Solvable groups	8	Discussion	Black Board
5.2	Jordan Holder theorem	7	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2 5 Mks.	M1+M2 5+5 =10 Mks	MID-SEM TEST 15 Mks	Once in a Semester 5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	-	-	-	-	-	-	-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30%
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5%
Non Scholastic	-	-	-			5	5	12.5 %

Total	**5**	**10**	**15**	**5**	**35**	**5**	**40 mks.**	**100 %**

CIA	
Scholastic	**35**
Non Scholastic	**5**
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

  K2-*Understand*, **K3**-*Apply*, **K4**-*Analyse*, **K5**-*Evaluate*

EVALUATION PATTERN

SCHOLASTIC				**NON - SCHOLASTIC**	**MARKS**		
C1	**C2**	**C3**	**C4**	**C5**	**CIA**	**ESE**	**Total**
5	**10**	**15**	**5**	**5**	**40**	**60**	**100**

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

COURSE OUTCOMES

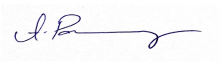
On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Recall various properties of algebraic structures and explain counting principle.	K2 ,K3	PSO1
CO 2	Describe Sylow's theorems and solve problems	K2, K3	PSO3
CO 3	Distinguish Integral Domain and Euclidean Rings	K4	PSO5
CO 4	Classify Rings	K2, K5	PSO2
CO 5	Describe basic concepts of Solvable groups	K2	PSO4

COURSE DESIGNER:

1. **Mrs. Nigila Ragavan**
2. **Dr. Mrs. V. Vanitha**

Forwarded By



(Dr. A. Paulin Mary)

HOD'S Signature & Name

I M.Sc. Mathematics

SEMESTER –I

For those who joined in 2019 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG1M2	Real Analysis	PG Core	6	4

COURSE DESCRIPTION

This course provides a comprehensive idea about the principles of Real Analysis.

COURSE OBJECTIVES

To enable the students learn real number system, metric spaces, limits, continuity and differentiation.

UNITS

UNIT –I THE REAL AND COMPLEX NUMBER SYSTEMS (15 HRS.)

Introduction – Ordered Sets – Fields – The Real Field – The Extended Real Number System–The Complex Field – Euclidean Spaces (excluding appendix)

UNIT –II BASIC TOPOLOGY (15 HRS.)

Finite, Countable and Uncountable Sets – Metric Spaces (self study) – Compact Sets – Perfect Sets – Connected Sets.

UNIT –III NUMERICAL SEQUENCES AND SERIES (20 HRS.)

Convergent sequences – Subsequences – Cauchy's sequences – Upper and lower limits (self study) – Some special sequences – Series : Series of Non negative terms – The number e – The Root and Ratio Tests – Power series – Summation by Parts – Absolute Convergence – Addition and Multiplication of series – Rearrangements.

UNIT –IV CONTINUITY (20 HRS.)

Limit of Functions – Continuous Functions – Continuity and Compactness – Continuity and Connectedness – Discontinuities – Monotonic functions – Infinite Limits and Limits at Infinity.

UNIT –V DIFFERENTIATION (20 HRS.)

The Derivative of a Real Function – Mean Value Theorems – The Continuity of Derivatives – L'Hospital's Rule – Derivatives of Higher Order – Taylor's Theorem – Differentiation of Vector-valued Functions

TEXT BOOK:

Walter Rudin - *Principles of Mathematical Analysis* - McGraw-Hill - Third Edition - 1976.

UNIT I : Chapter: 1
UNIT II : Chapter: 2
UNIT III : Chapter: 3
UNIT IV : Chapter: 4
UNIT V : Chapter: 5

REFERENCES:

1.Richard R. Goldberg - *Methods of Real Analysis* - Oxford & IBH Publishing Company - 1970
2.Apostol - *Mathematical Analysis* - Narosa Publishing House - Twentieth Reprint - 2002.
3. D. Somasundaram and Choudhary - *A first Course in Mathematical Analysis* - Narosa corrected Edition - 1999.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**THE REAL AND COMPLEX NUMBER SYSTEMS**			
1.1	Ordered Sets	4	Chalk & Talk	Black Board
1.2	Fields	3	Chalk & Talk	Black Board
1.3	The Real Field	4	Chalk & Talk	Black Board
1.4	The Extended Real Number System	3	Chalk & Talk	Black Board
1.5	The Complex Field	3	Chalk & Talk	Black Board
1.6	Euclidean Spaces	3	Chalk & Talk	Black Board
UNIT -2	**BASIC TOPOLOGY**			
2.1	Finite	4	Chalk & Talk	Green Board Charts
2.2	Countable and Uncountable Sets	3	Chalk & Talk	Green Board
2.3	Metric Spaces	3	Chalk & Talk	Black Board
2.4	Compact Sets	3	Chalk & Talk	Black Board
2.5	Perfect Sets	3	Chalk & Talk	Black Board
2.6	Connected Sets	4	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -3 NUMERICAL SEQUENCES AND SERIES				
3.1	Convergent sequences, Subsequences	3	Chalk & Talk	Black Board
3.2	Cauchy's sequences	3	Chalk & Talk	Black Board
3.3	Upper and lower limits - Some special sequences	2	Chalk & Talk	Black Board
3.4	Series : Series of Non negative terms – The number e	4	Chalk & Talk	Black Board
3.5	The Root and Ratio Tests	3	Chalk & Talk	Black Board
3.6	Power series – Summation by Parts	3	Chalk & Talk	Black Board
3.7	Absolute Convergence, Addition and Multiplication of series – Rearrangements	2	Chalk & Talk	Black Board
UNIT -4 CONTINUITY				
4.1	Limit of Functions	4	Discussion	Black Board
4.2	Continuous Functions – Continuity and Compactness	4	Discussion	Black Board
4.3	Continuity and Connectedness	4	Discussion	Black Board
4.4	Discontinuities – Monotonic functions	4	Discussion	Black Board
4.5	Infinite Limits and Limits at Infinity	4	Discussion	Black Board
UNIT -5 DIFFERENTIATION				

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.1	The Derivative of a Real Function	4	Discussion	Black Board
5.2	Mean Value Theorems	3	Discussion	Black Board
5.3	The Continuity of Derivatives	3	Discussion	Black Board
5.4	L'Hospital's Rule – Derivatives of Higher Order	3	Discussion	Black Board
5.5	Taylor's Theorem	4	Discussion	Black Board
5.6	Differentiation of Vector-valued Functions	3	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem .Test 15	Once in a Sem. 5	35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA

Scholastic	**35**
Non Scholastic	**5**
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 – Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	**C2**	**C3**	**C4**	**C5**	**CIA**	**ESE**	**Total**
5	**10**	**15**	**5**	**5**	**40**	**60**	**100**

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Describe analysis concepts in Real and Complex Number systems	K1	PSO1& PSO2
CO 2	Explain concepts of metric, compact and connected sets	K2 & K3	PSO3
CO 3	Recall Sequence and series in Real line	K1 & K2	PSO4
CO 4	Differentiate Continuous functions and Uniformly continuous functions	K1 & K4	PSO5
CO 5	Describe Derivatives of functions	K2 & K4	PSO3

COURSE DESIGNER:

3. **Mrs. A. Sheela Roselin**
4. **Dr. Mrs. C. Prasanna Devi**

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature & Name

I M.Sc. Mathematics

SEMESTER –I

For those who joined in 2019 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG1M3	NUMBER THEORY	PG Core	6	4

COURSE DESCRIPTION

This course discovers interesting and unexpected relationships between different sorts of numbers and to prove that these relationships are true.

COURSE OBJECTIVES

To help the students to learn the concepts of Divisibility, Congruences, Quadratic Reciprocity, some functions and Diophantine equations in Number Theory.

UNITS

UNIT –I DIVISIBILITY (15 HRS.)

Introduction, Divisibility, **Primes (Self Study).**

UNIT –II CONGRUENCES (20 HRS.)

Congruences, Solutions of Congruences, Congruences of Degree 1, the Function φ (n), Congruences of Higher Degree, Prime Power Moduli, Prime Modulus, Power Residues.

UNIT –III QUADRATIC RECIPROCITY (15 HRS.)

Quadratic Residues, Quadratic Reciprocity, **The Jacobi Symbol (Self study).**

UNIT –IV SOME FUNCTIONS OF NUMBER THEORY (20 HRS.)

Greatest Integer Function, Arithmetic Functions , the Moebius Inversion Formula, Recurrence Functions.

UNIT –V SOME DIOPHANTINE EQUATIONS (20 HRS.)

Diophantine Equations, The Equation ax + by = c, Positive Solutions, Other Linear Equations, **The Equation $x^2 + y^2 = z^2$ (Self study), The Equation $x^4 + y^4 = z^2$ (Self study)**,Sums of Four and Five Squares, Sum of Fourth Powers, Sum of Two Squares.

TEXT BOOK:

1. Ivan Nivan and Herbert S. Zuckerman, *An Introduction to the Theory of Numbers,* Third Edition, Wiley Eastern Ltd, 1976.

REFERENCES

1. T. M. Apostle, *Introduction to Analytic number theory*, Narosa Publishing House, 1998.

2. D.M.Burton, *Elementary Number Theory*, McGraw Hill Book Company, 7th Edition , 2006.

Unit 1 : Chapter 1 : 1.1 – 1.3

Unit 2 : Chaoter 2 : 2.1 – 2.7 , 2.9

Unit 3 : Chapter 1 : 3.1 – 3.3

Unit 4 : Chapter 1 : 4.1 – 4.3 , 4.5

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**DIVISIBILITY**			
1.1	Introduction	5	Chalk & Talk	Black Board
1.2	Divisibility	5	Chalk & Talk	Black Board
1.3	Primes	**5**	Discussion, Seminar	Black Board
UNIT -2	**CONGRUENCES**			
2.1	Congruences	3	Chalk & Talk	Black Board
2.2	Solutions of Congruences	3	Chalk & Talk	Black Board
2.3	Congruences of Degree 1	3	Chalk & Talk	Black Board
2.4	the Function φ (n)	3	Chalk & Talk	Black Board
2.5	Congruences of Higher Degree	2	Chalk & Talk	Black Board
2.6	Prime Power Moduli	3	Chalk & Talk	Black Board
2.7	Prime Modulus	2	Chalk & Talk	Black Board
2.8	Power Residues	1	Chalk & Talk	Black Board
UNIT -3	**QUADRATIC RECIPROCITY**			
3.1	Quadratic Residues	5	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.2	Quadratic Reciprocity	5	Chalk & Talk	Black Board
3.3	The Jacobi Symbol	**6**	Discussion, Seminar	Black Board
UNIT -4 SOME FUNCTIONS OF NUMBER THEORY				
4.1	Greatest Integer Function	5	Discussion	Black Board
4.2	Arithmetic Functions	5	Discussion	Black Board
4.3	the Moebius Inversion Formula	5	Discussion	Black Board
4.4	Recurrence Functions	5	Discussion	Black Board
UNIT -5 SOME DIOPHANTINE EQUATIONS				
5.1	Diophantine Equations	2	Discussion	Black Board
5.2	The Equation ax + by = c	2	Discussion	Black Board
5.3	Positive Solutions	2	Discussion	Black Board
5.4	Other Linear Equations	2	Discussion	Black Board
5.5	The Equation $x^2 + y^2 = z^2$	**3**	Discussion, Seminar	Black Board
5.6	The Equation $x^4 + y^4 = z^2$	**4**	Discussion, Seminar	Black Board
5.7	Sums of Four and Five Squares	2	Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.8	Sum of Fourth Powers, Sum of Two Squares	2	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2 5 Mks.	M1+M2 5+5 =10 Mks	MID-SEM TEST 15 Mks	Once in a Semester 5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	-	-	-	-	-	-	-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30%
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5%
Non Scholastic	-	-	-			5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

  K2-*Understand***,** **K3-***Apply***,** **K4-***Analyse* , **K5**-*Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non – Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Define and interpret the concepts of divisibility	K2	PSO1
CO 2	Explain properties of congruences	K2	PSO3
CO 3	Apply the Law of Quadratic Reciprocity	K3	PSO5
CO 4	Classify functions of number theory	K4	PSO4
CO 5	Solve Linear Diophantine equation	K3,K5	PSO2

COURSE DESIGNER:

1.Mrs. Nigila Ragavan

2.Dr. Mrs. V. Vanitha

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature & Name

SEMESTER –I

For those who joined in 2019 onwards

Employability-60%

Skill Development – 40%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG1M4	CLASSICAL MECHANICS	PG Core	6	4

COURSE DESCRIPTION

This course provides a sound knowledge of the concepts and principles in mechanics.

COURSE OBJECTIVES

The aim of the course is to help the students to understand mechanics of a particle, Lagrange's equations, Hamilton's principles, Two body problem and Kepler's problem and apply it for solving problems.

UNITS

UNIT –I MECHANICS OF A PARTICLE (15 HRS.)

Mechanics of a particle, Mechanics of a system of particles, Constraints, D'Alambert's principle.

UNIT –II LAGRANGE'S EQUATIONS (15HRS.)

Lagrange's equations, velocity – dependent potentials and the dissipation function, simple application of the Lagrangian formulation

UNIT –III HAMILTON'S PRINCIPLE (20 HRS.)

Hamilton's principle, some techniques of the calculus of variations, Derivation of Lagrange's equation from Hamilton's principle

UNIT –IV: LAGRANGE'S EQUATIONS FOR NON-HOLONOMIC SYSTEMS AND SYMMETRIC PROPERTIES (20HRS.)

Extension of Hamilton's principle to non-holonomic systems, **Advantages of a variational principle formulation (self study)**, conservation theorems and symmetry properties.

UNIT –V CLASSIFICATION OF ORBITS (20 HRS.)

Two body central force problem – reduction to the equivalent one-body problem – the equations of motions and first integrals – the equivalent one -dimensional problem and classification of orbits – the Virial theorem – **the differential equation for the orbit and integrable power law potentials – The Kepler problem; Inverse square law of force - The motion in time in the Kepler's problem-The Laplace –Runge-Lenz vector(self study**)

TEXT BOOK:

1..Herbert Goldstein , *Classical Mechanics* , Narosa Publishing House, Second Edition, 2001.

UNIT I : Chapter: 1(1.1-1.4)
UNIT II : Chapter: 1(1.4-1.6)
UNIT III : Chapter: 2(2.1-2.3)
UNIT IV : Chapter: 2(2.4-2.6)
UNIT V : Chapter: 3(3.1- 3.5,3.7- 3.9)

REFERENCES:

1. Rutherford,*Classical Mechanics,* Oliver and Boyd Ltd, 1964

2. RanaN.C. and JoagR.S., *Classical Mechanics,* TMH Publishers

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**MECHANICS OF A PARTICLE**			
1.1	Mechanics of a particle	4	Chalk & Talk	Black Board
1.2	Mechanics of a system of particles	4	Chalk & Talk	Black Board
1.3	Constraints	4	Chalk & Talk	Black Board
1.4	D'Alambert's principle	3	Chalk & Talk	Black Board
UNIT -2	**LAGRANGE'S EQUATIONS**			
2.1	Lagrange's equations	4	Chalk & Talk	Black Board
2.2	Velocity – dependent potentials and the dissipation function	5	Chalk & Talk	Black Board
2.3	Simple application of the Lagrangian formulation	6	Discussion	Black Board
UNIT -3	**HAMILTON'S PRINCIPLE**			
3.1	Hamilton's principle	6	Chalk & Talk	Black Board
3.2	Some techniques of the calculus of the variations	8	Chalk & Talk	Black Board
3.3	Derivation of Lagrange's equation from Hamilton's principle	6	Chalk & Talk	Black Board
UNIT -4	**LAGRANGE'S EQUATIONS FOR NON-HOLONOMIC SYSTEMS AND SYMMETRIC PROPERTIES**			

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.1	Extension of Hamilton's principle to non-holonomic systems	5	Chalk & Talk	Black Board
4.2	Advantages of a variational principle formulation	6	Discussion	Black Board
4.3	conservation theorems and symmetric properties	9	Discussion	Black Board
UNIT -5 CLASSIFICATION OF ORBITS				
5.1	Two body problem, reduction to the equivalent one body problem	2	Discussion	Black Board
5.2	The equations of motions and first integrals	3	Discussion	Black Board
5.3	The equivalent one dimensional problem and classification of orbits- The Virial theorem	4	Discussion	Black Board
5.4	The differential equation for the orbit and integrable power law potential	3	Discussion	PPT
5.5	The Kepler problem; Inverse square law of force.	5	Discussion	PPT
5.6	The motion in time in the Kepler's problem-The Laplace –Runge-Lenz vector	4	Discussion	PPT

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem .Test 15	Once in a Sem. 5	35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 – Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non – Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Describe the behaviour of a particle, the system of particles and D'Alambert's principle.	K2	PSO2
CO 2	Solve problems using Lagrangian formulation	K2& K3	PSO1
CO 3	Explain Hamilton's principle in Physical reality	K2,K3 & K4	PSO3
CO 4	Construct Lagrange's equation for non - holonomic system	K2, K3 & K4	PSO4

CO 5	Apply the laws of forces in central orbit to solve Kepler's problem	K2, K4&K5	PSO5

COURSE DESIGNER:

1.Dr. A. Paulin Mary

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature & Name

SEMESTER –I

For those who joined in 2019 onwards

Skill Development -60%

Entreprenuership – 40%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSMA	19M1EDC/ 19M2EDC	OPTIMIZATION METHODS	PG EDC	3	3

COURSE DESCRIPTION

This course helps the students to convert real life problems into mathematical models and solve them using various techniques.

COURSE OBJECTIVES

To enable the students to learn Transportation, Assignment Problems, Sequencing Problem and Game Theory.

UNITS

UNIT –I TRANSPORTATION PROBLEM **(9 HRS)**

Transportation Problem: Mathematical formulation - Existence of feasible solution - Feasible solution by (i) North – West corner rule (ii) Matrix – Minima method (iii) Vogel's approximation method.

UNIT –II MODIFIED DISTRIBUTION METHOD **(9HRS)**

Optimal solution to a T.P by modified distribution method – **Degeneracy in T.P – Unbalanced T.P .(Self Study)**

UNIT –III ASSIGNMENT PROBLEM **(9HRS)**

Introduction – Mathematical formulation of the problem – The assignment method – **Special cases in assignment problems.(Self study)**

UNIT –IV SEQUENCING PROBLEM (9 HRS)

Introduction – problem of sequencing – Basic terms used in sequencing – Processing n jobs through two machines – Processing n jobs through k machines – Processing 2 jobs through k machines.

UNIT –V GAME THEORY

Introduction – Two person zero sum games – Some basic terms - The maximin-minimax principle–Games without saddle points – mixed strategies – Graphical solution of 2 x n and m x 2 games – Dominance property .

REFERENCES:

1. Kanti Swarup, P.K.Gupta, Man Mohan - Operations Research, 2006 – Sultan Chand & Sons, New Delhi.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT –I TRANSPORTATION PROBLEM				
1.1	Transportation Problem: Mathematical formulation - Existence of feasible solution	1	Chalk & Talk	Black Board
1.2	Feasible solution by North – West corner rule	2	Chalk & Talk	Black Board
1.3	Feasible solution by Matrix – Minima method	2	Chalk & Talk	Black Board
1.4	Feasible solution by Vogel's approximation method.	2	Chalk & Talk	Black Board
UNIT –II MODIFIED DISTRIBUTION METHOD				
2.1	Optimal solution to a T.P by modified distribution method	4	Chalk & Talk	Black Board
2.2	Degeneracy in T.P – Unbalanced T.P.	5	Discussion	Black Board
UNIT –III ASSIGNMENT PROBLEM				

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.1	Introduction – Mathematical formulation of the problem	1	Chalk & Talk	Black Board
3.2	The assignment method	4	Chalk & Talk	Black Board
3.3	Special cases in assignment problems.	4	Discussion	Black Board
UNIT –IV SEQUENCING PROBLEM				
4.1	Introduction – problem of sequencing – Basic terms used in sequencing	1	Chalk & Talk	Black Board
4.2	Processing n jobs through two machines	2	Chalk & Talk	Black Board
4.3	Processing n jobs through k machines	2	Chalk & Talk	Black Board
4.4	Processing 2 jobs through k machines.	2	Chalk & Talk	Black Board
UNIT –V GAME THEORY				
5.1	Introduction – Two person zero sum games – Some basic terms	2	Chalk & Talk	Black Board
5.2	The maximin-minimax principle – Games without saddle points	3	Chalk & Talk	Black Board
5.3	Mixed strategies – Graphical solution of 2 x n and m x 2 games – Dominance property .	4	Chalk & Talk	Black Board

Levels	C1	C2	C3	Total Scholastic Marks	Non Scholastic Marks C4	CIA Total	% of Assessment
	Weekly 5 Mks	Monthly 10 Mks.	MID-SEM TEST 20 Mks	35 Mks.	5 Mks.	40Mks.	
K1	-	5	5	10	-	10	25 %
K2	-	5	8	13	-	13	32.5 %
K3	5	-	7	12	-	12	30 %
Non Scholastic	-	-	-		5	5	12.5 %
Total	5	10	20	35	5	40	100 %

CIA	
Scholastic	**35**
Non Scholastic	**5**
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I UG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 – Evaluate*

EVALUATION PATTERN

SCHOLASTIC			NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	CIA	ESE	Total
5	10	20	5	40	60	100

C1 Weekly Test

C2 –Monthly Test

C3 – Mid-Sem Test

C4 – Non – Scholastic

COURSE OUTCOMES

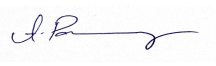
On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Distinguish Transportation problem and Assignment problem.	K2	PSO1& PSO2
CO 2	Classify the methods of finding IBFS to a transportation problem.	K2, K3,	PSO3
CO 3	Explain assignment problem and solve.	K2 & K4	PSO5
CO 4	Solve Sequencing problem.	K2, K3 & K4	PSO2
CO 5	Define two person zero sum game, saddle point and solve problems	K3 & K5	PSO4

COURSE DESIGNER:

1. **Sr. Fatima Mary**

Forwarded By



(Dr.A.Paulin Mary)

HOD'S Signature & Name

I M.Sc. Mathematics

SEMESTER –II

For those who joined in 2019 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG2M5	ADVANCED ALGEBRA	PG Core	6	4

COURSE DESCRIPTION

This course enables the students to study some advanced concepts in Algebra.

COURSE OBJECTIVES

To study the Dual spaces, Matrices, Linear Transformations and Galois Theory.

UNITS

UNIT –I DUAL SPACES (15 HRS.)

Dual spaces, the algebra of linear transformations, Characteristic roots.

UNIT –II MATRICES & TRANSFORMATIONS (20 HRS.)

Matrices (Self-study),Canonical forms: triangular form, Nilpotent transformations.

UNIT –III TYPES OF LINEAR TRANSFORMATIONS (15 HRS.)

Hermitian, Unitary and Normal transformations, **Real quadratic forms. (Self-study).**

UNIT –IV ROOTS IN EXTENSION FIELDS (20 HRS.)

Extension Fields, Roots of polynomials, **More about roots (Self-study).**

UNIT –V GALOIS THEORY (15 HRS.)

The elements of Galois Theory, Solvability by radicals, **Finite fields (Self-study)**

TEXT BOOK:

1) I. N. Herstein -*Topics in algebra,* 2nd Edition, John Wiley and Sons, 2002.

UNIT I : Chapter 4 (Section 4.3) , Chapter 6 (Section 6.1, 6.2)

UNIT II : Chapter 6 (Section 6.3, 6.4, 6.5)

UNIT III : Chapter 6 (Section 6.10 , 6.11)

UNIT IV : Chapter 5 (Section 5.1 , 5.3, 5.5)

UNIT V : Chapter 5 (Section 5.6) , Section 5.7 (Lemma 5.7.3, Theorms 5.7.2 & 5.7.3)

Chapter 7 (Section 7.1)

REFERENCES:

1. Micheal Artin - *Algebra,* Prentice Hall of India, 2002.

2. Surjeet Singh and Quazi Zameeruddin - *Modern Algebra,* 7th Edition, Vikas Publishing House Pvt Ltd., 1990.

3. K. Hoffman and R. Kunze - *Linear Algebra,* Prentice Hall, 1972.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT - 1	**DUAL SPACES**			
1.1	Dual spaces	5	Chalk & Talk	Green Board
1.2	the algebra of linear transformations	5	Chalk & Talk	Green Board
1.3	Characteristic roots	5	Chalk & Talk	Green Board
UNIT - 2	**MATRICES & TRANSFORMATIONS**			
2.1	Matrices	**4**	Discussion, Seminar	Green Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.2	Canonical forms : Triangular form	8	Chalk & Talk	Green Board
2.3	Nilpotent Trransformations	8	Chalk & Talk	Green Board
UNIT - 3 TYPES OF LINEAR TRANSFORMATIONS				
3.1	Hermitian, Unitary and Normal Transformations	12	Chalk & Talk	Green Board
3.2	Real Quadratic forms	**3**	Discussion, Seminar	Green Board
UNIT - 4 ROOTS IN WXTENSION FIELDS				
4.1	Extension Fields	8	Chalk & Talk	Green Board
4.2	Roots of polynomials	7	Chalk & Talk	Green Board
4.3	More about roots	**5**	Discussion, Seminar	Green Board
UNIT - 5 GALOIS THEORY				
5.1	The elements of Galois Theory	6	Chalk & Talk	Green Board
5.2	Solvability by radicals	8	Chalk & Talk	Green Board
5.3	Finite Fields	**6**	Discussion, Seminar	Green Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2	M1+M2	MID-SEM TEST	Once in a Semester				

	5 Mks.	5+5 =10 Mks	15 Mks	5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	-	-	-	-	-	-	-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30%
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5%
Non Scholastic	-	-	-			5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	**35**
Non Scholastic	**5**
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

  K2-*Understand*, **K3**-*Apply*, **K4**-*Analyse* , **K5**-*Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

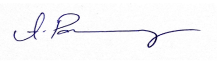
COURSE OUTCOMES

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Appraise characteristic roots of linear transformations	K5	PSO1& PSO2
CO 2	Explain Matrices and Nilpotent transformation	K2, K4	PSO3
CO 3	Classify transformations	K4	PSO5
CO 4	Describe various concepts of fields	K2, K4	PSO4
CO 5	Analyse Galois theory	K4	PSO3

COURSE DESIGNER:

1.Mrs NIGILA RAGAVAN

Forwarded By



(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER –II

For those who joined in 2022 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	22PG2M6	ADVANCED REAL ANALYSIS	PG Core	6	4

COURSE DESCRIPTION

This course enables the students to study some advanced concepts in Real Analysis.

COURSE OBJECTIVES

To study the Riemann integral, sequences and series of functions and special functions.

UNIT –I THE RIEMANN - STIELTJES INTEGRAL [20 HRS.]

Definition and Existence of the Integral – Properties of the Integral – Integration and Differentiation – Integration of Vector-valued Functions – Rectifiable Curves.

UNIT –II SEQUENCES AND SERIES OF FUNCTIONS [20HRS.]

Discussion of Main problem – Uniform Convergence – Uniform Convergence and Continuity – Uniform Convergence and Integration – Uniform Convergence and Differentiation – Equicontinuous Families of Functions – The Stone-Weierstrass Theorem.

UNIT –III SOME SPECIAL FUNCTIONS [20 HRS.]

Power Series – The Exponential and Logarithmic Functions – The Trigonometric Functions.

UNIT –IV SOME SPECIAL FUNCTIONS [15 HRS.]

The Algebraic Completeness of the Complex Field – Fourier Series – The Gamma Function.

UNIT –V FUNCTIONS OF SEVERAL VARIABLES [20 HRS.]

Linear Transformations – Differentiation – The Contraction Principle – The Inverse Function Theorem.

TEXT BOOK:

1.Walter Rudin, *Principles of Mathematical Analysis*, McGraw-Hill, Third edition, 1976.

UNIT I : Chapter : 6
UNIT II : Chapter : 7
UNIT III : Chapter : 8- pages 172 - 184
UNIT IV : Chapter : 8- pages 184 - 195
UNIT V : Chapter : 9- pages 204-223

REFERENCES:

1. Richard R. Goldberg, *Methods of Real Analysis,* Oxford & IBH Publishing Company,1970
2. Apostol, *Mathematical Analysis* - Narosa Publishing House, Twentieth Reprint, 2002.
3. D. Somasundaram and Choudhary, *A first Course in Mathematical Analysi,* Narosa corrected Edition, 1999.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	
UNIT -1			**THE RIEMANN - STIELTJES INT**	
1.1	Definition and Existence of the Integral	4	Chalk & Talk	
1.2	Properties of the Integral	5	Chalk & Talk	
1.3	Integration and Differentiation	4	Lecture	Black Board
1.4	Integration of Vector-valued Functions	5	Lecture	Black Board
1.5	Rectifiable Curves	2	Lecture	Black Board
UNIT - 2	**SEQUENCES AND SERIES OF FUNCTIONS**			
2.1	Discussion of Main problem, Uniform Convergence	4	Lecture	
2.2	Uniform Convergence and Continuity	3	Chalk & Talk	
2.3	Uniform Convergence and Integration	2	Chalk & Talk	Black Board
2.4	Uniform Convergence and Differentiation	6	Chalk & Talk	
2.5	Equicontinuous Families of Functions	3	Chalk & Talk	
2.6	The Stone-Weierstrass Theorem	2	Chalk & Talk	
UNIT -3	**SOME SPECIAL FUNCTIONS**			
3.1	Power Series	5	Chalk & Talk, Discussion	

Module No.	Topic	No. of Lectures	Teaching Pedagogy	
3.2	The Exponential and Logarithmic Functions	3	Chalk & Talk, Discussion	
3.3	The Trigonometric Functions	3	Chalk & Talk, Discussion	
		UNIT -4	**SOME SPECIAL FUNCTIONS**	
4.1	The Algebraic Completeness of the Complex Field	2	Chalk & Talk	
4.2	Fourier Series	3	Chalk & Talk, Discussion	
4.3	The Gamma Function	4	Chalk & Talk, Discussion	
		UNIT - 5	**FUNCTIONS OF SEVERAL VARIABL**	
5.1	Linear Transformations	4	Discussion	
5.2	Differentiation	6	Discussion	
5.3	The Contraction Principle	5	Discussion	
5.4	The Inverse Function Theorem	5	Discussion	

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2	M1+M2	Mid-Sem .Test	Once in a Sem.				
	5	5+5=10	15	5	35	5	40	

K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

All the course outcomes are to be assessed in the various CIA components.

✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

***K2**-Understand, **K3**-Apply, **K4**-Analyse, K5 – Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	**C2**	**C3**	**C4**	**C5**	**CIA**	**ESE**	**Total**
5	**10**	**15**	**5**	**5**	**40**	**60**	**100**

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non – Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED	PSOs ADDRESSED

		BLOOM'S TAXONOMY)	
CO 1	Identify Riemann Integral and Riemann - Stieltjes Integral	K5	PSO1& PSO2
CO 2	Explain Uniform convergence of functions	K2	PSO1& PSO4
CO 3	Define Power Series and Logarithmic Functions	K3	PSO1& PSO4
CO 4	Define Fourier Series and Gamma Function	K2 & K3	PSO3 & PSO5
CO 5	Describe Linear Transformations and Explain Inverse function theorem	K2 & K4	PSO 3 & PSO5

COURSE DESIGNER:

1. Dr. Mrs. C. Prasanna Devi

2. Mrs. A. Sheela Roselin

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature& Name

I M.Sc. Mathematics

SEMESTER –II

For those who joined in 2019 onwards

Employability - 100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG2M7	DIFFERENTIAL EQUATIONS	PG Core	6	4

COURSE DESCRIPTION

This course will provide the knowledge for solving of ordinary and partial differential equations in physical and other phenomena.

COURSE OBJECTIVES

To give an in-depth knowledge for solving differential equations which are frequently used in Physics, Chemistry, Biology, Economics and Mechanics.

UNITS

UNIT –I: LINEAR EQUATIONS WITH CONSTANT COEFFICIENTS (20 HRS)

Introduction-The second order homogeneous equation-Initial value problems for second order equations - Linear dependence and independence-A formula for the Wronskian - the non-homogeneous equation of order two- the homogeneous equation of order n- Initial value problems for n-th order equations-the non homogeneous equation of order n.

UNIT –II LINEAR EQUATIONS WITH VARIABLE COEFFICIENT (20 HRS)

Initial value problems for the homogeneous equations – solutions of the homogeneous equations – The Wronskian and linear independence – reduction of the order of a homogeneous equation - the non-homogeneous equation- homogeneous equation with analytic coefficients – the Legendre equation- Justification of the power series method

UNIT –III: LINEAR EQUATIONS WITH REGULAR SINGULAR POINTS

(15 HRS)

The Euler equation – second order equations with regular singular points – an example – The Bessel Equation – The Bessel Equations (Continued).

UNIT –IV PARTIAL DIFFERENTIAL EQUATIONS OF THE FIRST ORDER

(20 HRS)

Linear equations of the first order – integral surfaces passing through a given curve – Compatible systems of first order equations - **Charpit's method** – **solutions satisfying given conditions – Jacobi's method.**

UNIT –V PARTIAL DIFFERENTIAL EQUATIONS OF THE SECOND ORDER

(15 HRS)

The origin of second order equations – linear partial equations with constant coefficients (self study) – equations with variable coefficients – separation of variables.

TEXT BOOKS:

1. Earl. A. Coddington, *An Introduction to Ordinary Differential Equations,* Prentice Hall of India – 1987

Unit I **:** Chapter 2: 2.1- 2.8, 2.10

Unit II **:** Chapter 3**:** 3.1 - 3.9

Unit III **:** Chapter 4 **:** 4.1 - 4.3, 4.7 - 4.8

2. Ian Sneddon -*Elements of Partial differential equations,* McGraw-Hill International Editions, 1986

Unit IV **:** Chapters 2: 2.4 - 2.5, 2.9 - 2.13

Unit V **:** Chapters 3**:** 3.1, 3.4, 3.5, 3.9

REFERENCES:

1. S. G. Deo, & V. Raghvendra Rao- *Ordinary Differential Equations and stability Theory* - Prentice Hall Second Edition - 1988
2. John. F, Narosa - *Partial Differential Equations* - 3rd Edition – 1979
3. D. Somasundaram, Narosa - *Ordinary Differential Equations* -Narosa Publishing House - Fifth Reprint -2011.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**LINEAR EQUATIONS WITH CONSTANT COEFFICIENTS**			
1.1	Introduction-The second order homogeneous equation	3	Chalk & Talk	Black Board
1.2	Initial value problems for second order equations	3	Chalk & Talk	Black Board
1.3	Linear dependence and independence	3	Chalk & Talk	Black Board
1.4	A formula for the Wronskian	3	Chalk & Talk	Black Board
1.5	The non-homogeneous equation of order two, the homogeneous equation of order n	4	Chalk & Talk	Black Board
1.6	Initial value problems for n-th order equations-the non homogeneous equation of order n.	4	Chalk & Talk	Black Board
UNIT -2	**LINEAR EQUATIONS WITH VARIABLE COEFFICIENTS**			
2.1	Initial value problems for the homogeneous equations	3	Chalk & Talk	Black Board
2.2	Solutions of the homogeneous equations	3	Chalk & Talk	Black Board
2.3	The Wronskian and linear independence	3	Chalk & Talk	Black Board
2.4	Reduction of the order of the homogeneous equation	3	Chalk & Talk	Black Board
2.5	The non-homogeneous equation- homogeneous equation with analytic coefficients	4	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.6	The Legendre equation, Justification of the power series Method.	4	Chalk & Talk	Black Board
UNIT -3	**LINEAR EQUATIONS WITH REGULAR SINGULAR POINTS**			
3.1	The Euler equation	4	Chalk & Talk	Black Board
3.2	second order equations with regular singular points – an example	4	Chalk & Talk	Black Board
3.3	Bessel Equation	4	Chalk & Talk	Black Board
3.4	The Bessel Equations (Continued).	3	Chalk & Talk	Black Board
UNIT -4	**PARTIAL DIFFERENTIAL EQUATIONS OF THE FIRST ORDER**			
4.1	Linear equations of the first order	2	Chalk & Talk	Black Board
4.2	Integral surfaces passing through a given curve	4	Chalk & Talk	Black Board
4.3	Compatible systems of first order equations	4	Chalk & Talk	Black Board
4.4	Charpit's method	3	Discussion	Black Board
4.5	Solutions satisfying given conditions	4	Discussion	Black Board
4.6	Jacobi's method	3	Discussion	Black Board
UNIT -5	**PARTIAL DIFFERENTIAL EQUATIONS OF THE SECOND ORDER**			
5.1	The origin of second order equations	4	Discussion	PPT

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.2	Linear partial equations with constant coefficients	4	Discussion	PPT
5.3	Equations with variable coefficients	4	Discussion	Black Board
5.4	Separation of variables	3	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2	M1+M2	Mid-Sem .Test	Once in a Sem.				
	5	5+5=10	15	5	35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

✔ **All the course outcomes are to be assessed in the various CIA components.**

✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 – Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED	PSOs ADDRESSED

		BLOOM'S TAXONOMY)	
CO 1	Define Linear differential equations with constant coefficients and prove different theorems and solve problems.	K2&K3	PSO2
CO 2	Solving problems of the n^{th} order in differential equations with variable coefficients	K2& K3	PSO1
CO 3	Identify Regular singular points and derive Bessel's Equation.	K2 & K3	PSO4
CO 4	Explain the methods of solving problems in partial differential equations of first order.	K2, K3&K4	PSO5
CO 5	Form Partial differential equations of the second order and solve problems in partial differential equations of second order.	K2,K3, K4&K5	PSO3

COURSE DESIGNER:

1. Dr.Mrs. A. Paulin Mary

Forwarded By

(Dr.A. Paulin Mary)

HOD'S Signature& Name

I M.Sc. Mathematics

SEMESTER –II

For those who joined in 2019 onwards

Employability-60%

Skill Development-40%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG2M8	GRAPH THEORY	PG Core	6	4

COURSE DESCRIPTION

This course enables the students to study some advanced concepts in Graph Theory.

COURSE OBJECTIVES

To study the concepts of Connectivity, Digraphs, Matchings, Planarity and Domination in Graphs.

UNITS

UNIT –I CONNECTIVITY (15 HRS)

Cut vertices, Blocks, Connectivity, Menger's theorem.

UNIT –II TRAVERSABILITY (20 HRS)

Eulerian graphs, Hamiltonian graphs, **Hamiltonian walks and numbers (self study).**

UNIT –III DIGRAPHS, MATCHINGS AND FACTORIZATION (20 HRS)

Strong digraphs, Tournaments, Matchings, Factorization.

UNIT –IV PLANARITY AND COLORING (20 HRS)

Planar graphs, Four color problem, Vertex coloring, **edge coloring (self study)**.

UNIT –V DISTANCE AND DOMINATION (15 HRS)

The center of a graph, **distant vertices (self study)**, the domination number of a graph.

TEXT BOOK:

1.Gary Chartrand and Ping Zhang ,*Introduction to graph theory*, Tata McGraw Hill Publishing Company Ltd, Edition 2006.

UNIT I: Chapters 5: Sections 5.1 - 5.4,
UNIT II: Chapter 6: Sections 6.1 - 6.3
UNIT III: Chapter 7: Sections 7.1, 7.2,
Chapter 8: Sections 8.1, 8.2
UNIT IV: Chapter 9: Section 9.1
Chapter 10: Sections 10.1 - 10.3

UNIT V: Chapter 12: Sections 12.1, 12.2
Chapter13: Section 13.1

REFERENCES

1. Harary ,*Graph Theory*, Narosa Publishing Company, 2001
2. Douglas West, *Introduction to graph Theory,* Pearson Prentice Hall, 2nd Edition, 2006.
3. Bondy J. A and Murty V. S. R, *Graph Theory with applications* Macmillan Press Ltd, 1976.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	UNIT -1 CONNECTIVITY			

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
1.1	Cut vertices	4	Chalk & Talk	Black Board
1.2	Blocks,	4	Chalk & Talk	Black Board
1.3	Connectivity	4	Chalk & Talk	Black Board
1.4	Menger's theorem	3	Chalk & Talk	Black Board
UNIT -2 TRAVERSABILITY				
2.1	Eulerian graphs	7	Chalk & Talk	Black Board
2.2	Hamiltonian graphs	6	Chalk & Talk	Black Board
2.3	Hamiltonian walks and numbers	7	Chalk & Talk, Discussion	Black Board
UNIT -3 DIGRAPHS, MATCHINGS AND FACTORIZATION				
3.1	Strong digraphs	5	Chalk & Talk	Black Board
3.2	Tournaments	5	Chalk & Talk	Black Board
3.3	Matchings	5	Chalk & Talk	Black Board
3.4	Factorization	5	Chalk & Talk	Black Board
UNIT 4 PLANARITY AND COLORING				
4.1	Planar graphs	5	Discussion	Black Board
4.2	Four color problem	5	Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.3	Vertex coloring	4	Discussion	Black Board
4.4	edge coloring	6	Discussion	Black Board
UNIT 5 DISTANCE AND DOMINATION				
5.1	The center of a graph	5	Discussion	Black Board
5.2	distant vertices	5	Discussion	Black Board
5.3	the domination number of a graph	5	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment

	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem .Test 15	Once in a Sem. 5	 35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 – Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	**C2**	**C3**	**C4**	**C5**	**CIA**	**ESE**	**Total**
5	**10**	**15**	**5**	**5**	**40**	**60**	**100**

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Build the knowledge of Connectivity in graphs	K1	PSO1& PSO2
CO 2	Identify Eulerian and Hamiltonian graphs	K1 & K4	PSO2 & PSO4
CO 3	Explain Digraphs, Matchings and Factorization in graphs	K1 & K3	PSO4 & PSO5
CO 4	Describe Planarity and Coloring in graphs	K2 & K3	PSO3 & PSO4
CO 5	Define and Explain Domination in graph	K2 & K4	PSO3 & PSO5

COURSE DESIGNER:

1. **Mrs. A. Sheela Roselin**
2. **Dr. Sr. M. Fatima Mary**

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature & Name

II M.Sc. Mathematics

SEMESTER –III

For those who joined in 2022 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	22PG3M9	MEASURE AND INTEGRATION	PG Core	6	4

COURSE DESCRIPTION

This course presents the fundamental concepts and techniques of measure theory. It includes measures, measurable sets, functions, integrals as measures, modes of convergence and product measure.

COURSE OBJECTIVES

To provide the students a comprehensive idea about the measures on the real line, Integration of Functions of a real variable, Abstract Measure Spaces, Signed Measure.

UNITS

UNIT –I MEASURE ON THE REAL LINE (20 HRS.)

Lebesgue outer Measure, Measurable sets, Regularity.

UNIT –II MEASURE ON THE REAL LINE (20 HRS.)

Measurable functions, Borel and Lebesgue Measurability.

UNIT –III INTEGRATION OF FUNCTIONS OF A REAL VARIABLE (20 HRS.)

Integration of non-negative functions, the general integral, integration of series, Riemann and Lebesgue integrals.

UNIT –IV ABSTRACT MEASURE SPACES (20 HRS.)

Measures and outer Measures, Extension of a Measure, Uniqueness of extension, Completion of a Measure, Measure spaces and Integration with respect to a Measure.

UNIT –V SIGNED MEASURES (15HRS.)

Signed Measures and Hahn Decomposition, The Jorden Decomposition and the Radon – Nikodym Theorem.

TEXT BOOK:

1) G.de Barra, *Measure Theory and Integration*, New age International (p) Ltd. Publishers, 2008.

REFERENCES

1. Royden H.L, *Real Analysis,* Prentice Hall of India Pvt. Ltd, 2004

2. Paul R. Halmos, *Measure Theory*, Narosa Publishing House, 2000.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**MEASURE ON THE REAL LINE**			

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
1.1	Lebesgue outer Measure	4	Chalk & Talk	Black Board
1.2	Measurable sets	5	Chalk & Talk	Black Board
1.3	Regularity	5	Chalk & Talk	Black Board
UNIT -2 MEASURE ON THE REAL LINE				
2.1	Measurable functions	3	Chalk & Talk	Black Board
2.2	Borel and Lebesgue Measurability	3	Chalk & Talk	Black Board
UNIT -3 INTEGRATION OF FUNCTIONS OF A REAL VARIABLE				
3.1	Integration of non-negative functions	5	Chalk & Talk	Black Board
3.2	the general integral	5	Chalk & Talk	Black Board
3.3	integration of series	5	Chalk & Talk	Black Board
3.4	Riemann and Lebesgue integrals	5	Chalk & Talk	Black Board
UNIT -4 ABSTRACT MEASURE SPACES				
4.1	Measures and outer Measures	4	Chalk & Talk	Black Board
4.2	Extension of a Measure	4	Chalk & Talk	Black Board
4.3	Uniqueness of extension	4	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.4	Completion of a Measure	3	Chalk & Talk	Black Board
4.5	Measure spaces and Integration with respect to a Measure	5	Chalk & Talk	Black Board
UNIT -5 SIGNED MEASURES				
5.1	Signed Measures and Hahn Decomposition and The Jorden Decomposition	6	Discussion	Black Board
5.2	The Radon – Nikodym Theorem	9	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem .Test 15	Once in a Sem. 5	35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

✔ **All the course outcomes are to be assessed in the various CIA components.**

✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 - Evaluate*

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Scholas	
Non Scho	

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explain Lebesgue measurable sets and measurability	K2	PSO1& PSO2
CO 2	Explain measurable functions	K5	PSO2 & PSO4
CO 3	Classify Riemann and Lebesgue Integrals	K5	PSO2 & PSO4
CO 4	Describe Abstract measure spaces	K3 & K4	PSO1
CO 5	Define Signed Measures and distinguish Hahn Decomposition and Jorden Decomposition	K2 & K3	PSO5

COURSE DESIGNER:

1. Dr. Mrs. C. Prasanna Devi

2. Mrs. Nigila Ragavan

Forwarded By

(Dr.A. Paulin Mary)

HOD'S Signature& Name

II M.Sc. Mathematics

SEMESTER –III

For those who joined in 2019 onwards

Skill Development – 60%

Entrepreneurship – 40%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG3M10	OPTIMIZATION TECHNIQUES	PG	6	4

COURSE DESCRIPTION

This course makes the better decisions in complex scenarios by the application of a set of advanced analytical methods.

COURSE OBJECTIVES

To enable the students to become aware of and appreciate the potential of the theory of optimization and to introduce various decision making tools and techniques based on optimization.

UNITS

UNIT –I REVISED SIMPLEX METHOD (15 HRS.)

Introduction, Standard forms for Revised Simplex Method, Computational Procedure for Standard Form I, Comparison of Simplex Method and Revised Simplex Method.

UNIT –II INTEGER LINEAR PROGRAMMING (20 HRS.)

Introduction, Types of Integer Linear Programming Problems, Enumeration and Cutting Plane Solution Concept, Gomory's All Integer Cutting Plane Method , **Gomory's mixed Integer Cutting Plane method(Self Study)** , Branch and Bound Method

UNIT –III DYNAMIC PROGRAMMING (15 HRS.)

Introduction, Dynamic Programming Terminology, Developing Optimal Decision Policy, Dynamic Programming Under Certainty, **Dynamic**

Programming Approach for Solving Linear Programming Problem(Self Study).

UNIT –IV DETERMINISTIC INVENTORY CONTROL MODEL (20 HRS.)

Introduction, The Meaning of Inventory Control, Functional Role of Inventory, Reasons of Carrying Inventory, Factors Involved in Inventory Problem Analysis, Inventory Model building, Inventory Control Models without Shortage, **Inventory Control Models with Shortages (Self Study)**

UNIT –V QUEUING THEORY (20 HRS.)

Introduction, The structure of Queuing system, Performance Measures of a Queuing system, Probability Distributions in Queuing systems, Classification of Queuing Models, **Single server Queuing Models, Multi server Queuing Models, Finite calling population Queuing Models (Self Study)**

TEXT BOOK:

1.J.K. Sharma, *Operations Research Theory and Applications,*Second Edition, Macmillan (India) New Delhi 2005

REFERENCES:

1.J. Lieberman, F.S. Hiller, *Introduction to Operations Research,* 7th Edition, Tata- McGraw Hill Company, New Delhi, 2001.

2.Kanti Swarup, Manmohan, P.K. Gupta,*Operations Research*, , Sultan & Chand Publications, 2003.

3.Hamdy A. Taha, *Operations Research, ,* (Edition 7), Prentice - Hall of India Private Limited, New Delhi, 1997.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**REVISED SIMPLEX METHOD**			
1.1	Introduction	2	Lecture	Black Board
1.2	Standard forms for Revised Simplex Method	5	Chalk & Talk	Black Board
1.3	Computational Procedure for Standard Form I	5	Chalk & Talk	Black Board
1.4	Comparison of Simplex Method and Revised Simplex Method	3	Chalk & Talk	Black Board
UNIT -2	**INTEGER LINEAR PROGRAMMING**			
2.1	Introduction	1	Lecture	Black Board
2.2	Types of Integer Linear Programming Problems	1	Chalk & Talk	Black Board
2.3	Enumeration and Cutting Plane Solution Concept	3	Chalk & Talk	Black Board
2.4	Gomory's All Integer Cutting Plane Method	6	Chalk & Talk	Black Board
2.5	Gomory's mixed Integer Cutting Plane method	4	Discussion	Black Board
2.6	Branch and Bound Method	5	Chalk & Talk	Black Board
UNIT -3	**DYNAMIC PROGRAMMING**			
3.1	Introduction	1	Lecture	Black Board
3.2	Dynamic Programming Terminology	2	Chalk & Talk	Black Board
3.3	Developing Optimal Decision Policy	5	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.4	Dynamic Programming Under Certainty	5	Chalk & Talk	Black Board
3.5	Dynamic Programming Approach for Solving Linear Programming Problem.	2	Discussion	Black Board
UNIT- 4DETERMINISTIC INVENTORY CONTROL MODELS				
4.1	Introduction	1	Discussion	LCD
4.2	The Meaning of Inventory Control	1	Discussion	LCD
4.3	Functional Role of Inventory	3	Discussion	Black Board
4.4	Reasons of Carrying Inventory	3	Discussion	Black Board
4.5	Factors Involved in Inventory Problem Analysis	3	Discussion	Black Board
4.6	Inventory Model building	3	Discussion	Black Board
4.7	Inventory Control Models without Shortage	3	Discussion	Black Board
4.8	Inventory Control Models with Shortages	3	Discussion	Google Slides
UNIT- 5 QUEUING THEORY				
5.1	Introduction	1	Discussion	LCD
5.2	The structure of Queuing system	1	Discussion	Black Board
5.3	Performance Measures of a Queuing system	3	Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.4	Probability Distributions in Queuing systems	3	Discussion	Black Board
5.5	Classification of Queuing Models	3	Discussion	Black Board
5.6	Single server Queuing Models	3	Discussion	Black Board
5.7	Multi server Queuing Models	3	Discussion	Black Board
5.8	Finite calling population Queuing Models	3	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem .Test 15	Once in a Sem. 5	35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 – Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assign

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explain revised simplex method and solve problems	K2	PSO1& PSO2
CO 2	Classify integer programming problem and explain cutting plane and branch and bound methods	K2, K3,	PSO3
CO 3	Recognize dynamic programming problem and formulate recurrence relation	K2 & K4	PSO5
CO 4	Distinguish inventory control models	K2, K3, K4	PSO3
CO 5	Identify Queuing models	K2 & K4	PSO4

COURSE DESIGNER:

1. Dr. V. Vanitha

2. Dr. Sr. M. Fatima Mary

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

II M.Sc. Mathematics

SEMESTER –III

For those who joined in 2019 onwards

Employability – 100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSMA	19PG3M11	COMBINATORICS	PG Core	6	4

COURSE DESCRIPTION

Combinatorics may be defined as the study of discrete structures and how these structures can be combined subject to various constraints. It can be described as the art of counting.

COURSE OBJECTIVES

To introduce topics and techniques of discrete and combinatorial methods. Topics that will be studied includes generating functions, recurrence relations, the principle of inclusion and exclusion, Polya's theory of counting and methods to solve different equations.

UNITS

UNIT –I PERMUTATIONS AND COMBINATIONS (15 HRS.)

Introduction, rules of sum and product, Permutations and Combinations, Distributions of distinct objects, distributions of non distinct objects.

UNIT –II GENERATING FUNCTIONS (20 HRS.)

Generating functions for combinations, enumerators for permutations, Distributions of distinct objects into non distinct cells, partitions of integers.

UNIT –III RECURRENCE RELATIONS (20 HRS.)

Linear Recurrence relations with constant coefficients, Solution by the technique of generating functions, **A Special class of nonlinear difference equations,Recurrence relation with two indices (Self study).**

UNIT –IV THE PRINCIPLE OF INCLUSION AND EXCLUSION(15HRS.)

The principle of Inclusion and Exclusion, **the general formula, Derangements (Self Study),** Permutations with restrictions on relative positions.

UNIT –V POLYA'S THEORY OF COUNTING (20 HRS.)

Equivalence classes under a permutation group, Equivalence classes of functions, Weights and inventories of functions, Polya's fundamental theorem.

TEXT BOOK:

Liu C. L., *Introduction to Combinatorial Mathematics*, McGraw Hill, 1968.

UNIT I : Chapter1:Sections 1.1 -1.6,
UNIT II : Chapter 2: Sections 2.1 - 2.7,
UNIT III : Chapter 3: Sections 3.1 - 3.5,
UNIT IV : Chapter 4: Sections 4.1 - 4.5,
UNIT V : Chapter 5: Sections 5.3 - 5.6.

REFERENCES:

1. Alan Tucker , *Applied Combinatorics*, John Wiley and Sons (Asia) 2004
2. Herbert John Ryser, *Combinatorial Mathematics,* The Mathematical Association of America, 1963
3. I. A. Cohen, *Combinatorics,*
4. V.Krishnamurthy, *Combinatorics: Theory and Applications*, East-West Press, 2000.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**PERMUTATIONS AND COMBINATIONS**			
1.1	Introduction	3	Chalk & Talk	Black Board
1.2	Rules of sum and product	3	Chalk & Talk	Black Board
1.3	Permutations and Combinations	3	Chalk & Talk	Black Board
1.4	Distributions of distinct objects	3	Chalk & Talk	Black Board
1.5	Distributions of non distinct objects	3	Chalk & Talk	Black Board
UNIT -2	**GENERATING FUNCTIONS**			
2.1	Generating functions for combinations	5	Chalk & Talk	Black Board
2.2	Enumerators for permutations	5	Chalk & Talk	Black Board
2.3	Distributions of distinct objects into non distinct cells	5	Chalk & Talk	Black Board
2.4	partitions of integers	5	Chalk & Talk	Black Board
UNIT -3	**RECURRENCE RELATIONS**			
3.1	Linear Recurrence relations with constant coefficients	5	Chalk & Talk	Black Board
3.2	Solution by the technique of generating functions	5	Chalk & Talk	Black Board
3.3	A Special class of nonlinear difference equations	5	Chalk & Talk, Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.4	Recurrence relation with two indices	5	Chalk & Talk, Discussion	Black Board
UNIT -4	**THE PRINCIPLE OF INCLUSION AND EXCLUSION**			
4.1	The principle of Inclusion and Exclusion	4	Chalk & Talk	Black Board
4.2	The general formula	4	Chalk & Talk, Discussion	Black Board
4.3	Derangements	4	Chalk & Talk, Discussion	Black Board
4.4	Permutations with restrictions on relative positions	3	Discussion	Black Board
UNIT -5	**POLYA'S THEORY OF COUNTING**			
5.1	Equivalence classes under a permutation group	5	Discussion	Black Board
5.2	Equivalence classes of functions	5	Discussion	Black Board
5.3	Weights and inventories of functions	5	Discussion	Black Board
5.4	Polya's fundamental theorem	5	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment

	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem .Test 15	Once in a Sem. 5	 35	 5	 40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 – Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explain the rules of sum and product of permutations and combinations.	K2	PSO1& PSO2
CO 2	Describe distributions of distinct objects into non-distinct cells and partitions of integers.	K3&K5	PSO4
CO 3	Identify solutions by the technique of generating functions and recurrence relations with two indices	K2& K3	PSO2
CO 4	Solve problems on principle of inclusion and exclusion	K2 &K3	PSO3
CO 5	Apply Polya's theory using configuration.	K3& K4	PSO5

COURSE DESIGNER:

1. Mrs. M. Teresa Nirmala

2. Dr. V. Vanitha

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

II M.Sc. Mathematics

SEMESTER –III

For those who joined in 2019 onwards

Employability – 100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG3M12	TOPOLOGY	PG Core	6	6

COURSE DESCRIPTION

This course introduces the fundamental notions of topology which provides foundation for many other branches of mathematics.

COURSE OBJECTIVES

To enable the students to learn open sets, closed sets, continuous functions, compactness, connectedness and separation axioms in Topological spaces.

UNITS

UNIT –I TOPOLOGICAL SPACES (20 HRS.)

Topological Spaces, Basis for a topology, the order topology, the product topology on X × Y, **the subspace topology**, **Closed sets and limit points (self study)**.

UNIT –II CONTINUOUS FUNCTIONS (15 HRS.)

Continuous functions, The Product topology, The Metric topology.

UNIT –III CONNECTED SPACES (15HRS.)

Connected Spaces, connected subspaces of the real line, Components and Local connectedness

UNIT –IV COMPACT SPACES (20 HRS.)

Compact Spaces, Compact subspaces of the real line (self study), limit point compactness.

UNIT –V COUNTABILITY AND SEPARATION AXIOMS (20 HRS.)

The Countability axioms, The Separation axioms, Normal spaces, Urysohn lemma - Urysohn Metrization theorem-The Tychonoff's theorem.

TEXT BOOK:

1) James. R Munkres, *Topology*, Prentice Hall of India Private Ltd, New Delhi, Second Edition, 2012

REFERENCES:

1. George F.Simmons, *Introduction to Topology and Modern Analysis*, McGraw-Hill Book Co., INC, 1963

2. S. T. Hu, *Elements of General Topology*, London :Holden day, 1964.

3. K. D. Joshi, Introduction to General *Topology*, Wiley Eastern, 1983.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	
		UNIT -1		**TOPOLOGICAL SPACES**
1.1	Topological Spaces	3	Chalk & Talk	
1.2	Basis for a topology	4	Chalk & Talk	Black Board
1.3	the order topology	3	Chalk & Talk	Black Board
1.4	the product topology on X × Y	2	Chalk & Talk	Black Board
1.5	the subspace topology	3	Chalk & Talk	Black Board
1.6	Closed sets and limit points	5	Chalk & Talk, Discussion	Black Board
	UNIT -2	**CONTINUOUS FUNCTIONS**		
2.1	Continuous functions	5	Chalk & Talk	Black Board
2.2	The Product topology	5	Chalk & Talk	Black Board
2.3	The Metric topology	5	Chalk & Talk	Black Board
	UNIT -3	**CONNECTED SPACES**		
3.1	Connected Spaces	6	Chalk & Talk	Black Board
3.2	connected subspaces of the real line	7	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	
3.3	Components and Local connectedness	7	Chalk & Talk	Black Board
UNIT 4	**COMPACT SPACES**			
4.1	Compact Spaces	5	Discussion	Black Board
4.2	Compact subspaces of the real line	5	Discussion	Black Board
4.3	limit point compactness	5	Discussion	Black Board
UNIT 5	**COUNTABILITY AND SEPARATION AXIOMS**			
5.1	The Countability axioms	5	Discussion	Black Board
5.2	The Separation axioms	5	Discussion	Black Board
5.3	Normal spaces	5	Discussion	Black Board
5.4	Urysohn lemma	5	Discussion	Black Board
5.5	Urysohn Metrization theorem	3	Discussion	Black Board
5.6	The Tychonoff's theorem.	2	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment

	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem .Test 15	Once in a Sem. 5	35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-Understand, K3-Apply, K4-Analyse, K5 - Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Classify various Topologies in Topological spaces	K5	PSO1& PSO2
CO 2	Explain connectedness and Components in Topological spaces	K2	PSO3 & PSO4
CO 3	Describe compactness in Topological spaces	K2 & K3	PSO4 & PSO5
CO 4	Identify Seperation axioms	K2 & K3	PSO3
CO 5	Explain Urysohn Metrization theorem	K2 & K4	PSO4

COURSE DESIGNER:

1. Dr. Mrs. C. Prasanna Devi

2. Mrs. Nigila Ragavan

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

II M.Sc. Mathematics

SEMESTER –III

For those who joined in 2019 onwards

Employability-60%

Skill Development-40%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS /WEEK	CREDITS
PSMA	21PG3ME1	FUZZY SETS AND APPLICATIONS	PG Core	4	4

COURSE DESCRIPTION

This course is focused on the fundamental theory of fuzzy sets, fuzzy logic which can be applied in data mining and decision making in various fields.

COURSE OBJECTIVES

To enable the students to understand the basic concepts of Crisp sets, Fuzzy sets, operations on fuzzy set, Fuzzy relations and applications of Fuzzy sets.

UNITS

UNIT –I CRISP SETS AND FUZZY SETS (12 HRS.)

Crisp sets : An over view, the notion of Fuzzy sets, Basic concepts of Fuzzy sets, Classical Logic: an over view, Fuzzy logic.

UNIT –II OPERATIONS ON FUZZY SETS (12 HRS.)

General discussion, Fuzzy Complements, Fuzzy Union, Fuzzy Intersection, Combinations of operations.

UNIT –III FUZZY RELATIONS (12 HRS.)

Crisp and Fuzzy Relations, Binary Relations on a single set, **Equivalence and similarity Relations (self study)**..

UNIT –IV FUZZY MEASURES (12 HRS.)

General Discussion, Belief and Plausibility Measures, Possibility and Necessity Measures.

UNIT –V APPLICATIONS (12 HRS.)

General Discussion, natural, Life and Social Sciences, **Engineering**, **Medicine and Management and Decision making (self study)**.

TEXT BOOK:

1.George J. Klir And Tina A. Folger, *Fuzzy Sets*, Uncertainty and Information-Prentice Hall of India Private Limited, New Delhi – 1, 2009.

REFERENCES:

1. George J. Llir and Boyuan, *Fuzzy Sets and Fuzzy logic, Theory and applications*- Prentice Hall of India, 2002.

2. Zimmermann, *Fuzzy Set Theory and its applications*, Affiliated East West Press Pvt , Ltd, Second Edition 1996.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teachin
	UNIT -1	**CRISP SETS AND FUZZY SETS**		
1.1	Crisp sets : An over view	3	Chalk & Talk	Black B
1.2	the notion of Fuzzy sets	3	Chalk & Talk	Black Board
1.3	Basic concepts of Fuzzy sets	2	Chalk & Talk	Black Board
1.4	Classical Logic: an over view	2	Chalk & Talk	Black Board
1.5	Fuzzy logic.	2	Chalk & Talk	Black Board
	UNIT -2	**OPERATIONS ON FUZZY SETS**		
2.1	General discussion	3	Chalk & Talk	Black Board
2.2	Fuzzy Complements	3	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teachin
2.3	Fuzzy Union, Fuzzy Intersection	3	Chalk & Talk	Black Board
2.4	Combinations of operations	3	Chalk & Talk	Black Board
UNIT -3 FUZZY RELATIONS				
3.1	Crisp and Fuzzy Relations	4	Chalk & Talk	Black B
3.2	Binary Relations on a single set	4	Chalk & Talk	Green B
3.3	Equivalence and similarity Relations.	4	Chalk & Talk, Discussion	Black Board
UNIT -4 FUZZY MEASURES				
4.1	General Discussion	4	Discussion	Black Board
4.2	Belief and Plausibility Measures	4	Discussion	Black Board
4.3	Possibility and Necessity Measures.	4	Discussion	Black Board
UNIT -5 APPLICATIONS				
5.1	General Discussion, natural , Life and Social Sciences	4	Discussion	Black Board
5.2	Engineering	4	Discussion	Black Board
5.3	Medicine and Management and Decision making .	4	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2	M1+M2	Mid-Sem Test	Once in a Sem.				
	5	5+5=10	15	5	35	5	40	
K1	-	-	-	-	-	-	-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

SCHOLASTIC

NON - SCHOLASTIC

MARKS

C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 – Evaluate*

EVALUATION PATTERN

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Distinguish crisp sets and Fuzzy sets	K2	PSO1
CO 2	Classify operators on Fuzzy sets	K2, K3,	PSO1 & PSO2
CO 3	Describe Fuzzy relations	K2 & K4	PSO2 & PSO4
CO 4	Describe Fuzzy Measures	K2, K3 & K4	PSO3 & PSO4
CO 5	Apply Fuzzy sets in real life situations	K3 & K5	PSO3 & PSO5

COURSE DESIGNER:

1. **Ms. A. Sahaya Roseline Divya**
2. **Dr. Mrs. V. Vanitha**

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

II M.Sc. Mathematics

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	21PG3ME2	NUMERICAL ANALYSIS	PG Core	4	4

COURSE DESCRIPTION

This course provides knowledge to solve equations using Numerical methods.

COURSE OBJECTIVES

To enable the students to solve equations like Algebraic, Transcendental, Differential Equations and Integrals by various Numerical methods.

UNITS

UNIT –I SOLVING SETS OF EQUATIONS (12 HRS.)

The Elimination Method, The Gaussian Elimination and Gauss- Jordan Method, Iterative Methods - The Relaxation Method.

UNIT –II INTERPOLATION AND CURVE FITTING (12 HRS.)

Lagrangian Polynomials, Divided Differences, Interpolation with Cubic Spline,

Least-Square Approximation (self study).

UNIT –III NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION (12HRS.)

Derivatives form Difference tables, Extrapolation Techniques, The Trapezoidal Rule –A Composite formula, **Simpson's rules (self study).**

UNIT –IV NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (12 HRS.)

The Taylor – Series method (self study), Euler and Modified Euler methods, Runge- Kutta Methods, **Milne's Method (self study)**.

UNIT –V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS (12 HRS.)

Introduction, Difference Quotients, Geometrical representation of partial differential quotients.

TEXT BOOK:

1) Curtis .F. Gerald, Patrick O. Wheatley, *Applied Numerical Analysis*, 5th Edition Pearson Education, New Delhi, 2005.

UNIT I : Chapter 2 : Sections 2.3-2.4 & 2.10-2.11

UNIT II: Chapter 3: Sections 3.2-3.4 & 3.7

UNIT III: Chapter 5: Sections 5.2, 5.4 & 5.6-5.7

UNIT IV: Chapter 6: Sections 6.2- 6.4 & 6.6

UNIT V: Chapter 12 : Sections 12.1 – 12.3

REFERENCES:

1. R.L. Burden, J. Dougles Faires, *Numerical Analysis*, Thompson Books, USA, 2005.

2. S.S Sastry, *Introductory Methods of Numerical Analysis* , Prentice- Hall of India Pvt. Ltd., New Delhi, 2005.

3. M.K.Jain , S.R.K. Lyengar, R.K. Jain, *Numerical Methods for scientific and Engineering Computation*, 3rd Edition, Wiley Eastern Ltd., New Delhi, 1993.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**SOLVING SETS OF EQUATIONS**			
1.1	The Elimination Method	4	Chalk & Talk	Black Board
1.2	The Gaussian Elimination and Gauss- Jordan Method	4	Chalk & Talk	Black Board
1.3	The Relaxation Method.	4	Chalk & Talk	Black Board
UNIT - 2	**INTERPOLATION AND CURVE FITTING**			
2.1	Lagrangian Polynomials Divided Differences	4	Chalk & Talk	Black Board
2.2	Interpolation with Cubic Spline	4	Chalk & Talk	Black Board
2.3	Least-Square Approximation	4	Chalk & Talk, Discussion	Black Board
UNIT -3	**NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION**			
3.1	Derivatives form Difference tables	3	Chalk & Talk	Black Board
3.2	Extrapolation Techniques	3	Chalk & Talk	Black Board
3.3	The Trapezoidal Rule –A Composite formula	3	Chalk & Talk	Black Board
3.4	Simpson's rules	3	Chalk & Talk, Discussion	Black Board
UNIT - 4	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**			

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.1	The Taylor – Series method	3	Discussion	Black Board
4.2	Euler and Modified Euler methods	3	Discussion	Black Board
4.3	Runge- Kutta Methods	4	Discussion	Black Board
4.4	Milne's Method	2	Discussion	Black Board
UNIT - 5	**NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS**			
5.1	Difference Quotients	6	Discussion	Black Board
5.2	Geometrical representation of partial differential quotients	6	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2	M1+M2	Mid-Sem .Test	Once in a Sem.				
	5	5+5=10	15	5	35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 - Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

COURSE OUTCOMES

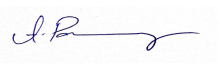
On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify the various methods of solving simultaneous linear algebraic equations.	K2	PSO1& PSO2
CO 2	Recognize difference operators and apply the concept of interpolation.	K2	PSO2 & PSO4
CO 3	Compute the values of the derivatives at some point using numerical differentiation and integration.	K2 & K4	PSO4 & PSO5
CO 4	Solve problems on higher order differential equations using Euler's, Runge- kutta methods	K2 & K3	PSO4& PSO5
CO 5	Explain Geometrical representation of partial differential quotients.	K2 & K4	PSO1, PSO2 & PSO3

COURSE DESIGNER:

1. **Dr. Mrs. C. Prasanna Devi**
2. **Mrs. A. Paulin Mary**

Forwarded By



(Dr. A. Paulin Mary)

HOD'S Signature

& Name

SEMESTER –IV

For those who joined in 2019 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG4M13	COMPLEX ANALYSIS	PG Core	6	5

COURSE DESCRIPTION

This course enables the students to study some advanced concepts in Complex Analysis

COURSE OBJECTIVES

To enable the students to understand the notions complex functions, complex integration, harmonic functions, series, product development and elliptic functions.

UNITS

UNIT –I COMPLEX FUNCTIONS (20 HRS.)

Spherical Representation of complex numbers, **limits and continuity, analytic functions, polynomials, sequences, series, uniform convergence (self study)**, power series, Abel's limit theorem.

UNIT –II COMPLEX INTEGRATION (20 HRS.)

Line integrals as functions of arcs, Cauchy's theorem for a rectangle, the index of a point with respect to a closed curve, the integral formula, higher derivatives, removable singularities, Taylor's theorem, zeros and poles.

UNIT –III HARMONIC FUNCTIONS (15 HRS.)

Definition and basic properties, the mean value property, Poisson's formula, Schwartz's theorem.

UNIT –IV SERIES AND PRODUCT DEVELOPMENTS (15 HRS.)

Weierstrass's theorem, the Taylor series, the Laurent series, partial fractions and infinite products.

UNIT –V ELLIPTIC FUNCTIONS (20 HRS.)

Representation by exponentials, the Fourier Development, functions of finite order, the period module, Unimodular transformation, the canonical basis, general properties of Elliptic functions,**the Wierstrass ρ-function, the functions ζ(z) and σ(z).**

TEXT BOOK:

LarsV. Ahlfors, *Complex Analysis*, 3rd McGraw-Hill International Edition,1979

REFERENCES:

1. ConwayJ. B, *Functions of one Complex Variable,* Springer-Verlog, International Student Edition, Narosa Publishing Company,2002.

2.Copson, *Introduction to theory of function of a Complex variable,*London Oxford University Press,1962.

3. KarunakaranV, *Complex Analysis,* Second edition, Narosa Publishing House pvt. Ltd. 2005.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**COMPLEX FUNCTIONS**			
1.1	Spherical Representation of complex numbers	4	Chalk & Talk	Black Board
1.2	limits and continuity	3	Chalk & Talk, Discussion	Black Board
1.3	analytic functions, polynomials, sequences	4	Chalk & Talk, Discussion	Black Board
1.4	series, uniform convergence	3	Chalk & Talk, Discussion	Black Board
1.5	power series, Abel's limit theorem	6	Chalk & Talk	Black Board
UNIT -2	**COMPLEX INTEGRATION**			
2.1	Line integrals as functions of arcs	3	Chalk & Talk	Black Board
2.2	Cauchy's theorem for a rectangle	3	Chalk & Talk	Black Board
2.3	The index of a point with respect to a closed curve	3	Chalk & Talk	Black Board
2.4	The integral formula	3	Chalk & Talk	Black Board
2.5	Higher derivatives	2	Chalk & Talk	Black Board
2.6	Removable singularities	3	Chalk & Talk	Black Board
2.7	Taylor's theorem, zeros and poles	3	Chalk & Talk	Black Board
UNIT -3	**HARMONIC FUNCTIONS**			

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.1	Definition and basic properties	5	Chalk & Talk	Black Board
3.2	The mean value property	4	Chalk & Talk	Black Board
3.3	Poisson's formula	3	Chalk & Talk	Black Board
3.4	Schwartz's theorem	3	Chalk & Talk	Black Board
UNIT -4 SERIES AND PRODUCT DEVELOPMENTS				
4.1	Weierstrass's theorem	5	Chalk & TalkDiscussion	Black Board
4.2	The Taylor series	3	Chalk & Talk Discussion	Black Board
4.3	The Laurent series	3	Chalk & Talk Discussion	Black Board
4.4	Partial fractions and infinite products	4	Chalk & Talk Discussion	Black Board
UNIT -5 ELLIPTIC FUNCTIONS				
5.1	Representation by exponentials - the Fourier Development - functions of finite order	4	Chalk & Talk Discussion	Black Board
5.2	The period module - Unimodular transformation - the canonical basis	4	Chalk & Talk Discussion	Black Board
5.3	General properties of Elliptic functions	4	Chalk & Talk Discussion	Black Board
5.4	The Wierstrass ρ-function	4	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.5	The functions ζ(z) and σ(z)	4	Chalk & Talk Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2	M1+M2	Mid-Sem .Test	Once in a Sem.				
	5	5+5=10	15	5	35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 – Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify continuous, differentiable and analytic functions.	K2	PSO1& PSO2
CO 2	Explain Cauchy's theorem for rectangle and Cauchy's integral formula	K3& K5	PSO3
CO 3	Summarize the conditions for a complex variable to be harmonic	K2& K3	PSO5
CO 4	Compute analytic functions in series form.	K2 & K3	PSO2

CO 5	Identify the conditions for a function to be elliptic and bring out its properties.	K2& K4	PSO4

COURSE DESIGNER:

1. Mrs. M. Teresa Nirmala

2. Ms. A. Sahaya Roseline Divya

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

II M.Sc. Mathematics

SEMESTER –IV

For those who joined in 2019 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG4M14	STATISTICS	PG Core	6	5

COURSE DESCRIPTION

This course provides various concepts of Statistics which can beapplied in real life situations

COURSE OBJECTIVES

To enable the students to understand some discrete and continuous distributions, Testing of hypothesis and Estimation

UNITS

UNIT –I SOME SPECIAL DISTRIBUTIONS (20 HRS.)

The Binomial and Related Distributions – The Poisson distribution – **The Gamma, Chi-square and Beta distributions (self study)** – The Normal distribution .

UNIT –II T, F DISTRIBUTIONS AND LIMITING DISTRIBUTIONS (20 HRS.)

t and F distributions, Expectations of Functions(self study), Convergence in Probability, Convergence in Distribution, central Limit theorem.

UNIT –III SOME ELEMENTARY STATISTICAL INFERENCES (15 HRS.)

Sampling and Statistics, More on confidence Intervals, Introduction to hypothesis testing, Additional Comments about Statistical Tests.

UNIT –IV MAXIMUM LIKLELIHOOD METHODS AND SUFFICIENCY (20 HRS.)

Maximum Likelihood Estimation, Rao-Cramer Lower Bound and efficiency, Maximum Likelihood Tests. Measures of quality of Estimators, A sufficient statistic for a parameter, Properties of a sufficient statistic .

UNIT –V OPTIMAL TESTS OF HYPOTHESES (15 HRS.)

Most Powerful Tests, **Uniformly Most Powerful Test(self study)**, Likelihood Ratio Tests.

TEXT BOOK:

1. Robert V. Hogg, Joseph W.McKean and Allen T. Craig, *Introduction to mathematical statistics*, Sixth Edition , Pearson Education. Inc. and Dorling Kindersley Publishing, Inc.2007.

REFERENCES:

1. John E. Freund, M T.J. Wilmore, *Mathematical Statistics*, Prentice Hall of India,2000.

2. Rohatgi V. K. and A. K. Md. L Saleh, *An Introduction to Probability and Statistics,* 2nd Edition, John Wiley & Sons, New York, 2002.

3. A. M. Mood, F. A. GrayBill and D. C. Bose, *Introduction to the Theory of Statistics*, Third Edition, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2001.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**SOME SPECIAL DISTRIBUTIONS**			
1.1	The Binomial and Related Distributions	5	Chalk & Talk	Black Board
1.2	The Poisson distribution	5	Chalk & Talk	Black Board
1.3	The Gamma, Chi-square and Beta distributions	5	Discussion	Black Board
1.4	The Normal distribution	5	Chalk & Talk	Black Board
UNIT -2	**T, F DISTRIBUTIONS AND LIMITING DISTRIBUTIONS**			
2.1	t and F distributions	4	Discussion	Black Board
2.2	Expectations of Functions	4	Discussion	Black Board
2.3	Convergence in Probability	4	Chalk & Talk	Black Board
2.4	Convergence in Distribution	4	Chalk & Talk	Black Board
2.5	central Limit theorem	4	Chalk & Talk	Black Board
UNIT -3	**SOME ELEMENTARY STATISTICAL INFERENCES**			
3.1	Sampling and Statistics	4	Chalk & Talk	Black Board
3.2	More on confidence Intervals	4	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.3	Introduction to hypothesis testing	4	Chalk & Talk	Black Board
3.4	Additional Comments about Statistical Tests	3	Chalk & Talk	Black Board
UNIT - 4	**MAXIMUM LIKLELIHOOD METHODS AND SUFFICIENCY**			
4.1	Maximum Likelihood Estimation	4	Discussion	Black Board
4.2	Rao-Cramer Lower Bound and efficiency	4	Discussion	Black Board
4.3	Maximum Likelihood Tests	4	Discussion	Black Board
4.4	Measures of quality of Estimators	4	Discussion	Black Board
4.5	A sufficient statistic for a parameter	2	Discussion	Black Board
4.6	Properties of a sufficient statistic	2	Discussion	Black Board
UNIT -5	**OPTIMAL TESTS OF HYPOTHESES**			
5.1	Most Powerful Tests	5	Discussion	Black Board
5.2	Uniformly Most Powerful Test	5	Discussion	Black Board
5.3	Likelihood Ratio Tests.	5	Discussion	Black Board

CIA	
Scholastic	**35**
Non Scholastic	**5**

	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for II PG are :**

K2-Understand, **K3**-Apply, **K4**-Analyse, **K5**- Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Average of Two Session Wise Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Best of Two Weekly Tests

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Classify discrete and continuous distributions	K2	PSO1& PSO4
CO 2	Describe t, F and limiting distributions	K1, K2, & K5	PSO2& PSO3
CO 3	Explain statistical tests	K1 & K3	PSO3& PSO5
CO 4	Summarize maximum likelihood methods	K1, K2, K3 & K5	PSO5
CO 5	Distinguish tests of hypothesis	K2 & K4	PSO3& PSO5

COURSE DESIGNER:

1.Dr. Mrs. E. Helena

2.Ms. A. Sahaya Roseline Divya

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

II M.Sc. Mathematics

SEMESTER –IV

For those who joined in 2019 onwards

Employability-100%

RSE DESCRIPTION

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSMA	19PG4M15	METHODS OF APPLIED MATHEMATICS	PG	6	4

This course provides various methods of Applied Mathematics which will be helpful for the students to attempt NET/SET exams.

COURSE OBJECTIVES

To enable the students to study the concepts of Calculus of variations, Boundary value problems, Differential and Integral equations, Fourier transforms.

UNITS

UNIT –I CALCULUS OF VARIATIONS (18 HRS.)

Calculus of variations-maxima and minima -The simplest case-Natural and Transition boundary conditions-variational notation-more general case.

UNIT –II BOUNDARY VALUE PROBLEMS (18 HRS.)

Constraints and Lagrange multipliers-variable end points-sturm liouville problems-small vibrations about equilibrium-variation problems for deformable bodies-Rayleigh-Ritz method.

UNIT –III DIFFERENTIAL AND INTEGRAL EQUATIONS (18 HRS.)

Integral equations-Relations between differential and integral equations-Green's function-Fredholm equations with separable kernels.

UNIT –IV METHODS FOR SOLVING INTEGRAL EQUATIONS (18 HRS.)

Hilbert Schmidt theory-Iterative methods for solving equations of the second kind.Neumann series-**Fredholm theory-singular integral equations-special devices.(self study)**

UNIT –V FOURIER TRANSFORMS (18 HRS.)

Fourier Transform-Fourier sine and cosine transforms-properties -convolution-**solving integral equations- Finite Fourier sine and cosine transforms-Fourier integral theorem-parseval's identity.(self study)**

TEXT BOOKS:

1. Hildebrand F.B., *Methods of Applied Mathematics*, Second Edition, PHI, New Delhi,1972.
2. Goyal & Gupta, *Laplace and Fourier Transforms*, Pragati Prakashan, Meerut,1987.

REFERENCES

1.Sharma, D. C and Goyal, M. C, *Integral equations,* PHI, New Delhi, 2017

2.Sharma, R. K, *Calculus of variations, Meditech, 2017.*

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**CALCULUS OF VARIATIONS**			
1.1	Calculus of variations	3	Chalk & Talk	Black Board
1.2	Maxima and minima	3	Chalk & Talk	Black Board
1.3	The simplest case	3	Chalk & Talk	Black Board
1.4	Natural and Transition boundary conditions	3	Chalk & Talk	Black Board
1.5	Variational notation	3	Chalk & Talk	Black Board
1.6	more general case	3	Chalk & Talk	Black Board
UNIT -2	**BOUNDARY VALUE PROBLEMS**			
2.1	Constraints and Lagrange multipliers	3	Chalk & Talk	Black Board
2.2	variable end points	3	Chalk & Talk	Black Board
2.3	sturm liouville problems	3	Chalk & Talk	Black Board
2.4	small vibrations about equilibrium	3	Chalk & Talk	Black Board
2.5	variational problems for deformable bodies	3	Chalk & Talk	Black Board
2.6	Rayleigh-Ritz method	3	Chalk & Talk	Black Board
UNIT -3	**DIFFERENTIAL AND INTEGRAL EQUATIONS**			

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.1	Integral equations	5	Chalk & Talk	Black Board
3.2	Relations between differential and integral equations	4	Chalk & Talk	Black Board
3.3	Green's function	5	Chalk & Talk	Black Board
3.4	Fredholm equations with separable kernels	4	Chalk & Talk	Black Board
UNIT -4METHODS FOR SOLVING INTEGRAL EQUATIONS				
4.1	Hilbert Schmidt theory	3	Discussion	Black Board
4.2	Iterative methods for solving equations of the second kind	3	Discussion	Black Board
4.3	Neumann series	3	Discussion	Black Board
4.4	Fredholm theory	3	Discussion	Black Board
4.5	singular integral equations	3	Discussion	Black Board
4.6	special devices	3	Discussion	Black Board
UNIT -5	**FOURIER TRANSFORMS**			
5.1	Fourier Transform	3	Discussion	Black Board
5.2	Fourier sine and cosine transforms	3	Discussion	Black Board
5.3	convolution	3	Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.4	solving integral equations	3	Discussion	Black Board
5.5	Finite Fourier sine and cosine transforms	3	Discussion	Black Board
5.6	Fourier integral theorem	1	Discussion	Black Board
5.7	parseval's identity	2	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2	M1+M2	Mid-Sem .Test	Once in a Sem.				
	5	5+5=10	15	5	35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-Understand, K3-Apply, K4-Analyse, K5 – Evaluate

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explain Eulers equation and its applications	K2	PSO1& PSO2
CO 2	Solve variational problems	K2, K3,	PSO4
CO 3	Distinguish Integral equations.	K4& K3	PSO3
CO 4	Describe various methods for solving integral equations	K2, K3, K4&	PSO2 &PSO4
CO 5	Solving problems using fourier transforms	K2 & K4	PSO1 &PSO4

COURSE DESIGNER:

1. **Dr. Mrs. V. Vanitha**

2. **Mrs. A. Paulin Mary**

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

II M.Sc Mathematics

SEMESTER –IV

For those who joined in 2019 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG4M16	FUNCTIONAL ANALYSIS	Lecture	6	4

COURSE DESCRIPTION

This course enables the students to study the advanced concepts of Functional Analysis.

COURSE OBJECTIVES

To enable the students to understand the concepts of Banach spaces, Hilbert spaces and Finite dimensional spectral theory

UNIT I: BANACH SPACES (20 HRS.)

The definition and some examples, continuous linear transformations, the Hahn-Banach theorem.

UNIT II: BANACH SPACES (CONTINUED) (15 HRS.)

The natural imbedding of N in N**, the open mapping theorem, the conjugate of an operator.

UNIT III: HILBERT SPACES (20 HRS.)

The definition and some simple properties, orthogonal complements, Orthonormal sets, the conjugate space H*.

UNIT IV: HILBERT SPACES (CONTINUED) (15 HRS.)

The adjoint of an operator**, self-adjoint operators, normal and unitary operators (Self Study).**

UNIT V: FINITE DIMENSIONAL SPECTRAL THEORY (20 HRS.)

Matrices, determinants (Self Study) and the spectrum of an operator, the spectral theorem.

TEXT BOOK:

1. Simmons. G. F, *Introduction to Topology and Modern Analysis*, Tata McGraw Hill Publishing Company Ltd, edition 2004. (Chapters: **9**, **10**(except 59), **11**(60, 61, 62))

REFERENCE BOOKS:

1. Dr.D.Somasundaram, *Functional Analysis*, Viswanathan Printers and Publishers Ltd, 1999.
2. Balmohan V. Limaye, *Functional Analysis*, New Age International Publishers, Revised 2nd Edition, 2006.
3. S. Ponnusamy, *Foundation of Functional Analysis,* Narosa, 2002.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**BANACH SPACES**			
1.1	Definition and examples	8	Chalk & Talk	Black Board
1.2	Continuous linear transformations	8	Chalk & Talk	Black Board
1.3	Hahn-Banach theorem	4	Chalk & Talk	Black Board
UNIT -2	**BANACH SPACES (CONTINUED)**			
2.1	The natural imbedding of N in N**	5	Chalk & Talk	Black Board
2.2	Open mapping theorem	5	Chalk & Talk	Black Board
2.3	Conjugate of an operator	5	Chalk & Talk	Black Board
UNIT - 3	**HILBERT SPACES**			

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.1	Definition and simple properties	5	Chalk & Talk	Black Board
3.2	Orthogonal complements	5	Chalk & Talk	Black Board
3.3	Orthonormal sets	5	Chalk & Talk	Black Board
3.4	Conjugate space H*.	5	Discussions	PPT
UNIT - 4 HILBERT SPACES(CONTINUED)				
4.1	The adjoint of an operator	5	Chalk & Talk	Black Board
4.2	Self-adjoint operators	4	Chalk & Talk	Black Board
4.3	Normal operators	3	Chalk & Talk	Black Board
4.4	Unitary operators	3	Discussions	PPT
UNIT -5 FINITE DIMENSIONAL SPECTRAL THEORY				
5.1	Matrices	4	Chalk & Talk	Black Board
5.2	Determinants	4	Chalk & Talk	Black Board
5.3	Spectrum of an operator	6	Discussions	PPT
5.4	The spectral theorem.	6	Chalk & Talk	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment

	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem.Test 15	Once in a Sem. 5	35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy are :**

K2- Understand, **K3** -Apply, **K4-** Analyse, **K5- Evaluate**

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Best of Two Weekly Tests

C2 – Sum of Two Monthly Tests

C3 - Mid Sem Test

C4 – Seminar

C5 – Non – Scholastic

COURSE OUTCOMES

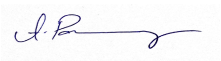
On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Create knowledge with the basic concepts, principles and methods of functional analysis and its applications.	K2 & K3	
CO 2	Analyze the concept of normed spaces, Banach spaces, and the theory of linear operators	K3, K4 & K5	
CO 3	Explain in detail the Hahn-Banach theorem, the open mapping and closed graph theorems	K4 & K5	
CO 4	Define and thoroughly explain Hilbert spaces and self-adjoint operators	K2, K3 & K4	
CO 5	Discuss in detail the study of the spectrum of an operator and its properties	K2 & K4	

COURSE DESIGNER:

1.Dr. Sr. A. Fatima Mary

Forwarded By



(Dr. A. Paulin Mary)

HOD'S Signature

& Name

II M.Sc. Mathematics

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PG4ME3	FORMAL LANGUAGES	PG Core	4	4

COURSE DESCRIPTION

This course explains and manipulates the different concepts in Automata Theory and Formal Languages

COURSE OBJECTIVES

To introduce some fundamental concepts in automata theory and formal languages including grammar, finite automaton and Regular Grammars

UNITS

UNIT –I GRAMMARS (10 HRS.)

Alphabets and Languages, Motivation, The Formal Notion of a Grammar, The Types of Grammars.

UNIT –II GRAMMARS (CONTINUED) (10 HRS.)

The empty sentence, Recursiveness of Context-sensitive Grammars, **Derivation Trees of Context-Free Grammars.(self study)**

UNIT –III FINITE AUTOMATA (10 HRS.)

The Finite Automaton, Equivalence Relations and Finite Automata, Nondeterministic Finite Automata

UNIT –IV FINITE AUTOMATA AND REGULAR GRAMMARS (15 HRS.)

Finite Automata and Type3 languages.(self study), Properties of Type3 Languages, Solvable Problems concerning Finite Automata

UNIT –V CONTEXT-FREE GRAMMARS (15 HRS.)

Simplification of Context-Free Grammars.(self study), Chomsky Normal Form, Greibach Normal Form, Solvability of Finiteness and the *uvwxy* theorem, The self-embedding property.

TEXT BOOK:

1. E. Hopcroft and Jeffrey D. Ullman, *Formal Languages and their Relation to Automata,* John, Addison Wesley Publishing Company, 1969.

Chapters: 2 – 4 (Except section 3.7 from page 41 - 44)

REFERENCES:

1. John E.Hopcroft and Jeffrey D. Ullman, *Introduction to Automata Theory, Languages and Computation*, Narosa Publishing House, 1999.

2.Alexander Meduna, *Automata and Language,s* Springer, 2000.
3.Rani Siromoney, *Formal Languages*.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	
		UNIT -1		**GRAMMARS**
1.1	Alphabets and Languages	2	Chalk & Talk	Black Board
1.2	Motivation	2	Chalk & Talk	Black Board
1.3	The Formal Notion of a Grammar	3	Chalk & Talk	Black Board
1.4	The Types of Grammars	3	Chalk & Talk	Black Board
		UNIT – 2		**GRAMMARS (CONTINUED)**
2.1	The empty sentence	3	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	
2.2	Recursiveness of Context-sensitive Grammars	3	Chalk & Talk	Black Board
2.3	Derivation Trees of Context-Free Grammars.	4	Chalk & Talk	Black Board
UNIT – 3 FINITE AUTOMATA				
3.1	The Finite Automaton	3	Chalk & Talk	Black Board
3.2	Equivalence Relations and Finite Automata	3	Chalk & Talk	Black Board
3.3	Nondeterministic Finite Automata	4	Chalk & Talk	Black Board
UNIT – 4 FINITE AUTOMATA AND REGULAR GRAMMARS				
4.1	Finite Automata and Type3 languages.	5	Discussion	Black Board
4.2	Properties of Type3 Languages	5	Discussion	Black Board
4.3	Solvable Problems concerning Finite Automata	5	Discussion	Black Board
UNIT -5 CONTEXT-FREE GRAMMARS				
5.1	Simplification of Context-Free Grammars .	3	Discussion	Black Board
5.2	Chomsky Normal Form	3	Discussion	Black Board
5.3	Greibach Normal Form	3	Discussion	Black Board
5.4	Solvability of Finiteness and the *uvwxy* theorem	3	Discussion	Black Board
5.3	The self-embedding property	3	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem .Test 15	Once in a Sem. 5	35	5	40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5 %
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 - Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Design the basic concepts in automata theory and formal languages	K2	PSO1& PSO2

CO 2	Identify different formal language classes and their relationships	K2, K3,	PSO3
CO 3	Transform between equivalent deterministic and non-deterministic finite automata, and regular expressions	K2 & K4	PSO5
CO 4	Discuss about the automata, regular expressions and context-free grammars accepting or generating a certain language	K2, K3 & K4	
CO 5	Simplify the theorems in automata theory using its properties	K3 & K5	

COURSE DESIGNER:

1.Dr. Sr. M. Fatima Mary
2.A. Sahaya Rosline Divya

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(Dr. A. Paulin Mary)

HOD'S Signature

& Name

II M.Sc. Mathematics

SEMESTER –IV

For those who joined in 2019 onwards

Skill Development – 100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	**19PG4ME4**	**ALGEBRAIC GRAPH THEORY**	**PG Core**	**4**	**4**

COURSE DESCRIPTION

This course enables the students to study some concepts in Algebraic Graph Theory

COURSE OBJECTIVES

To study the Automorphism Group of a Graph, Cayley Graphs, Transitive Graphs, Homomorphism and Matrix Theory of Graphs

UNITS

UNIT –I THE AUTOMORPHISM GROUP OF A GRAPH (12 HRS.)

Definitions - Operations on Permutations Groups - Computing Automorphism Groups of Graphs - Graphs with a Given Automorphism Group.

UNIT –II CAYLEY GRAPHS (12 HRS.)

The Cayley Color Graph of a Group Presentation: Definitions - Automorphisms - Properties - Products - Cayley Graphs.

UNIT –III TRANSITIVE GRAPHS (12 HRS.)

Vertex Transitive Graphs - Edge Transitive Graphs - Edge Connectivity - Vertex Connectivity

UNIT –IV HOMOMORPHISM (12 HRS.)

The Basics of Homomorphism - Cores - Products - The Map Graph - Counting Homomorphisms

UNIT –V MATRIX THEORY OF GRAPHS (12 HRS.)

The Adjacency Matrix, The Incidence Matrix, The Incidence Matrix of an Oriented Graph

TEXT BOOKS :

1. Arthur T.White, Graphs of Groups on Surfaces: Interactions and Models, Elsevier Science B.V., North-Holland, 2001.

REFERENCES:

1) Norman Biggs, Algebraic Graph Theory, Cambridge University Press, 1974.
2) L. W. Beineke and Robin Wilson, Topics in Algebraic Graph Theory, Cambridge University Press, 2005.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**THE AUTOMORPHISM GROUP OF A GRAPH**			
1.1	Definitions	1	Chalk & Talk	Black Board
1.2	Operations on Permutations Groups	1	Chalk & Talk	Black Board
1.3	Computing Automorphism Groups of Graphs	4	Chalk & Talk	Black Board
1.4	Graphs with a Given Automorphism Group	1	Chalk & Talk	Black Board
UNIT -2	**CAYLEY GRAPHS**			
2.1	The Cayley Color Graph of a Group Presentation: Definitions	3	Chalk & Talk	Black Board
2.2	Automorphisms	3	Chalk & Talk	Black Board
2.3	Properties	2	Chalk & Talk	Black Board
2.4	Products	2	Chalk & Talk	Black Board
2.5	Cayley Graphs	2	Chalk & Talk	Black Board
UNIT -3	**TRANSITIVE GRAPHS**			
3.1	Vertex Transitive Graphs	3	Chalk & Talk	Black Board
3.2	Edge Transitive Graphs	3	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.3	Edge Connectivity	3	Chalk & Talk	Black Board
3.4	Vertex Connectivity	3	Chalk & Talk	Black Board
UNIT -4 HOMOMORPHISM				
4.1	The Basics of Homomorphism	3	Discussion	Black Board
4.2	Cores	3	Discussion	Black Board
4.3	Products	2	Discussion	Black Board
4.4	The Map Graph	2	Discussion	Black Board
4.5	Counting Homomorphisms	2	Discussion	Black Board
UNIT -5 MATRIX THEORY OF GRAPHS				
5.1	The Adjacency Matrix	4	Discussion	Black Board
5.2	The Incidence Matrix	4	Discussion	Black Board
5.3	The Incidence Matrix of an Oriented Graph	4	Discussion	Black Board

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment

	Better of W1, W2 5	M1+M2 5+5=10	Mid-Sem .Test 15	Once in a Sem. 5	 35	 5	 40	
K1	-	-	-	-	-		-	-
K2	-	2	3	-	5		5	12.5 %
K3	5	3	4	-	12		12	30 %
K4	-	5	4	-	9		9	22.5%
K5	-	-	4	5	9		9	22.5 %
Non-Scho.						5	5	12.5 %
Total	5	10	15	5	35	5	40 mks.	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K2-*Understand,* ***K3-****Apply,* ***K4-****Analyse, K5 - Evaluate*

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

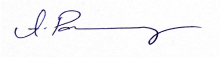
COURSE OUTCOMES

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explain Automorphism Group of a Graph	K1	PSO1& PSO2
CO 2	Describe Cayley Graphs	K1, K2,	PSO3
CO 3	Explain Transitive graphs	K1 & K3	PSO5
CO 4	Describe Homomorphism	K1, K2, K3 &	
CO 5	Explain the concept of Matrix Theory	K2 & K4	

COURSE DESIGNER:

1. A. Sheela Roselin
2. **Sr. M. Fatima Mary**

Forwarded By



(Dr. A. Paulin Mary)

HOD'S Signature

& Name

II M.Sc. Mathematics

SEMESTER –III & IV

PROBLEMS IN ADVANCED MATHEMATICS

For those who joined in 2019 onwards

Employability - 40%

Skill Development - 40%

Entrepreneurship - 20%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	19PGSLM1	PROBLEMS IN ADVANCED MATHEMATICS	PG Core	-	4

COURSE DESCRIPTION

This course enables the students to solve problems in various branches of Mathematics.

COURSE OBJECTIVES

To study the problem solving techniques in Analysis, Algebra and Differential equations.

UNITS

UNIT –I PROBLEMS IN REAL ANALYSIS

Sequences and series, convergence, limsup, liminf. Bolzano Weierstrass theorem, Heine Borel theorem. Continuity, uniform continuity, differentiability, mean value theorem. Sequences and series of functions, uniform convergence. Riemann sums and Riemann integral, Improper Integrals. Monotonic functions, types of discontinuity, functions of bounded variation

UNIT-II: PROBLEMS IN COMPLEX ANALYSIS

Analytic functions, Cauchy-Riemann equations. Contour integral, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem, Maximum modulus principle, Schwarz lemma, Open mapping theorem. Taylor series, Laurent series, calculus of residues.

UNIT-III: PROBLEMS IN ALGEBRA

Groups, subgroups, normal subgroups, quotient groups, homomorphisms, cyclic groups, permutation groups, Cayley's theorem, class equations, Sylow theorems. Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domain, principal ideal domain, Euclidean domain. Fields, Field extensions.

UNIT-IV: PROBLEMS IN LINEAR ALGEBRA

Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations. Algebra of matrices, rank and determinant of matrices, linear equations. Eigenvalues and eigenvectors, Cayley-Hamilton

theorem. Matrix representation of linear transformations. Inner Product spaces

UNIT-V: PROBLEMS IN DIFFERENTIAL EQUATIONS

Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs. Lagrange and Charpit methods for solving first order PDEs, Cauchy problem for first order PDEs. Classification of second order PDEs

REFERENCE BOOKS:

1. Walter Rudin, Principles of Mathematical Analysis, Third Edition, McGraw-Hill International Book Company, New York, 1976

2. John B. Conway, Functions of one Complex Variable, Second Edition, Springer Graduate Texts in Mathematics, New York, 1978

3. Joseph .A. Gallian , Contemporary Abstract Algebra , 7Th Edition Katherine Tegen Books

4. Seymour Lipschutz and Marc Lipson, Schaum's Outlines Linear Algebra Third Edition

5. Gilbert Strang , Introduction to Linear Algebra Fourth Edition, Wellesley Cambridge Press

6. Earl A. Coddington, An Introduction to Ordinary Differential Equations, Prentice-Hall of India, New Delhi, 1992

7. M.D. Raisinghania, Advanced Differential Equations, S. Chand and Company Ltd, New Delhi, 2001

COURSE OUTCOMES

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED

CO 1	Solve problems in Real Analysis	K1	PSO1& PSO2
CO 2	Solve problems in Complex Analysis	K1, K2,	PSO3
CO 3	Solve problems in Algebra	K1 & K3	PSO5
CO 4	Solve problems in Linear Algebra	K1, K2, K3 &	
CO 5	Solve problems in Differential Equations	K2 & K4	

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	**C2**	**C3**	**C4**	**C5**	**CIA**	**ESE**	**Total**
5	**10**	**15**	**5**	**5**	**40**	**60**	**100**

C1 – Better of Two Weekly Tests

C2 – Total of Two Monthly Tests

C3 - Mid Sem Test

C4 – Once in a semester (Seminar / Assignment/Project)

C5 – Non - Scholastic

COURSE DESIGNER:

Department staff members

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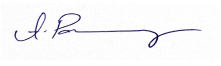

(Dr. A. Paulin Mary)

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