FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with "A++" Grade by NAAC (4th Cycle)
Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT: MATHEMATICS

NAME OF THE PROGRAMME : M.Sc. MATHEMATICS

PROGRAMME CODE : PSMA

ACADEMIC YEAR : 2023 - 2024

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 2021 onwards

PROGRAMME CODE: PSMA

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
SEMESTER - I						
23PG1M1	Algebraic Structures	6	5	40	60	100
23PG1M2	Real Analysis-I	6	5	40	60	100
23PG1M3	Ordinary Differential Equations	6	4	40	60	100
23PG1ME1/23PG1ME2	Number Theory / Integral Transforms	5	3	40	60	100
23PG1ME3/23PG1ME4	Fuzzy Sets and its Applications / Differential Geometry	5	3	40	60	100
23PG1MAE	Linear Programming – EDC	4	2	40	60	100
	Library	3	-	-	-	-
Total		**30**	**19**			
SEMESTER - II						
23PG2M4	Advanced Algebra	6	5	40	60	100
23PG2M5	Real Analysis-II	6	5	40	60	100

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
23PG2M6	Mechanics	6	4	40	60	100
23PG2ME5/ 23PG2ME6	Mathematical Statistics / Statistical Methods	4	3	40	60	100
23PG2ME7/ 23PG2ME8	Graph Theory / Numerical Analysis	4	3	40	60	100
23PG2MSE1	Optimization Methods – EDC	4	2	40	60	100
	Library	3	-	-	-	-
Total		**30**	**19**			
SEMESTER - III						
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
21PG3ME1/21PG3ME2	Fuzzy sets and Applications/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

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
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
21PG2SLLM1	**VERBAL AND NUMERICAL APTITUDE FOR NATIONAL EXAMINATIONS**	-	4	II	40	60	100
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 2023 onwards

Employablility-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG1M1	Algebraic Structures	PG Core	6	5

COURSE DESCRIPTION

This course is designed to emphasis the study of Algebra.

COURSE OBJECTIVES

To introduce the concepts and to develop working knowledge on class equation, solvability of groups, finite abelian groups, linear transformations, real quadratic forms.

UNIT-I :

Counting Principle - Class equation for finite groups and its applications - Sylow's theorems (For theorem 2.12.1, First proof only).

UNIT-II :

Solvable groups - Direct products - Finite abelian groups- Modules

UNIT-III :

Linear Transformations: Canonical forms –Triangular form - Nilpotent transformations.

UNIT-IV :

Jordan form - rational canonical form.

UNIT-V:

Trace and transpose - Hermitian, unitary, normal transformations, real quadratic form.

TEXT BOOKS:

1. I.N. Herstein. *Topics in Algebra* (II Edition) Wiley Eastern Limited, New Delhi, 1975

Unit I : Chapter 2: Sections 2.11 and 2.12 (Omit Lemma 2.12.5)

Unit II: Chapter 5 : Section 5.7 (Lemma 5.7.1, Lemma 5.7.2, Theorem 5.7.1)

Chapter 2: Section 2.13 and 2.14 (Theorem 2.14.1 only)

Chapter 4: Section 4.5

Unit III : Chapter 6: Sections 6.4, 6.5

Unit IV : Chapter 6 : Sections 6.6 and 6.7

Unit V : Chapter 6 : Sections 6.8, 6.10 and 6.11 (Omit 6.9)

REFERENCE BOOKS

1. M.Artin, *Algebra*, Prentice Hall of India, 1991.
2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, *Basic Abstract Algebra* (II Edition) Cambridge University Press, 1997. (Indian Edition)
3. I.S.Luther and I.B.S.Passi, *Algebra*, Vol. I –Groups(1996); Vol. II Rings, Narosa Publishing House , New Delhi, 1999
4. D.S.Malik, J.N. Mordeson and M.K.Sen, *Fundamental of Abstract Algebra*, McGraw Hill (International Edition), New York. 1997.
5. N.Jacobson, *Basic Algebra*, Vol. I & II W.H.Freeman (1980); also published by Hindustan Publishing Company, New Delhi.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1				
1.1	Counting Principle	4	Chalk & Talk	Black Board
1.2	Class equation for finite groups	3	Chalk & Talk, Discussion	Black Board
1.3	Applications	4	Chalk & Talk,	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	Board
1.4	Sylow's theorems	6	Chalk & Talk, Discussion	Black Board
UNIT -2				
2.1	Solvable groups	5	Chalk & Talk	Black Board
2.2	Direct products	4	Chalk & Talk	Black Board
2.3	Finite abelian groups	5	Chalk & Talk	Black Board
2.4	Modules	4	Chalk & Talk	Black Board
UNIT -3				
3.1	Linear Transformations	5	Chalk & Talk	Black Board
3.2	Canonical forms	4	Chalk & Talk	Black Board
3.3	Triangular form	4	Chalk & Talk	Black Board
3.4	Nilpotent transformations	3	Chalk & Talk	Black Board
UNIT -4				
4.1	Introduction	5	Chalk & TalkDiscussion	Black Board
4.2	Jordan form	4	Chalk & Talk Discussion	Black Board
4.3	rational canonical form	4	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -5 ELLIPTIC FUNCTIONS				
5.1	Introduction	4	Chalk & Talk Discussion	Black Board
5.2	Trace and transpose	4	Chalk & Talk Discussion	Black Board
5.3	Hermitian, unitary	4	Chalk & Talk Discussion	Black Board
5.4	normal transformations	4	Chalk & Talk Discussion	Black Board
5.5	real quadratic form	4	Chalk & Talk Discussion	Black Board

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 basic counting principle, define class equations to solve problems, explain Sylow's theorems and apply the	K2 ,K3	PSO 1

	theorem to find number of Sylow subgroups .		
CO 2	Define Solvable groups, define direct products, examine the properties of finite abelian groups, define modules	K2, K3	PSO 3
CO 3	Define similar Transformations, define invariant subspace, explore the properties of triangular matrix, to find the index of nilpotence to decompose a space into invariant subspaces, to find invariants of linear transformation, to explore the properties of nilpotent transformation relating nilpotence with invariants	K4	PSO 5
CO 4	Define Jordan, canonical form, Jordan blocks, define rational canonical form, define companion matrix of polynomial, find the elementary devices of transformation, apply the concepts to find characteristic polynomial of linear transformation	K2, K5	PSO 2
CO 5	Define trace, define transpose of a matrix, explain the properties of trace and transpose, to find trace, to find transpose of matrix, to prove Jacobson lemma using the triangular form, define symmetric matrix, skew symmetric matrix, adjoint, to define Hermitian, unitary, normal transformations and to verify whether the transformation in Hermitian, unitary and normal	K2	PSO 4

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

EVALUATION PATTERN

SCHOLASTIC					**NON - SCHOLASTIC**	**MARKS**		
C1	**C2**	**C3**	**C4**	**C5**	**C6**	**CIA**	**ESE**	**Total**

10	**10**	**5**	**5**	**5**	**5**	**40**	**60**	**100**

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

****The best out of two will be taken into account***

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated – **3**
♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Mrs. Nigila Ragavan

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER –I

For those who joined in 2023 onwards

Employablility-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG1M2	REAL ANALYSIS-I	PG Core	6	5

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 : Functions of bounded variation - Introduction - Properties of monotonic functions - Functions of bounded variation - Total variation - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of two increasing functions - Continuous functions of bounded variation.

Chapter – 6 : Sections 6.1 to 6.8

Infinite Series : Absolute and conditional convergence - Dirichlet's test and Abel's test - Rearrangement of series - Riemann's theorem on conditionally convergent series.

Chapter 8 : Sections 8.8, 8.15, 8.17, 8.18

UNIT-II : The Riemann - Stieltjes Integral - Introduction - Notation - The definition of the Riemann - Stieltjes integral - Linear Properties - Integration by parts- Change of variable in a Riemann - Stieltjes integral - Reduction to a Riemann Integral – Euler's summation formula - Monotonically increasing integrators, Upper and lower integrals - Additive and linearity properties of upper, lower integrals - Riemann's condition - Comparison theorems.

Chapter - 7 : Sections 7.1 to 7.14

UNIT-III : The Riemann-Stieltjes Integral - Integrators of bounded variation-Sufficient conditions for the existence of Riemann-Stieltjes integrals-Necessary conditions for the existence of RS integrals- Mean value theorems -integrals as a function of the interval – Second fundamental theorem of integral calculus-Change of variable -Second Mean Value Theorem for Riemann integral- Riemann-Stieltjes integrals depending on a parameter- Differentiation under integral sign-Lebesgue criteriaon for existence of Riemann integrals. Chapter - 7 : 7.15 to 7.26

UNIT-IV : Infinite Series and infinite Products - Double sequences - Double series - Rearrangement theorem for double series - A sufficient condition for equality of iterated series - Multiplication of series – Cesaro summability - Infinite products.

Chapter - 8 Sec, 8.20, 8.21 to 8.26

Power series - Multiplication of power series - The Taylor's series generated by a function - Bernstein's theorem - Abel's limit theorem - Tauber's theorem

Chapter 9 : Sections 9.14 9.15, 9.19, 9.20, 9.22, 9.23

UNIT-V: Sequences of Functions – Pointwise convergence of sequences of functions - Examples of sequences of real - valued functions - Uniform convergence and continuity - Cauchy condition for uniform convergence - Uniform convergence of infinite series of functions - Riemann - Stieltjes integration – Non-uniform Convergence and Term-by-term Integration - Uniform convergence and differentiation - Sufficient condition for uniform convergence of a series - Mean convergence.

Chapter -9 Sec 9.1 to 9.6, 9.8,9.9,9.10,9.11, 9.13

TEXT BOOK:

Tom M.Apostol : *Mathematical Analysis*, 2nd Edition, Addison-Wesley Publishing Company Inc. New York, 1974.

UNIT-I : Chapter – 6 : Sections 6.1 to 6.8

Chapter 8 : Sections 8.8, 8.15, 8.17, 8.18

UNIT-II : Chapter - 7 : Sections 7.1 to 7.14

UNIT-III : Chapter - 7 : 7.15 to 7.26

UNIT-IV : Chapter - 8 Sec, 8.20, 8.21 to 8.26

Chapter 9 : Sections 9.14 9.15, 9.19, 9.20, 9.22, 9.23

UNIT-V: Chapter -9 Sec 9.1 to 9.6, 9.8, 9.9, 9.10, 9.11, 9.13

REFERENCES:

1. Bartle, R.G. *Real Analysis*, John Wiley and Sons Inc., 1976.

2. Rudin,W. *Principles of Mathematical Analysis*, 3rd Edition. McGraw Hill Company, New York, 1976.

3. Malik,S.C. and Savita Arora. *Mathematical Anslysis*, Wiley Eastern Limited.New Delhi, 1991.

4. Sanjay Arora and Bansi Lal, *Introduction to Real Analysis*, Satya Prakashan, New Delhi, 1991.

5. Gelbaum, B.R. and J. Olmsted, *Counter Examples in Analysis*, Holden day, San Francisco, 1964.

6. A.L.Gupta and N.R.Gupta, *Principles of Real Analysis*, Pearson Education, (Indian print) 2003.

Website and e-Learning Source

http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics,

http://www.opensource.org, www.mathpages.com

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1				
1.1	Properties of monotonic functions	4	Chalk & Talk Discussion	Black Board
1.2	Functions of bounded variation	4	Chalk & Talk Discussion	Black Board
1.3	Total variation	5	Chalk & Talk Discussion	Black Board
1.4	Additive property of total variation	5	Chalk & Talk Discussion	Black Board
1.5	Continuous functions of bounded variation	3	Chalk & Talk Discussion	Black Board
UNIT -2				

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.1	Change of variable in a Riemann-Stieltjes integral	5	Chalk & Talk Discussion	Black Board
2.2	Reduction to a Riemann Integral	3	Chalk & Talk Discussion	Black Board
2.3	Euler's summation formula	3	Chalk & Talk Discussion	Black Board
2.4	Monotonically increasing integrators	3	Chalk & Talk Discussion	Black Board
2.5	Upper and lower integrals	3	Chalk & Talk Discussion	Black Board
2.6	Riemann's condition - Comparison theorems.	3	Chalk & Talk Discussion	Black Board
UNIT -3				
3.1	Sufficient conditions for the existence of Riemann-Stieltjes integrals	4	Chalk & Talk Discussion	Black Board
3.2	Necessary conditions for the existence of RS integrals	5	Chalk & Talk Discussion	Black Board
3.3	Mean value theorems	4	Chalk & Talk Discussion	Black Board
3.4	Second fundamental theorem of integral calculus	5	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	Infinite Series and infinite Products	3	Chalk & Talk Discussion	Black Board
4.2	**Power series**	4	Chalk & Talk Discussion	Black Board
4.3	Bernstein's theorem	4	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.4	Abel's limit theorem	4	Chalk & Talk Discussion	Black Board
UNIT -5				
5.1	Sequences of Functions	3	Chalk & Talk Discussion	Black Board
5.2	Pointwise convergence of sequences of functions	5	Chalk & Talk Discussion	Black Board
5.3	Uniform convergence and continuity	4	Chalk & Talk Discussion	Black Board
5.4	Cauchy condition for uniform convergence	4	Chalk & Talk Discussion	Black Board
5.5	Uniform convergence and differentiation	4	Chalk & Talk Discussion	Black Board

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 Functions of bounded variation and Infinite series	K2	PSO1& PSO2
CO 2	Explain concepts of Reimann Steljes Integral	K2 & K3	PSO3

CO 3	Describe the theorems on Reimann Steljes Integral	K3 & K2	PSO4
CO 4	Describe Infinite products	K2 & K4	PSO5
CO 5	Describe Sequences of function	K2 & K4	PSO3

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PS O1	PS O2	PS O3	PS O4	PS O5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note:
- ♦ Strongly Correlated – **3**
- ♦ Moderately Correlated – **2**
- ♦ Weakly Correlated -**1**

COURSE DESIGNER:

A. Sheela Roselin

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER –I

For those who joined in 2023 onwards

Entrepreneurship -100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG1M3	ORDINARY 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.

UNIT-I: LINEAR EQUATIONS WITH CONSTANT COEFFICIENTS (18 HRS.)

Second order homogeneous equations-Initial value problems-Linear dependence and independence-Wronskian and a formula for Wronskian-Non-homogeneous equation of order two.

UNIT-II: LINEAR EQUATIONS WITH CONSTANT COEFFICIENTS (18 HRS.)

Homogeneous and non-homogeneous equation of order n –Initial value problems- Annihilator method to solve non-homogeneous equation- Algebra of constant coefficient operators.

UNIT-III: LINEAR EQUATION WITH VARIABLE COEFFICIENTS (18 HRS.)

Initial value problems -Existence and uniqueness theorems – Solutions to solve a non-homogeneous equation – Wronskian and linear dependence – reduction of the order of a homogeneous equation – homogeneous equation with analytic coefficients-The Legendre equation.

UNIT-IV: LINEAR EQUATION WITH REGULAR SINGULAR POINTS (18 HRS.)

Euler equation – Second order equations with regular singular points – Exceptional cases – Bessel Function.

UNIT-V: EXISTENCE AND UNIQUENESS OF SOLUTIONS TO FIRST ORDER EQUATIONS **(18 HRS.)**

Equation with variable separated – Exact equation – method of successive approximations – the Lipschitz condition – convergence of the successive approximations and the existence theorem.

TEXT BOOKS:

1. E. A. Coddington, *A introduction to ordinary differential equations* (3rd Printing) Prentice-Hall of India Ltd., New Delhi, 1987.

UNIT-I: Chapter 2: Sections 1 to 6

UNIT-II: Chapter 2: Sections 7 to 12.

UNIT-III: Chapter 3: Sections 1 to 8 (Omit section 9)

UNIT-IV: Chapter 4: Sections 1 to 4 and 6 to 8(Omit sections 5 and 9)

UNIT-V: Chapter 5: Sections 1 to 6 (Omit Sections 7 to 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				
1.1	Second order homogeneous equations	4	Chalk & Talk Discussion	Black Board
1.2	Initial value problems	4	Chalk & Talk Discussion	Black Board
1.3	Linear dependence and independence	5	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	Board
1.4	Non-homogeneous equation of order two.	5	Chalk & Talk Discussion	Black Board
UNIT -2				
2.1	Homogeneous and non-homogeneous equation of order n	5	Chalk & Talk Discussion	Black Board
2.2	Initial value problems	5	Chalk & Talk Discussion	Black Board
2.3	Annihilator method to solve non-homogeneous equation	4	Chalk & Talk Discussion	Black Board
2.4	Algebra of constant coefficient operators.	3	Chalk & Talk Discussion	Black Board
UNIT -3				
3.1	Initial value problems	4	Chalk & Talk Discussion	Black Board
3.2	Existence and uniqueness theorems	5	Chalk & Talk Discussion	Black Board
3.3	Solutions to solve a non-homogeneous equation	4	Chalk & Talk Discussion	Black Board
3.4	The Legendre equation	5	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	Euler equation	4	Chalk & Talk Discussion	Black Board
4.2	Second order equations with regular singular points	4	Chalk & Talk Discussion	Black Board
4.3	Bessel Function	4	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -5				
5.1	*Equation with variable separated*	3	Chalk & Talk Discussion	Black Board
5.2	*Exact equation*	5	Chalk & Talk Discussion	Black Board
5.3	*method of successive approximations*	4	Chalk & Talk Discussion	Black Board
5.4	*Lipschitz condition*	4	Chalk & Talk Discussion	Black Board
5.5	*convergence of the successive approximations*	4	Chalk & Talk Discussion	Black Board
5.6	*existence theorem.*			

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	Establish the qualitative behavior of solutions of systems of differential equations.	K1	PSO1& PSO2
CO 2	Recognize the physical phenomena modeled by differential equations and dynamical systems.	K2 & K3	PSO3
CO 3	Analyze solutions using appropriate methods	K1 & K2	PSO4

	and give examples.		
CO 4	Formulate Green's function for boundary value problems.	K1 & K4	PSO5
CO 5	Understand and use various theoretical ideas and results that underlie the mathematics in this course.	K2 & K4	PSO3

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	**C2**	**C3**	**C4**	**C5**	**C6**	**CIA**	**ESE**	**Total**
10	**10**	**5**	**5**	**5**	**5**	**40**	**60**	**100**

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated – **3**
♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr. A. Paulin Mary

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER – I

For those who joined in 2023 onwards

Skill Development - 100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG1ME1	NUMBER THEORY	PG Elective	5	3

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.)

Divisibility, Primes.

UNIT –II CONGRUENCES (15 HRS.)

Congruences, Solutions of Congruences, Congruences of Degree 1, the Function φ (n).

UNIT –III QUADRATIC RECIPROCITY (15 HRS.)

Quadratic Residues, Quadratic Reciprocity, the Jacobi Symbol.

UNIT –IV SOME FUNCTIONS OF NUMBER THEORY (15 HRS.)

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

UNIT –V SOME DIOPHANTINE EQUATIONS (15 HRS.)

Diophantine Equations, The Equation $x^2 + y^2 = z^2$, Sums of Four and Five Squares, 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.

Unit 1: Chapter 1: 1.2 , 1.3

Unit 2: Chapter 2: 2.1 – 2.4

Unit 3: Chapter 3: 3.1 – 3.3

Unit 4: Chapter 4: 4.1 – 4.3

Unit 5: Chapter 5: 5.1, 5.5, 5.7, 5.10

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.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1				
1.1	Introduction	4	Chalk & Talk Discussion	Black Board
1.2	Divisibility	4	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
1.3	Primes	5	Chalk & Talk Discussion	Black Board
UNIT -2				
2.1	Congruences	5	Chalk & Talk Discussion	Black Board
2.2	Solutions of Congruences	4	Chalk & Talk Discussion	Black Board
2.3	Congruences of Degree 1	3	Chalk & Talk Discussion	Black Board
2.4	the Function φ (n)	4	Chalk & Talk Discussion	Black Board
UNIT -3				
3.1	Quadratic Residues	4	Chalk & Talk Discussion	Black Board
3.2	Quadratic Reciprocity	5	Chalk & Talk Discussion	Black Board
3.3	the Jacobi Symbol	4	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	Greatest Integer Function	3	Chalk & Talk Discussion	Black Board
4.2	Arithmetic Functions	4	Chalk & Talk Discussion	Black Board
4.3	The Moebius Inversion Formula.	4	Chalk & Talk Discussion	Black Board
UNIT -5				
5.1	Diophantine Equations	4	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	Board
5.2	The Equation $x^2 + y^2 = z^2$	4	Chalk & Talk Discussion	Black Board
5.3	Sums of Four and Five Squares	4	Chalk & Talk Discussion	Black Board
5.4	Sum of Two Squares	4	Chalk & Talk Discussion	Black Board

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, K3, K4, K5	PSO1
CO 2	Explain properties of congruences	K2, K3, K4, K5	PSO3
CO 3	Apply the Law of Quadratic Reciprocity	K2, K3, K4, K5	PSO5
CO 4	Classify functions of number theory	K2, K3, K4, K5	PSO4
CO 5	Solve Linear Diophantine equation	K2, K3, K4, K5	PSO2

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated – **3**
♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Mrs. Nigila Ragavan

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature
& Name

I M.Sc. Mathematics

SEMESTER – I

For those who joined in 2023 onwards

Skill Development - 100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG1ME2	INTEGRAL TRANSFORMS	PG Elective	5	3

COURSE DESCRIPTION

This course discovers interesting and unexpected relationships between transforms.

COURSE OBJECTIVES

To help the students to learn the concepts of various transforms such as Laplace transform, Fourier transform, Mellin transform and z-transform.

UNITS

UNIT –I LAPLACE TRANSFORM (15 HRS.)

Definition of Laplace Transform, Laplace transforms of some elementary functions, Properties of Laplace transform, Laplace transform of the derivative of a function, Heaviside's expansion theorem, Application of Laplace transform to solutions of ODEs and PDEs.

UNIT –II INVERSE LAPLACE TRANSFORM

Inverse Laplace Transform, Properties of Inverse Laplace Transform, Inverse Laplace Transform of derivatives, Convolution Theorem

Unit -III FOURIER TRANSFORM (15 HRS.)

Fourier Integral theorem, Properties of Fourier Transform, Inverse Fourier Transform, Convolution Theorem, Fourier Transform of the derivatives of functions, Parseval's Identity, Relationship of Fourier and Laplace Transform,

Application of Fourier transforms to the solution of initial and boundary value problems.

Unit -IV MELLIN TRANSFORM (15 HRS.)

Properties and evaluation of Mellin transforms, Convolution theorem for Mellin transform, Complex variable method and applications.

UNIT –V Z-TRANSFORM SOME FUNCTIONS (15 HRS.)

Definition of Z-transform, Inversion of the Z-transform, Solutions of difference equations using Z-transform.

TEXT BOOK:

1. Brian Davies, Integral transforms and their Applications, Springer.
2. L. Andrews and B. Shivamogg, Integral Transforms for Engineers, Prentice Hall of India.
3. I.N.Sneddon, Use of Integral Transforms, Tata-McGraw Hill.
4. R. Bracemell, Fourier Transform and its Applications, MacDraw hill.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1				
1.1	Definition of Laplace Transform	4	Chalk & Talk Discussion	Black Board
1.2	Laplace transforms of some elementary functions	4	Chalk & Talk Discussion	Black Board
1.3	Properties of Laplace transform	5	Chalk & Talk Discussion	Black Board
1.4	Laplace transform of the derivative of a function	5	Chalk & Talk Discussion	Black Board
1.5	Heaviside's expansion theorem	3	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	Board
UNIT -2				
2.1	Inverse Laplace Transform	5	Chalk & Talk Discussion	Black Board
2.2	Properties of Inverse Laplace Transform	3	Chalk & Talk Discussion	Black Board
2.3	Inverse Laplace Transform of derivatives	3	Chalk & Talk Discussion	Black Board
2.4	Convolution Theorem	3	Chalk & Talk Discussion	Black Board
UNIT -3				
3.1	Fourier Integral theorem	4	Chalk & Talk Discussion	Black Board
3.2	Properties of Fourier Transform	3	Chalk & Talk Discussion	Black Board
3.3	Inverse Fourier Transform	4	Chalk & Talk Discussion	Black Board
3.4	Convolution Theorem	3	Chalk & Talk Discussion	Black Board
3.5	Relationship of Fourier and Laplace Transform	3	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	Properties and evaluation of Mellin transforms	3	Chalk & Talk Discussion	Black Board
4.2	Convolution theorem for Mellin transform	5	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.3	Complex variable method	4	Chalk & Talk Discussion	Black Board
4.4	Applications	3	Chalk & Talk Discussion	Black Board
UNIT -5				
5.1	Definition of Z-transform	4	Chalk & Talk Discussion	Black Board
5.2	Inversion of the Z-transform	5	Chalk & Talk Discussion	Black Board
5.3	Solutions of difference	4	Chalk & Talk Discussion	Black Board
5.4	equations using Z-transform	4	Chalk & Talk Discussion	Black Board

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 Laplace Transform and apply them to solve differential equations	K2, K3, K4, K5	PSO1
CO 2	Define Inverse Laplace Transform and solve problems	K2, K3, K4, K5	PSO3
CO 3	Define Fourier Transform and use them to solve differential equations	K2, K3, K4, K5	PSO5
CO 4	Define Mellin Transform and use them to solve differential equations	K2, K3, K4, K5	PSO4

CO 5	Define Z-Transform and use them to solve differential equations	K2, K3, K4, K5	PSO2

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note:
- ♦ Strongly Correlated – **3**
- ♦ Moderately Correlated – **2**
- ♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr. E. Helena

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER –I

For those who joined in 2023 onwards

Employablility-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG1ME3	FUZZY SETS AND ITS APPLICATIONS	Lecture	5	3

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.

UNIT –I CRISP SETS AND FUZZY SETS (15 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 (15 HRS.)

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

UNIT –III FUZZY RELATIONS (15 HRS.)

Crisp and Fuzzy Relations, Binary Relations on a single set, Equivalence and similarity Relations.

UNIT –IV FUZZY MEASURES (15 HRS.)

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

UNIT –V APPLICATIONS (15 HRS.)

General Discussion, natural, Life and Social Sciences, Engineering, Medicine and Management and Decision making.

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	Teaching Aids
UNIT -1 CRISP SETS AND FUZZY SETS				
1.1	Crisp sets: An over view	4	Chalk & Talk Discussion	Black Board
1.2	The notion of Fuzzy sets	4	Chalk & Talk Discussion	Black Board
1.3	Basic concepts of Fuzzy sets	5	Chalk & Talk Discussion	Black Board
1.4	Classical Logic: an over view	5	Chalk & Talk Discussion	Black Board
1.5	Fuzzy logic	3	Chalk & Talk Discussion	Black Board
UNIT -2 OPERATIONS ON FUZZY SETS				
2.1	General discussion of fuzzy operations	5	Chalk & Talk Discussion	Black Board
2.2	Fuzzy Complements	3	Chalk & Talk Discussion	Black Board
2.3	Fuzzy Union	3	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.4	Fuzzy Intersection	3	Chalk & Talk Discussion	Black Board
2.5	Combinations of operations	3	Chalk & Talk Discussion	Black Board
UNIT -3 FUZZY RELATIONS				
3.1	Crisp Relations	4	Chalk & Talk Discussion	Black Board
3.2	Fuzzy Relations	5	Chalk & Talk Discussion	Black Board
3.3	Binary Relations on a single set	4	Chalk & Talk Discussion	Black Board
3.4	Equivalence Relations	5	Chalk & Talk Discussion	Black Board
3.5	Similarity Relations	3	Chalk & Talk Discussion	Black Board
UNIT -4 FUZZY MEASURES				
4.1	General Discussion fuzzy measures	3	Chalk & Talk Discussion	Black Board
4.2	Belief Measures	4	Chalk & Talk Discussion	Black Board
4.3	Plausibility Measures	4	Chalk & Talk Discussion	Black Board
4.4	Possibility Measures	4	Chalk & Talk Discussion	Black Board
4.5	Necessity Measures	4	Chalk & Talk Discussion	Black Board
UNIT -5 APPLICATIONS				
5.1	General Discussion of fuzzy	3	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	applications		Discussion	Board
5.2	Fuzzy applications of Natural & Life	5	Chalk & Talk Discussion	Black Board
5.3	Fuzzy applications of Social Sciences & Engineering	4	Chalk & Talk Discussion	Black Board
5.4	Fuzzy applications of Medicine and Management	4	Chalk & Talk Discussion	Black Board
5.5	Fuzzy applications of Decision making	4	Chalk & Talk Discussion	Black Board

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Distinguish crisp sets and Fuzzy sets
CO 2	Classify operators on Fuzzy sets
CO 3	Describe Fuzzy relations
CO 4	Describe Fuzzy Measures
CO 5	Apply Fuzzy sets in real life situations

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note:
- ♦ Strongly Correlated – **3**
- ♦ Moderately Correlated – **2**
- ♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr. A. Jose Little Flower

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER –II

For those who joined in 2023 onwards

Employablility-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CRED S
PSMA	23PG2ME4	DIFFERENTIAL GEOMETRY	PG ELECTIVE	5	3

COURSE DESCRIPTION

This course provides various concepts of Differential Geometry which can be applied in real life situations

COURSE OBJECTIVES

To enable the students to understand curves, space curves, smooth surface and the curvature of curves on a surface.

UNITS

UNIT –I **(12 HRS.)**

Curves- arc length- Reparametrization-Level curves - Curvature - Plane curves.

Sections: 1.1 to 1.4 and Sections 2.1,2.2.

UNIT –II **(12 HRS.)**

Space curves-Torsion- Serret Frenet equations- Simple closed curves- The Isoperimetric Inequality The Four vertex Theorem.

Sections 2.3 and Sections 3.1 to 3.3

UNIT –III **(12 HRS.)**

Smooth surface- Tangents, normal and orientability- Examples of surfaces- Quadratic surfaces- Triple orthogonal systems- Applications of Inverse function theorem

Sections 4.1 to 4.7

UNIT –IV (12 HRS.)

Lengths of curves on surfacesa- First fundamental form- Isometries of surfaces- Conformal mapping of surfaces-Surface area- Equiareal maps and a theorem of Archimedes.

Sections: 5.1 to 5.5

UNIT –V (12 HRS.)

The Second Fundamental form- The Curvature of curves on a surface- The normal and principal curvature- Euler's theorem- The geometric interpretation of principal curvatures.

Sections: 6.1 to 6.4

TEXT BOOK:

1. Andrew Pressley, Elementary Differential Geometry, Springer, 2004.

REFERENCES:

1. Christian Bar, Elementary Differential Geometry, Cambridge University Press, 2 1.

2. Thomas F. Banchoff and Stephen T. Lovett, Differential Geometry of Curves and Surfaces, A.K Peters/CRC press, 2010.

3. W. Klingenberg, A course in Differential Geometry, Springer-Verlag, New York, 1978.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1				
1.1	Curves- arc length	4	Chalk & Talk Discussion	Black Board
1.2	Level curves – Curvature	4	Chalk & Talk Discussion	Black Board
1.3	Plane curves	5	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -2				
2.1	Space curves-Torsion	3	Chalk & Talk Discussion	Black Board
2.2	Serret Frenet equations	4	Chalk & Talk Discussion	Black Board
2.3	Simple closed curves	3	Chalk & Talk Discussion	Black Board
2.4	The Isoperimetric Inequality	3	Chalk & Talk Discussion	Black Board
2.5	The Four vertex Theorem	3	Chalk & Talk Discussion	Black Board
UNIT -3				
3.1	Smooth surface	4	Chalk & Talk Discussion	Black Board
3.2	Tangents and normal	5	Chalk & Talk Discussion	Black Board
3.3	Examples of surfaces	4	Chalk & Talk Discussion	Black Board
3.4	Quadratic surfaces	4	Chalk & Talk Discussion	Black Board
3.5	Triple orthogonal systems	4	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	Lengths of curves on surface	3	Chalk & Talk Discussion	Black Board
4.2	First fundamental form	4	Chalk & Talk Discussion	Black Board
4.3	Isometries of surfaces	4	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	Board
4.4	Conformal mapping of surfaces	4	Chalk & Talk Discussion	Black Board
4.5	Surface area	4	Chalk & Talk Discussion	Black Board
UNIT -5				
5.1	The Second Fundamental form	3	Chalk & Talk Discussion	Black Board
5.2	The Curvature of curves on a surface	5	Chalk & Talk Discussion	Black Board
5.3	The normal and principal curvature	4	Chalk & Talk Discussion	Black Board
5.4	Euler's theorem	4	Chalk & Talk Discussion	Black Board
5.5	The geometric interpretation of principal curvatures.	4	Chalk & Talk Discussion	Black Board

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING	PSOs ADDRESSED

		TO REVISED BLOOM'S TAXONOMY)	
CO 1	Classify Reparametrization of curves	K2	PSO1& PSO4
CO 2	Describe the Isoperimetric Inequality	K1, K2, & K5	PSO2& PSO3
CO 3	Summarize Triple orthogonal systems	K1 & K3	PSO3& PSO5
CO 4	Describe the Conformal mapping of surfaces	K1, K2, K3 & K5	PSO5
CO 5	Distinguish the normal and pr curvature	K2 & K4	PSO3& PSO5

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	**C2**	**C3**	**C4**	**C5**	**C6**	**CIA**	**ESE**	**Total**
10	**10**	**5**	**5**	**5**	**5**	**40**	**60**	**100**

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated – **3**
♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr. C. Prasanna Devi

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER –I

For those who joined in 2023 onwards

Employablility-40%

Skill Development - 60%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATE GORY	HRS/W EEK	CREDITS
PSMA	23PG1MAE	LINEAR PROGRAMMING	PG EDC	2	2

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 LPP, Graphical Method, Simplex Method, Decision Analysis.

UNITS

UNIT –I MATHEMATICAL FORMULATION OF LPP (6 HRS)

Formulation of Linear Programming Problem - Model Formulation - Problem in Mathematical Model Formulation.

UNIT –II GRAPHICAL SOLUTION OF LPP (6 HRS)

Graphical Solution Method –Maximization & Minimization Case

Standard Form & Basic Solutions.

UNIT –III SOLUTIONS OF LPP (6 HRS)

Definition of objective function - Linear and Non-negative Constraints - Feasible Solution - Basic Feasible Solution - Optimum Basic Feasible Solution - Degenerate solution - Evaluation and Net Evaluation - Unbounded Solutions and conditions for Optimality of a Feasible Solution in terms of net Evaluations (no proof) - Pivotal element

UNIT –IV SIMPLEX METHOD **(6 HRS)**

Computational procedure of the simplex method - Tie for entering basis vector and leaving basis vector - Problems in Simplex Method .

UNIT –V DECISION ANALYSIS **(6 HRS.)**

Introduction – decision making environment – decisions under uncertainity – the Laplace criterion – the Maximin or Minimax criterion – the Maximax or Minimin criterion – the Savage criterion – the Hurwicz criterion.

TEXT BOOKS:

1.Kanti Swarup, P.K.Gupta, Man Mohan - Operations Research, 2015– Sultan Chand & Sons, New Delhi.

Unit I – Chapters II
Unit II – Chapters III
Unit III- Chapters IV (sec 4.1-4.2)
Unit IV- Chapters IV (sec 4.3)
Unit V – Chapter XVI (sec 16.1 – 16.5)

REFERENCES:

1.P.K.Gupta, Man Mohan – Problems in Operation Research, 2015 - Sultan Chand & Sons, New Delhi.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1				
1.1	Formulation of Linear Programming Problem	4	Chalk & Talk Discussion	Black Board
1.2	Model Formulation	4	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	Board
1.3	Problem in Mathematical Model Formulation	5	Chalk & Talk Discussion	Black Board
UNIT -2				
2.1	Graphical Solution Method	5	Chalk & Talk Discussion	Black Board
2.2	Maximization & Minimization Case	4	Chalk & Talk Discussion	Black Board
2.3	Standard Form	4	Chalk & Talk Discussion	Black Board
2.4	Basic Solutions	3	Chalk & Talk Discussion	Black Board
UNIT -3				
3.1	Linear and Non-negative Constraints	4	Chalk & Talk Discussion	Black Board
3.2	Feasible Solution	5	Chalk & Talk Discussion	Black Board
3.3	Basic Feasible Solution	4	Chalk & Talk Discussion	Black Board
3.4	Degenerate solution	5	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	Computational procedure of the simplex method	5	Chalk & Talk Discussion	Black Board
4.2	Tie for entering basis vector and leaving basis vector	4	Chalk & Talk Discussion	Black Board
4.3	Problems in Simplex Method	4	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -5				
5.1	decision making environment	4	Chalk & Talk Discussion	Black Board
5.2	the Laplace criterion	3	Chalk & Talk Discussion	Black Board
5.3	the Maximin or Minimax criterion	3	Chalk & Talk Discussion	Black Board
5.4	the Savage criterion	4	Chalk & Talk Discussion	Black Board
5.5	the Hurwicz criterion	4	Chalk & Talk Discussion	Black Board

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Formulate linear programming problems
CO 2	Solve linear programming problems by graphical method
CO 3	Describe feasible Solution, basic feasible solution, optimum basic feasible solution and degenerate solution.
CO 4	Describe simplex method to solve linear programming problems
CO 5	Solve problems in decision making.

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated – **3**
♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Mrs. Nigila Ragavan

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER – II

For those who joined in 2023 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG2M4	ADVANCED ALGEBRA	PG Core	6	5

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 (18 HRS.)

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

UNIT –II MATRICES & TRANSFORMATIONS (18 HRS.)

Matrices, Canonical forms: triangular form, Nilpotent transformations.

UNIT –III TYPES OF LINEAR TRANSFORMATIONS (18 HRS.)

Hermitian, Unitary and Normal transformations, Real quadratic forms

UNIT –IV ROOTS IN EXTENSION FIELDS (18 HRS.)

Extension Fields, Roots of polynomials, More about roots.

UNIT –V GALOIS THEORY (18 HRS.)

The elements of Galois Theory, Solvability by radicals, Finite fields**.**

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, Theorems 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				
1.1	Dual spaces	6	Chalk & Talk Discussion	Black Board
1.2	The algebra of linear transformations	6	Chalk & Talk Discussion	Black Board
1.3	Characteristic roots	6	Chalk & Talk Discussion	Black Board
UNIT -2				
2.1	Matrices	6	Chalk & Talk Discussion	Black Board
2.2	Canonical forms: triangular form	6	Chalk & Talk Discussion	Black Board
2.3	Nilpotent transformations.	6	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	Board
UNIT -3				
3.1	Hermitian	4	Chalk & Talk Discussion	Black Board
3.2	Unitary Transformation	5	Chalk & Talk Discussion	Black Board
3.3	Normal transformations	4	Chalk & Talk Discussion	Black Board
3.4	Real quadratic forms	5	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	Extension Fields	6	Chalk & Talk Discussion	Black Board
4.2	Roots of polynomials	6	Chalk & Talk Discussion	Black Board
4.3	More about roots	6	Chalk & Talk Discussion	Black Board
UNIT -5				
5.1	The elements of Galois Theory	6	Chalk & Talk Discussion	Black Board
5.2	Solvability by radicals	5	Chalk & Talk Discussion	Black Board
5.3	Finite fields	7	Chalk & Talk Discussion	Black Board

COURSE OUTCOMES

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Appraise characteristic roots of linear transformations	K2, K3, K4, K5	PSO1& PSO2
CO 2	Explain Matrices and Nilpotent transformation	K2, K3, K4, K5	PSO3
CO 3	Classify transformations	K2, K3, K4, K5	PSO5
CO 4	Describe various concepts of fields	K2, K3, K4, K5	PSO4
CO 5	Analyse Galois theory	K2, K3, K4, K5	PSO3

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	**C2**	**C3**	**C4**	**C5**	**C6**	**CIA**	**ESE**	**Total**
10	**10**	**5**	**5**	**5**	**5**	**40**	**60**	**100**

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2

CO3	**2**	**2**	**3**	**2**
CO4	**2**	**3**	**2**	**2**
CO5	**2**	**3**	**2**	**2**

Note: ♦ Strongly Correlated – **3**
♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Mrs. Nigila Ragavan

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER –II

For those who joined in 2023 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG2M5	REAL ANALYSIS II	PG Core	6	5

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 :Measure on the Real line - Lebesgue Outer Measure - Measurable sets - Regularity - Measurable Functions - Borel and Lebesgue Measurability

Chapter - 2 Sec 2.1 to 2.5 (de Barra)

UNIT-II : Integration of Functions of a Real variable - Integration of Non- negative functions - The General Integral - Riemann and Lebesgue Integrals

Chapter - 3 Sec 3.1,3.2 and 3.4 (de Barra)

UNIT-III : Fourier Series and Fourier Integrals - Introduction - Orthogonal system of functions - The theorem on best approximation - The Fourier series of a function relative to an orthonormal system - Properties of Fourier Coefficients - The Riesz-Fischer Thorem - The convergence and representation problems in for trigonometric series - The Riemann - Lebesgue Lemma - The Dirichlet Integrals - An integral representation for the partial sums of Fourier series - Riemann's localization theorem - Sufficient conditions for convergence of a Fourier series at a particular point –Cesaro summability of Fourier series- Consequences of Fejes's theorem - The Weierstrass approximation theorem

Chapter 11 : Sections 11.1 to 11.15 (Apostol)

UNIT-IV : Multivariable Differential Calculus - Introduction - The Directional derivative - Directional derivative and continuity - The total derivative - The total derivative expressed in terms of partial derivatives - The matrix of linear function - The Jacobian matrix - The chain rule

- Matrix form of chain rule - The mean - value theorem for differentiable functions - A sufficient condition for differentiability - A sufficient condition for equality of mixed partial derivatives - Taylor's theorem for functions of R^n to R^1

Chapter 12 : Section 12.1 to 12.14 (Apostol)

UNIT –I THE RIEMANN - STIELTJES INTEGRAL [18 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 [18 HRS.]

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 [18 HRS.]

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

UNIT –IV SOME SPECIAL FUNCTIONS [18 HRS.]

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

UNIT –V FUNCTIONS OF SEVERAL VARIABLES [18 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 : Chapters: 6
UNIT II : Chapters: 7
UNIT III: Chapter: 8 : Pages 172 – 184
UNIT IV : Chapter: 8 : Pages 184 – 195
UNIT V : Chapter: 9 : 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	Teaching Aids
UNIT -1				
1.1	Definition and Existence of the Integral, Properties of the Integral	4	Chalk & Talk Discussion	Black Board
1.2	Integration and Differentiation	4	Chalk & Talk Discussion	Black Board
1.3	Integration of Vector-valued Functions	5	Chalk & Talk Discussion	Black Board
1.4	Rectifiable Curves	5	Chalk & Talk Discussion	Black Board
UNIT -2				
2.1	Discussion of Main problem, Uniform Convergence	3	Chalk & Talk Discussion	Black Board
2.2	Uniform Convergence and Continuity	3	Chalk & Talk Discussion	Black Board
2.3	Uniform Convergence and Integration	3	Chalk & Talk Discussion	Black Board
2.4	Uniform Convergence and Differentiation	3	Chalk & Talk Discussion	Black Board
2.5	Equicontinuous Families of Functions	3	Chalk & Talk Discussion	Black Board
2.6	The Stone-Weierstrass Theorem	3	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	Board
UNIT -3				
3.1	Power Series	4	Chalk & Talk Discussion	Black Board
3.2	The Exponential Functions	5	Chalk & Talk Discussion	Black Board
3.3	Logarithmic Functions	4	Chalk & Talk Discussion	Black Board
3.4	The Trigonometric Functions	5	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	The Algebraic Completeness of the Complex Field	7	Chalk & Talk Discussion	Black Board
4.2	Fourier Series	6	Chalk & Talk Discussion	Black Board
4.3	The Gamma Function	5	Chalk & Talk Discussion	Black Board
UNIT -5				
5.1	Linear Transformations	5	Chalk & Talk Discussion	Black Board
5.2	Differentiation	5	Chalk & Talk Discussion	Black Board
5.3	The Contraction Principle	4	Chalk & Talk Discussion	Black Board
5.4	The Inverse Function Theorem	4	Chalk & Talk Discussion	Black Board

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 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

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PS O1	PS O2	PS O3	PS O4	PS O5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note:
- ♦ Strongly Correlated – **3**
- ♦ Moderately Correlated – **2**
- ♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr. C. Prasanna Devi

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER –II

For those who joined in 2023 onwards

Skill Development-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSMA	23PG2M6	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 (18 HRS.)

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

UNIT –II LAGRANGE'S EQUATIONS (18 HRS.)

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

UNIT –III HAMILTON'S PRINCIPLE (18 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 (18 HRS.)

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

UNIT –V CLASSIFICATION OF ORBITS (18 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

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 - 3.5,37-3.9)

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				
1.1	Mechanics of a particle	4	Chalk & Talk Discussion	Black Board
1.2	Mechanics of a system of particles	4	Chalk & Talk Discussion	Black Board
1.3	Constraints	5	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	Board
1.4	D'Alambert's principle	5	Chalk & Talk Discussion	Black Board
UNIT -2				
2.1	Lagrange's equations, velocity	5	Chalk & Talk Discussion	Black Board
2.2	Dependent potentials and the dissipation function	5	Chalk & Talk Discussion	Black Board
2.3	simple application of the Lagrangian formulation	8	Chalk & Talk Discussion	Black Board
UNIT -3				
3.1	Hamilton's principle	7	Chalk & Talk Discussion	Black Board
3.2	some techniques of the calculus of variations	6	Chalk & Talk Discussion	Black Board
3.3	Derivation of Lagrange's equation from Hamilton's principle	5	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	Extension of Hamilton's principle to non-holonomic systems	5	Chalk & Talk Discussion	Black Board
4.2	Advantages of a variational principle formulation	5	Chalk & Talk Discussion	Black Board
4.3	conservation theorems	4	Chalk & Talk Discussion	Black Board
4.4	symmetry properties.	4	Chalk & Talk Discussion	Black Board
UNIT -5				

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.1	Two body central force problem, reduction to the equivalent one-body problem	3	Chalk & Talk Discussion	Black Board
5.2	The equations of motions and first integrals	3	Chalk & Talk Discussion	Black Board
5.3	The equivalent one - dimensional problem and classification of orbits	3	Chalk & Talk Discussion	Black Board
5.4	The Virial theorem, The differential equation for the orbit and integrable power law potentials	3	Chalk & Talk Discussion	Black Board
5.5	The Kepler problem; Inverse square law of force	3	Chalk & Talk Discussion	Black Board
5.6	The motion in time in the Kepler's problem, The Laplace –Runge-Lenz vector	3	Chalk & Talk Discussion	Black Board

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

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note:
- ♦ Strongly Correlated – **3**
- ♦ Moderately Correlated – **2**
- ♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr. A. Paulin Mary

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER –II

For those who joined in 2023 onwards

Entrepreneurship-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSMA	23PG2ME5	MATHEMATICAL STATISTICS	PG Core	4	3

COURSE DESCRIPTION

This course provides various concepts of Statistics which can be applied 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 (12 HRS.)

The Binomial and Related Distributions – The Poisson distribution – The Gamma, hi-square and Beta distributions - The Normal distribution.

UNIT –II t, F DISTRIBUTIONS AND LIMITING DISTRIBUTIONS (12 HRS.)

t and F distributions, Expectations of Functions, central Limit theorem.

UNIT –III MAXIMUM LIKLELIHOOD METHODS (12 HRS.)

Maximum Likelihood Estimation, Rao-Cramer Lower Bound and efficiency, Maximum Likelihood Tests.

UNIT –IV SUFFICIENCY (12 HRS.)

Measures of quality of Estimators, A sufficient statistic for a parameter, Properties f a sufficient statistic.

UNIT –V OPTIMAL TESTS OF HYPOTHESES (12 HRS.)

Most Powerful Tests, Uniformly Most Powerful Test, Likelihood Ratio Tests.

TEXT BOOK:

1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig, *Introduction to mathem cal statistics*, Sixth Edition, Pearson Education. Inc. and Dorling Kindersley Publis g, 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 Statistic* 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				
1.1	The Binomial and Related Distributions	4	Chalk & Talk Discussion	Black Board
1.2	The Poisson distribution	4	Chalk & Talk Discussion	Black Board
1.3	The Gamma, Chi-square and Beta distributions	4	Chalk & Talk Discussion	Black Board
1.4	The Normal distribution	4	Chalk & Talk Discussion	Black Board
UNIT -2				
2.1	T distributions	3	Chalk & Talk Discussion	Black Board
2.2	F distributions	4	Chalk & Talk Discussion	Black Board
2.3	Expectations of Functions	3	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	Board
2.4	central Limit theorem.	2	Chalk & Talk Discussion	Black Board
UNIT -3				
3.1	Maximum Likelihood Estimation	5	Chalk & Talk Discussion	Black Board
3.2	Rao-Cramer Lower Bound and efficiency	3	Chalk & Talk Discussion	Black Board
3.3	Maximum Likelihood Tests	4	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	Measures of quality of Estimators	5	Chalk & Talk Discussion	Black Board
4.2	A sufficient statistic for a parameter	4	Chalk & Talk Discussion	Black Board
4.3	Properties of a sufficient statistic	3	Chalk & Talk Discussion	Black Board
UNIT -5				
5.1	Most Powerful Tests	4	Chalk & Talk Discussion	Black Board
5.2	Uniformly Most Powerful Test	5	Chalk & Talk Discussion	Black Board
5.3	Likelihood Ratio Tests	3	Chalk & Talk Discussion	Black Board

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	Summarize maximum likelihood methods	K1 & K3	PSO3& PSO5
CO 4	Describe the measures of quality estimators.	K1, K2, K3 & K5	PSO5
CO 5	Distinguish tests of hypothesis	K2 & K4	PSO3& PSO5

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated – **3**
♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr. A. Jose Little Flower

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature
& Name

I M.Sc. Mathematics

SEMESTER –I

For those who joined in 2023 onwards

Skill Development-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG2ME6	Statistical Methods	Lecture	4	3

COURSE DESCRIPTION

This course is focused on the fundamental concepts of Statistical Methods and its applications in various fields.

COURSE OBJECTIVES

To enable the students to understand the basic concepts of Statistical Methods and R programming.

UNIT –I BASIC NOTIONS OF STATISTICS (15 HRS.)

Measures of central tendencies: Mean, Median, Mode. Measures of Dispersion: Range, Mean deviation, Standard deviation. Measures of skewness. Measures of relationship: Covariance, Karl Pearson's coefficient of Correlation, Rank Correlation.

Chapter 8 of Book 1

UNIT –II SAMPLING AND TESTING OF HYPOTHESIS (15 HRS.)

Sampling Distribution, Student's t-Distribution, Chi-square Distribution, Snedecor's F-Distribution. Standard Error. Central Limit theorem. Type I and Type II Errors, Critical Regions. F-test, t-test, x 2 test, goodness of Fit test.

Chapter 9,10 and 11 of Book 1

UNIT –III ANALYSIS OF VARIANCE (15 HRS.)

The Anova Technique. The basic Principle of Anova. One Way ANOVA, Two Way ANOVA. Latin square design. Analysis of Co-variance.

Chapter 12 of Book 1

UNIT –IV USE OF PACKAGE R (15 HRS.)

R as Statistical software and language, methods of Data input, Data accessing, usefull built-in functions

Chapter 1 of Book 2

UNIT –V Continuation of USE OF PACKAGE R (15 HRS.)

Graphics with R, Saving, storing and retrieving work.

Chapter 1 of Book 2

TEXT BOOK:

1. C. R. Kothari and G. Garg, Research Methodology Methods and Techniques, New Age International.
2. S.G. Purohit, S.D. Gore and S.R. Deshmukh, Statistics using R, Narosa.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1				
1.1	Measures of central tendencies: Mean, Median, Mode	4	Chalk & Talk Discussion	Black Board
1.2	Measures of Dispersion: Range, Mean deviation, Standard deviation. Measures of skewness	4	Chalk & Talk Discussion	Black Board
1.3	Measures of relationship: Covariance, Karl Pearson's coefficient of Correlation	4	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
1.4	Rank Correlation	3	Chalk & Talk Discussion	Black Board
UNIT -2				
2.1	Sampling Distribution, Student's t-Distribution	3	Chalk & Talk Discussion	Black Board
2.2	Chi-square Distribution	2	Chalk & Talk Discussion	Black Board
2.3	Snedecor's F-Distribution. Standard Error	3	Chalk & Talk Discussion	Black Board
2.4	Central Limit theorem	2	Chalk & Talk Discussion	Black Board
2.5	Type I and Type II Errors, Critical Regions	2	Chalk & Talk Discussion	Black Board
2.6	F-test, t-test, x 2 test, goodness of Fit test	3	Chalk & Talk Discussion	Black Board
UNIT -3				
3.1	The Anova Technique. The basic Principle of Anova.	3	Chalk & Talk Discussion	Black Board
3.2	One Way ANOVA	4	Chalk & Talk Discussion	Black Board
3.3	Two Way ANOVA	4	Chalk & Talk Discussion	Black Board
3.4	Latin square design. Analysis of Co-variance	4	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	R as Statistical software and	3	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	language		Discussion	Board
4.2	methods of Data input	4	Chalk & Talk Discussion	Black Board
4.3	Data accessing	4	Chalk & Talk Discussion	Black Board
4.4	useful built-in functions	4	Chalk & Talk Discussion	Black Board
UNIT -5				
5.1	Graphics with R	8	Chalk & Talk Discussion	Black Board
5.2	Saving, storing and retrieving work.	7	Chalk & Talk Discussion	Black Board

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Distinguish Correlation, Rank Correlation.
CO 2	Classify t-Distribution, Chi-square Distribution
CO 3	Describe Analysis of Co-variance
CO 4	Describe R Programming

NO.	COURSE OUTCOMES
CO 5	Apply R programming for storing and retrieving work

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated – **3**
♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr. E. Helena

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER –II

For those who joined in 2023 onwards

Employability-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG2ME7	GRAPH THEORY	PG Core	4	3

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 (12 HRS)

Connectivity, Menger's theorem.

UNIT –II TRAVERSABILITY (12 HRS)

Eulerian graphs, Hamiltonian graphs

UNIT –III DIGRAPHS and TOURNAMENTS (12 HRS)

Strong digraphs, Tournaments

UNIT –IV MATCHINGS AND PLANARITY (12 HRS)

Matchings - Planar graphs

UNIT –V DOMINATION (12 HRS)

Dominating set- the domination number of a graph - Open dominating set- open 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 5.3 - 5.4,

UNIT II: Chapter 6: Sections 6.1 - 6.2
UNIT III: Chapter 7: Sections 7.1, 7.2,
UNIT IV: Chapter 8: Sections 8.1
Chapter 9: Section 9.1
UNIT V: 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				
1.1	Connectivity	6	Chalk & Talk Discussion	Black Board
1.2	Menger's theorem.	5	Chalk & Talk Discussion	Black Board
UNIT -2				
2.1	Eulerian graphs	5	Chalk & Talk Discussion	Black Board
2.2	Hamiltonian graphs	6	Chalk & Talk Discussion	Black Board
UNIT -3				
3.1	Strong digraphs	7	Chalk & Talk Discussion	Black Board
3.2	Tournaments	5	Chalk & Talk Discussion	Black Board
UNIT -4				

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.1	Matchings	6	Chalk & Talk Discussion	Black Board
4.2	Planar graphs	6	Chalk & Talk Discussion	Black Board
UNIT -5				
5.1	Dominating set, the domination number of a graph	3	Chalk & Talk Discussion	Black Board
5.2	Open dominating set-	5	Chalk & Talk Discussion	Black Board
5.3	open domination number of a graph	4	Chalk & Talk Discussion	Black Board

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 in graphs	K1 & K3	PSO4 & PSO5
CO 4	Describe Planarity and Matchings in graphs	K2 & K3	PSO3 & PSO4

CO 5	Define and Explain Domination in graph	K2 & K4	PSO3 & PSO5

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

EVALUATION PATTERN

SCHOLASTIC					**NON - SCHOLASTIC**	**MARKS**		
C1	**C2**	**C3**	**C4**	**C5**	**C6**	**CIA**	**ESE**	**Total**
10	**10**	**5**	**5**	**5**	**5**	**40**	**60**	**100**

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks

C6 - Attendance - 5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated – **3**
♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Mrs. A. Sheela Roselin

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature
& Name

II M.Sc. Mathematics

SEMESTER –II

For those who joined in 2023 onwards

Entrepreneurship-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG2ME8	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

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

Derivatives form Difference tables, Extrapolation Techniques, The Trapezoidal Rule –A Composite formula, Simpson's rules.

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

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

UNIT –V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS

(12 HRS.)

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

TEXT BOOK:

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				
1.1	The Elimination Method, The Gaussian Elimination	4	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
1.2	Gauss- Jordan Method	4	Chalk & Talk Discussion	Black Board
1.3	Iterative Methods - The Relaxation Method	4	Chalk & Talk Discussion	Black Board
UNIT -2				
2.1	Lagrangian Polynomials, Divided Differences	5	Chalk & Talk Discussion	Black Board
2.2	Interpolation with Cubic Spline	3	Chalk & Talk Discussion	Black Board
2.3	Least-Square Approximation	4	Chalk & Talk Discussion	Black Board
UNIT -3				
3.1	Derivatives form Difference tables	3	Chalk & Talk Discussion	Black Board
3.2	Extrapolation Techniques	3	Chalk & Talk Discussion	Black Board
3.3	The Trapezoidal Rule	2	Chalk & Talk Discussion	Black Board
3.4	A Composite formula, Simpson's rules	4	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	The Taylor – Series method	3	Chalk & Talk Discussion	Black Board
4.2	Euler and Modified Euler methods	4	Chalk & Talk Discussion	Black Board
4.3	Runge- Kutta Methods	3	Chalk & Talk Discussion	Black Board
4.4	Milne's Method.	2	Chalk & Talk	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	Board
UNIT -5				
5.1	Introduction, Difference Quotients	7	Chalk & Talk Discussion	Black Board
5.2	Geometrical representation of partial differential quotients	5	Chalk & Talk Discussion	Black Board

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

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note:
- ♦ Strongly Correlated – **3**
- ♦ Moderately Correlated – **2**
- ♦ Weakly Correlated -**1**

COURSE DESIGNER:

1. Dr. V. Vanitha

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.Sc. Mathematics

SEMESTER –II

For those who joined in 2023 onwards

Entrepreneurship-100%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSMA	23PG2MSE1	OPTIMIZATION METHODS	PG EDC	4	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 (12 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 (12 HRS)

Optimal solution to a T.P by modified distribution method – Degeneracy in T.P – Unbalanced T.P.

UNIT –III ASSIGNMENT PROBLEM (12 HRS)

Introduction – Mathematical formulation of the problem – The assignment method – Special cases in assignment problems.

UNIT –IV SEQUENCING PROBLEM (12 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 **(12 HRS)**

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 -1				
1.1	Transportation Problem: Mathematical formulation, Existence of feasible solution	5	Chalk & Talk Discussion	Black Board
1.2	Feasible solution by (i) North – West corner rule	1	Chalk & Talk Discussion	Black Board
1.3	Matrix – Minima method (iii) Vogel's approximation method.	6	Chalk & Talk Discussion	Black Board
UNIT -2				
2.1	Optimal solution to a T.P by modified distribution method	5	Chalk & Talk Discussion	Black Board
2.2	Degeneracy in T.P	4	Chalk & Talk Discussion	Black Board
2.3	Unbalanced T.P.	3	Chalk & Talk Discussion	Black Board
UNIT -3				

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.1	Introduction, Mathematical formulation of the problem	4	Chalk & Talk Discussion	Black Board
3.2	The assignment method	4	Chalk & Talk Discussion	Black Board
3.3	Special cases in assignment problems	4	Chalk & Talk Discussion	Black Board
UNIT -4				
4.1	Introduction, problem of sequencing	3	Chalk & Talk Discussion	Black Board
4.2	Basic terms used in sequencing, Processing n jobs through two machines	3	Chalk & Talk Discussion	Black Board
4.3	Processing n jobs through k machines	3	Chalk & Talk Discussion	Black Board
4.4	Processing 2 jobs through k machines	3	Chalk & Talk Discussion	Black Board
UNIT -5				
5.1	Introduction, Two person zero sum games, Some basic terms	3	Chalk & Talk Discussion	Black Board
5.2	The maximin-minimax principle, Games without saddle points	2	Chalk & Talk Discussion	Black Board
5.3	mixed strategies, Graphical solution of 2 x n and m x 2 games	4	Chalk & Talk Discussion	Black Board
5.4	Dominance property .	3	Chalk & Talk Discussion	Black Board

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

CIA

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

EVALUATION PATTERN

SCHOLASTIC	NON - SCHOLASTIC	MARKS

C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

The best out of two will be taken into account

Mapping COs Consistency with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	2	2
CO4	2	2	2	2	3
CO5	2	2	3	2	3

Mapping of C0s with POs

CO/ PO	PO1	PO2	PO3	PO4
CO1	3	2	2	2
CO2	3	2	2	2
CO3	2	2	3	2
CO4	2	3	2	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated – **3**
♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

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

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**			
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

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.3	Uniqueness of extension	4	Chalk & Talk	Black Board
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	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 %

✔ **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*

CI	
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
3.4	Recurrence relation with two indices	5	Chalk & Talk,	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Discussion	
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	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 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 $X \cdot Y$, **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 SPAC**
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 $X \cdot Y$	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	Te hing
	UNIT -1		**CRISP SETS AND FUZZY SETS**	
1.1	Crisp sets : An over view	3	Chalk & Talk	
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	Te
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	B
3.2	Binary Relations on a single set	4	Chalk & Talk	G
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

Le e	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks	CIA Total	me
	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

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	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	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

Skill Development-100%

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**			
4.1	The Taylor – Series method	3	Discussion	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
				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 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)

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

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	COURSE DESCRIPTION
PSMA	19PG4M13	COMPLEX ANALYSIS	PG Core	6	5	

SCRIPTION

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 ⟩-function, the functions ⟨(z) and ⟨(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

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -3 HARMONIC FUNCTIONS				
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 ⟩-function	4	Chalk & Talk Discussion	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.5	The functions $f(z)$ and $f'(z)$	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 Statistic* 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
3.3	Introduction to hypothesis testing	4	Chalk &	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
			Talk	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:

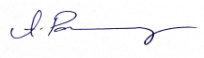
NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Classify discrete and continuous distributions	K2	PSO1& PSO4
CO 2	Describe t, F and limiting distributions	K1, K2, & K5	PSO2& PSO3
CO 3	Explain statistical tests	K1 & K3	PSO3& PSO5
CO 4	Summarize maximum likelihood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

Skill Development-100%

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

RSE DESCRIPTION

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
5.4	solving integral equations	3	Discussion	Black

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
				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**

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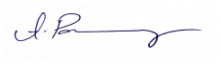

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

II M.Sc Mathematics

SEMESTER –IV

For those who joined in 2019 onwards

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

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.3	Conjugate of an operator	5	Chalk & Talk	Black Board
UNIT - 3 HILBERT SPACES				
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	PSO1& PSO2
CO 2	Analyze the concept of normed spaces, Banach spaces, and the theory of linear operators	K3, K4 & K5	PSO4
CO 3	Explain in detail the Hahn-Banach theorem, the open mapping and closed graph theorems	K4 & K5	PSO3
CO 4	Define and thoroughly explain Hilbert spaces and self-adjoint operators	K2, K3 & K4	PSO2 &PSO4
CO 5	Discuss in detail the study of the spectrum of an operator and its properties	K2 & K4	PSO1 &PSO4

COURSE DESIGNER:

1.Dr. Sr. A. Fatima Mary

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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

Employability-100%

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

Module No.	Topic	No. of Lectures	Teaching Pedagogy	
UNIT – 2 GRAMMARS (CONTINUE				
2.1	The empty sentence	3	Chalk & Talk	Black Board
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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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	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

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
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
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

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
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	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

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**

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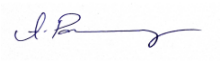

(Dr. A. Paulin Mary)

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

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name

I M.A./ I M.Sc./ I M.Com.

SEMESTER – II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
PSMA & PSEN	21PG2SLLM1	VERBAL AND NUMERICAL APTITUDE FOR NATIONAL EXAMINATIONS	SELF LEARNING	-	2

COURSE DESCRIPTION

This course aims to creating positive attitude among students and motivate them toclear competitive exams to reach their life goals.

COURSE OBJECTIVES

- To motivate the students to appear for NET & SET exams.
- To help them for post-examination preparation.
- To enthuse them to crack NET & SET exams

UNIT I: Teaching and Research Aptitude

1. Reading Comprehension

2. Teaching Aptitude

3. Teaching aids and evaluation system

4. Research Aptitude, Research Ethics and Thesis writing

UNIT II: Verbal Reasoning

1. General Abbreviations and terminology

2. Letter series and codes

3. Relationships and classification

4. Verbal Analogy and classification

Unit-III: Mathematical Reasoning and Aptitude

1. Types of reasoning.

2. Number series.

3. Mathematical Aptitude -Fraction, Time & Distance, Ratio, Proportion and Percentage, Profit and Loss, Interest and Discounting, Averages.

Unit-IV: Logical Reasoning

1. Understanding the Structure of Arguments: argument forms, Structure of categorical propositions, Mood and Figure, Formal and Informal fallacies, Classical square of opposition.

2. Evaluating and distinguishing deductive and inductive reasoning.

3. Analogies.

4. Venn Diagram: Simple and multiple uses for establishing validity of arguments.

Unit-V: Data Interpretation

1. Sources, acquisition and classification of data

2. Quantitative and Qualitative data

3. Graphical representation (Bar-chart, Histograms, Pie-chart, Table-chart and Line-chart) and mapping of data

4. Data and Governance

REFERENCES

1. Raghu R. Alla& K. Anusha,QuickNET Sure Success SeriesCBSE UGC NET/JRF/SET Teaching & Research Aptitude (General Paper – I), 2019 Edition.
2.K.V.S.MadaanNTA UGC Paper I Teaching and Research Aptitude , Third Edition.

EVALUATION PATTERN

INTERNAL

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment

	T1 10 Mks.	T2 10 Mks.	Seminar 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	**4**	**4**	**-**	**-**	**-**	**8**	-	**8**	20 %
K3	**2**	**2**	**-**	**5**	**-**	**9**	-	**9**	22.5 %
K4	**2**	**2**	**-**	**-**	**5**	**9**	-	**9**	22.5 %
K5	**2**	**2**	**5**	**-**	**-**	**9**	-	**9**	22.5 %
Non Scholastic	**-**	**-**	**-**	**-**	-		**5**	**5**	12.5 %
Total	**10**	**10**	**5**	**5**	**5**	**35**	**5**	**40**	**100 %**

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	**C2**	**C3**	**C4**	**C5**	**C6**	**CIA**	**ESE**	**Total**
10	**10**	**5**	**5**	**5**	**5**	**40**	**60**	**100**

End Semester

Levels	Section A 10 Mks	Section B 20 Mks.	Section C 10 Mks	Section D 10 Mks.	Section E 10 Mks.	Total 60Mks.	
K2	10	5	-	-	-	15	25 %
K3	-	5	10	-	-	15	25 %
K4	-	5	-	-	10	15	25 %
K5	-	5	-	10	-	15	25 %
Total	10	20	10	10	10	60	100 %

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	enhance the teaching and research quality of aspirants	K2 & K3	PSO3 & PSO5
CO 2	develop the cognitive and creative thinking ability	K3 & K4	PSO3 & PSO5
CO 3	develop reasoning techniques	K3	PSO3 & PSO5
CO 4	evaluate quantitative arguments that utilize mathematical, statistical, and quantitative information	K4	PSO3 & PSO5
CO 5	identify analogy and solve problems on data interpretation	K3	PSO3 & PSO5

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5

CO1	1	1	3	1	3
CO2	1	1	3	1	3
CO3	1	1	3	1	3
CO4	1	1	3	1	3
CO5	1	1	3	1	3

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	1	1	3	1
CO2	1	1	2	1	1	3	1
CO3	1	1	1	1	1	3	1
CO4	1	1	1	1	1	3	1
CO5	1	1	1	1	1	3	1

COURSE DESIGNERS:

1Mrs. Sajitha (Dept. of English)

Forwarded By

(Dr. A. Paulin Mary)

HOD'S Signature

& Name