E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI – 625 014.

(*An Autonomous Institution – Affiliated to Madurai Kamaraj University*)

Re-accredited (**3rd Cycle**) with Grade **A+** & **CGPA 3.51** by NAAC

DEPARTMENT OF MATHEMATICS

CBCS with OBE

MASTER OF SCIENCE

PROGRAMME CODE - OPM

COURSE STRUCTURE

(w.e.f. 2021 – 2022 Batch onwards)

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CRITERION - I

1.1.3 Details of courses offered by the institution that focus on employability / entrepreneurship / skill development during the year.

Syllabus copies with highlights of contents focusing on Employability / Entrepreneurship / Skill Development

To be Noted:

HIGHLIGHTED COLORS	COURSES
	Employability
	Skill Development
	Entrepreneurship
	Skilled & Employability

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CBCS and OBE

DEPARTMENT OF MATHEMATICS- PG

(w.e.f. 2021 – 2022 onwards)

VISION

To mold the students to have strong Mathematical and Analytical skills to meet the challenges open to them.

MISSION

To provide the students with a strong Mathematical Foundation through courses which cater to the needs of Industry, Research and Higher Education

Programme Educational Objectives (PEOs)

M.Sc.,

PEO	On completion of the Programme, the student will be able to
PEO1	Apply their knowledge in modern industry or teaching, or secure acceptance in high quality graduate programs in mathematics.
PEO2	Keep on discovering new avenues in the chosen field and exploring areas that remain conducive for research and development.
PEO3	Promote the culture of interdisciplinary research among all disciplines and Applied Mathematics.
PEO4	Strengthen in logical and analytical ability by knowing the Knowledge of Mathematics
PEO5	Handle the problems faced by industry through Mathematical knowledge and scientific computational techniques
PEO6	To develop teaching skills, subject knowledge in the course of their study which will help them to shine in various field including Education ,IT etc.,

Programme Outcomes (POs) with Graduate Attributes

PO	Graduate Attributes	On completion of the Programme, the student will be able to
PO1	**Knowledge Base**	Equipped with intense knowledge in their discipline.
PO2	**Problem Analysis & Investigation**	Develop specialized skills to plan, analyze and draw conclusions related to their respective field of study.
PO3	**Communication Skills & Design**	Assess and interpret complex situations which enables them to choose successful career in Education and Industry
PO4	**Individual and Team Work**	Undergo projects and research activities to develop knowledge and become expertise in their field of study.
PO5	**Professionalism, Ethics and equity**	Develop social and ethical responsibility in the transfer of knowledge.
PO6	**Lifelong learning**	Crack lectureship and fellowship exams approved by UGC like CSIR – NET and SET.

Programme Specific Outcomes (PSOs) with Graduate Attributes

PSO	Graduate Attributes	On completion of the Programme, the student will be able to
PSO1	Knowledge Base	Understand of the fundamental axioms in mathematics and capability of developing ideas based on them.
PSO 2	Problem Analysis & Investigation	Solve complex problems by critical understanding, analysis and synthesis
PSO 3	Communication Skills & Design	Provide knowledge of a wide range of mathematical techniques and application of mathematical methods
PSO 4	Individual and Team Work	Solving problems skills, thinking, creativity through assignments, project work
PSO 5	Professionalism, Ethics and equity	Broaden their professional foundations through activities such as internships, fellowships, teaching and project work.
PSO 6	Lifelong learning	Recognize the need to engage in lifelong learning through continuous education, and research leading to higher degrees like PhD, D.Sc., etc

Eligibility for Admission: Pass in B.Sc., Mathematics

Duration of the Course:
The students shall undergo prescribed courses of study for the period of two academic years under CBCS semester pattern with Outcome Based Education.

Medium of Instruction: English

System: Choice Based Credit System with Outcome Based Education.

Courses of Study with Credit Distribution

Category	No. of Courses	No. of Credits
Core	16	64
Elective	4	16
Non Major Elective	2	4
Project	1	6
Total	23	90

Nature of the Course
Courses are classified according to the following nature
1. Knowledge & Skill
2. Employability Oriented
3. Entrepreneurship Oriented

Outcome Based Education (OBE) & Assessment
Students understanding must be built on and assessed for wide range of learning activities, which includes different approaches and are classified along several bases, such as

1. Based on purpose:
- Formative (Internal tests, Assignment, Seminar, Quiz, Documentation, Case lets, ICT based Assignment, Mini Projects administered during the learning process)
- Summative (Evaluation of students learning at the end of instructional unit)

2. Based on Domain knowledge: (Post Graduate Up to K4 Levels)
- Assessment through K1, K2,K3 & K4

Evaluation

Continuous Internal Assessment Test (CIA)	: 25 Marks
Summative Examination	: 75 Marks
Total	: 100 Marks

CIA-Continuous Internal Assessment: 25 Marks

Components	Marks
Test (Average of three tests) (Conduct for 150 marks and converted into 15 marks)	15
Assignment	5
Seminar	5
Total	**25**

- Centralized system of Internal Assessment Tests
- There will be a three Internal Assessment Tests
- Duration of Internal Assessment Test I will be 1 1/4 hours and Internal Assessment Test II and III will be 2 1/2 hours.
- Students shall write retest on the genuine grounds if they are absent in either Test I or Test II and Test III with the approval of Head of the Department.

Question Paper Pattern for Continuous Internal Assessment Test I

Section	Marks
A – Multiple Choice Questions (4x1 Mark)	4
B– Short Answer (3x2 Marks)	6
C – Either Or type (2/4 x 5 Marks)	10
D – Open Choice type (1/2 x10 Marks)	10
Total	**30**

Question Paper Pattern for Continuous Internal Assessment Test II and Test III

Section	Marks
A – Multiple Choice Questions (8x1Mark)	8
B – Short Answer (6 x 2 Marks)	12
C – Either Or type (4/8 x 5 Marks)	20
D – Open Choice type (2/4 x 10 Marks)	20
Total	**60**

Conducted for 150 marks and converted into 15 marks

Question Paper Pattern for Summative Examination

Section	Marks
A – Multiple Choice Questions without choice (10x 1Mark)	10
B – Short Answer Questions without choice (5 x 2 Marks)	10
C – Either Or type (5 X 5Marks)	25
D – Open Choice type(3out of 5 X 10Marks)	30
Total	**75**

Latest amendments and revisions as per UGC and TANSCHE Norms are taken into consideration in curriculum preparation.

Annexure -1

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CBCS and OBE

DEPARTMENT OF MATHEMATICS- PG

(w.e.f. 2021 – 2022 onwards)

COURSE STRUCTURE –SEMETER WISE

Sem	Category	Course Code	Title of the Course	Teaching (hrs. per Week)	Exam Duration (Hrs.)	Marks Allotted			
						CIA	S.E	Total	Credits
I	Core	21OPM11	Abstract Algebra	5	3	25	75	100	4
	Core	21OPM12	Real Analysis	5	3	25	75	100	4
	Core	21OPM13	Differential Equations	6	3	25	75	100	4
	Core	21OPM14	Differential Geometry	6	3	25	75	100	4
	Core		**Elective –I**	6	3	25	75	100	4
	NME	21OPMNM1	Teaching & Research Aptitude Paper -I	2	3	25	75	100	2
II	Core	21OPM21	Linear Algebra	5	3	25	75	100	4
	Core	21OPM22	Measure and Integration	5	3	25	75	100	4
	Core	21OPM23	Graph Theory with Applications	6	3	25	75	100	4
	Core	21OPM24	Advanced Statistics-1	6	3	25	75	100	4
	Core		**Elective - II**	6	3	25	75	100	4
	NME	21OPMNM2	Teaching & Research Aptitude Paper -II	2	3	25	75	100	2
III	Core	21OPM31	Advanced Statistics-II	6	3	25	75	100	4
	Core	21OPM32	Complex Analysis	6	3	25	75	100	4
	Core	21OPM33	Mechanics	6	3	25	75	100	4
	Core	21OPM34	Topology	6	3	25	75	100	4
	Core		**Elective –III**	6	3	25	75	100	4
IV	Core	21OPM41	Advanced Topology	6	3	25	75	100	4
	Core	21OPM42	Research Methodology & Mathematical Methods	6	3	25	75	100	4
	Core	21OPM43	Functional Analysis	6	3	25	75	100	4
	Core	21OPM44	Operations Research	6	3	25	75	100	4
	Core		**Elective –IV**	6	3	25	75	100	4
		21OPMPR4	Project			20	80		6
			Total Credits						**90**

Annexure -1

ELECTIVE PAPERS

Core Elective – I has to be chosen in Semester I from the following:

1. Number Theory& Cryptography - 21OPME1A
2. Fluid Dynamics - 21OPME1B

Core Elective – II has to be chosen in semester II from the following:

1. Fuzzy Sets and Logic -21OPME2A
2. Automata Theory and Formal Languages -21OPME2B

Core Elective – III has to be chosen in semester III from the following:

1. Numerical Analysis -21OPME3A
2. Stochastic Process -21OPME3B

Core Elective – IV has to be chosen in semester IV from the following:

1. Discrete Mathematics - 21OPME4A
2. Financial Mathematics - 21OPME4B

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
1	Core	21OPM11	**Abstract Algebra**	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives

1. To develop working knowledge of group and ring theory and skill for applying to construct certain field.
2. To acquire knowledge of polynomial Rings
3. To learn deep concepts in algebra such as splitting field, normal and separable extensions.
4. To understand Galois Theory
5. To know about solvability by radicals

Course Content:

Unit	Course Contents	Hours	K Level	CLO
I	**Group Theory:** Another Counting Principle – Sylow's Theorems.	15	Up to K3	CLO 1
II	**Continuation of Group Theory and Ring Theory:** Direct Products – Finite Abelian Groups - Polynomial Rings	15	Up to K3	CLO 2
III	**Continuation of Ring Theory and Fields:** Polynomials over the Rational Fields - Extension Fields – Roots of Polynomials.	15	Up to K3	CLO 3
IV	**Continuation of Fields :** More About Roots -The Elements of Galois Theory	15	Up to K4	CLO 4
V	**Continuation of Fields and Selected Topics** Solvability by Radicals – Galois Groups over the Rationales -Finite Fields	15	Up to K4	CLO 5

Annexure -1

Book for study:

I.N. Herstein, *Topics in Algebra*, 2nd Edition, John Wiley and Sons, NewYork1975.

UNIT	CHAPTER(S)	SECTIONS
I	2	2.11 & 2.12
II	2 & 3	2.13,2.14 & 3.9
III	3&5	3.10,5.1 & 5.3
IV	5	5.5 & 5.6
V	5&7	5.7,5.8& 7.1

Books for Reference:

1. S. Lang, *Algebra*, 3rd Edition, Addison-Wesley,Mass, 1993.
2. John B. Fraleigh, *A First Course in Abstract Algebra*, Addison Wesley,Mass, 1982.
3. Surjeet Singh, Qazi Zameeruddin *Mordern Algebra* 8thEdc, 2008.
4. N.S.Gopalakrishnan, *University Algrbra*1st edition, 2009.
5. Michael Artin, *Algebra*2nd edition,2011

Web Resources:

1. http://math.uchicago.edu/~may/REU2016/REUPapers/Idelhaj.pdf
2. http://torus.math.uiuc.edu/jms/m317/handouts/finabel.pdf
3. http://www.math.brown.edu/dabramov/MA/f1314/251/Zijian-notes.pdf

E-Books:

1.https://books.google.co.in/books?id=6N2aoMYbYQMC&printsec=frontcover&source=gbs_ge_summary_r&c=0

2.https://books.google.co.in/books?id=baEQAAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&c=0

Pedagogy:

Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar.

Rationale for nature of Course:

Knowledge and Skill:

- Acquaintance with the fundamental algebraic structures, namely group, rings and fields, essential for further study of algebra.
- Skill to apply in modern mathematics and other fields.

Activities to be given:

We will be providing students with intellectual problems, theory application problems, group discussion and other practical works and also insist them to check the Books for References and web resources.

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

CLO	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Analyze counting principle and sylow's theorem and apply them for describing structures of finite groups	Up to K3
CLO2	Describe polynomial rings and other forms of polynomial rings	Up to K3
CLO3	Derive and apply Guass lemma and Eisentein criterion for irreducibility of polynomials	Up to K3
CLO4	Learn fundamental theorem of Galois theory and related results	Up to K4
CLO5	Understand solvability by radicals and know the application of Galois theory	Up to K4

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems

K4- Analyzing, examining and making presentations with evidence

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	1	2	1	3
CLO2	3	2	2	2	1	3
CLO3	3	2	2	2	2	3
CLO4	3	2	2	2	2	3
CLO5	3	3	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either / or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K3	4	K1(2) & K2(2)	3	K1(1), K2(1) & K3(1)	4	K2(2) & K3(2)	2	K3(2)
Question Pattern CIA I	**No. of Questions to be asked**		**4**		**3**		**4**		**2**	
	No. of Questions to be Answered		**4**		**3**		**2**		**1**	
	Marks for each Question		**1**		**2**		**5**		**10**	
	Total Marks for each section		**4**		**6**		**10**		**10**	
Question Pattern CIAII& CIAIII	CLO2	Up to K 3	4	K1(2) & K2(2)	3	K1(1) & K2(2)	4	K2(2) & K3(2)	2	K2(1) & K3(1)
	CLO3	Up to K 3	4	K1(2) & K2(2)	3	K1(1) & K2(2)	4	K2(2) & K3(2)	2	K2(1) & K3(1)
	CLO4	Up to K4	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K3(1) & K4(1)
	CLO5	Up to K 4	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K3(1) & K4(1)
No of questions to be asked			**8**		**6**		**8**		**4**	
No of questions to be answered			**8**		**6**		**4**		**2**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**8**		**12**		**20**		**20**	

Annexure -1

Distribution of Marks with K Levels CIA I, CIA II and CIA III

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)
I	K1	2	2	-	-	4	8
	K2	2	2	10	-	14	28
	K3	-	2	10	20	32	64
	K4	-	-	-	-	-	-
	Marks	**4**	**6**	**20**	**20**	**50**	**100**
II	K1	4	4	-	-	8	8
	K2	4	8	20	20	52	52
	K3	-	-	20	20	40	40
	K4	-	-	-	-	-	-
	Marks	**8**	**12**	**40**	**40**	**100**	**100**
III	K1	4	4	-	-	8	8
	K2	4	4	20	-	28	28
	K3	-	4	20	20	44	44
	K4	-	-	-	20	20	20
	Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K1&K2)	1(K1)	2(K2&K2)	1(K3)
2	CLO 2	Up to K3	2(K1&K2)	1(K1)	2(K2&K2)	1(K3)
3	CLO 3	Up to K3	2(K1&K2)	1(K2)	2(K3&K3)	1(K3)
4	CLO 4	Up to K4	2(K1&K2)	1(K2)	2(K4&K4)	1(K4)
5	CLO 5	Up to K 4	2(K1&K2)	1(K3)	2(K4&K4)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inferences with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	-	-	9	7.5	8
K2	5	4	20	-	29	24.17	24
K3	-	2	10	30	42	35	35
K4	-	-	20	20	40	33.33	33
K5	-	-	-	-	-	-	-
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plan

Unit	Course Content	Hours		Mode of Teaching
1	Another Counting Principle – 1st, 2nd and 3rd parts of Sylow's Theorems Double Coset – the normalizer of a group.	9 6	15	Chalk & Talk
II	External and Internal direct Products – structure theorem for finite abelian groups Non isomorphic abelian groups - polynomial rings.	8 7	15	Chalk & Talk
III	Polynomials over rational fields – the Eisenstein criterion extension fields – roots of polynomials – splitting fields	7 8	15	PowerPoint Presentation & Seminar
IV	More about roots – simple extension – separable extension fixed fields – symmetric rational functions – normal extension Galois group – fundamental theorem of Galois theory	6 5 4	15	PowerPoint Presentation, Seminar Assignment
V	Solvable group – the commutator subgroup – Solvability by radicals Finite fields.	9 6	15	PowerPoint Presentation & Seminar
	Total Hours	**75**		

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
1	Core	21OPM12	Real Analysis	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives

1. To introduce the fundamental of Mathematical Analysis
2. To Understand the concepts of continuity, differentiability and integrability.
3. To study the new concept of Riemann Stieljes integral
4. Apply the techniques of Power series.
5. To know about the primitive mapping

Course Content

Unit	Course Contents	Hours	K Level	CLO
I	**The derivative of a real function:** Mean Value Theorem - The continuity of derivatives – L' Hospital's Rule - Taylor's Theorem- Differentiation of vector –valued functions.	15	Up toK3	CLO1
II	**The Riemann-Stieltjes integral:** Definition and Existence of the Integral - Properties of the Integral. Integration and differentiation - Integration of vector- valued functions - Rectifiable curves	15	Up toK3	CLO2
III	**Uniform convergence and Continuity:** Uniform convergence and Integration- Uniform convergence and differentiation – Equicontinuous Families of functions- The Stone- Weierstrass Theorem	15	Up toK3	CLO3
IV	**Power Series**: The Exponential and Logarithmic Functions –The Trigonometric Functions-The Algebraic Completeness of the complex Field- Fourier series- The Gamma functions	15	Up toK4	CLO4
V	**Integration:** Primitive mappings- Partitions of unity- change of variables –Differential forms – Simplexes and chains-Stokes theorem	15	Up toK4	CLO5

Annexure -1

Book for study:

Walter Rudin, *Principles of Mathematical Analysis*, 3rd Edition, McGraw – Hill Book Company (1976).

Chapters:

UNIT	CHAPTER(S)	SECTIONS
I	5	5.1 to 5.15
II	6	6.1 to 6.27
III	7	7.1 to 7.26
IV	8	8.1 to 8.22
V	10	10.1 to10.26 & 10.33

Books for Reference:

1. Dr. B .S. Vatsa, *Introduction to Real Analysis,* CBS publishers & Distribution, (2002)
2 Russell A. Gordon, *Real Analysis,* Second Edition, Pearson Pvt Ltd, *(2002)*
3. S.C. Malik, *Principles of Real Analysis*, New Age Inter National (p) ltd Publishers Second Edition (2008)
4. Shanti Narayan, M.D. Raisnghania, *Elements of Real Analysis,* S.Chand &Company Ltd.
5. H.L.Royden, P.M.Fitzpatrick , *Real Analysis* Fourth Edition ,PHI Learning Pvt. Ltd,

Web Resources:

1. https://nptel.ac.in/courses/111/106/11110 053/#053/#
2.https://www.jirka.org
3.https://s2pnd-matematika.fkip.unpatti.ac.id

E-Books:

1 https://wp.ufpel.edu.br/zahn/files/2017/01/book.pdf
2. https://www.jirka.org/ra/realanal.pdf

Pedagogy:

- Chalk and Talk, Powerpoint presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:

Knowledge and Skill:

Demonstrate capacity for mathematical reasoning through analyzing , proving and explaining concepts from Real Analysis and skill to apply for other field in mathematics.

Activities to be given:

We will be providing students with intellectual problems, theory application problems, group discussion and other practical works and also insist them to check the books for references and web resources.

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

CLO	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Know how continuity of derivatives are generalized from real line	Up to K3
CLO2	Determine the Riemann-stieltjes integrability of a function ,prove a selection of theorems and concerning integration.	Up to K3
CLO3	Illustrate the effect of uniform convergence in the limit function with respect to continuity, differentiability and integrability.	Up to K3
CLO4	To be able to differentiate and integrate power series to obtain new ways to represent functions.	Up to K4
CLO5	To be able to understand the concept of integration of differential forms.	Up to K4

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented

K4- Analyzing, examining and making presentations with evidence.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	1	1	3	3
CLO2	3	3	2	2	1	3
CLO3	3	3	2	2	2	3
CLO4	3	2	2	2	1	3
CLO5	3	3	2	2	1	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K3	4	K1(2) & K2(2)	3	K1 (1) & K 2(2)	4	K2 (2) & K3 (2)	2	K1 (1) & K3 (1)
Question Pattern CIA I	**No. of Questions to be asked**		**4**		**3**		**4**		**2**	
	No. of Questions to be Answered		**4**		**3**		**2**		**1**	
	Marks for each Question		**1**		**2**		**5**		**10**	
	Total Marks for each section		**4**		**6**		**10**		**10**	
Question Pattern CIAII& CIAIII	CLO2	Up to K3	4	K1(2) & K2(2)	3	K1(2) & K2(1)	4	K2(2) & K3(2)	2	K1(1) & K3(1)
	CLO3	Up to K3	4	K1(2) & K2(2)	3	K1(2) & K2(1)	4	K2(2) & K3(2)	2	K1(1) & K2(1)
	CLO4	Up to K4	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K3(2) & K4(2)	2	K2(1) & K3(1)
	CLO5	Up to K4	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K3(1) & K4(1)
No of questions to be asked			**8**		**6**		**8**		**4**	
No of questions to be answered			**8**		**6**		**4**		**2**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**8**		**12**		**20**		**20**	

Annexure -1

Distribution of Marks with K Levels CIA I, CIA II and CIA III

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C (Either Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)
I	K1	2	2	-	10	14	28
	K2	2	4	10	-	16	32
	K3	-	-	10	10	20	40
	K4	-	-	-	-	-	-
	Marks	**4**	**6**	**20**	**20**	**50**	**100**
II	K1	4	8	-	20	32	32
	K2	4	4	20	10	38	38
	K3	-	-	20	10	30	30
	K4	-	-	-	-	-	-
	Marks	**8**	**12**	**40**	**40**	**100**	**100**
III	K1	4	4	-	-	8	8
	K2	4	4	10	10	28	28
	K3	-	4	20	20	44	44
	K4	-	-	10	10	20	20
	Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K2&K2)	1(K1)	2(K1&K1)	1(K2)
2	CLO 2	Up to K3	2(K1&K2)	1(K1)	2(K2&K2)	1(K3)
3	CLO 3	Up to K3	2(K1&K2)	1(K2)	2(K3&K3)	1(K3)
4	CLO 4	Up to K4	2(K1&K2)	1(K2)	2(K4&K4)	1(K4)
5	CLO 5	Up to K4	2(K1&K2)	1(K3)	2(K4&K4)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inferences with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	10	-	19	15.83	16
K2	5	4	10	10	29	24.17	24
K3	-	2	10	20	32	26.67	27
K4	-	-	20	20	40	33.33	33
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plan

Unit	Course Content	Hours	Total Hours	Mode of Teaching
1	**The derivative of a real function:** Mean Value Theorem The continuity of derivatives – L' Hospital's Rule -	7	15	Chalk & Talk
	Taylor's Theorem- Differentiation of vector –valued functions	8		
II	**The Riemann-Stieltjes integral:** Definition and Existence of the Integral - Properties of the Integral. Integration	7	15	Chalk & Talk
	differentiation - Integration of vector-valued functions - Rectifiable curves	8		
III	**Uniform convergence and Continuity:** Uniform convergence and Integration- Uniform convergence	8	15	PowerPoint presentations & Seminar
	differentiation – Equicontinuous Families of functions- The Stone-Weierstrass Theorem	7		
IV	**Power Series**: The Exponential and Logarithmic Functions –The Trigonometric Functions	8	15	PowerPoint presentations , Seminar& Assignment
	The Algebraic Completeness of the complex Field-Fourier series- The Gamma functions.	7		
V	**Integration:** Primitive mappings-Partitions ounity-change of variables	8	15	PowerPoint presentation & Seminar
	Differential forms –Simplexes and chains-Stokes theorem	7		

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
1	Core	21OPM13	**Differential Equations**	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives

1. Develop strong background on finding solutions to linear differential equations with variable coefficients and also with singular points.
2. Study the existence and uniqueness of the solutions of first order differential equations.
3. Finding various solutions to first order linear and nonlinear Partial Differential equations (PDE's).
4. To solve the nonlinear Partial Differential Equations by Charpit's Method and Jacobi's Method
5. To learn Euler Method.

Course Content:

Unit	Course Content	Hours	K Level	CLO
I	**Linear Equations with Variable Coefficients:** Introduction - Initial value problems for the homogeneous equation - Solutions of the homogeneous equation - The Wronskian and Linear independence - Reduction of the order of a homogeneous equation- The Non-homogeneous equation-Homogeneous equation with analytic coefficients – The Legendre Equation.	18	Up to K3	CLO1
II	**Linear Equations with Regular Singular Points:** Introduction - The Euler equation - Second order equations with regular singular points - An example – Second order Equations with regular singular points - the general case - The Bessel equation- The Bessel equation(continued)	18	Up to K3	CLO2
III	**Existence and Uniqueness of Solutions to First Order Equations:** Introduction – Equations with variables separated - Exact equations -The method of successive approximations - The Lipschitz condition - Convergence of the successive approximations – Non-local existence of solutions – Equations with complex -valued functions.	18	Up to K4	CLO3

IV	**Partial Differential Equations of the First Order :** Partial Differential Equations - Origins of First -order Partial Differential Equations - Cauchy's Problem for First- order Equations - Linear Equations of the First Order - Integral Surfaces Passing through a Given Curve - Surfaces Orthogonal to Given System of Surfaces.	18	Up to K4	CLO4
V	**Partial Differential Equations of The First Order :** Nonlinear Partial Differential Equations of the First Order -Cauchy's Method of Characteristics - Compatible Systems of First order Equations – Charpit's Method - Special Types of First order Equations-Solutions Satisfying Given Conditions- Jacobi's Method- Applications of First- order Equations.	18	Up to K4	CLO5

Books for study:

1. Earl A. Coddington, *An Introduction to Ordinary Differential Equations* PHI Learning Private Limited, Delhi, 2013.
2. IAN N.Sneddon, *Elements of partial Differential Equations*, McGraw –Hill International Editions,(1957)

UNIT	CHAPTER(S)	SECTIONS
I	3	1 to 8 (Text Book 1)
II	4	1to4 &7,8(Text Book 1)
III	5	1to 7 and 9(Text Book 1)
IV	2	1to 6 (Text Book 2)
V	2	7 to 14 (Text Book 2)

Books for Reference:

1. D. Somasundaram, *Ordinary Differential Equations*, Narosa Publishing House(2002)
2. E. Rukmanga Dachari, *Differential Equation*, Dorling Kindersley (India) Pvt. Ltd (2012)
3. M. D., Raisinghania, *Advanced Differential Equaitons* , S. Chand & Company Limited, New Delhi,2012.
4. K. Sankara Rao, *Introduction to Partial Differential Equations*, Third Edition, PHI Learning, New Delhi, 2011.
5. J. N. Sharma & K. Singh, *Partial Differential Equations for Engineer and Scientists*, Narosa Publishing House,2001.

Annexure -1

Web Resources:

1. http://eqworld.ipmnet.ru/en/solutions/ode.htm
2.https://mathinsight.org/ordinary_differential_equation_introduction
3.https://tutorial.math.lamar.edu/Classes/DE/DE.aspx

E-Book:

1. **https://books.google.com/books?id=PwivyktplHUC&printsec=frontcover&dq=introduction+to+ordinary+differential+Equations&hl=en&newbks=1&newbks_redir=1&sa=X&ved=2ahUKEwiFrpT4-Mb0AhXNwzgGHe0PC2IQ6wF6BAgFEAE**

2. **https://books.google.co.in/books?id=m2hvDwAAQBAJ&printsec=frontcover&dq=partial+differential+equations&hl=en&newbks=1&newbks_redir=1&sa=X&ved=2ahUKEwjQpbyL-sb0AhXhxDgGHSC5B6MQ6wF6BAgDEAE**

Pedagogy:

- Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:

Knowledge and Skill:

- Have a good introduction to the study of ordinary differential equation and partial differential equation
- Learn techniques of finding solutions of some special type of equations and how to establish uniqueness and existences.

Activities to be given:

We will be providing students with intellectual problems, theory application problems, group discussion and other practical works and also insist them to check the Books for References and web resource

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

CLO	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Obtain the solutions of second order homogenous and non-homogenous linear differential equation with constant coefficients and understand the utility of Wronskian, linear independence and linear independence solutions.	Up to K3
CLO2	Understand the concepts regular singular points and solve the Bessel equation.	Up to K3
CLO3	Understand the concept of successive approximation, the Lipchitz condition and prove local and Non-local existence theorems	Up to K4
CLO4	Classify first order partial differential equations and their solutions and solve those using different methods.	Up to K4
CLO5	Solve the first order linear and nonlinear PDE's by using charpits and Jacobi's method respectively.	Up to K4

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented- Solving Problems

K4- Analyzing, examining and making presentations with evidence

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	1	2	1	3
CLO2	3	3	2	1	1	3
CLO3	3	3	1	2	2	3
CLO4	3	3	2	3	2	3
CLO5	3	3	1	2	1	3

Annexure -1

1-Basic Level 2- Intermediate Level 3- Advanced Level

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either / or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K 3	4	K1(2) & K2(2)	3	K1 (1) & K2 (2)	4	K2 (2) & K3 (2)	2	K3 (2)
Question Pattern CIA I	**No. of Questions to be asked**		**4**		**3**		**4**		**2**	
	No. of Questions to be Answered		**4**		**3**		**2**		**1**	
	Marks for each Question		**1**		**2**		**5**		**10**	
	Total Marks for each section		**4**		**6**		**10**		**10**	
Question Pattern CIAII& CIAIII	CLO2	Up to K3	4	K1(2) & K2(2)	3	K1,K2 & K3	4	K2(2) & K3(2)	2	K3(2)
	CLO3	Up to K 4	4	K1(2) & K2(2)	3	K1,K2 & K3	4	K2(2) & K3(2)	2	K3(1) & K4(1)
	CLO4	Up to K4	4	K1(2) & K2(2)	3	K1,K2 & K3	4	K2(2) & K3(2)	2	K3(1) & K4(1)
	CLO5	Up to K 4	4	K1(2) & K2(2)	3	K1,K2 & K3	4	K2(2) & K3(2)	2	K3(1) & K4(1)
No of questions to be asked			**8**		**6**		**8**		**4**	
No of questions to be answered			**8**		**6**		**4**		**2**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**8**		**12**		**20**		**20**	

Annexure -1

Distribution of Marks with K Levels CIA I, CIA II and CIA III

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)
I	K1	2	2	-		4	8
	K2	2	4	10	-	16	32
	K3	-	-	10	20	30	60
	K4	-	-	-	-	-	-
	Marks	**4**	**6**	**20**	**20**	**50**	**100**
II	K1	4	4			8	8
	K2	4	4	20		28	28
	K3	-	4	20	30	54	54
	K4	-	-	-	10	10	10
	Marks	**8**	**12**	**40**	**40**	**100**	**100**
III	K1	4	4	-	-	8	8
	K2	4	4	20	-	28	28
	K3	-	4	20	20	44	44
	K4	-	-	-	20	20	20
	Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K1&K2)	1(K1)	2(K2&K2)	1(K3)
2	CLO 2	Up to K 3	2(K1&K2)	1(K2)	2(K2&K2)	1(K3)
3	CLO 3	Up to K4	2(K1&K2)	1(K2)	2(K3&K3)	1(K3)
4	CLO 4	Up to K 4	2(K1&K2)	1(K2)	2(K4&K4)	1(K4)
5	CLO 5	Up to K4	2(K1&K2)	1(K3)	2(K4&K4)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inferences with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	2	-	-	7	5.83	6
K2	5	6	20	-	31	25.83	26
K3	-	2	10	30	42	35	35
K4	-	-	20	20	40	33.33	33
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plan

Unit	Course Content	Hours		Mode of Teaching
I	Introduction - Initial value problems for the homogeneous equation	5	18	Chalk & Talk
	Solutions of the homogeneous equation - The Wronskian and Linear independence	4		
	Reduction of the order of a homogeneous equation- The Non homogeneous equation	4		
	Homogeneous equation with analytic coefficients	3		
	The Legendre Equation	2		
II	Second order equations with regular singular points - An exampleSecond order Equations with regular singular points - the general case	4	18	Chalk & Talk
		3		
		3		
	The Bessel equatio	4		
		4		
III	Introduction – Equations with variables separated	5	18	PowerPoint Presentations & Seminar
	Exact equations -The method of successive approximations	4		
	The Lipschitz condition - Convergence of the successive approximations	4		
	Non-local existence of solutions – Equations with complex -valued functions.	5		
IV	Partial Differential Equations - Origins of First -order Partial Differential Equations	5	18	PowerPoint Presentations, Seminar &Assignment
	Cauchy's Problem for First- order Equations	3		
	Linear Equations of the First Order - Integral Surfaces Passing through a Given Curve	5		
	Surfaces Orthogonal to Given System of Surfaces.	5		
V	Nonlinear Partial Differential Equations of the First Order Cauchy's Method of Characteristics - Compatible Systems of First order Equations	3	18	PowerPoint Presentations & Seminar
		5		
	Charpit's Method - Special Types of First order Equations-Solutions Satisfying Given Conditions	5		
	Jacobi's Method- Applications of First- order Equations.	5		

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
1	Core	21OPM14	Differential Geometry	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

1. To impart knowledge of curves on surfaces, curvature and torsion.
2. To develop the concept of metric spaces and orthogonal trajectories.
3. To demonstrate the construction of new surface Geodesic.
4. To know the concept of second fundamental form and its principal curvature
5. To analyze the structure of developable and minimal surface

Course Content:

Unit	Course Contents	Hours	K Level	CLO
I	**The theory of Space curve:** Arc length - Tangent, normal and binomial – Curvature and torsion of a curve given as intersection of two surfaces- Contact between curves and surfaces – Tangent Surface – Involutes and Evolutes – Intrinsic equations – Fundamentals existence theorem for space curves – Helices	18	Up toK3	CLO1
II	**The Metric: Local Intrinsic Properties of a Surface:** Definition of a surface – Curves on a surface – Surface of revolution – Helicoids – Metric – Direction Coefficients – Families of Curves – Isometric correspondence - Intrinsic properties	18	Up toK3	CLO2
III	**The Metric: Local Intrinsic Properties of a Surface:** Geodesics – Canonical Geodesic equations – Normal property of Geodesics – Existence theorems – Geodesic parallels – Geodesic curvature.	18	Up toK4	CLO3
IV	**The Second Fundamental Form: Local Non- Intrinsic Properties of a Surface** The Second fundamental form – Principal curvature – Lines of curvature.	18	Up toK4	CLO4
V	**The Second Fundamental Form: Local Non-Intrinsic Properties of a Surface** Developable – Developable associated with space curve – Developable associated with curves on surfaces – Minimal surfaces – Ruled surfaces	18	Up toK4	CLO5

Annexure -1

Book for study:

T.J.Willmore, *An Introduction to Differential Geometry*, Oxford University Press (2008).

UNIT	CHAPTER(S)	SECTIONS
I	1	3 to 9
II	2	1 to 9
III	2	10 to 15
IV	3	1to3
V	3	4 to 8

Books for Reference :

1. D. Somasundaram, *Differential Geometry*, Narosa Publishing House (2008)
2..J.A.Thorpe, *Elementary topics in Differential Geometry*, Springs-verlag,(1997)
3. S.C.Mittal and D.C.Agarwall, *Differential Geometry*, Krishna Prakashan Media (P) Ltd (2001).
4.C.E.Weatherburn ,*Differential Geometry of Three Dimensions* , Edition 1964,Reprint 1971, The English language Book Society and Cambridge University Press.
5. P.P.Gupta, G.S.Malik and S.K.Pundir,*Differential Geometry* 4th edition 2012, Pragati Prakashan

Web Resources:

1) http://www2.ing.unipi.it/griff/files/dC.pdf
2) https://link.springer.com/book/10.1007/978-3-319-55084-8
3) http://etananyag.ttk.elte.hu/FiLeS/downloads/_01_Csikos_Differential_geometry.pdf

E-books:

1. https://books.google.co.in/books/about/An_Introduction_to_Differential_Geometry.html?id=dbIAAQAAQBAJ&printsec=frontcover&source=kp_read_button&hl=en&newbks=1&newbks_redir=1&redir_esc=y
2. http://www.freebookcentre.net/maths-books-download/Elementary-Differential-Geometry-Curves-and-Surfaces.html

Pedagogy:

- Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:

Knowledge and Skill:

- Analyze and solve complex problems using appropriate techniques from differential geometry.
- Apply differential geometry techniques to specific research problems in mathematics and other fields.

Activities to be given:

We will be providing students with intellectual problems, theory application problems and other practical works and also insist them to check the Books for References and web resources

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Understand the curvature and torsion of a space curve	Up to K3
CLO2	Understand the idea of surface of revolution	Up to K3
CLO3	Illustrate Geodesics on Curves	Up to K4
CLO4	Identifying the concept of principal curvature and lines of curvature	Up to K4
CLO5	Demonstrate the concept of developable and minimal surface	Up to K4

K1- Remembering facts with specific answers
K2- Basic understanding of facts.
K3- Application oriented
K4- Analyzing, examining and making presentations with evidence.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	3	2	3	3
CLO2	3	2	3	2	1	3
CLO3	3	1	3	2	2	3
CLO4	2	2	3	2	3	3
CLO5	2	2	3	2	3	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either / or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K 3	4	K1(2) & K2(2)	3	K1 (2) & K2 (1)	4	K2 (2) & K3 (2)	2	K1 (1) & K3 (1)
Question Pattern CIA I	**No. of Questions to be asked**		**4**		**3**		**4**		**2**	
	No. of Questions to be Answered		**4**		**3**		**2**		**1**	
	Marks for each Question		**1**		**2**		**5**		**10**	
	Total Marks for each section		**4**		**6**		**10**		**10**	
Question Pattern CIAII& CIAIII	CLO2	Up to K3	4	K1(2) & K2(2)	3	K1(1) & K2(2)	4	K1(2) & K2(2)	2	K1(1) & K2(1)
	CLO3	Up to K3	4	K2(2) & K3(2)	3	K1(1) K2(1) &K3(1)	4	K3(2) & K4(2)	2	K2(1) & K4(1)
	CLO4	Up to K4	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K3(1) & K4(1)
	CLO5	Up to K4	4	K2(2) & K3(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K3(1) & K4(1)
No of questions to be asked			**8**		**6**		**8**		**4**	
No of questions to be answered			**8**		**6**		**4**		**2**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**8**		**12**		**20**		**20**	

Annexure -1

Distribution of Marks with K Levels CIA I, CIA II and CIA III

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)
I	K1	2	4	-	10	16	32
	K2	2	2	10	-	14	28
	K3	-	-	10	10	20	40
	K4	-	-	-	-	-	-
	Marks	**4**	**6**	**20**	**20**	**50**	**100**
II	K1	2	4	10	-	16	16
	K2	4	6	10	10	30	30
	K3	2	2	10	10	24	24
	K4	-	-	10	20	30	30
	Marks	**8**	**12**	**40**	**40**	**100**	**100**
III	K1	2	4	-	-	6	6
	K2	4	4	20	-	28	28
	K3	2	4	20	20	46	46
	K4	-	-	-	20	20	20
	Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K1&K2)	1(K1)	2(K1&K1)	1(K2)
2	CLO 2	Up to K3	2(K2&K3)	1(K1)	2(K2&K2)	1(K3)
3	CLO 3	Up to K4	2(K1&K2)	1(K2)	2(K3&K3)	1(K3)
4	CLO 4	Up to K4	2(K2&K3)	1(K2)	2(K4&K4)	1(K4)
5	CLO 5	Up to K4	2(K2&K3)	1(K3)	2(K4&K4)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inferences with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	2	4	10	-	16	13.33	14
K2	5	4	10	10	29	24.17	24
K3	3	2	10	20	35	29.17	29
K4	-	-	20	20	40	33.3	33
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plan

Unit	Course Content	Hours	Total Hours	Mode of Teaching
1	**Theory of space curves**: Arc length - Tangent, normal and binomial –	6	18	Chalk & Talk
	Curvature and torsion of a curve given as intersection of two surfaces- Contact between curves and surfaces- Tangent surface	6		
	Involutes and Evolutes – Intrinsic equations – Fundamentals existence theorem for space curves – Helices	6		
II	**The Metric: Local Intrinsic Properties of a Surface:** Definition of a surface – Curves on a surface – Surface of revolution	6	18	Chalk &Talk
	Helicoids – Metric – Direction Coefficients – Families of Curves	6		
	Isometric correspondence - Intrinsic properties .	6		
III	**The Metric: Local Intrinsic Properties of a Surface:** Geodesics – Canonical Geodesic equations	6	18	Chalk & Talk
	Normal property of Geodesics – Existence theorems	6		
	Geodesic parallels – Geodesic curvature.	6		
IV	**The Second Fundamental Form: Local Non- Intrinsic Properties of a Surface** The Second fundamental form	6	18	PowerPoint Presentation & Seminar
	Principal curvature	6		
	Lines of curvature.	6		
V	**The Second Fundamental Form: Local Non- Intrinsic Properties of a Surface** Developable	6	18	PowerPoint Presentation & Seminar
	Developable associated with space curve – Developable associated with curves on surfaces	6		
	Minimal surfaces –Ruled surfaces	6		

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
1	Core Elective -I	21OPME1A	Number Theory and Cryptography	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives

1. To know about fundamental algorithms for integer arithmetic and greatest common divisor calculation.
2. To find modular arithmetic and other number theoretic computations.
3. To derive algorithms and linear congruence
4. To Analyze Quadratic Residues and Diophantine equation
5. To explore applications of number theory in cryptography.

Course Content:

Unit	Course Contents	Hours	K Level	CLO
I	**Arithmetical Functions and Dirichlet Multiplication** Introduction – Divisibility – The Mobius function μ(n) – The Euler totient function φ(n) – A relation connecting φ and μ – A product formula for φ (n) – The Dirichlet product of arithmetical functions – Dirichlet inverses and the mobius inversion formula – The Mangoldt function Λ(n) – Multiplicative functions - Multiplicative functions and Dirichlet multiplication – The inverse of a completely multiplicative function- Liouville's function λ(n) - The divisor functions σ_α (n)- Generalized convolutions – Formal power series – The Bell series of an arithmetical function – Bell series and Dirichlet multiplication – Derivatives of arithmetical functions – The Selberg Identity.	18	Up to K3	CLO1
II	**Averages of Arithmetical Functions** Introduction – The big oh notation. Asymptotic equality of functions – Euler's summation formula – Some elementary asymptotic formulas – The average order of d(n) - The average order of the divisor functions σ_α (n) - The average order of φ(n) - An application to the distribution of lattice points visible from the origin – The average order of μ(n) and of Λ(n) - The partial sums of a Dirichlet product - Applications to μ(n) and Λ(n) - Another identity for the partial sums of a Dirichlet product.	18	Up to k4	CLO2

III	**Some Elementary Theorems on the Distribution of Prime Numbers and Congruence's:** Introduction – Chebyshev's functions $\Psi(x)$ and $\vartheta(x)$ - Definition and basic properties of congruence - Residue classes and complete residue systems – Linear congruence – Reduced residue systems and the Euler Fermat theorem – Polynomial congruence modulo p .Lagrange's theorem – Applications of Lagrange's theorem – Simultaneous linear Congruence . The Chinese Remainder theorem – Applications of the Chinese Remainder theorem – Polynomial congruence with prime power moduli - The Principle of cross classification – A decomposition property of reduced residue systems	18	Up to K4	CLO3
IV	**Quadratic Residues and the Quadratic Reciprocity Law:** Quadratic residues – Legendre's symbol and its properties – Evaluation of (-1/p) and (2/p) –Gauss' lemma- The quadratic reciprocity law-Applications of the reciprocity law- The Jacobi symbol - Applications to Diophantine equations- Gauss sums and the Quadratic reciprocity law.	18	Up to K4	CLO4
V	**More on Number Theory: Public-Key Cryptography, RSA and Other Public Cryptosystems** Discrete logarithm – Principles of public key – Cryptosystem – RSA algorithm – Elliptic curve cryptography.	18	Up to K4	CLO5

Books for study:

1. TOM.M. Apostol, *Introduction to Analytic Number theory,* Narosa Publishing *House (1998).*
2. William Stallings, *Cryptography and Network Security Principles and Practice*,Prentice Hall, Fifth Edition, 2011

UNIT	CHAPTER(S)	SECTIONS
I	2	2.1 to 2.19 Book No.1
II	3	3.1 to 3.12 BookNo1
III	4&5	4.1,4.2 &5.1 to 5.11 Book No1
IV	9	9.1 to 9.9 Book No1
V	8,9&10	8.5, 9.1,9.2 & 10.4 Book No2

Annexure -1

Books for Reference:

1) S.G. Telang, *Number Theory*, Tata McGraw-Hill (2001).
2) Neal Koblitz, *A Course in Number Theory and Cryptography*, Springer-Verlag, 1987.
3) Ivan Niven, Niven Ivan, Herbert S. Zuckerman, Zuckerman Herbert S A*n introduction to the theory of numbers* ,1972.
4) Martin Erickson, Anthony Vazzana, i*ntroduction to Number Theory* ,first Indian , 2009.
5) David M.Burton, *Elementary Number Theory*, Wm.C.Brown Publishers 1989.

Web Resources

1. http://www.fuchs-braun.com/media/532896481f9c1c47ffff8077fffffff0.pdf
2.https://www.flowsurfv3.net/c.php?cu=https%253A%252F%252Fwstein.org%252Fent%252Fent.pdf&sh=wstein.org%2Fent%2Fent.pdf&l=IN&po=2&u=mbeh-20210420-ccmnet-flga33&a=3100&tr=7gb1211411dgd&keyword=number%2Btheory%2Bpdf%2Bfree%2Bdownload&aid=61a887bb708ea&t=8&bc=0&rt=1638434746.9534&n=5&loc=normal. 3.https://crypto.stanford.edu/pbc/notes/numbertheory/book.pdf

E-books

1. http://www.freebookcentre.net/maths-books-download/gotoweb.php?id=9568
2.https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxha2hsYWdoZWF8Z3g6MTRmYTdkZDQ4Y2Q2MmFhMQ

Pedagogy:

- Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:

Knowledge and Skill:

- Develop a deeper conceptual understanding of the theoretical basis of number theory and cryptography.
- Apply elementary number theory to cryptography

Activities to be given:

We will be providing students with intellectual problems, theory application problems and other practical works and also insist them to check the Books for References and web resources.

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Understand the properties of divisibility and congruence.	Up to K3
CLO2	Use arithmetic functions in area of mathematics	Up to K4
CLO3	Understand and use the theorems ,Chinese reminder theorem and Lagrange's theorem	Up to K4
CLO4	Know the applications of reciprocity law and Diophantine equation	Up to K4
CLO5	Apply elementary number theory concepts in cryptography.	Up to K4

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented

K4- Analyzing, examining and making presentations with evidence.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	3	2	3	3
CLO2	3	2	2	2	1	3
CLO3	3	3	2	2	2	3
CLO4	3	3	2	2	1	3
CLO5	3	3	2	2	1	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either / or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K3	4	K1(2) K2(1) & K3(1)	3	K1 (2) & K2 (1)	4	K1 (2) & K2 (2)	2	K2 (1) & K3 (1)
Question Pattern CIA I	**No. of Questions to be asked**		**4**		**3**		**4**		**2**	
	No. of Questions to be Answered		**4**		**3**		**2**		**1**	
	Marks for each Question		**1**		**2**		**5**		**10**	
	Total Marks for each section		**4**		**6**		**10**		**10**	
Question Pattern CIAII& CIAIII	CLO2	Upto K4	4	K1(2) & K2(2)	3	K1(1) & K2(2)	4	K1(2) & K3(2)	2	K3(1) & K4(1)
	CLO3	Up to K4	4	K2(2) & K3(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K2(1) & K3(1)
	CLO4	Upto K4	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K2(1) & K3(1)
	CLO5	Up to K4	4	K2(2) & K3(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K3(1) & K4(1)
No of questions to be asked			**8**		**6**		**8**		**4**	
No of questions to be answered			**8**		**6**		**4**		**2**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**8**		**12**		**20**		**20**	

Annexure -1

Distribution of Marks with K Levels CIA I, CIA II and CIA III

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)
I	K1	2	4	10	-	16	32
	K2	1	2	10	10	23	46
	K3	1	-	-	10	11	22
	K4	-	-	-	-	-	-
	Marks	**4**	**6**	**20**	**20**	**50**	**100**
II	K1	2	4	10	-	16	16
	K2	4	6	10	10	30	30
	K3	2	2	20	20	44	44
	K4	-	-	-	10	10	10
	Marks	**8**	**12**	**40**	**40**	**100**	**100**
III	K1	2	4	-	-	6	6
	K2	4	4	20	10	38	38
	K3	2	4	20	20	46	46
	K4	-	-	-	10	10	10
	Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K1&K2)	1(K1)	2(K1&K1)	1(K2)
2	CLO 2	Up to K4	2(K2&K3)	1(K1)	2(K2&K2)	1(K3)
3	CLO 3	Up to K4	2(K1&K2)	1(K2)	2(K3&K3)	1(K3)
4	CLO 4	Up to K4	2(K2&K3)	1(K2)	2(K4&K4)	1(K4)
5	CLO 5	Up to K4	2(K2&K3)	1(K3)	2(K4&K4)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inferences with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	2	4	10	-	16	13.33	14
K2	5	4	10	10	29	24.16	24
K3	3	2	10	20	35	29.16	29
K4	-	-	20	20	40	33.33	33
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plan

Unit	Course Content	Hours	Total Hours	Mode of Teaching
1	**Arithmetical Functions and Dirichlet Multiplication** Introduction – Divisibility – The Mobius function μ(n) – The Euler totient function φ(n) – A relation connecting φ and μ	6	18	Chalk & Talk
	A product formula for φ(n) – The Dirichlet product of arithmetical functions – Dirichlet inverses and the mobius inversion formula – The Mangoldt function ∧(n) – Multiplicative functions - Multiplicative functions and Dirichlet multiplication	6		
	The inverse of a completely multiplicative function- Liouville's function λ(n) - The divisor functions σ_α (n) - Generalized convolutions –Formal power series – The Bell series of an arithmetical function – Bell series and Dirichlet multiplication –Derivatives of arithmetical functions – The Selberg Identity.	6		
II	**Averages of Arithmetical Functions** Introduction – The big oh notation. Asymptotic equality of functions – Euler's summation formula – Some elementary asymptotic formulas	6	18	Chalk & Talk
	The average order of d(n) - The average order of the divisor functions σ_α (n) - The average order of φ(n) - An application to the distribution of lattice points visible from the origin	6		
	The average order of μ(n) and of ∧(n) - The partial sums of a Dirichlet product - Applications to μ(n) and ∧ (n) - Another identity for the partial sums of a Dirichlet product.	6		

Annexure -1

III	**Some Elementary Theorems on the Distribution of Prime Numbers and Congruence's:** Introduction – Chebyshev's functions $\psi(x)$ and $\vartheta(x)$ - Definition and basic properties of congruence - Residue classes and complete residue systems	6	18	Chalk & Talk
	Linear congruence – Reduced residue systems and the Euler Fermat theorem – Polynomial congruence modulo p -Lagrange's theorem – Applications of Lagrange's theorem – Simultaneous linear Congruence . The Chinese Remainder theorem – Applications of the Chinese Remainder theorem	6		
	Polynomial congruence with prime power moduli - The Principle of cross classification – A decomposition property of reduced residue systems.	6		
IV	**Quadratic Residues and the Quadratic Reciprocity Law:** Quadratic residues – Legendre's symbol and its properties –Applications of the reciprocity law- The Jacobi symbol	6	18	PowerPoint Presentation &Seminar
	Evaluation of (-1/p) and (2/p) –Gauss' lemma- The quadratic reciprocity law	6		
	Applications to Diophantine equations- Gauss sums and the Quadratic reciprocity law.	6		
V	**More on Number Theory: Public-Key Cryptography, RSA and Other Public Cryptosystems** Discrete logarithm	6	18	PowerPoint Presentation & Seminar
	Principles of public key – Cryptosystem	6		
	RSA algorithm – Elliptic curve cryptography	6		

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
1	Core Elective-I	21OPME1B	Fluid Dynamics	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives

1. To develop an application for properties of Newtonian Fluid.
2. To Study analytical solution to variety of simplified problems.
3. To understand the dynamics of fluid flows and governing the non dimensional parameters.
4. To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
5. To describe the principles of motion for fluids.

Course Content:

Unit	Course Contents	Hours	K Level	CLO
I	Real fluids and Ideal fluids- Velocity of a fluid at a point – streamlines path lines- velocity potential –Vorticity Vector – Equation of continuity – acceleration of a fluid	18	Up to K3	CLO1
II	Equation of motion of a fluid: Pressure at a point in a fluid at rest – pressure at a point in a moving fluid-Euler's equations of motion – Bernoulli's Equation, Bernoulli's theorem.	18	Up to K3	CLO2
III	Some two-dimensional flows: meaning of two-dimensional flow –stream function – two dimensional image systems-Milne – Thomson circle theorem –Theorem of Blasius.	18	Up to K4	CLO3
IV	Elements of Thermodynamics: The equation of state of a substance – the first law of thermodynamics- internal energy of a gas – specific heats o f a gas- function of state; Entropy- Maxwell's thermodynamics relation	18	Up to K4	CLO4
V	Shock waves: formation of shock waves – elementary analysis of normal shock waves –elementary analysis of oblique shock waves-the method of characteristics for two – dimensional ,homentropic, irrational flow.	18	Up to K4	CLO5

Annexure -1

Book for study:

F.Chorlton: *Text book of Fluid Dynamics*, CBS publishers and Distributors Pvt.Limited,2004.

Books for Reference:

1. M.D.Raisinghania: *Fluid Dynamics*, S.Chand,2003.
2. Michel Rieutord: *Fluid Dynamics*, Springer International Publishing,2015.
3. Geoffrey K. Vallis *Essentials of Atmospheric and Oceanic Dynamics* 1st dition,2019.
4. Richard W. Johnson *: Handbook of Fluid Dynamics* 2nd Edition.
5. George EmKarniadakis , Spencer J. SherwinSpectral/hp *Element Methods for Computational Fluid Dynamics (Numerical Mathematics and Scientific Computation)* 2nd Edition

Web Resourses:

1.https://www.meteo.physik.unimuenchen.de/lehre/roger/manuskripte/Fluid_Dynamics.pdf

2. http://www.ccpo.odu.edu/~klinck/Reprints/PDF/groschBook2011.pdf

3.https://www.engineerclassroom.com/2019/01/a-textbook-of-fluid-mechanics-and_18.html

E-books:

1.http://www.issp.ac.ru/ebooks/books/open/Advanced_Fluid_Dynamics.pdf

2.https://www.u-cursos.cl/usuario/5d90bc31eadb7b756f4a0d3fd9789c4f/mi_blog/r/1205763481Batchelor.-Introduction-to-Fluid-Dynamics.pdf

Pedagogy:

- Chalk and Talk, Powerpoint presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:

Knowledge and Skill:

- Students will get the knowledge of basic principles of fluids mechanics
- To get the ability to analyze the fluid flow problems with the application of Bernoulli's theorem.

Activities to be given: We will be providing students with intellectual problems, theory application problems, group discussions and other practical works and also insist them to check the Books for References and web resources.

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Describe the principles of motion for fluids	Up to K3
CLO2	Formulate the motion of fluid element	Up to K3
CLO3	Use the dimensional analysis and derive dimensional numbers	Up to K4
CLO4	Understanding of thermo dynamics properties and processes	Up to K4
CLO5	Be able to analyze shock waves	Up to K4

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented

K4- Analyzing, examining and making presentations with evidence.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	1	3	2	3	3
CLO2	1	2	2	2	1	3
CLO3	1	1	3	3	1	3
CLO4	2	2	2	2	2	3
CLO5	2	2	3	2	3	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either / or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K 3	4	K1(2) & K2(2)	3	K1 (2) & K2 (1)	4	K2 (2) & K3 (2)	2	K1 (1) & K3 (1)
Question Pattern CIA I	**No. of Questions to be asked**		**4**		**3**		**4**		**2**	
	No. of Questions to be Answered		**4**		**3**		**2**		**1**	
	Marks for each Question		**1**		**2**		**5**		**10**	
	Total Marks for each section		**4**		**6**		**10**		**10**	
Question Pattern CIAII& CIAIII	CLO2	Up to K3	4	K1(2) & K2(2)	3	K1(1) & K2(2)	4	K1(2) & K2(2)	2	K1(1) & K3(1)
	CLO3	Up to K4	4	K2(2) & K3(2)	3	K1(1) K2(1) &K3(1)	4	K2(2) & K3(2)	2	K2(1) & K3(1)
	CLO4	Up to K4	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K2(1) & K3(1)
	CLO5	Up to K4	4	K2(2) & K3(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K3(1) & K4(1)
No of questions to be asked			**8**		**6**		**8**		**4**	
No of questions to be answered			**8**		**6**		**4**		**2**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**8**		**12**		**20**		**20**	

Annexure -1

Distribution of Marks with K Levels CIA I, CIA II and CIA III

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks with choice)
I	K1	2	4	10	-	16	32
	K2	2	2	-	10	14	28
	K3	-	-	10	10	20	40
	K4	-	-	-	-	-	-
	Marks	**4**	**6**	**20**	**20**	**50**	**100**
II	K1	2	4	10	-	16	16
	K2	4	6	20	20	50	50
	K3	2	2	10	20	34	34
	K4	-	-	-	-	-	-
	Marks	**8**	**12**	**40**	**40**	**100**	**100**
III	K1	2	4	-	-	6	6
	K2	4	4	20	10	38	38
	K3	2	4	20	20	46	46
	K4	-	-	-	10	10	10
	Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K1&K2)	1(K1)	2(K1&K1)	1(K2)
2	CLO 2	Up to K3	2(K2&K3)	1(K1)	2(K2&K2)	1(K3)
3	CLO 3	Up to K3	2(K1&K2)	1(K2)	2(K3&K3)	1(K3)
4	CLO 4	Up to K4	2(K2&K3)	1(K2)	2(K4&K4)	1(K4)
5	CLO 5	Up to K 4	2(K2&K3)	1(K3)	2(K4&K4)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inferences with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	2	4	10	-	16	13.33	14
K2	5	4	10	10	29	24.16	24
K3	3	2	10	20	35	29.16	29
K4	-	-	20	20	40	33.33	33
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plan

Unit	Course Content	Hours	Total Hours	Mode of Teaching
1	Real fluids and Ideal fluids- Velocity of a fluid at a point	6	18	Chalk and Talk
	streamlines path lines- velocity potential	6		
	Vorticity Vector – Equation of continuity –acceleration of a fluid.	6		
II	Equation of motion of a fluid: Pressure at a point in a fluid at rest	6	18	Chalk and Talk
	pressure at a point in a moving fluid-Euler's equations of motion	6		
	Bernoulli's Equation, Bernoulli's theorem.	6		
III	Some two-dimensional flows: meaning of two- dimensional flow	6	18	Chalk and Talk
	stream function – two dimensional image systems	6		
	Milne – Thomson circle theorem –Theorem of Blasius.	6		
IV	Elements of Thermodynamics: The equation of state of a substance – the first law of thermodynamics	6	18	PowerPoint Presentation &Seminar
	internal energy of a gas – specific heats of a gas- function of state; Entropy	6		
	Maxwell's thermodynamics relation	6		
V	Shock waves: formation of shock waves – elementary analysis of normal shock waves	6	18	PowerPoint Presentation &Seminar
	elementary analysis of oblique shock waves-the method of characteristics for two	6		
	dimensional, homentropic, irrational flow.	6		

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
1	NME-I	21OPMNM1	**Teaching & Research Aptitude Paper - I**	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives

1. To enhance the problem solving skills.
2. To improve the basic mathematical skills
3. To help to clear the students who are preparing for any type of competitive exams
4. To identify number in logical reasoning
5. To apply the number in related test

Course Content:

Unit	Course Contents	Hours	K Level	CLO
I	Alphabet test, Classification Test- Analogy Test	6	Up to K2	CLO1
II	Coding and Decoding Test number and Alphabetical series test ,Number related, test blood relations test	6	Up to K3	CLO2
III	Assertions and presumption ,statement and conclusion	6	Up to K3	CLO3
IV	Series completion test, Venn diagram, diagram type test different position of dice	6	Up to K4	CLO4
V	Missing number-figure analogy test figure classification test classification of figures into groups.	6	Up to K4	CLO5

Book for study:

Upkar's UGC *NET/JRF/SET Teaching & Research Aptitude (General Paper-I).*

UNIT	CHAPTER(S)	PAGES
I	4	145 to 160
II	4	161 to 176
III	4	184 to 191
IV	4	192 to 206
V	4	207 to 215

Books for References:

1) R. Gupta's *UGC-NET Junior Research Fellowship and Lectureship Exam Paper-1 Teaching and Research Aptitude* **,**
2) Dr. K. Kautilya , *UGC Net/Jrf/Set Teaching & Research Aptitude General Paper-1*, 1761,
3) Oswaal 20 Practice Papers – *General Paper 1 (Teaching and Research Aptitude): UGC NET/JRF for 2020 Examination.*

Web resources:

https://www.upkar.in ›

E-book:

https://www.google.co/url?sa=i&url=https%3A%2F%2Fwww.scholarify.in%2Fugc-net-study-materialsforpaper1%2F&psig=AOvVaw1W10vu2X5bv7m7tR3nkJ8s&ust=1638600886154000&source=images&cd=vfe&ved=0CAsQjRxqFwoTCICNmpmGx_QCFQAAAAAdAAAAABAD

Pedagogy:

- Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:

Knowledge and Skill:

- The students able to perceive and process numbers and related symbols to perform basic arithmetic operations and perform estimates
- Develop decision making skill

Activities to be given

Practice latest question papers of various competitive exams

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Able to do verbal reasoning problems	Up to K3
CLO2	Able to do non verbal reasoning problems	Up to K3
CLO3	Understand and practice assertions and presumption problems.	Up to K3
CLO4	Understand and practice classification of figures and venn diagram	Up to K4
CLO5	Able to do critical thinking and decision making ability	Up to K4

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented

K4- Analyzing, examining and making presentations with evidence.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	2	2	3
CLO2	3	3	2	1	2	3
CLO3	3	3	1	2	2	3
CLO4	3	3	1	2	2	3
CLO5	3	3	2	1	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either / or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K3	1	K2	-	-	-	-	-	-
Question Pattern CIA	CLO2	Up to K3	1	K3	-	-	-	-	-	-
	CLO3	Up to K 3	1	K1	1	K2	-	-	-	-
	CLO4	Up to K 4	1	K3	1	K2	2	K3	1	K3
	CLO5	Up to K 4	-		1	K3	-	-	1	K4
No of questions to be asked			**4**		**3**		**2**		**2**	
No of questions to be answered			**4**		**3**		**1**		**1**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**4**		**6**		**5**		**10**	

Annexure -1

Distribution of Marks with K Levels CIA I

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C (Either/ Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)
I	K1	1	-	-	-	1	2.5
	K2	1	4	-	-	5	12.5
	K3	2	2	10	10	24	60
	K4	-	-	-	10	10	25
	Marks	**4**	**6**	**10**	**20**	**40**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K1&K2)	1(K2)	2(K2&K2)	1(K3)
2	CLO 2	Up to K3	2(K1&K2)	1(K2)	2(K2&K2)	1(K3)
3	CLO 3	Up to K3	2(K1&K2)	1(K3)	2(K3&K3)	1(K3)
4	CLO 4	Up to K4	2(K1&K2)	1(K3)	2(K2&K2)	1(K4)
5	CLO 5	Up to K4	2(K1&K2)	1(K3)	2(K3&K3)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inferences with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	4
K2	5	4	30	-	39	32.5	33
K3	-	6	20	30	56	46.67	63
K4	-	-	-	20	20	16.67	
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plan

Unit	Course Content	Hours	Mode of Teaching
1	Alphabet test, Classification Test- Analogy Test	6	Chalk & Talk
II	Coding and Decoding Test number and Alphabetical series test ,Number related, test blood relations test	6	Chalk & Talk
III	Assertions and presumption ,statement and conclusion	6	Chalk & Talk
IV	Series completion test, Venn diagram, diagram type test different position of dice	6	Chalk & Talk
V	Missing number-figure analogy test figure classification test classification of figures into groups.	6	Chalk & Talk

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
II	Core	21OPM21	LINEAR ALGEBRA	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives

1. To familiarize with linear system and matrices
2. To understand the concepts of polynomials, Determinants and their properties
3. To learn, how linear algebra in ubiquitous in Mathematics
4. To acquire idea to know linear transformation and its algebra
5. To impact the knowledge of rational forms and Jordon forms

Course Content:

Unit	Course Contents	Hours	K Level	CLO
I	**Linear Transformations** Linear Transformations–The Algebra of Linear Transformations– Isomorphism – Representations of Transformations by Matrices – Linear Functionals.	15	Up to K3	CLO1
II	**Polynomials, Determinants** Algebras-The Algebra of Polynomials –Polynomial Ideals - The Prime Factorization of a Polynomial –Commutative Rings - Determinant Functions.	15	Up to K3	CLO2
III	**Determinants, Elementary Canonical Forms** Permutations and the Uniqueness of Determinants – Additional Properties of Determinants - Characteristic Values – Annihilating Polynomials.	15	Up to K3	CLO3
IV	**Elementary Canonical Forms** Invariant Subspaces – Simultaneous Triangulations; Simultaneous Diagonalization –Direct- Sum Decompositions – Invariant Direct Sums – The Primary Decomposition Theorem.	15	Up to K4	CLO4
V	**The Rational and Jordan Forms** Cyclic Subspaces and Annihilators– Cyclic Decompositions and the Rational Forms– The Jordan Form.	15	Up to K4	CLO5

Annexure -1

Book for study:

1. Kenneth Hoffman and Ray Kunze, *Linear Algebra*, 2nd Edition, Prentice-Hall of India Pvt. Ltd, New Delhi, 2013.

UNIT	CHAPTER(S)	SECTIONS
I	3	3.1 to 3.5
II	4&5	4.1,4.2&4.4.,4.5&5.1,5.2
III	5&6	5.3,5.4&6.2,6.3
IV	6	6.2,6.3,6.4 to 6.8
V	7	7.1 to 7.3

Books for Reference:

1. I.N. Herstein, *Topics in Algebra* , 2nd Edition, Wiley Eastern Ltd, New Delhi, 2013.
2. Michael Artin, *Algebra* 2nd edition,2011.
3. Surjeet Singh, Qazi Zameeruddin Mordern Algebra 8th Edc,2008.

Web Resources:

1.https://nptel.ac.in/courses/111/106/111106051/

2.https://nrich.maths.or g/1422

3.http://www.math.brown.edu/dabramov/MA/f1314/251/Zijian-notes.pdf

E-Books:

1,https://books.google.com/books?id=0DUXym7QWfYC&printsec=frontcover&dq=linear+algebra&hl=en&newbk=1&newbks_redir=1&sa=X&ved=2ahUKEwioj5pwtP0AhUTSWwGHRsgAdUQ6wF6BAgEEAE

2,https://books.google.com/books?id=FhPhDAAAQBAJ&printsec=frontcover&dq=linear+algebra&hl=en&newbks=1&newbks_redir=1&sa=X&ved=2ahUKEwiywLSLw9P0AhXK8XMBHXwiB1wQ6AF6BAgEEAI

Pedagogy:

- Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course: Knowledge and Skill:

- Demonstrate accurate and efficient use of linear algebra techniques as they relate to the concepts like linear transformation, polynomial etc.,
- Apply problem solving using linear algebra techniques applied to diverse situations in physics, computer science and other mathematical contexts.

Activities to be given:

We will be providing students with intellectual problems, theory application problems, group discussions and other practical works and also insist them to check the reference books and web resources

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Understand the relationship between a linear transformation and its matrix representation	Up to K3
CLO2	Understand the idea of algebra of polynomials	Up to K3
CLO3	Understand the concept of Determinants and matrix with various conditions	Up to K3
CLO4	decompose a vector apace into a sum of invariant subspaces an a linear transformation into a direct sum of induced operators	Up to K4
CLO5	Compute the cyclic subspace generators by a vector and to construct the rational and Jordon form of linear transformation .	Up to K4

K1- Remembering facts with specific answers
K2- Basic understanding of facts.
K3- Application oriented
K4- Analyzing, examining and making presentations with evidence

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	1	2	3
CLO2	3	3	2	2	2	3
CLO3	3	3	2	2	1	3
CLO4	3	2	1	2	1	3
CLO5	3	2	1	2	1	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either / or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K3	4	K1(2) & K2(2)	3	K1(1), K2(1) & K 3(1)	4	K2 (2) & K3 (2)	2	K3(2)
Question Pattern CIA I	No. of Questions to be asked		4		3		4		2	
	No. of Questions to be Answered		4		3		2		1	
	Marks for each Question		1		2		5		10	
	Total Marks for each section		4		6		10		10	
Question Pattern CIAII& CIAIII	CLO2	Up to K3	4	K1(2) & K2(2)	3	K1(1) & K2(2)	4	K2(2) & K3(2)	2	K2(1) & K3(1)
	CLO3	Up to K3	4	K1(2) & K2(2)	3	K1(1), K2(1) & K3(1)	4	K2(2) & K3(2)	2	K2(1) & K3(1)
	CLO4	Up to K4	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K3(1) & K4(1)
	CLO5	Up to K4	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K3(1) & K4(1)
No of questions to be asked			8		6		8		4	
No of questions to be answered			8		6		4		2	
Marks for each question			1		2		5		10	
Total marks for each section			8		12		20		20	

Annexure -1

Distribution of Marks with K Levels CIA I, CIA II and CIA III

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)
I	K1	2	2	-	-	4	8
	K2	2	2	10	-	14	28
	K3	-	2	10	20	32	64
	K4	-	-	-	-	-	-
	Marks	**4**	**6**	**20**	**20**	**50**	**100**
II	K1	4	4	-	-	8	8
	K2	4	6	20	20	50	50
	K3	-	2	20	20	42	42
	K4	-	-	-	-	-	-
	Marks	**8**	**12**	**40**	**40**	**100**	**100**
III	K1	4	4	-	-	8	8
	K2	4	4	20	-	28	28
	K3	-	4	20	20	44	44
	K4	-	-	-	20	10	10
	Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K1&K2)	1(K1)	2(K2&K2)	1(K3)
2	CLO 2	Up to K3	2(K1&K2)	1(K1)	2(K2&K2)	1(K3)
3	CLO 3	Up to K3	2(K1&K2)	1(K1)	2(K3&K3)	1(K3)
4	CLO 4	Up to K4	2(K1&K2)	1(K2)	2(K3&K3)	1(K4)
5	CLO 5	Up to K4	2(K1&K2)	1(K2)	2(K4&K4)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inferences with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	6	-	-	**11**	9.17	**9**
K2	5	4	20	-	**29**	**24.16**	24
K3	-	-	20	30	**50**	**41.67**	42
K4	-	-	10	20	**30**	**25**	**25**
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plan

Unit	Course Content	Hours	Total Hours	Pedagogy
I	Linear transformations	3	15	Chalk and Talk
	The Algebra of Linear transformations	3		Chalk and Talk
	Isomorphism of vector spaces	3		Chalk and Talk
	Representations of linear transformations by matrices	3		Chalk and Talk & Seminar
	Linear Functionals.	3		Chalk and Talk & Group Discussion
II	Algebras	2	15	Chalk and Talk
	The algebra of polynomials	3		Chalk and Talk& Seminar
	Polynomial ideals	3		Chalk and Talk
	The prime factorization of a polynomial	2		Chalk and Talk
	Commutative rings	3		Chalk and Talk& Group Discussion
	Determinant functions.	2		Chalk and Talk & Seminar
III	Permutations and the uniqueness of determinants	3	15	Chalk and Talk
	Classical adjoint of a (square) matrix	3		Chalk and Talk
	Inverse of an invertible matrix using determinants	3		Chalk and Talk
	Characteristic values	3		Chalk and Talk
	Annihilating polynomials	3		Chalk and Talk & Seminar

IV	Invariant subspaces	3		Chalk and Talk
	Simultaneous triangulations	3	15	Chalk and Talk& Seminar
	Simultaneous Diagonalization	2		Chalk and Talk & Group Discussion
	Direct-sum decompositions	3		
	Invariant direct sums	2		
	Primary decomposition theorem	2		
V	Cyclic subspaces	2	15	Chalk and Talk
	Cyclic decompositions theorem (Statement only)	3		Chalk and Talk & Seminar
	Generalized Cayley	3		Chalk and Talk
	Hamilton theorem	3		Chalk and Talk
	Rational forms	2		Chalk and Talk & Seminar
	Jordan forms	2		Chalk and Talk & Group Discussion
	Total Hours		**75**	

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
II	Core	21OPM22	Measure and Integration	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives

1. To familiarize with the Measurable sets and Measurable Functions
2. To understand the concepts of Abstract Measure Space and L^P Space
3. To acquire idea to know functions of several variables
4. To obtain the knowledge of the lebesgue measure and integral
5. To know the Radon – Nikodym theorem

Course Content:

Unit	Course Contents	Hours	K Level	CLO
I	**Measure on a Real line:** Lebesgue Outer Measure-Measurable Sets – Measurable Functions .	15	Up to K3	CLO1
II	**Integration of functions of a Real line:** Integration of non - negative functions- The General Integral - Integration of Series – Riemann and Lebesgue Integral.	15	Up to K3	CLO2
III	**Abstract Measure Spaces:** Measures and outer Measures-Extension of a Measure-Measure Spaces-Integration With Respect to a Measure.	15	Up to K3	CLO3
IV	**Inequalities and the L^p Spaces:** The L^p spaces -Convex functions – Jensen's Inequality-The Inqualities of Holder and Minkowski.	15	Up to K4	CLO4
V	**Singed Measures and their Derivatives:** Signed measures and the Hahn Decomposition – The Jordan Decomposition- The Radon – Nikodym theorem	15	Up to K4	CLO5

Annexure -1

Book for study:

G.de Barra, *Measure Theory and Integration*, (Second Edition)-2013,New Age international(p) Ltd, Publishers

UNIT	CHAPTER(S)	SECTIONS
I	2	2.1,2.2&2.4
II	3	3.1to3.4
III	5	5.1,5.2&5.5,5.6
IV	6	6.1 to 6.4
V	8	8.1 to 8.3

Books for Reference:

1.H.L.Royden,*Real Analysis*, Prentice Hall of India, pvt., Ltd. (2004).

2.Robert G. Bartle,Donald R. Sherbert, *Introduction to Real Analysis*, John Wiley & Sons1982.

3.Tom M.Apostol,*Mathematical Analysis*,Second Edition, 1974 Narosa Publishing House

Web Resources:

1.https://www.cmi.ac.in/~prateek/measure_theory/2010-10-13.pdf
2.http://infoedu.ir/wp-content/uploads/2014/03/MeasureTheoryBook.pdf
3.https://doi.org/10.1007/978-3-030-33143-6

E-books:

1. https://people.math.ethz.ch/~salamon/PREPRINTS/measure.pdf
2.https://terrytao.files.wordpress.com/2012/12/gsm-126-tao5-measure-book.pdf

Pedagogy:

- Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course: Knowledge and Skill:

The knowledge of the measure and integration is used to study of several advanced topics in functional analysis ,partial differential equations and many other areas of mathematics, and familiar with application of measure theory to probability theory**.** To perform operations using the Lebeque integral and Lebeque space and also able to apply integration theory in one or several variable to formulate and solve problems in mathematics.

Activities to be given:

We will be providing students with intellectual problems, theory application problems, group discussions and other practical works and also insist them to check the reference books and web resources.

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

CLO	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Understand and analyze outer measure and measurable sets	Up to K3
CLO2	Be able to understand, the requirement and the concept of the Lebesque integral along its properties	Up to K3
CLO3	Be able to extend the concept of outer measure in an abstract space and integration with respect to a measure	Up to K3
CLO4	Be able to learn and apply Holder and Minkowski inequalities in L^p-spaces.	Up to K4
CLO5	Do decomposition	Up to K4

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented

K4- Analyzing, examining and making presentations with evidence.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	1	2	1	3
CLO2	3	3	1	2	2	3
CLO3	3	3	2	2	1	3
CLO4	3	3	1	2	1	3
CLO5	3	2	1	1	1	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either / or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K3	4	K1(2) & K2(2)	3	K1(2) & K2(1)	4	K2 (2) & K3 (2)	2	K3(2)
Question Pattern CIA I	**No. of Questions to be asked**		**4**		**3**		**4**		**2**	
	No. of Questions to be Answered		**4**		**3**		**2**		**1**	
	Marks for each Question		**1**		**2**		**5**		**10**	
	Total Marks for each section		**4**		**6**		**10**		**10**	
Question Pattern CIAII& CIAIII	CLO2	Up to K3	4	K1(2) & K2(2)	3	K1(1) & K2(2)	4	K2(2) & K3(2)	2	K3(2)
	CLO3	Up to K3	4	K1(2) & K2(2)	3	K1(1), K2(1) & K3(1)	4	K1(2) & K2(2)	2	K2(2)
	CLO4	Up to K4	4	K1(2) & K2(2)	3	K1(1), K2(1) & K3(1)	4	K2(1), K3(2) & K4(1)	2	K3(1) & K4(1)
	CLO5	Up to K4	4	K1(2) & K2(2)	3	K1(1) K2(2)	4	K2(1), K3(2) & K4(1)	2	K3(1) & K4(1)
No of questions to be asked			**8**		**6**		**8**		**4**	
No of questions to be answered			**8**		**6**		**4**		**2**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**8**		**12**		**20**		**20**	

Annexure -1

Distribution of Marks with K Levels CIA I, CIA II and CIA III

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)
I	K1	2	4	-	-	6	12
	K2	2	2	10	-	14	28
	K3	-	-	10	20	30	60
	K4	-	-	-	-	-	-
	Marks	**4**	**6**	**20**	**20**	**50**	**100**
II	K1	4	4	10	-	18	18
	K2	4	6	20	20	50	50
	K3	-	2	10	20	32	32
	K4	-	-	-	-	-	
	Marks	**8**	**12**	**40**	**40**	**100**	**100**
III	K1	4	4	-	-	8	8
	K2	4	6	10	-	20	20
	K3	-	2	20	20	42	42
	K4	-	-	10	20	30	30
	Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K1&K2)	1(K1)	2(K2&K2)	1(K3)
2	CLO 2	Up to K3	2(K1&K2)	1(K1)	2(K3&K3)	1(K3)
3	CLO 3	Up to K3	2(K1&K2)	1(K2)	2(K2&K2)	1(K3)
4	CLO 4	Up to K4	2(K1&K2)	1(K3)	2(K3&K4)	1(K4)
5	CLO 5	Up to K4	2(K1&K2)	1(K2)	2(K3&K4)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inferences with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	-	-	9	7.5	8
K2	5	4	20	-	29	24.17	24
K3	-	2	20	30	52	43.33	43
K4	-	-	10	20	30	25	25
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plan

Units	Description	Hours	Total Hours	Mode of Teaching
I	• Lebesgue Outer Measure Measurable Sets • Measurable Sets • Measurable Functions	5 5 5	15	Chalk and Talk& Group Discussion
II	• Integration of non - negative functions • The General Integral • Integration of Series • Riemann and Lebesgue Integral	4 4 4 3	15	Chalk and Talk
III	• Measures and outer Measures. • Extension of a Measure • Measure Spaces • Integration With Respect to a Measure	4 4 4 3	15	Chalk and Talk, PPT,Seminar
IV	• The L^p spaces • Convex functions • Jensen's Inequality • The Inequalities of Holder and Minkowski	3 4 4 4	15	Chalk and Talk, Seminar PPT, Group Discussion Assignment
V	• Signed measures and the Hahn • Decomposition • The Jordan Decomposition • The Radon – Nikodym theorem	5 5 5	15	Chalk and Talk, Seminar ,PPT
	Total Hours		**75**	

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
II	Core	21OPM23	Graph Theory with Applications	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives

1. To enable the students to apply Graph Theritical Techniques in Applications.
2. To demonstrate knowledge of Connectivity.
3. To study relationship between Euler Tours and Hamilton Cycles.
4. To make familiarity with Directed Graphs.
5. To assist the students to explore social network analysis software.

Course Content:

Unit	Course Contents	Hours	K Level	CLO
I	**Graphs and Subgraphs** Definition and Examples of a Graph – Simple Graphs - Graphs Isomorphism- The Incidence and Adjacency Matrices - Subgraphs – Vertex Degrees – Paths and Connection– Cycles - Trees - Cut Edges and Bonds – Cut Vertices – Cayley's Formula(Applications) -The Connector Problem.	18	Up to K3	CLO1
II	**Connectivity** Connectivity – Blocks (Applications) - Construction of Reliable Communication Networks	18	Up to K3	CLO2
III	**Euler Tours and Hamilton Cycles** Euler Tours - Hamilton Cycles (Applications) - The Chinese Postman Problem – The Travelling Salesman Problem.	18	Up to K3	CLO3
IV	**Directed Graphs** Directed Graphs - Directed Paths - Directed Cycles (Applications) – A Job sequencing Problem - Designing an Efficient Computer Drum - Making a Road System One–way - Ranking the Participants in Tournament.	18	Up to K4	CLO4
V	**Networks** Flows-Cuts-The Max-Flow Min-Cut Theorem (Applications)–Menger's Theorems - Feasible Flows	18	Up to K4	CLO5

Book for study:

.J.A. Bondy and U.S.R. Murty.(1982), *Graph Theory with Applications*. 5th print,North Holland .

UNIT	CHAPTER(S)	SECTIONS
I	1and 2	1.1 to 1.7 &2.1 to 2.5
II	3	3.1 to 3.3
III	4	4.1 to 4.4
IV	10	10.1 to 10.7
V	11	11.1 to 11.5

Books for Reference:

1. John Clark. Derek Allan Holton. *Graph Theory*. University of Otago (1995).
2. Frank Harary, (1969), *Graph theory*, Addition-Wesley Publishing Company , First Edition.
3.Murugan.M.,(2003),*Topics in Graph theory and Algorithms*, Muthal Publishing House,
4. S.A. Choudum. *A First Course in Graph Theory*.Macmillan Publishers India Limited (2011).
5. Narasing Deo (2007), *Graph Theory with Applications to Engineering and Computer science*,Pretice .

Web Resources:

1.https://www.shahucollegelatur.org.in/Department/Studymaterial/sci/it/BCS/FY/book.pdf
2.https://www.flowsurfv3.net/c.php?cu=https%253A%252F%252Fwww.shahucollegelatur.org.in%252FDepartment%252FStudymaterial%252Fsci%252Fit%252FBCS%252FFY%252Fbook.pdf&sh=www.shahucollegelatur.org.in%2F...%2Fit%2FBCS%2FFY%2Fbook.pdf&l=IN&po=2&u=mbeh-20210420-ccmnet-flga33&a=3100&tr=1712umd71g10&keyword=Graph%2Btheory%2Bwith%2Bapplication%2Bpdf&aid=61a88bda894f1&t=8&bc=0&rt=1638435802.1301&n=3&loc=normal

E – Books:

1.http://www.freebookcentre.net/maths-books-download/Descriptive-Complexity,-Canonisation and-Definable-Graph-Structure-Theory.html
2. https://www.maths.ed.ac.uk/~v1ranick/papers/wilsongraph.pdf

Pedagogy:

Chalk and Talk, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course: Knowledge and Skill:

Provides a helpful tool to quantity & simplify the many moving parts of dynamic systems

Activities to be given:

(i) To create social graphs for their own social networks. Group Discussion, Seminar & Project

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

CLO	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Examine the Graphs and Subgraphs .	Up to K3
CLO2	Understand the Connectivity	Up to K3
CLO3	Investigating the relationship between Euler Tours and Hamilton Cycles.	Up to K3
CLO4	Explain the Directed Graphs.	Up to K4
CLO5	Compute the Analysis of Networks.	Up to K4

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented

K4- Analyzing, examining and making presentations with evidence.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	3	3	2	3
CLO2	3	3	3	2	3	3
CLO3	3	2	2	3	3	3
CLO4	3	3	2	2	3	3
CLO5	3	2	3	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K3	4	K1(2) & K2(2)	3	K1(1) & K2(2)	4	K1 (2) & K3 (2)	2	K2(1) & K3(1)
Question Pattern CIA I	**No. of Questions to be asked**		**4**		**3**		**4**		**2**	
	No. of Questions to be Answered		**4**		**3**		**2**		**1**	
	Marks for each Question		**1**		**2**		**5**		**10**	
	Total Marks for each section		**4**		**6**		**10**		**10**	
Question Pattern CIAII& CIAIII	CLO2	Up to K3	4	K1(2) & K2(2)	3	K1(1) K2(1)& K3(1)	4	K2(2) & K3(2)	2	K3(2)
	CLO3	Up to K3	4	K2(2) & K3(2)	3	K2(2) & K3(1)	4	K2(2) & K3(2)	2	K2(2)
	CLO4	Up to K4	4	K1(1) K2(2)& K3(1)	3	K2(2) & K3(1)	4	K3(2) & K4(2)	2	K4(2)
	CLO5	Up to K4	4	K1(1) K2(1)& K3(2)	3	K1(1) K2(1)& K3(1)	4	K2(2) & K3(2)	2	K4(2)
No of questions to be asked			**8**		**6**		**8**		**4**	
No of questions to be answered			**8**		**6**		**4**		**2**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**8**		**12**		**20**		**20**	

Annexure -1

Distribution of Marks with K Levels CIA I, CIA II and CIA III

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C Either or Choice	Section D (Open Choice)	Total Marks	% of(Marks without choice)
I	K1	2	2	10	-	14	28
	K2	2	4	-	10	16	32
	K3	-	-	10	10	20	40
	K4	-	-	-	-	-	-
	Marks	**4**	**6**	**20**	**20**	**50**	**100**
II	K1	2	2	-	-	4	4
	K2	4	6	20	-	30	30
	K3	2	4	20	20	46	46
	K4	-	-	-	20	20	20
	Marks	**8**	**12**	**40**	**40**	**100**	**100**
III	K1	2	2	-	-	4	4
	K2	3	6	10	-	19	19
	K3	3	4	20	20	47	47
	K4	-	-	10	20	30	30
	Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K1&K2)	1(K1)	2(K3&K3)	1(K3)
2	CLO 2	Up to K3	2(K1&K2)	1(K2)	2(K2&K2)	1(K3)
3	CLO 3	Up to K3	2(K1&K2)	1(K3)	2(K3&K3)	1(K3)
4	CLO 4	Up to K4	2(K1&K2)	1(K3)	2(K4&K4)	1(K4)
5	CLO 5	Up to K4	2(K1&K2)	1(K2)	2(K4&K4)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inference with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Shor Answer Questions)	Section C (Either Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	2	-	-	7	5.83	6
K2	5	4	10	-	19	15.83	8
K3	-	4	20	30	54	45	45
K4	-	-	20	20	40	33.33	33
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plane

Unit	Course Content	Hours		Mode of Teaching
I	Definition and Examples of a Graph – Simple Graphs - Graphs Isomorphism- The Incidence and Adjacency Matrices – Subgraphs.	6	18	Chalk & Talk, Quiz, Exercise
	Vertex Degrees – Paths and Connection– Cycles	6		
	Trees - Cut Edges and Bonds – Cut Vertices – Cayley's Formula (Applications) -The Connector Problem.	6		
II	Connectivity.	6	18	Chalk & Talk, PPTs, Quiz, Exercise
	Blocks (Applications).	6		
	Construction of Reliable Communication Networks.	6		
III	Euler Tours and Hamilton Cycles.	6	18	Chalk & Talk, PPTs, Exercise, Quiz
	The Chinese Postman Problem.	6		
	The Travelling Salesman Problem.	6		
IV	Directed Graphs - Directed Paths - Directed Cycles (Applications)	6	18	Chalk & Talk, Exercise PPTs, Quiz, seminar
	A Job sequencing Problem-Designing an Efficient Computer Drum	6		
	Making a Road System One–way Ranking the Participants in Tournament..	6		
	Flows-Cuts-The Max-Flow Min-Cut Theorem (Applications).	6	18	Chalk & Talk, Exercise Quiz Assignment PPTs, seminar
	Menger's Theorems	6		
	Feasible Flows.	6		

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
II	Core	21OPM24	Advanced Statistics-I	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives

1. To enable the students to apply Statistical Techniques in decision making.
2. To demonstrate knowledge of probability and distributions.
3. To study relationship between some special distributions.
4. To make familiarity with statistical methodsl the business and academic environment.
5. To assist the students to conduct a Statistical investigation.

Course Content:

Unit	Course Contents	Hours	K Level	CLO
I	**Probablitiy and Distributions** Introduction – Set Theory – The Probability Set Function – Conditional Probability and Independence – Random Variables of the Discrete Type – Random Variables of the Continuous Type – Properties of the Distribution Function – Expectation of a Random Variable – Some Special Expectations – Chebyshev's Inequality	18	Up to K3	CLO1
II	**Multivariate Distributions** Distributions of Two Random Variables – Conditional Distributions and Expectations – The Correlation Coefficient – Independent Random Variables – Extension to Several Random Variables.	18	Up to K3	CLO2
III	**Some Special Distributions** The Binomial and Related Distributions – The Poisson Distribution – The Gamma and Chisquare Distributions – The Normal Distribution – The Bivariate Normal Distribution.	18	Up to K4	CLO3
IV	**Distributions of Funcions of Random Variables** Sampling Theory – Transformations of Variables of the Discrete Type – Transformations of Variables of Continuous Type – The Beta, t and F Distributions – Extensions of the Change of Variables Technique – Distributions of Order Statistics – The Moment Generating Function Technique – The Distributions of $\bar{X}$ and nS^2/σ^2 – Expectations of Functions of Random Variables..	18	Up to K4	CLO4

V	**Limiting Distributions** Convergence in Distribution – Convergence in Probability – Limiting Moment Generating Functions – The Central Limit Theorem – Some Theorems on Limiting Distributions.	18	Up to K3	CLO5

Book for study:

Robert V.Hogg and Allen T. Craig. *Introduction to Mathematical Statistics*, 5th Edition,Pearson Education (2004).

UNIT	CHAPTER(S)	SECTIONS
I	1	1.1 to 1.10
II	2	2.1 to 2.5
III	3	3.1 to 3.5
IV	4	4.1 to 4.9
V	5	5.1 to 5.5

Books for Reference:

1. John .E.Freund, M.T.J.Wilmore *Mathematical statistics*,7th Edition Prentice Hall of India,(2000.)
2. R.S.N.Pillai, Bagavathi *Statistics*. S.Chand & Company Ltd.,(2009).
3. S.P.Gupta. *Statistical Methods* .Sultan Chan & Sons (2004).
4. Roger E.kirk(2007), *statistics*, fifth edition.
5. Narayanan Nadar E.,(2007),*statistics*,second edition.

Web Resources:

1.https://www.uibk.ac.at/statistics/personal/janettewalde/lehre/phd_biology/advanced_statistics.pdf

2.https://www.researchgate.net/publication/328214659_Book_Advanced_Statistical_Methods_and_Applications

E – Book:

1.https://openstax.org/books/introductory-statistics/pages/1-introduction

2. http://julio.staff.ipb.ac.id/files/2015/02/Ross_8th_ed_English.pdf

Pedagogy:

- Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:

Knowledge and Skill:

Used to describe and analyze phenomena involving uncertainty and variation.

Activities to be given:

Practice to analyze problems .Group Discussion., Seminar & Project.

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

CLO.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Investigating the relationship between Probability and Distributions	Up to K3
CLO2	Identify the multivariate Distributions	Up to K3
CLO3	Resolve the test of some special distributions.	Up to K4
CLO4	Analyze the concept of distributions of functions of Random variables.	Up to K4
CLO5	Apply knowledge to the limiting distributions	Up to K3

K1- Remembering facts with specific answer
K2- Basic understanding of facts.
K3- Application oriented
K4- Analyzing, examining and making presentations with evidence.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	2	2	3
CLO2	3	3	1	2	2	3
CLO3	3	3	2	1	1	3
CLO4	3	3	2	2	2	3
CLO5	3	3	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K3	4	K1(2) & K2(2)	3	K1(2) & K2(1)	4	K2 (2) & K3 (2)	2	K2(1) & K3(1)
Question Pattern CIA I	**No. of Questions to be asked**		**4**		**3**		**4**		**2**	
	No. of Questions to be Answered		**4**		**3**		**2**		**1**	
	Marks for each Question		**1**		**2**		**5**		**10**	
	Total Marks for each section		**4**		**6**		**10**		**10**	
Question Pattern CIAII& CIAIII	CLO2	Up to K3	4	K1(2) & K2(2)	3	K1(1)& K2(2)	4	K2(2) & K3(2)	2	K3(2)
	CLO3	Up to K4	4	K2(2) & K3(2)	3	K2(2) & K3(1)	4	K3(2) & K4(2)	2	K4(2)
	CLO4	Up to K4	4	K1(1) K2(2)& K3(1)	3	K2(2) & K3(1)	4	K3(2) & K4(2)	2	K4(2)
	CLO5	Up to K3	4	K1(1) K2(1)& K3(2)	3	K1(1) K2(1)& K3(1)	4	K2(2) & K3(2)	2	K3(2)
No of questions to be asked			**8**		**6**		**8**		**4**	
No of questions to be answered			**8**		**6**		**4**		**2**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**8**		**12**		**20**		**20**	

Annexure -1

Distribution of Marks with K Levels CIA I, CIA II and CIA III

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C Either or Choice	Section D (Open Choice)	Total Marks	% of(Marks without choice)
I	K1	2	4	-	-	6	12
	K2	2	2	10	10	24	48
	K3	-	-	10	10	20	40
	K4	-	-	-	-	-	-
	Marks	**4**	**6**	**20**	**20**	**50**	**100**
II	K1	2	2	-	-	4	4
	K2	4	8	10	-	22	22
	K3	2	2	20	20	44	44
	K4	-	-	10	20	30	30
	Marks	**8**	**12**	**40**	**40**	**100**	**100**
III	K1	2	2	-	-	4	4
	K2	3	6	10	-	19	19
	K3	3	4	20	20	47	47
	K4	-	-	10	20	30	30
	Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K1&K2)	1(K1)	2(K2&K2)	1(K1)
2	CLO 2	Up to K3	2(K1&K2)	1(K2)	2(K2&K2)	1(K3)
3	CLO 3	Up to K4	2(K2&K3)	1(K3)	2(K3&K3)	1(K4)
4	CLO 4	Up to K4	2(K2&K3)	1(K3)	2(K4&K4)	1(K4)
5	CLO 5	Up to K3	2(K1&K2)	1(K2)	2(K3&K3)	1(K3)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inference with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Shor Answer Questions)	Section C (Either Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	2	-	10	17	14.16	14
K2	5	4	20	-	29	24.16	24
K3	-	4	20	20	44	36.66	37
K4	-	-	10	20	30	25	25
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plan

Unit	Course Content	Hours	Total Hours	Mode of Teaching
I	Introduction – Set Theory – The Probability Set Function – Conditional Probability and Independence	6	18	Chalk & Talk, Quiz, Exercise
	Random Variables of the Discrete Type – Random Variables of the Continuous Type.	6		
	Properties of the Distribution Function – Expectation of a Random Variable – Some Special Expectations – Chebyshev's Inequality	6		
II	Distributions of Two Random Variables – Conditional Distributions and Expectations.	6	18	Chalk & Talk, PPTs, Quiz, Exercise
	The Correlation Coefficient – Independent Random Variables Extension to Several Random Variables.	6		
		6		
III	The Binomial and Related Distributions – The Poisson Distribution.	6	18	Chalk & Talk, PPTs, Exercise, Quiz
	The Gamma and Chisquare Distributions – The Normal Distribution.	6		
	The Bivariate Normal Distribution.	6		
IV	Sampling Theory – Transformations of Variables of the Discrete Type – Transformations of Variables of Continuous Type – The Beta, t and F Distributions.	6	18	Chalk & Talk, Exercise PPTs, Quiz, seminar
	Sampling Theory – Transformations of Variables of the Discrete Type	6		
	Transformations of Variables of Continuous Type – The Beta,t and F Distributions	6		
V	Convergence in Distribution – Convergence in Probability	6	18	Chalk & Talk, Exercise Quiz Assignment PPTs, seminar
	Limiting Moment Generating Functions.	6		
	The Central Limit Theorem – Some Theorems on Limiting Distributions.	6		

Annexure -1

Department of Mathematics				I M.Sc., Mathematics				
Sem.	Category	**Course Code**	**Course Title**	**Credits**	**Hrs.**	**CIA**	**SE**	**Total**
II	Core Elective-II	21OPME2A	Fuzzy Sets and Logic	5	6	25	75	100

Nature of the Course

Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship Oriented

Course Objectives:

1. To understand fundamental of fuzzy set.
2. To learn fuzzy set, Arithmetic operation on fuzzy set.
3. To understand fuzzy notation
4. To know about fuzzy relation.
5. To apply fuzzy logic in real world problem.

Unit	Course Content	Hours	K-Level	CLO
I	Introduction ,Crisp Sets: An Overview, The Notation of Fuzzy Sets, Basic Concepts of Fuzzy Sets, Classical Logic: An Overview, Fuzzy Logic	18	Up to K3	CLO1
II	General Discussion, Fuzzy Complement, Fuzzy Union, Fuzzy Intersection, Combinations of Operations, General Aggregation Operations.	18	Up to K3	CLO2
III	Crisp and Fuzzy Relations, Binary Relations, Binary Relations On a Single Set, Equivalence and Similarity Relations.	18	Up to K3	CLO3
IV	Compatibility or Tolerance Relations, Orderings	18	Up to K3	CLO4
V	Morphisms, Fuzzy Relation Equations	18	Up to K4	CLO5

Book for Study:

Fuzzy Sets, Uncertainty and Information, George J.Klir,Tina A. Folger.

Chapters:

UNIT	CHAPTER(S)	SECTIONS
I	1	1.1 to 1.6
II	2	2.1 to 2.6
III	3	3.1 to 3.4
IV	3	3.5 & 3.6
V	3	3.7 & 3.8

Books for Reference:

1) Bhargava A.K *Fuzzy Set Theory Fuzzy Logic and Their Applications,* S.Chand& Company Pvt. Ltd.2013.
2) Chennakesava,R.Alavala, *Fuzzy Logic and Neural Network Basic Concepts& Applications,* New Age International Publishers 2008.
3) George J.Klir and Boyuan, *Fuzzy sets Fuzzy Logic, Theory and Applications,* Prentice Hall of India , 2002.
4) George Bojadziev and Maria Bojadziev, *Fuzzy Sets, Fuzzy Logic, Applications*, 1996.
5) Bhargava A.K.*Fuzzy Set Theory Fuzzy Logic and their Applications,* 2013.

Web Resources :

1.https://cours.etsmtl.ca/sys843/REFS/Books/ZimmermannFuzzySetTheory2001.pdf
2. https://link.springer.com/book/10.1007/978-3-642-35221-8
3. https://www.b-farhadinia.ir/bfarhadiadmin/file/stdfile/Klir.pdf

E-books :

1. https://bookauthority.org/books/beginner-fuzzy-logic-ebooks
2. https://www.phindia.com/Books/ShowBooks/NzI/Fuzzy-Sets-and-Fuzzy-Logic
3. https://onlinelibrary.wiley.com/doi/book/10.1002/9781119193210

Pedagogy :

Chalk and Talk, Group Discussion, Student Seminar, Spot Test, Assignments, Quiz.

Rationale for Nature of the Course:

Knowledge and Skill

To understand the concept of fuzzy and its application in various field

Activities to be given:

We will be providing students with intellectual problems, theory application problems, group discussion and other practical works and also insist them to check the Books for References and web resource

Annexure -1

Course Learning Outcomes (CLO):
On successful Completion of the course Students will be able to

CLO	Course Outcomes	Knowledge Level
CLO1	Understand to Examine the Basic Concepts of Crisp sets and Fuzzy sets	**UptoK3**
CLO2	Describe Fuzzy Operations	**UptoK3**
CLO3	Understand the concept of Fuzzy Arithmetic	**UptoK3**
CLO4	Determine the difference between Crisp and Fuzzy Relation	**UptoK3**
CLO5	Use Fuzzy Relation as tools to Visualize and Simplify	**Upto K4**

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3– Application oriented – Solving Problems

K4 –Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcome(CLOs) with Program Outcomes(Pos)

CLOs	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	2	3	2	2	3
CLO2	1	2	3	2	2	3
CLO3	2	3	2	2	2	1
CLO4	2	2	3	2	2	2
CLO5	2	2	3	2	2	3

1 – Basic Level **2 – Intermediate Level** **3- Advance Level**

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K Level	Section A MCQs		Section B Short Answers		Section C (Either/Or Choice)		Section D (Open Choice)	
			No. of Questions	K Level	No. of Questions	K Level	No. of Questions	K Level	No. of Questions	K Level
I	CLO1	**Upto K3**	4	K1(2) K2(2)	3	K2(2) K3(1)	4	K1(2) K3(2)	2	K1(1) K2(1)
Question Pattern CIA I	No. of Questions to be Asked		4		3		4		2	
	No. of Questions to be Answered		4		3		2		1	
	Marks for each Question		1		2		5		10	
	Total Marks for each Section		**4**		**6**		**10**		**10**	
II	CLO2	**Upto K3**	4	K1(2) K2(2)	3	K1(1) K2(2)	4	K1(2) K2(2)	2	K1(1) K2(1)
	CLO3	**Upto K3**	4	K1(2) K2(2)	3	K2(2) K3(1)	4	K1(2) K3(2)	2	K1(1) K3(1)
III	CLO4	**Upto K3**	4	K1(2) K2(2)	3	K1(1) K2(2)	4	K1(2) K2(2)	2	K1(1) K3(1)
	CLO5	**Upto K4**	4	K1(2) K2(2)	3	K2(1) K3(2)	4	K1(2) K3(2)	2	K2(1) K4(1)
Question Pattern CIA II And CIA III	No. of Questions to be Asked		8		6		8		4	
	No. of Questions to be Answered		8		6		4		2	
	Marks for each Question		1		2		5		10	
	Total Marks for each Section		**8**		**12**		**20**		**20**	

Annexure -1

Distribution of Marks with K levels CIA I ,CIA II and CIA III

CIA	K-Levels	Section A MCQ	Section B (Short Answer)	Section C (Either/ Choice)	Section D (Open Choice)	Total Marks	% of Marks without choice
I	K1	2	-	10	10	22	44 %
	K2	2	4	-	10	16	32 %
	K3	-	2	10	-	12	24 %
	K4	-	-	-	-	-	-
	Total Marks	**4**	**6**	**20**	**20**	**50**	**100**
II	K1	4	2	20	20	46	46%
	K2	4	8	10	10	32	32%
	K3	-	2	10	10	22	22%
	K4	-	-	-	-	-	-
	Total Marks	**8**	**12**	**40**	**40**	**100**	**100**
III	K1	4	2	20	10	36	36%
	K2	4	6	10	10	30	30%
	K3	-	4	10	10	24	24%
	K4	-	-	-	10	10	10%
	Total Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination – Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section- A MCQs	Section – B Short Answers	Section C (Either or Choice)	Section D (Open Choice)
			K-Level	**K-Level**	**K-Level**	**K-Level**
1	CLO1	Up to K3	K1(2)	1K1(1)	2(K1&K1)	K2(1)
2	CLO2	Up to K3	K2(2)	1K1(1)	2(K2&K2)	K2(1)
3	CLO3	Up to K3	K3(2)	1K2(1)	2(K3&K3)	K3(1)
4	CLO4	Up to K3	K3(2)	1K2(1)	2(K3&K3)	K4(1)
5	CLO5	Up to K4	K4(2)	1K3(1)	2(K4&K4)	K4(1)
No. of Questions to be Asked			10	5	10	5
No. of Questions to be Answered			10	5	5	3
Marks for each Question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

Annexure -1

Distribution of Marks with K Level for Summative Examination

K-Levels	Section A MCQ	Section B Short Answer	Section C (Either/ Choice)	Section D (Open Choice)	Total Marks	% of Marks without Choice
K1	2	4	10	-	16	13.3%
K2	2	4	10	20	36	30%
K3	4	2	20	10	36	30%
K4	2	-	10	20	32	26.7%
Total Marks	**10**	**10**	**50**	**50**	**120**	**100**

LESSON PLAN:

Units	Course Contents	HRS		Mode of Teaching
I	▪ Introduction , Crisp Sets	6	18	Chalk & Talk
	▪ An Overview: The Notation of Fuzzy Sets.	6		Chalk & Talk , Spot Test
	▪ Basic Concepts: Fuzzy Sets, Classical Logic: An Overview, Fuzzy Logic.	6		Chalk & Talk
II	▪ General Discussion, Fuzzy Complement,	6	18	Chalk & Talk
	▪ Fuzzy Union , Fuzzy Intersection	6		Chalk & Talk
	▪ Fuzzy Intersection, Combinations of Operations			
	Combinations of Operations, General Aggregation Operations.	6		Chalk & Talk
III	▪ Crisp and Fuzzy Relations	6	18	Chalk & Talk, Spot Test
	▪ Relations, Binary Relations On a Single Set			
	▪ Equivalence and Similarity Relations.	6		Chalk & Talk
		6		Chalk & Talk , Group Discussion
IV	▪ Compatibility	6	18	Chalk & Talk
	▪ Tolerance Relations			
	▪ Orderings	6		Chalk & Talk, Spot Test,
		6		Chalk & Talk
V	▪ Morphisms	9	18	Chalk & Talk
	▪ Fuzzy Relation and Equation	9		Chalk & Talk, Students Seminar

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**SE**	**Total**
II	Core Elective - II	21OPME2B	Automata Theory& Formal Languages	5	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives

1.To identify different formal language classes and their notation strips.

2.To design grammars and recognizes for different formal languages.

3.To prove or disperse theories in automata theory using its properties

4.To understand the regular expression in UNIX.

5.To acquire the idea about regular languages and Pumping Lemma

Course Content

Unit	Course Contents	Hours	K Level	CLO
I	**Inductive Proofs-**Inductions on integers – Mutual inductions The Central Concept of Automata Theory Alphabets and strings-languages	18	Up to K3	CLO1
II	**Finite Automata**-An informal Picture of finite Automata-The ground Rules- Deterministic finite Automata: Definition of a Deterministic Finite automata-How a FDA Processes Strings.	18	Up to K3	CLO2
III	**Regular Expressions and Languages**-Building Regular Expressions Finite Automata and Regular Expressions-From DFA'S to Regular Expression-Converting DFA's to Regular Expressions by Eliminating States.	18	Up to K3	CLO3
IV	**Applications of Regular Expressions**-Regular Expressions in UNIX-Lexical Analysis-Finding Patterns in Text Discovering Laws for Regular Expressions-The Test for a Regular-Expressions Algebraic Law	18	Up toK4	CLO4
V	**Properties of Regular Languages**-Proving Languages not to be Regular-The Pumping Lemma for Regular Languages-Applications of the Pumping Lemma. Closure Properties of Regular Languages.	18	Up toK4	CLO5

Annexure -1

Book for study:

John.E.Hopcroft, Jeffrey D.Ullman.*Introduction to Automata Theory Languages and computation*, DorlingKindersley (India Pvt. Ltd.,) 2001.

Chapters:

UNIT	CHAPTER(S)	SECTIONS
I	1	1.4 & 1.5
II	2	2.1 & 2.2
III	3	3.1 & 3.2
IV	3	3.3 & 3.4
V	4	4.1 & 4.2

Books for Reference:

1. Alexander Meduna, *Automata and Languages* Springer (2000).
2. .Kohavi, ZVI, *Switching And Finite Automata Theory*, Tata McGraw-Hill, 2006.
3. ShyamalenduKandar, *Automata Theory and Formal Languages* Dorling Kindersley(India) Pvt.Ltd(2000)
4. Debidas gosh, *Introduction to Theory Of Automata, formal languages and computation*, PHI Learning; 21 August 2013
5. Pandey,*An Introduction to Automata Theory and Formal languages*, S.K.Kataria& Sons, 2010

Web Resources:

1. https://www.oreilly.com/library/view/formal-languages and/9789332558274/xhtml/References.xhtml
2. https://dl.acm.org/doi/book/10.5555/1096945
3. https://cs.stanford.edu/people/eroberts/courses/soco/projects/2004-05/automata-theory/refs.html

E-books:

1. http://www.gutenberg.org

2.https://www.google.com/url?sa=t&source=web&rct=j&url=https://www.phindia.com/Books/ShoweBooks/NDU/Automata-Theory-of-Computer-Science&ved=2ahUKEwjBydWhitL0AhWd4zgGHapDDHAQFnoECBoQAQ&usg=AOvVaw01lede-zvaFH6j0yzWpjaP

Pedagogy:

- Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:

Knowledge and Skill: Acquire in fundamental understanding of the core concepts in automata theory and formal languages .An ability to design grammars and automata for different languages classes.

Activities to be given:

We will be providing students with intellectual problems, theory application problems, group discussion and other practical works and also insist them to check the Books for References and web resource.

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

CLO	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Understanding the basic properties of formal languages.	UptoK3
CLO2	Utilize the two way finite Automata	Up to K3
CLO3	Analyze the properties of regular sets	Up to K3
CLO4	Present the context free grammars	Up to K4
CLO5	Build the algorithm of DFA's	Up to K4

K1- Remembering facts with specific answers
K2- Basic understanding of facts.
K3- Application oriented
K4- Analyzing, examining and making presentations with evidence.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	3	2	2	3
CLO2	3	3	3	2	1	3
CLO3	3	3	3	1	2	3
CLO4	3	2	3	2	2	3
CLO5	3	2	3	2	1	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either / or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K3	4	K1(2) & K2(2)	3	K1(1) & K2(2)	4	K1 (2) K2(1)& K3(1)	2	K2(1) & K3(1)
Question Pattern CIA I	**No. of Questions to be asked**		**4**		**3**		**4**		**2**	
	No. of Questions to be Answered		**4**		**3**		**2**		**1**	
	Marks for each Question		**1**		**2**		**5**		**10**	
	Total Marks for each section		**4**		**6**		**10**		**10**	
Question Pattern CIAII& CIAIII	CLO2	Up to K3	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K1(1) K2(2)& K3(1)	2	K2(1) & K3(1)
	CLO3	Up to K3	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K1(1) & K3(1)
	CLO4	Up to K4	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K2(1) K3(2)& K4(1)	2	K3(1) & K4(1)
	CLO5	Up to K4	4	K1(2) & K2(2)	3	K1(1) K2(1) & K3(1)	4	K2(2) & K3(2)	2	K3(1) & K4(1)
No of questions to be asked			**8**		**6**		**8**		**4**	
No of questions to be answered			**8**		**6**		**4**		**2**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**8**		**12**		**20**		**20**	

Annexure -1

Distribution of Marks with K Levels CIA I, CIA II and CIA III

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)
I	K1	2	2	10	-	14	28
	K2	2	4	5	10	21	42
	K3	-	-	5	10	15	30
	K4	4	6	-	-	50	-
	Marks	**4**	**4**	**20**	**20**	**28**	**100**
II	K1	4	4	10	10	50	28
	K2	4	6	40	-	22	50
	K3	-	2	10	10	-	22
	K4	-	-	-	-	-	-
	Marks	**8**	**12**	**60**	**20**	**100**	**100**
III	K1	4	4	-	-	8	8
	K2	4	4	20	10	38	38
	K3	-	4	20	20	44	44
	K4	-	-	-	10	10	10
	Marks	**8**	**12**	**40**	**40**	**100**	**100**

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs	Section B Short Answers	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K1&K2)	1(K1)	2(K2&K2)	1(K3)
2	CLO 2	Up to K3	2(K1&K2)	1(K1)	2(K3&K3)	1(K3)
3	CLO 3	Up to K3	2(K1&K2)	1(K2)	2(K3&K3)	1(K3)
4	CLO 4	Up to K4	2(K1&K2)	1(K2)	2(K4&K3)	1(K4)
5	CLO 5	Up to K4	2(K1&K2)	1(K3)	2(K4&K4)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inferences with evidence.

Annexure -1

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	-	-	9	7.5	8
K2	5	4	10	-	19	15.83	16
K3	-	2	20	30	52	43.33	43
K4	-	-	20	20	40	33.33	33
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Lesson Plan

Unit	Course Content	Hours		Mode of Teaching
1	**Inductive Proofs-**Inductions on integers– Mutual inductions The Central Concept of Automata Theory Alphabets and strings –languages	6 6 6	18	Lecture, Quiz, PPT
II	**Finite Automata**: An informal Picture of finite Automata Deterministic finite Automata: Definition of a Deterministic Finite automata The ground Rules- -How a FDA Processes Strings.	6 6 6	18	Lecture, Quiz, PPT
III	**Regular Expressions and Languages-** Building Regular Expressions Finite Automata and Regular Expressions From DFA'S to Regular Expression Converting DFA's to Regular Expressions by Eliminating States.	6 6 6	18	Lecture, Quiz,
IV	**Applications of Regular Expressions:** Regular Expressions in UNIX-Lexical Analysis Finding Patterns in Text Discovering Laws for Regular Expressions The Test for a Regular Expressions Algebraic Law	6 6 6	18	PPT, Lecture
V	**Prosperities of Regular Languages:** Proving Languages not to be Regular The Pumping Lemma for Regular Languages Applications of the Pumping Lemma. Closure Properties of Regular Languages.	6 6 6	18	Lecture, Tutorial

Annexure -1

Department of Mathematics					I M.Sc.,			
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
II	NME-II	21OPMNM2	TEACHING & RESEARCH APTITUDE PAPER - II	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	Entrepreneurship oriented

Course Objectives

1. To enhance the employability skill.
2. To learn and analyze Information and Communication Technology.
3. To analyze data.
4. To understand the shortcuts for the competitive exams.
5. To gain knowledge about value education.

Course Content:

Unit	Course Contents	Hours	K Level	CLO
I	**Data Interpretations:** Sources of data – Acquisition of Data – Discrimination of Data	6	Up to K3	CLO1
II	**Data Interpretations:** Collection of data – Representation of data - Interpretation of data	6	Up to K3	CLO2
III	**Information and communication Technology:** Application of Information Technology in Modern World – Data and Information –Value Of Information – Quality of Information – Aims of Information – Need and Importance of Information – Role of Information.	6	Up to K4	CLO3
IV	**Information and communication Technology:** Evolution of Computer – Computer Generations – Structure of Modern Computer – Objectives of ERNET – Terminology Related to Computer.	6	Up to K4	CLO4
V	**Higher Education System:** Value Education – Scriptural Value System and Operational Value System –Type of Values – Value system and Mental Health – The need of Value Education – Value and Science.	6	Up to K4	CLO5

Annexure -1

Book for study:

Upkar's ,*UGC NET/JRF/SET Teaching & Research Aptitude (General Paper-I).*

UNIT	CHAPTERS	SECTION
I	5	219 to 220
II	5	221 to 247
III	6	248 to 251
IV	6	251 to 263
V	8	308 to 320

Books for Reference:

*1)*R. Gupta's ,*UGC-NETJunior Research Fellowship and Lectureship Exam Paper-1 Teaching and Research Aptitude* .

2)Dr. K. Kautilya *, UGC Net/Jrf/Set Teaching & Research Aptitude General Paper-1*, 1761,

*3)*Oswaal 20 Practice Papers – *General Paper 1 (Teaching and Research Aptitude): UGC NET/JRF for 2020Examination.*

Web Resources:

https://www.upkar.in ›

E-Books:

https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.scholarify.in%2Fugc-net-study-materials-for-paper-1%2F&psig=AOvVaw1W10vu2X5bv7m7tR3nkJ8s&ust=1638600886154000&source=images&cd=vfe&ved=0CAsQjRxqFwoTCICNmpmGx_QCFQAAAAAdAAAAABAD

Pedagogy:

- Chalk and Talk, Power point presentations, Group Discussions, Quiz, Assignment and Seminar

Rationale for nature of Course:

Knowledge and Skill:

1. To get the knowledge of data interpretation and higher education system.
2. Use of media and technology in the classroom.

Activities to be given:

Practice latest question papers of various competitive exams.

Annexure -1

Course Learning Outcome (CLOs)

On completion of the course, behind the students would be able to:

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CLO1	Understand the concept of Data Interpretations	Up to K3
CLO2	Classify the interpretations of data	Up to K3
CLO3	Learn the Information and Communication Technology	Up to K4
CLO4	Identify the classification of Structure of Modern Computer	Up to K4
CLO5	To know about the value Education	Up to K4

K1- Remembering facts with specific answers

K2- Basic understanding of facts.

K3- Application oriented

K4- Analyzing, examining and making presentations with evidence.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	1	1	3
CLO2	3	3	2	1	1	3
CLO3	3	2	1	2	1	3
CLO4	3	2	1	2	1	3
CLO5	2	3	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -1

Continuous Internal Assessment (CIA) - Blueprint

Articulate mapping –K Levels with Course Learning Outcomes (CLOs)

CIA	CLOs	K-Level	Section A MCQs		Section B Short Answer		Section C Either / or choice		Section D Open Choice	
			No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level	No of Questions	K-Level
I	CLO1	Up to K3	1	K2(1)	1	K2(1)	-	-	1	K3 (1)
Question Pattern CIA	CLO2	Up to K3	1	K2(1)	-		1	K3(1)	-	-
	CLO3	Up to K4	1	K1(1)	1	K1(1)	-	-	-	-
	CLO4	Up to K4	-	-	-	-	1	K4(1)	-	-
	CLO5	Up to K4	1	K1(1)	1	K2(1)	-	-	1	K4 (1)
No of questions to be asked			**4**		**3**		**2**		**2**	
No of questions to be answered			**4**		**3**		**1**		**1**	
Marks for each question			**1**		**2**		**5**		**10**	
Total marks for each section			**4**		**6**		**5**		**10**	

Distribution of Marks with K Levels CIA I

CIA	K Levels	Section A MCQ	Section B (Short Answer Questions)	Section C (Either/ Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)
I	K1	2	2	-	-	4	10
	K2	2	4	-	-	6	15
	K3	-	-	5	10	15	37.5
	K4	-	-	5	10	15	37.5
	Marks	**4**	**6**	**10**	**20**	**40**	**100**

Annexure -1

Summative Examination -Blue Print

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section A MCQs	Section B Short Answers	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2(K2&K3)	1(K3)	2(K3& K3)	1(K3)
2	CLO 2	Up to K3	2(K2&K3)	1(K3)	2(K3& K3)	1(K3)
3	CLO 3	Up to K4	2(K1&K1)	1(K2)	2(K2& K2)	1(K4)
4	CLO 4	Up to K4	2(K1&K1)	1(K2)	2(K2& K2)	1(K4)
5	CLO 5	Up to K4	2(K1&K1)	1(K2)	2(K2& K2)	1(K4)
No. of Questions to be asked			10	5	10	5
No. of Questions to be answered			10	5	5	3
Marks for each question			1	2	5	10
Total Marks for each Section			**10**	**10**	**25**	**30**

K1- Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – solving problems

K4- Examining, analyzing, presentation and making inferences with evidence.

Distribution of Marks with K Level for Summative Examination

K Levels	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	6	-	-	-	6	5	5
K2	2	6	30	-	38	31.666	32
K3	2	4	20	20	46	38.333	38
K4	-	-	-	30	30	25	25
Total	**10**	**10**	**50**	**50**	**120**	**100**	**100**

Annexure -1

Lesson Plan:

Units	Description	Hours	Total Hours	Mode of Teaching
I	Sources of Data Acquisition of Data Discrimination of Data	2 2 2	6	Chalk and Talk, Problem Solving, Tutorial
II	Collection of Data Representation of Data Interpretation of Data	2 2 2	6	Chalk and Talk
III	Data and Information Value of Information Quality of Information Aims of Information	1 1 2 2	6	Chalk and Talk, PPT,Group Discussion
IV	Evolution of Computer Structure of Modern Computer Terminology Related To Computer	 2 2 2	6	Chalk and Talk, Seminar PPT, Group Discussion
V	Scriptural Value System and Operational Value Sy Value System and Mental Health Value and Science	2 2 2	6	Chalk and Talk, Assignment, Group Discussion
Total Hours			**30**	