M.Sc. Mathematics

Motto

Improve to Empower, Sustain to Success.

Math Metrons

Vision

To be a dynamic hub of mathematical exploration, where the Math Metrons Association nurtures analytical thinkers, problem solvers, and mathematical enthusiasts who shape the future through the power of mathematics.

Mission

- Foster Mathematical Excellence and Curiosity.
- Promote Real-World Applications and Interdisciplinary Engagement.
- Enhance Community Outreach and Education.

Euclid's Club

Vision

To foster a community of passionate mathematicians who explore the limitless beauty and applications of mathematics, inspiring a profound understanding and appreciation for the subject.

Mission

- To foster collaborative research, creativity and exploration in all areas of mathematics.
- To develop skilled, community-focused leaders through mathematical engagement and outreach.

Preamble

The M.Sc. Mathematics programme at St. Joseph's College of Arts and Science for Women, Hosur (Autonomous), is designed to offer a profound and rigorous postgraduate education in advanced mathematical theories, methodologies, and applications. The programme aims to empower women with analytical, logical, and abstract thinking skills that are essential for both academic and professional success in the mathematical sciences.

The curriculum offers a rich blend of pure and applied mathematics, including Real and Complex Analysis, Algebra, Topology, Differential Equations, Graph Theory, Functional Analysis, Mathematical Statistics, Operations Research, and Computational Mathematics. Emphasis is also placed on mathematical modelling, research methodology, and the use of mathematical software tools such as MATLAB, R, Mathematica, and Python.

To bridge the gap between undergraduate learning and advanced postgraduate expectations, the

department conducts orientation sessions and bridge courses. Certificate courses in specialized areas and research-driven project work further enhance academic depth and employability.

Academic enrichment is pursued through seminars, invited lectures, interdisciplinary collaborations, and participation in mathematical conferences. Internships, fieldwork, and problem-solving sessions are integrated to align theoretical learning with real-world contexts.

Leadership skills, communication, aptitude training, and ethical reasoning are embedded throughout the curriculum to promote holistic development. The inclusion of interdisciplinary and value-based courses broadens students' perspectives, equipping them to address social, economic, and scientific challenges with responsibility and innovation.

Supported by experienced faculty and modern infrastructure, the M.Sc Mathematics programme nurtures scholars and professionals who are capable of contributing to research, education, and industry with a strong foundation in mathematics and a commitment to lifelong learning.

Nature and Extent of the Programme

The **Master of Science – Mathematics (M.Sc. Mathematics)** is an **advanced postgraduate programme** that deepens learners' expertise in **mathematical theory**, **research methodology** and **problem-solving strategies**. The programme is designed to align with **national and international academic standards**, providing a robust platform for careers in **academia**, **research**, **industry** and **interdisciplinary innovation**.

Mathematics, as a **foundational and ever-evolving discipline**, supports a wide spectrum of fields including **artificial intelligence**, **cryptography**, **computational sciences**, **quantitative finance**, **operations research** and **data analytics**. Upon successful completion, graduates are well-prepared for roles in **teaching**, **research**, **software development**, **actuarial analysis**, **data science** and **scientific computing**. They are also equipped to pursue **doctoral studies** and **competitive research fellowships** in mathematics and allied domains.

The **curriculum**, developed under the **Learning Outcomes-based Curriculum Framework (LOCF)**, offers a **rigorous and integrated study** of **pure and applied mathematics**. It emphasizes **critical and analytical thinking**, **logical abstraction**, **quantitative modelling** and **computational efficiency**.

This programme fosters **independent inquiry**, **mathematical innovation** and **interdisciplinary exploration**, encouraging students to formulate and investigate **complex theoretical and practical problems**. Through a blend of **advanced coursework**, **research training** and **value-based learning**, the programme cultivates **ethically grounded**, **research-oriented** and **socially responsible professionals** who are capable of contributing meaningfully to both **academic** and **real-world problem-solving landscapes**.

Aim of the Programme

The primary aim of the **M.Sc. Mathematics postgraduate programme** is to cultivate in students an **advanced mastery of mathematical theories**, **abstract reasoning**, and **research-oriented analytical skills**. The programme is designed to foster **mathematical depth**, **problem-solving**

expertise and **academic rigor**, empowering students to apply advanced mathematical concepts in both **theoretical exploration** and **practical problem-solving** across diverse domains.

To achieve this, the programme integrates:

- A **systematic and research-driven teaching-learning approach** that imparts both **c**ore and specialized knowledge in pure and applied mathematics;

- **Hands-on training** with **computational tools and software** to strengthen skills in mathematical modelling, statistical computation, and data interpretation;

- Opportunities for **academic and research enrichment** through seminars, conferences, workshops, interdisciplinary projects, and collaborative learning platforms;

- Platforms to enhance **communication**, **collaboration** and **critical inquiry skills**, which are essential for success in research, teaching, industry, and global mathematical engagements.

Duration of the Programme

The M.Sc. Mathematics programme shall extend over a period of **two academic years,** comprising of **four semesters**. Each academic year shall consist of **two semesters**:

- **Odd Semester**: June to November
- **Even Semester**: December to May

Each semester shall have **a minimum of 90 working days**, exclusive of examination days.

Eligibility for Admission

A candidate shall be eligible for admission to the **M.Sc. Mathematics** programme if she has passed the **B.Sc. Degree Examination** of **Periyar University** or any other equivalent examination recognized by the University, with **Mathematics as the main subject of study**.

Eligible qualifications include:

- **B.Sc. Mathematics**
- **B.Sc. Mathematics with Computer Applications**
- **Any other equivalent B.Sc. degree** with Mathematics as a **core or major subject**

Candidates must have secured the **minimum qualifying marks** as prescribed by the **Government of Tamil Nadu** and **Periyar University regulations** for postgraduate admissions.

This includes graduates from **academic and vocational streams**, as per the eligibility norms approved by the University and recognized by the **University Grants Commission (UGC)**.

Credit Requirements and Eligibility for Award of Degree

A candidate shall be eligible for the **award of the M.Sc Mathematics degree** only if she has:

- Successfully completed the prescribed **course of study** in a college affiliated to the University for a **minimum duration of two academic years (four semesters)**.
- Passed all prescribed **semester examinations**.
- **Earned a minimum of 92 credits** as distributed under the following Parts:

    - **Part I** – Discipline Specific Core, Discipline Specific Elective and Project
    - **Part II** – Skill Enhancement Courses, Extra Disciplinary Courses, Non-Major Electives, Internship and Inter -Disciplinary Course
    - **Part III**– Extension Activity

The candidate must also have fulfilled any other requirements as prescribed by the College/University regulations for the award of the degree.

Here is the refined version of the **Programme Outcomes (POs)**, **Programme Specific Outcomes (PSOs)**, and **Programme Educational Objectives (PEOs)** tailored for the **M.Sc. Mathematics** programme, with appropriate phrasing and **bolded side headings**:

PROGRAMME OUTCOMES (POs)

PO1: Graduates will demonstrate advanced logical reasoning, analytical thinking, and abstract mathematical skills to model and solve complex theoretical and real-world problems.

PO2: Graduates will communicate mathematical concepts and research findings clearly and effectively through verbal, written, symbolic, and graphical forms.

PO3: Graduates will exhibit proficiency in applying advanced mathematical tools, statistical methods, and computational software for mathematical modelling and data analysis.

PO4: Graduates will integrate pure and applied mathematical knowledge with concepts from science, technology, and economics to address interdisciplinary challenges.

PO5: Graduates will formulate and develop mathematical models, algorithms, and proofs for problems in academic research, industry, and societal applications.

PO6: Graduates will function effectively in independent and collaborative research environments, demonstrating leadership, teamwork, and organizational abilities.

PO7: Graduates will adhere to ethical standards, demonstrating professional integrity in mathematical research, publication, and teaching practices.

PO8: Graduates will engage in lifelong learning and pursue continuous professional development to adapt to evolving mathematical frontiers and global demands.

PO9: Graduates will analyze and apply quantitative techniques to address societal and environmental issues, promoting responsible and sustainable practices.

PO10: Graduates will utilize advanced digital tools, programming languages, and mathematical software for effective research, teaching, and industry applications.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Graduates will demonstrate mastery in core areas of pure and applied mathematics, including analysis, algebra, topology, graph theory, and differential equations for solving complex mathematical problems.

PSO2: Graduates will employ modern computational tools and techniques such as MATLAB, Mathematica, Python, and R for mathematical computation, simulation, and data-driven decision-making.

PSO3: Graduates will construct and evaluate mathematical models using abstract reasoning, research methodologies, and analytical strategies across disciplinary domains.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduates will acquire a strong academic foundation and research aptitude in mathematics to pursue doctoral studies, academic research, or professional roles in mathematics-related fields.

PEO2: Graduates will remain professionally competent by adapting to emerging tools, technologies, and interdisciplinary innovations in mathematical sciences.

PEO3: Graduates will demonstrate ethical awareness, team leadership, and a sense of social responsibility in their contributions to research, education, and community engagement.

MAPPING OF PEO WITH PO AND PSO:

PEO \ Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2	PSO 3
PEO1	3	2	3	3	3	2	2	2	2	3	3	3	3
PEO2	3	2	2	3	3	2	2	3	2	3	3	3	3
PEO3	2	2	2	2	3	3	3	2	3	2	2	2	2

3 = Strongly Related, 2 = Moderately Related, 1 = Slightly Related

Course Components and Credit Distribution

The curriculum framework for the M.Sc. Mathematics programme under the autonomous structure is designed to ensure holistic academic development, skill enhancement and societal contribution. The credit distribution across the various components is as follows:

S. No.	Study Components	Part	Sem I		Sem II		Sem III		Sem IV		Total No. of Hours	Total Credits
			No. of Hours	Credits	No. of Hours	Credits	No. of Hours	Credits	No. of Hours	Credits		
1	Core Course / DSC	I	23	19	21	17	30	22	18	14	**92**	**72**
2	Elective / DSE	I	4	3	4	3					**8**	**6**
3	Project	I							10	5	**10**	**5**
4	EDC	II	3	2	3	2					**6**	**4**
5	IDC	II			2	1					**2**	**1**
6	SEC	II							2	1	**2**	**1**
7	Internship	II						2				**2**
8	Extension Activity	III								1		**1**
	Total		**30**	**24**	**30**	**23**	**30**	**24**	**30**	**21**	**120**	**92**

Details of Course of Study for Parts I–II

PART I – Core, Elective, and Project

This part comprises the Core Discipline Courses, Discipline Specific Elective, and a Project in the final semester. The content and structure of these courses are prescribed by the respective Board of Studies in Computer Science and approved by the Academic Council to align with current academic and industry standards.

PART II -Value and Skill-Oriented Courses

This part comprises the Skill Enhancement Course, Internship, and Extra Disciplinary Courses. The content and structure of these courses are prescribed by the respective Board of Studies in Computer Science and approved by the Academic Council to align with current academic and industry standards.

PART III - Extension Activity

Students shall earn **a maximum of 1 credit** through participation in **Compulsory Extension Services**. Every student must enrol in **NSS, Red Ribbon Club, Youth Red Cross, Field Work, Outreach Activities or any other Clubs** recognized by the College

Inclusion of Massive Open Online Courses (MOOCs) via SWAYAM and NPTEL

MOOC Courses for Credit Mobility

As part of the credit-based curriculum design and in alignment with the guidelines of higher education regulatory bodies, students are encouraged to enrol in Massive Open Online Courses (MOOCs) offered on SWAYAM or NPTEL platforms. These courses can be opted under Core, Elective, or Soft Skill categories. The student shall be eligible for award of the degree only upon submission of a valid certificate as proof of successful completion of the chosen MOOC course. **Two credits** will be given to candidates who successfully complete the course.

M.Sc. Mathematics

Curriculum Design

First Year

Semester – I

S. No	Part	Nature of the Course	Course Code	Name of the Course	Hours per Week	Credits	Marks		
							CIA	ESE	Total
1	I	DSC I	25PMA1C01	Algebraic Structures **(Employability)**	6	5	25	75	100
2		DSC II	25PMA1C02	Real Analysis-I **(Skill Development)**	6	5	25	75	100
3		DSC III	25PMA1C03	Ordinary Differential Equations **(Employability)**	6	5	25	75	100
4		DSC IV	25PMA1C04	Graph Theory **(Employability)**	5	4	25	75	100
5		DSE I	25PMA1E01	Advanced Number Theory **(Employability)**	4	3	25	75	100
			25PMA1E02	Differential Geometry **(Employability)**					
			25PMA1E03	Discrete Mathematics **(Employability)**					
6	II	EDC / NME		Extra Disciplinary Course	3	2	25	75	100
Total					**30**	**24**	**150**	**450**	**600**

Semester – II

S. No	Part	Nature of the Course	Course Code	Name of the Course	Hours per Week	Credits	Marks		
							CIA	ESE	Total
1	I	DSC V	25PMA2C05	Advanced Algebra **(Skill Development)**	6	5	25	75	100
2		DSC VI	25PMA2C06	Real Analysis II **(Skill Development)**	6	5	25	75	100
3		DSC VII	25PMA2C07	Partial Differential Equations **(Employability)**	5	4	25	75	100

4		DSC Practical	25PMA2CP1	Mathematical Algorithms using C++ (Practicals) **(Employability &Entrepreneurship)**	4	3	40	60	100
5		DSE II	25PMA2E01	Numerical Analysis **(Employability)**	4	3	25	75	100
			25PMA2E02	Computational Mathematics **(Employability)**					
			25PMA2E03	Research Tools and Techniques **(Skill Development)**					
6	II	IDC	25PHMR201	Human Rights **(Skill Development)**	2	1	25	75	100
7		EDC / NME		Extra Disciplinary	3	2	25	75	100
Total					**30**	**23**	**190**	**510**	**700**

Second Year

Semester – III

S. No	Part	Nature of the Course	Course Code	Name of the Course	Hours per Week	Credits	Marks		
							CIA	ESE	Total
1	I	DSC VIII	25PMA3C08	Complex Analysis **(Skill Development)**	6	5	25	75	100
2		DSC IX	25PMA3C09	Topology **(Skill Development)**	6	5	25	75	100
3		DSC X	25PMA3C10	Fluid Dynamics **(Employability)**	5	4	25	75	100
4		DSC XI	25PMA3C11	Measure Theory & Integration **(Employability)**	5	4	25	75	100
6		DSC Practical	25PMA3CP2	Programming R for Statistical Computing and Inference (Practicals**) (Employability)**	4	2	40	60	100
7			25PMA3CP3	LaTex-Documentation Tool for Mathematical Sciences	4	2	40	60	100

				(Practicals) **(Employability)**					
8	II	Internship	25PMA3INT	Internship	-	2	-	-	-
Total					**30**	**24**	**180**	**420**	**600**

Semester – IV

S. No	Part	Nature of the Course	Course Code	Name of the Course	Hours per Week	Credits	Marks		
							CIA	ESE	Total
1	I	DSC XII	25PMA4C12	Functional Analysis **(Skill Development)**	5	4	25	75	100
2		DSC XIII	25PMA4C13	Probability Theory **(Skill Development)**	5	4	25	75	100
3		DSC XIV	25PMA4C14	Calculus of Variation **(Employability)**	5	4	25	75	100
4		DSC Practical	25PMA4CP4	Computational Optimization with Python (Practicals) **(Employability& Entrepreneurship)**	3	2	25	75	100
5	I	DSC XV	25PMA4PRV	Core Project with Viva–Voce	10	5	25	75	100
6	II	SEC	25PMA4SP1	Data-driven Modelling using Spreadsheets (Practicals) **(Employability)**	2	1	25	75	100
7	III			Extension Activity		1	-	-	-
Total					**30**	**21**	**150**	**450**	**600**
Grand Total					**120**	**92**	**670**	**1830**	**2500**
8		Extra Credit	Mandatory	Extra Credit - Swayam/MOOC/ NPTEL Online Course	-	2	-	-	-

DSC	Discipline Specific Core
DSE	Discipline Specific Elective
IDC	Inter Disciplinary Course
EDC	Extra Disciplinary Course
SEC	Skill Enhancement Course

Discipline Specific Elective Courses

Semester	Part	Nature of the Course	Course Code	Name of the Course
I	I	DSE I	25PMA1E01	Advanced Number Theory(**Employability)**
			25PMA1E02	Differential Geometry**(Employability)**
			25PMA1E03	Discrete Mathematics **(Employability)**
II	I	DSE II	25PMA2E01	Numerical Analysis **(Employability)**
			25PMA2E02	Computational Mathematics **(Employability)**
			25PMA2E03	Research Tools and Techniques **(Skill Development)**

EDC-EXTRA DISCIPLINARY COURSES

Students are expected to opt for EDC (Non-major elective) offered to other departments

Semester	Part	Nature of the Course	Course Code	Name of the Course
I	II	EDC I	25PMA1ED1	Mathematics for Life Sciences **(Employability)**
			25PMA1ED2	Mathematics for Social Sciences **(Employability)**
II		EDC II	25PMA2ED3	Statistics for Life and Social Sciences **(Employability)**
			25PMA2ED4	Game Theory and Strategy **(Employability)**

M.Sc., MATHEMATICS LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA1C01	**ALGEBRAIC STRUCTURES**	**DSC THEORY**	**I**	**90**	**6**	**Y**	**-**	**5**

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

Unit	Course Content	Knowledge Levels	Sessions
I	**Group Theory Foundations**:** Counting Principle - Class equation for finite groups and its applications - Sylow's theorems (For theorem 2.12.1, First proof only). ****SDG 4 – Quality Education.** **Chapter 2: Sections 2.11 and 2.12 Omit Lemma 2.12.5**.	K1	18
II	**Advanced Group Theory**:** Solvable groups - Direct products - Finite abelian groups Modules. ****SDG 9 – Industry, Innovation, and Infrastructure.** **Chapter 5: Section 5.7 (Lemma 5.7.1, Lemma 5.7.2, Theorem 5.7.1), Chapter 2: Section 2.13 and 2.14 (Theorem 2.14.1 only), Chapter 4: Section 4.5.**	K2	18
III	**Linear Transformations**:** Canonical forms –Triangular form - Nilpotent transformations. ****SDG 8 – Decent Work and Economic Growth.** **Chapter 6: Sections 6.4, 6.5**	K2, K3	18
IV	**Linear Transformations (Canonical Forms II)**:** Jordan form - rational canonical form. ****SDG 7 – Affordable and Clean Energy.** **Chapter 6: Sections 6.6 and 6.7**	K3	18
V	**Special Transformations**:** Trace and transpose - Hermitian, unitary, normal transformations. ****SDG 11 – Sustainable Cities and Communities.** **Chapter 6: Sections 6.8, 6.10 and 6.11 (Omit 6.9)**	K3	18

Course Outcome	**CO1:** Recall and apply the class equation and Sylow's theorems to analyze the structure of finite groups.	K1
	CO2: Understand and work with solvable groups, direct products, finite abelian groups, and modules.	K2
	CO3: Explain and apply linear transformations and their canonical forms including triangular and nilpotent transformations.	K2, K3
	CO4: Analyze and construct Jordan and rational canonical forms of linear transformations.	K3
	CO5: Examine and evaluate special matrix properties such as trace, transpose, Hermitian, unitary, and normal transformations, and apply them to real quadratic forms.	K3

LEARNING RESOURCES	
Text Books	I.N. Herstein, Topics in Algebra (Second Edition), Wiley Eastern Limited, New Delhi, 1975.
Reference Books	1.M. Artin, Algebra, Prentice Hall of India, 1991. 2.P.B. Bhattacharya, S.K. Jain, S.R. Nagpaul, Basic Abstract Algebra (2nd Edition), Cambridge University Press, 1997. 3.D.S. Malik, J.N. Mordeson, M.K. Sen, Fundamentals of Abstract Algebra, McGraw Hill, 1997. 4.N. Jacobson, Basic Algebra, Vol. I & II, W.H. Freeman (Also published by Hindustan Publishing Company, New Delhi).
Website Link	1. https://www.youtube.com/watch?v=Mix8G-Ye9uI. 2. https://www.youtube.com/watch?v=IauA1asFy4I.
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	3	1	-	2	1	2	3	1	2
CO2	3	2	2	2	3	1	-	2	1	2	3	2	3
CO3	3	2	3	2	3	2	-	2	1	3	3	2	3
CO4	3	2	3	2	3	2	-	2	1	3	3	2	3
CO5	3	2	3	2	3	2	-	2	2	3	3	2	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. A. Kalai Vanitha.	**Verified By HOD: Dr. B. K. Jaleesha.**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University) , Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	

M.Sc. Mathematics LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA1C02	**REAL ANALYSIS -I**	**DSC THEORY**	**I**	**90**	**6**	**Y**	**-**	**5**

Objective:
Develop students' understanding of functions of bounded variation-Introduce Riemann and Riemann–Stieltjes Integrals-Familiarize students with convergence of series and infinite products-Build foundational knowledge on sequences of functions and uniform convergence.

Unit	Course Content	Knowledge Levels	Sessions
I	**Functions of Bounded Variation (Infinite Series)**:** Introduction - Properties of monotonic functions - Functions of bounded variation - Total variation - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of two increasing functions - Continuous functions of bounded variation- **Infinite Series** -Absolute and conditional convergence - Dirichlet's test and Abel's test - Rearrangement of series - Riemann's theorem on conditionally convergent series. ****SDG 4 – Quality Education.** **Chapter 6: Sections 6.1 to 6.8, Chapter 8: Sections 8.8, 8.15, 8.17, 8.18.**	K1, K2	18
II	**Riemann–Stieltjes Integral**:** Introduction - Notation - The definition of the Riemann - Stieltjes integral - Linear Properties - Integration by parts- Change of variable in a Riemann - Stieltjes integral - Reduction to a Riemann Integral – Euler's summation formula - Monotonically increasing integrators, Upper and lower integrals - Additive and linearity properties of upper, lower integrals - Riemann's condition. ****SDG 9 – Industry, Innovation and Infrastructure.** **Chapter - 7: Sections 7.1 to 7.14.**	K2, K3	18
III	**The Riemann-Stieltjes Integral****: Integrators of bounded variation-Sufficient conditions for the existence of Riemann-Stieltjes integrals - Necessary conditions for the existence of RS integrals- Mean value theorems -integrals as a function of the interval – Second fundamental theorem of integral calculus- Change of variable -Second Mean Value Theorem for Riemann integral- Riemann-Stieltjes integrals depending on a parameter. ****SDG 7 – Affordable and Clean Energy.** **Chapter - 7: 7.15 to 7.23**	K2, K3	18
IV	**Infinite Series and infinite Products**:** Double sequences - Double series - Rearrangement theorem for double series - A sufficient condition for equality of iterated series - Multiplication of series – Cesaro summability - Infinite	K3	18

	products. Power series - The Taylor's series generated by a function - Bernstein's theorem - Abel's limit theorem - Tauber's theorem. ****SDG 8 – Decent Work and Economic Growth.** **Chapter 8:Section 8: 8.20,8.21 to 8.26** **Chapter 9: Sections 9.14, 9.19, 9.20, 9.22, 9.23**		
V	**Sequences of Functions**:** Pointwise convergence of sequences of functions - Examples of sequences of real - valued functions - Uniform convergence and continuity - Cauchy condition for uniform convergence - Uniform convergence of infinite series of functions - Riemann - Stieltjes integration – Non-uniform Convergence and Term-by-term Integration - Uniform convergence and differentiation - Sufficient condition for uniform convergence of a series - Mean convergence. ****SDG 11 – Sustainable Cities and Communities.** **Chapter -9 Sec 9.1 to 9.6, 9.8,9.9,9.10,9.11, 9.13**	K3, K4	18

Course Outcome	**CO1:** Understand and describe properties of functions of bounded variation and their role in real analysis.	K1, K2
	CO2: Understand and describe properties of functions of bounded variation and their role in real analysis**.**	K2, K3
	CO3: Apply integration techniques to solve problems using Riemann integrals and related theorems.	K3
	CO4: Analyze convergence of infinite series and products, including double sequences and Cesaro summability**.**	K1, K3
	CO5: Evaluate convergence of sequences of functions and apply Weier strass M-test and term-by-term operations**.**	K3, K4

Learning Resources	
Text Books	1. Tom M. Apostol, *Mathematical Analysis*, 2nd Edition, Addison–Wesley Publishing Company, 1974.
Reference Books	1. G. Das and S. Pattanayak, *The Elements of Real Analysis*, Tata McGraw Hill, 2005. 2. A.L. Gupta and R.C. Gupta, *Principles of Real Analysis*, Pearson Education, 2003.
Website Link	1. https://youtu.be/PMS-UoqwPfA?si=o4gi3OO5FGpkf4wK. 2. https://youtu.be/uMWHWeaMD48?si=PgH-sKGE6rpftugJ. 3. https://youtu.be/qu7kJCPDUvA?si=aYioui1ZCW19zNMJ.
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	1	2	1	2	3	1	2
CO2	3	2	3	2	3	2	1	2	1	3	3	3	3
CO3	3	2	2	3	3	2	1	2	1	2	3	2	3
CO4	3	2	2	3	3	2	2	2	2	2	3	2	3
CO5	3	2	3	3	3	2	2	2	2	3	3	2	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. B. Deepa	**Verified By HOD: Dr. B. K. Jaleesha**
Checked By CDC: Mrs.C.Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

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M.Sc. Mathematics LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA1C03	**ORDINARY DIFFERENTIAL EQUATIONS**	**DSC THEORY**	**I**	**90**	**6**	**Y**	**-**	**5**

Objective:

To develop a strong background in finding solutions to linear differential equations. With constant and variable coefficients and also with singular points. To study existence and uniqueness of the solutions of first-order differential equations**.**

Unit	Course Content	Knowledge Levels	Sessions
I	**Linear equations with constant coefficients**:** Second order homogeneous equations – Initial value problems – Linear dependence and independence – Wronskian and a formula for Wronskian – Non-homogeneous equation of order two. ****SDG 4 – Quality Education.** **Chapter 2: Sections 2 to 6**	K1, K2	18
II	**Linear equations with constant coefficients**:** The homogeneous equation order n **-** Initial value problems nth order equation – The non homogeneous equation of order n. ****SDG 9 – Industry, Innovation and Infrastructure.** **Chapter 2: Sections 7 to 10 (omit Section 9)**	K2, K3	18
III	**Linear equations with variable coefficients**:** Initial value problems for the homogeneous equations – Solutions to solve a homogeneous equation – Wronskian and linear independence - non-homogeneous equations- Homogeneous equations with analytic co-efficients – Legendre equation. ****SDG 7 – Affordable and Clean Energy.** **Chapter 3: Sections 2 to 8**	K2, K3	18
IV	**Linear equations with regular singular points**:** Introduction **-** Euler equation - Second order equations with regular singular points & General case - The Bessel Equation ****SDG 3 – Good Health and Well-Being.** **Chapter 4: Sections 1 to 8 (omit 5 & 6)**	K3, K4	18
V	**Existence and Uniqueness of solutions to First Order Equations**:** Introduction - Equations with variable separated – Exact equations – Method of successive approximations - The Lipschitz condition. ****SDG 11 – Sustainable Cities and Communities.** **Chapter 5: Sections 1 to 5**	K3, K4	18

Course Outcome	**CO1:** Understand the fundamental concepts and solution techniques for first and second order linear differential equations with constant coefficients.	K1, K2
	CO2: Apply the annihilator method and algebra of constant coefficient operators to solve non-homogeneous linear equations.	K2, K3
	CO3: Analyze and solve linear equations with variable coefficients, including Cauchy–Euler and Legendre equations, and apply the existence and uniqueness theorems.	K2, K3
	CO4: Solve second-order equations with regular singular points and apply special functions such as Bessel functions in solving ODEs.	K3, K4
	CO5: Apply series solutions, Taylor series methods, and successive approximation techniques to solve differential equations and assess the accuracy of approximations.	K3, K4

Learning Resources	
Text Books	E.A. Coddington, *An Introduction to Ordinary Differential Equations*, 3rd Printing, Prentice Hall of India Ltd., New Delhi, 1987.
Reference Books	1. W.E. Boyce and Richard C. Di Prima, *Elementary Differential Equations and Boundary Value Problems*, John Wiley & Sons, New York, 1967. 2. George F. Simmons, *Differential Equations with Applications and Historical Notes*, 2nd Ed., McGraw Hill, New Delhi, 1991. 3. Shepley L. Ross, *Differential Equations*, 3rd Ed., John Wiley & Sons, New York, 1984. 4. M.D. Raisinghania, *Advanced Differential Equations*, S. Chand & Company Pvt. Ltd., New Delhi, 2001. 5. R.P. Agarwal, D.P. Choudhary and H.I. Freedman, *A Course in Ordinary Differential Equations*, Narosa Publishing House, New Delhi, 2000.
Website Link	1. https://youtu.be/B5IjsTONKkw?si=Go3rtDndqf4DSQbd. 2. https://youtu.be/qmt0IvotTh8?si=OJnjVRz0zVXpGX3n.
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	3	3	2	2	2	2	3	3	2	3
CO2	3	3	3	3	3	2	2	2	2	3	3	3	3
CO3	3	2	3	3	3	2	2	2	3	3	3	3	3
CO4	3	2	3	3	3	2	2	2	2	3	3	3	3
CO5	3	2	3	3	3	2	2	3	3	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. Deepa	**Verified By HOD: Dr. B. K. Jaleesha**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University) , Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	

M.Sc., MATHEMATICS LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA1C04	**GRAPH THEORY**	**DSC THEORY**	**I**	**75**	**5**	**Y**	**-**	**4**

Objective:

Graph theory introduces the basic ideas of graphs, subgraphs, and their properties, helping students build a strong foundation in the subject. It improves problem-solving skills through topics like connectivity, trees, matchings, and coloring, and shows how these concepts can be used to solve really combinatorial and computational problems. Students also learn about advanced topics such as planar graphs, duality, and important theorems, which strengthen their understanding. Overall, the study of graph theory prepares students for research and competitive exams by equipping them with useful techniques and problem-solving skills.

Unit	Course Content	Knowledge Levels	Sessions
I	**Basic Results & Directed Graphs**:** Introduction to Graph Theory – Basic Concepts, Subgraphs - Degrees of vertices, paths, connectedness, automorphisms of simple graphs - Directed Graphs – Basic Concepts, tournaments. ****SDG 4 – Quality Education.** **Ch. 1, Sec. 1.1–1.6; Ch. 2, Sec. 2.1–2.3.**	K2, K3	15
II	**Connectivity and Trees**:** Vertex cut and edge cut, connectivity and edge connectivity - Trees – Definition, characterization, properties - Centers and centroids, cutting spanning trees, Cayley's formula. ****SDG 9 – Industry, Innovation and Infrastructure.** **Ch. 3, Sec. 3.1–3.3; Ch. 4, Sec. 4.1–4.5.**	K3, K4	15
III	**Independent Sets, Matchings, and Cycles**:** Vertex-independent sets, vertex coverings, edge-independent sets - Matchings and factors, matchings in bipartite graphs. Cycles: Introduction- Eulerian Graphs Hamiltonian Graphs ****SDG 8 – Decent Work and Economic Growth.** **Ch. 5, Sec. 5.1–5.5. Ch 6: Sec. 6.1- 6.3**	K3, K4	15
IV	**Graph Coloring**:** Vertex coloring, chromatic number, critical graphs - Edge coloring, Kirkman's Schoolgirl problem, chromatic polynomials. ****SDG 11 – Sustainable Cities and Communities.** **Ch. 7, Sec. 7.1, 7.2, 7.3 [7.2.1 & 7.2.3 only], 7.6, 7.8, 7.9.**	K3, K5	15

V	**Planarity**:** Introduction- Planar and Nonplanar Graphs –Euler Formula and its Consequences K and K3 are Nonplanar Graphs –Dual of a Plane Graph- The Four-Color Theorem 5 3 and the Heawood Five- Color Theorem-Hamiltonian Plane Graphs-Tait Coloring. ****SDG 13 – Climate Action.** **Ch 8: Sec 8.1 - 8.6 ,8.8 and 8.9**	K4, K5	15

Course Outcome	**CO1:**Understand and apply the basic concepts of graphs and digraphs.	K2, K3
	CO2: Analyze connectivity, spanning trees, and Cayley's formula.	K4
	CO3: Solve problems on independent sets, matchings, and bipartite graphs.	K3, K4
	CO4: Apply graph coloring and chromatic polynomials in problem solving.	K3, K5
	CO5: Examine planar graphs and prove related theorems.	K4, K5

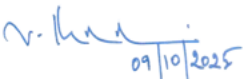
LEARNING RESOURCES	
Text Books	R. Balakrishnan & K. Ranganathan, A Textbook of Graph Theory, 2nd Edition, Springer, New York, 2012.
Reference Books	1. J.A. Bondy & U.S.R. Murty, Graph Theory with Applications, North Holland, New York, 1982. 2. Narasing Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, New Delhi, 2003. 3. F. Harary, Graph Theory, Addison-Wesley, 1969. 4. L.R. Foulds, Graph Theory Applications, Narosa Publishing House, Chennai, 1993.
Website Link	1. https://youtu.be/-uN_NIi8pcA?si=brnFsPsfsg-WWCeu. 2. https://youtu.be/f1JTtMP6NGw?si=WFEnhHFjhKWUMgMd.
L – Lecture T – Tutorial P – Practical C - Credit	

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Mapping of CO's with PO's and PSO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	3	3	2	2	2	2	3	3	+2	3
CO2	3	2	3	3	3	2	2	2	2	3	3	2	3
CO3	3	2	3	3	3	2	2	2	2	3	3	2	3
CO4	3	2	2	3	3	2	2	2	2	3	3	2	3
CO5	3	2	2	3	3	2	2	2	2	3	3	2	3

Course Designed By: Ms. B. Deepa	**Verified By HOD: Dr. B. K. JALEESHA**
Checked By CDC: Mrs.C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**



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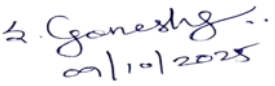

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Ms. B. Dilshad M.Sc.
Assistant Manager, State Bank of India, Mangalore.

M.Sc. Mathematics LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA1E01	**ADVANCED NUMBER THEORY**	**DSE THEORY**	**I**	**60**	**4**	**Y**	**-**	**3**

Objective:

To develop a strong foundation in algebraic number theory by exploring rings, fields, ideals, and factorization, and to apply these concepts in analysing number theoretic structures and theorems.

Unit	Course Content	Knowledge Levels	Sessions
I	**Rings, Fields, and Modules**:** Rings and Fields- Factorization of Polynomials - Field Extensions - Symmetric Polynomials - Modules - Free Abelian Groups. ****SDG 4 – Quality Education.** **Chapter 1: Sec. 1.1 to 1.6**	K3, K4	12
II	**Algebraic Numbers and Rings of Integers**:** Algebraic numbers - Conjugates and Discriminants - Algebraic Integers - Integral Bases - Norms and Traces - Rings of Integers. ****SDG 9 – Industry, Innovation and Infrastructure.** **Chapters 2: Sec. 2.1 to 2.6**	K3, K4	12
III	**Quadratic and Cyclotomic Fields**:** Quadratic fields and cyclotomatic fields Factorization into Irreducible Trivial factorization - Factorization into irreducible - Examples of non-unique factorization into irreducible. ****SDG 8 – Decent Work and Economic Growth.** **Chapter 3: Sec. 3.1 and 3.2; Chapter 4: Sec. 4.2 to 4.4**	K4, K5	12
IV	**Prime Factorization & Euclidean Domains**:** Prime Factorization - Euclidean Domains - Euclidean Quadratic fields - Consequences of unique factorization - The Ramanujan -Nagell Theorem. ****SDG 11 – Sustainable Cities and Communities.** **Chapter 4: Sec. 4.5 to 4.9**	K4, K5	12
V	**Prime Factorization of Ideals**:** Prime Factorization of Ideals - The norms of an Ideal - Non-unique Factorization in Cyclotomic Fields. ****SDG 16 – Peace, Justice, and Strong Institutions.** **Chapter 5: Sec. 5.2 to 5.4**	K4, K5	12

Course Outcome	**CO1:** Apply the concepts of rings, fields, and modules to solve problems involving polynomial factorization and field extensions.	K3, K4
	CO2: Analyze properties of algebraic numbers, integers, norms, and traces to study rings of integers.	K3, K4
	CO3: Illustrate factorization behaviour in quadratic and cyclotomic fields with examples of unique and non-unique factorization.	K4, K5
	CO4: Examine unique factorization in Euclidean quadratic fields and apply it to number theoretic results like the Ramanujan–Nagell theorem.	K4, K5
	CO5: Evaluate prime factorization and norms of ideals in number fields and identify cases of non-unique factorization.	K4, K5

LEARNING RESOURCES	
Text Books	1. I. Steward and D. Tall. Algebraic Number Theory and Fermat's Last Theorem (3rd Edition) A. K. Peters Ltd., Natrick, Mass. 2002.
Reference Books	1. Z. I. Bosevic and I. R. Safarevic, Number Theory, Academic Press, New York, 1966. 2. W. S. Cassels and A. Frohlich, Algebraic Number Theory, Academic Press, New York, 1967. 3. P. Ribenboim, Algebraic Numbers, Wiley, New York, 1972. 4. P. Samuel, Algebraic Theory of Numbers, Houghton Mifflin Company, Boston, 1970. 5. A. Weil. Basic Number Theory, Springer, New York, 1967.
Website link	**1.** https://www.youtube.com/@nptel-nociitm9240. **2.** https://www.youtube.com/watch?v=uQ9nPcYHAHw.
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	1	2	1	1	1	1	2	3	2	1
CO2	2	1	3	1	2	1	1	1	1	1	2	1	3
CO3	2	3	2	1	1	1	1	1	1	1	3	1	2
CO4	1	1	2	1	3	1	1	1	1	2	3	1	2
CO5	3	2	2	1	2	1	1	1	1	3	2	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. S. Bhuvaneswari	**Verified By HOD: Dr. B. K. Jaleesha**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University), Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	

M.Sc. Mathematics – LOCF – CBCS with effect from 2025–2026 onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA1E02	**DIFFERENTIAL GEOMETRY**	**DSE THEORY**	**I**	**60**	**4**	**Y**	**-**	**3**

Objective:
This course introduces space curves and their intrinsic properties of a surface and geodesics. Further the non-intrinsic properties of surface and the differential geometry of surfaces are explored

Unit	Course Content	Knowledge Levels	Sessions
I	**Space curves**:** Definition of a space curve – Arc length – tangent – normal and binormal – curvature and torsion – contact between curves and surfaces- tangent surface- involutes and evolutes Intrinsic equations – Fundamental Existence Theorem for space curves Helie's. ****SDG 9 – Industry, Innovation, and Infrastructure.** **Chapter I: Sections 1 to 9**	K1, K2, K3	12
II	**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. ****SDG 11 – Sustainable Cities and Communities.** **Chapter II: Sections 1 to 9**	K1, K2, K3	12
III	**Geodesics**:** Geodesics – Canonical geodesic equations – Normal property of geodesics- Existence Theorems – Geodesic parallels – Geodesics curvature- Gauss- Bonnet Theorem – Gaussian curvature surface of constant curvature. ****SDG 13 – Climate Action.** **Chapter II: Sections 10 to 18.**	K2, K3, K4	12
IV	**Non-Intrinsic properties of a surface**:** The second fundamental form- Principal curvature – Lines of curvature – Developable - Developable associated with space curves and with curves on surface - Minimal surfaces – Ruled surfaces. ****SDG 12 – Responsible Consumption and Production.** **Chapter III: Sections 1 to 8.**	K2, K3, K4	12
V	**Differential Geometry of Surfaces**:** Compact surfaces whose points are umblics - Hilbert 's lemma – Compact surface of constant curvature – Complete surface and their characterization – Hilbert 's Theorem – Conjugate points on geodesics.****SDG 4 – Quality Education.** **Chapter IV: Sections 1 to 8 (Omit 9 to 15).**	K2, K3, K4	12

Course Outcome	**CO1:** Explain space curves, Curves between surfaces, metrics on a surface, fundamental form of a surface and Geodesics.	K1, K2, K3
	CO2: Evaluate these concepts with related examples.	K1, K2, K3
	CO3: Compose problems on geodesics.	K2, K3, K4
	CO4: Recognize applicability of developable.	K2, K3, K4
	CO5: Construct and analyze the problems on curvature and minimal surfaces	K2, K3, K4

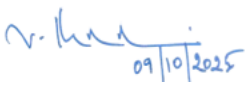
Learning Resources	
Text Books	1. T. J. Willmore, *An Introduction to Differential Geometry,* Oxford University Press, (17th Impression) New Delhi 2002. (Indian Print)
Reference Books	1. Struik, D.T. *Lectures on Classical Differential Geometry*, Addison – Wesley, Mass. 1950. 2. Kobayashi. S. and Nomizu. K. *Foundations of Differential Geometry,* Inter science Publishers, 1963. 3. Wilhelm Klingenberg: *A course in Differential Geometry*, Graduate Texts in Mathematics, Springer-Verlag 1978. 4. J.A. Thorpe *Elementary topics in Differential Geometry*, Under graduate Texts in Mathematics, Springer - Verlag 1979.
Website Link	1. https://www.youtube.com/watch?v=_mvjOoTieTk
L – Lecture T – Tutorial P – Practical C – Credit	

Mapping of CO's with PO's and PSO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	2	1	1	2	1	2	3	2	2
CO2	3	2	3	2	2	1	1	2	1	2	3	2	2
CO3	3	2	2	2	3	1	1	2	1	2	3	2	3
CO4	2	1	2	2	2	1	1	2	2	2	2	1	2
CO5	3	2	3	3	3	1	1	2	2	3	3	2	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. S. Bhuvaneswari	**Verified By HOD: Dr. B. K. Jaleesha**
Checked By CDC: Mrs.C.Magila	**Approved By: Dr. J. Caroline Rose** **Principal**



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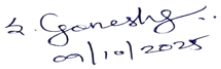

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M.Sc., MATHEMATICS LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA1E03	**DISCRETE MATHEMATICS**	**DSE THEORY**	**I**	**60**	**4**	**Y**	**-**	**3**

Objective:
This course helps students build a strong understanding of the logical foundations of mathematics using propositional logic, predicates, and quantifiers. It develops problem-solving skills by teaching both basic and advanced counting techniques to handle combinatorial problems efficiently. Students are introduced to recurrence relations and generating functions to solve real-world discrete problems, and they also learn Boolean algebra and its applications in logic circuit design. In addition, the course enhances algorithmic thinking by exploring the growth rates of functions and applying circuit minimization techniques, preparing students to analyze and design efficient solutions.

Unit	Course Content	Knowledge Levels	Sessions
I	**The Foundations**:** Logic and Proofs: Propositional - Applications of Propositional-Propositional Equivalences - Predicates and Quantifiers. ****SDG 4 – Quality Education.** **Chapter 1: Sections 1.1 - 1.3.**	K1, K2, K3	12
II	**Counting**:** The Basics of Counting- The Pigeonhole Principle - Permutations and Combinations - Generalized Permutations and Combinations - Generating Permutations and Combinations. ****SDG 9 – Industry, Innovation, and Infrastructure.** **Chapter 5: Sections 5.1- 5.3, 5.5 and 5.6.**	K1, K2, K3	12
III	**Advanced Counting Techniques**:** Applications of Recurrence Relations - Solving Linear Recurrence Relations Generating Functions. ****SDG 8 – Decent Work and Economic Growth.** **Chapter 6: Sections 6.1, 6.2 and 6.4.**	K2, K3, K4	12
IV	**Boolean Algebra**:** Boolean Functions- Representing Boolean Functions. ****SDG 12 – Responsible Consumption and Production.** **Chapter 10: Sections 10.1 & 10.2.**	K1, K2, K3	12
V	**Algorithms & Logic Gates**:** The Growth of Functions. Logic Gates-Minimization of Circuits. ****SDG 7 – Affordable and Clean Energy.** **Chapter 3: Section 3.2, Chapter 10: Sections 10.3 -10.4.**	K2, K3, K4, K5	12

Course Outcome	**CO1:** Explain the principles of propositional logic, propositional equivalences, predicates, and quantifiers.	K1, K2
	CO1: Explain the principles of propositional logic, propositional equivalences, predicates, and quantifiers	K2, K3
	CO3: Solve combinatorial problems using recurrence relations and generating functions.	K3, K4
	CO4: Interpret and design Boolean functions and represent them using different forms.	K2, K3, K4
	CO5: Analyze logic gates and apply minimization techniques to design efficient circuits.	K3, K4, K5

Text Books	1. Kenneth H. Rosen, Discrete Mathematics and it's Applications,7th Edition, WCB / McGraw Hill Education, New York,2008.
Reference Books	1. J.P. Trembley and R. Manohar, Discrete Mathematical Structures applications to Computer Science, Tata McGraw Hills, New Delhi. 2. T. Veera Rajan, Discrete Mathematics with Graph Theory and Combinatorics, Tata McGraw Hills Publishing Company Limited ,7th Reprint,2008
Website Link	1. https://www.youtube.com/watch?v=A3Ffwsnad0k&list=PLl-gb0E4MII28GykmtuBXNUNoej-vY5Rz
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	1	1	2	1	2	3	2	2
CO2	3	2	3	2	3	2	1	2	2	3	3	3	2
CO3	3	2	3	2	3	2	1	2	1	3	3	3	3
CO4	3	2	3	3	3	2	1	2	2	3	3	3	3
CO5	3	2	3	3	3	2	2	2	2	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Ms. A. SOWMIYA	**Verified By HOD: Dr. B. K. Jaleesha**
Checked By CDC: Mrs. C .Magila	**Approved By: Dr. J. Caroline Rose Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University), Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
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M.Sc. Mathematics – LOCF – CBCS with effect from 2025–2026 onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA2C05	**ADVANCED ALGEBRA**	**DSC THEORY**	**II**	**90**	**6**	**Y**	**-**	**5**

Objective:
To study field extension, roots of polynomials, Galois Theory, finite fields, division rings, solvability by radicals, and to develop the ability to work skillfully in abstract algebra**.**

Unit	Course Content	Knowledge Levels	Sessions
I	**Extension Fields & Transcendence**:** Extension Fields-Transcendence of e. ****SDG 4 – Quality Education.** **Chapter 5: Sections 5.1 and 5.2**	K1, K2	18
II	**Roots of Polynomials**:** Roots of Polynomials-More about roots. ****SDG 9 – Industry, Innovation, and Infrastructure.** **Chapter 5: Sections 5.3 and 5.5**	K2, K3	18
III	**Elements of Galois Theory**:** Elements of Galois Theory. ****SDG 8 – Decent Work and Economic Growth.** **Chapter 5: Section 5.6**	K2, K3	18
IV	**Finite Fields**:** Finite Fields-Wedderburn's theorem on finite division rings. ****SDG 11 – Sustainable Cities and Communities.** **Chapter 7: Sections 7.1 and 7.2; Theorem 7.2.1 only**	K3, K4	18
V	**Solvability by Radicals & Quaternion Theory**:** Solvability by Radicals-A theorem of Frobenius – Integral Quaternions and the Four-Square Theorem. ****SDG 16 – Peace, Justice, and Strong Institutions.** **Chapter 5: Section 5.7 — omit Lemma 5.7.1, Lemma 5.7.2, and Theorem 5.7.1; Chapter 7: Sections 7.3 and 7.4**	K3, K4	18

Course Outcome	**CO1:** Explain extension fields and transcendence of numbers.	K1, K2
	CO2: Apply properties of roots of polynomials and irreducibility tests	K2, K3
	CO3: Demonstrate understanding of Galois theory and its applications.	K2, K3
	CO4: Analyze finite fields and prove results using Wedderburn's theorem.	K3, K4
	CO5: Solve problems on solvability by radicals, Frobenius theorem,and integral quaternions.	K3, K4

Learning Resources	
Text Books	1. I.N. Herstein, *Topics in Algebra* (II Edition), Wiley Eastern Limited, New Delhi, 1975.
Reference Books	1. M. Artin, *Algebra*, Prentice Hall of India, 1991. 2. P.B. Bhattacharya, S.K. Jain, and S.R. Nagpaul, *Basic Abstract Algebra* (II Edition), Cambridge University Press, 1997 (Indian Edition). 3. I.S. Luther and I.B.S. Passi, *Algebra*, Vol. I – Groups (1996); Vol. II – Rings, Narosa Publishing House, New Delhi, 1999. 4. D.S. Malik, J.N. Mordeson, and M.K. Sen, *Fundamentals of Abstract Algebra*, McGraw Hill, New York, 1997. 5. N. Jacobson, *Basic Algebra*, Vol. I & II, Hindustan Publishing Company, New Delhi.
Website Link	1. https://youtu.be/IZnstV_8--s?si=jM-p016t42ifwmx5 2. https://youtu.be/czsI6svTn7o?si=NgEzQHng47EWjBGT
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	2	2	2	2	3	3	3	3
CO2	3	2	3	2	3	2	2	2	2	3	3	3	3
CO3	3	2	3	3	3	2	2	2	2	3	3	3	3
CO4	3	2	3	3	3	2	2	2	2	3	3	3	3
CO5	3	2	3	3	3	2	2	2	2	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. B. Deepa	**Verified By HOD: Dr. B. K. Jaleesha.**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University) , Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	

M.Sc. Mathematics – LOCF – CBCS with effect from 2025–2026 onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA2C06	**REAL ANALYSIS -II**	**DSC THEORY**	**II**	**90**	**6**	**Y**	**-**	**5**

Objective:
To provide a rigorous understanding of Lebesgue measure and integration, Fourier series and integrals, multivariable calculus, and constrained optimization, fostering advanced problem-solving and proof-writing skills.

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Unit	Course Content	Knowledge Levels	Sessions
I	**Integration of Functions of a Real variable**:** Integration of Non- negative functions - The General Integral - Riemann and Lebesgue Integrals ****SDG 7 – Affordable and Clean Energy** **Chapter - 3 Sec 3.1,3.2 and 3.4 (de Barra)**	K1, K2	18
II	**Fourier Series and Integrals**:** Introduction - Orthogonal system of functions - The theorem on best approximation - The Fourier series of a function relative to an orthonormal system - The Riesz-Fischer Thorem - The convergence and representation problems in for trigonometric series ****SDG 9: Industry, Innovation, and Infrastructure** **Chapter 11 : Sections 11.1 to 11.7(Apostol)**	K2, K3	18
III	**Riemann and Integrals**:** The Riemann - Lebesgue Lemma - The Dirichlet Integrals - An integral representation for the partial sums of Fourier series - Riemann's localization theorem - Sufficient conditions for convergence of a Fourier series at a particular point- Consequences of Fejes's theorem - The Weierstrass approximation theorem . ****SDG 4: Quality Education** **Chapter 11 : Sections 11.8 to 11.15 (Apostol)**	K2, K3	18
IV	**Multivariable Differential Calculus**:** Introduction - The Directional derivative - Directional derivative and continuity - The total derivative - The total derivative expressed in terms of partial derivatives - The matrix of linear function - The Jacobian matrix - The chain rule - Matrix form of chain rule - The mean - value theorem for differentiable functions - A sufficient condition for differentiability - A sufficient condition for equality of mixed partial derivatives .	K3, K4	18

	****SDG 13 – Climate Action** **Chapter 12 : Section 12.1 to 12.14 (Apostol)**		
V	**Implicit Functions and Extremum Problems**:** Functions with non-zero Jacobian determinants – The inverse function theorem-The Implicit function theorem-Extrema of real valued functions of severable variables****SDG 2 – Zero Hunger** **Chapter 13 : Sections 13.1 to 13.6 (Apostol)**	K3, K4	18

Course Outcome	**CO1:** Apply the concepts of Riemann and Lebesgue integration to analyze functions and energy-related models..	K1, K2
	CO2: Utilize Fourier series and orthogonal systems to approximate functions in science and engineering applications	K2, K3
	CO3: Analyze convergence theorems and approximation results to strengthen foundational knowledge in Fourier analysis.	K2, K3
	CO4: Apply advanced multivariable calculus, including differentiation theorems for functions of several variables**.**	K3, K4
	CO5: Solve constrained optimization problems using Lagrange multipliers and Kuhn–Tucker conditions**.**	K3, K4

Learning Resources	
Text Books	1. Tom M. Apostol, *Mathematical Analysis*, 2nd Edition, Addison–Wesley Publishing Company, 1974.
Reference Books	1. Royden, H.L., *Real Analysis*, Macmillan Pub. Company, New York, 1988. 2. Rudin, W., *Principles of Mathematical Analysis*, McGraw Hill, 1976. 3. Malik, S.C. & Savita Arora, *Mathematical Analysis*, New Age International, 1992. 4. Saks, S. & Zygmund, A., *Analytic Functions*, Polish Scientific Publishers, 1965.
Website Link	1. https://youtu.be/PGPZ0P1PJfw?si=BNiekZNwbcLvHlHj 2. https://youtu.be/3N32_BrS4zw?si=qcp_XVFBE4HuuhPJ
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	3	2	1	1	2	1	2	3	1	2
CO2	3	2	3	3	3	2	1	2	1	3	3	3	3
CO3	3	2	3	3	3	2	1	2	2	2	3	3	3
CO4	3	2	3	3	3	2	2	2	2	2	3	3	3
CO5	3	2	3	3	3	2	2	2	2	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. B. Deepa	**Verified By HOD: Dr. B. K. Jaleesha.**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University) , Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	

M.Sc. Mathematics – LOCF – CBCS with effect from 2025–2026 onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA2C07	**PARTIAL DIFFERENTIAL EQUATIONS**	**DSC THEORY**	**II**	**75**	**5**	**Y**	–	**4**

Objective:

This course is designed to help students understand the fundamental concepts and classifications of partial differential equations (PDEs). It develops their problem-solving skills by introducing analytical and transform methods for solving PDEs. Moreover, students learn to apply these concepts to real-world problems in physics, engineering, and other scientific fields, there by connecting theory with practical applications.

Unit	Course Content	Knowledge Levels	Sessions
I	**Second Order Partial Differential Equations**:** Origin of second order PDEs – Linear differential equations with constant coefficients – Method of solving partial (linear) differential equations – Classification of second order PDEs – Canonical forms – Adjoint operators – Riemann method. ****SDG 4 – Quality Education.** **(Chapter 2: Sections 2.1 to 2.5)**	K1, K2	15
II	**Elliptic Differential Equations**:** Elliptic differential equations – occurrence of Laplace and Poisson equations – Boundary value problems – Separation of variables method – Laplace equation in cylindrical and spherical coordinates – Dirichlet and Neumann problems for circle- sphere. ****SDG 9 – Industry, Innovation, and Infrastructure.** **(Chapter 3: Sections 3.1 to 3.9)**	K2, K3	15
III	**Parabolic Differential Equations**:** Parabolic Differential Equations-Occurrence of the diffusion equation – Boundary condition – Separation of variables method – Diffusion equation in cylindrical - spherical coordinates. ****SDG 3 – Good Health and Well-Being.** **(Chapter 4: Sections 4.1 to 4.5)**	K2, K3	15
IV	**Hyperbolic Differential Equations**:** Hyperbolic Differential Equations-Occurrence of the wave equation – One-dimensional wave equation –Reduction to canonical form- D'Alembert solution – Separation of variables method – Periodic solutions – cylindrical -spherical co-ordinates- Duhamel principle for wave Equation. ****SDG 11 – Sustainable Cities and Communities.** **(Chapter 5: Sections 5.1 to 5.6 and 5.9)**	K3, K4	15
V	**Integral Transforms**:** Laplace transforms – Application to PDEs: diffusion equation, wave equation – Fourier transforms – Application to PDEs: diffusion equation, wave equation – Laplace equation. ****SDG 7 – Affordable and Clean Energy.(Chapter 6: Sections 6.2 to 6.4)**	K3, K4	15

Course Outcome	**CO1:** Apply analytical techniques to solve first- and second-order PDEs, including classification, canonical forms, and standard methods of solution**.**	K1, K2
	CO2: Solve elliptic PDEs such as Laplace and Poisson equations using various coordinate systems and boundary conditions**.**	K2, K3
	CO3: Analyze and solve parabolic PDEs such as the heat equation with appropriate initial and boundary conditions**.**	K2, K3
	CO4:. Apply methods for solving hyperbolic PDEs including wave equations using separation of variables and D'Alembert's solution**.**	K3, K4
	CO5: Utilize Laplace transform techniques to solve PDEs related to diffusion and wave equations**.**	K3, K4

Learning Resources	
Text Books	1. J.N. Sharma and K. Singh, *Partial Differential Equation for Engineers and Scientists*, Narosa Publishing House, Chennai, 2001.
Reference Books	1. I.N. Sneddon, *Elements of Partial Differential Equations*, McGraw Hill, New York, 1964. 2. K. Sankar Rao, *Introduction to Partial Differential Equations*, Prentice Hall of India, New Delhi, 1995. 3. S.J. Farlow, *Partial Differential Equations for Scientists and Engineers*, John Wiley & Sons, New York, 1982.
Website Link	1. https://youtu.be/JL5MP-ewE0c?si=g-IgySPAI8bu34jD 2. https://youtu.be/571fU5LrzTM?si=LSKDzskLC3UxsrDp
L – Lecture	**T – Tutorial** **P – Practical** **C - Credit**

Mapping of CO's with PO's and PSO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	2	3	2	2	2	2	3	3	3	3
CO2	3	2	3	2	3	2	2	2	2	2	3	3	3
CO3	3	2	3	2	3	2	2	2	2	2	3	3	3
CO4	3	2	3	2	3	2	2	2	2	3	3	3	3
CO5	3	2	3	2	3	2	2	2	2	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. B. Deepa	**Verified By HOD: Dr. B. K. Jaleesha.**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University) , Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.		**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.

M.Sc. Mathematics LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA2CP1	**MATHEMATICAL ALGORITHMS USING C++ (PRACTICALS)**	**DSC PRACTICAL**	**II**	**60**	**-**	**Y**	**4**	**3**

Objective:
To develop fundamental C++ programming skills by implementing control structures, functions, classes, constructors, and operator overloading, along with basic file handling.

S. No	Course Content	Knowledge Levels	Sessions
1.	**Basics of C++ Programming**:** Write a simple C++ program to display basic input/output using cin and cout. ****SDG 4 – Quality Education.**	K2	6
2.	**Control Structures**:** Write a C++ program to demonstrate control structures (if, switch, loops). ****SDG 17 – Partnerships for the Goals**	K2	6
3	**Functions and Classes**:** Write a C++ program to illustrate the use of functions (call by value, call by reference, ****SDG 9 – Industry, Innovation, and Infrastructure.**	K3	6
4.	**Classes and Objects**:** Write a C++ program to create a class and define member functions inside and outside the class. ****SDG 3 – Good Health and Well-Being.**	K3	6
5.	**Arrays and Objects**:** Write a C++ program to demonstrate arrays within a class and array of objects. ****SDG 8 – Decent Work and Economic Growth.**	K3	6
6.	**Constructors**:** Write a C++ program to use constructors (default, parameterized, copy constructors). ****SDG 11 – Sustainable Cities and Communities.**	K3	6
7.	**Constructors and Operator Overloading**:** Write a C++ program to overload unary and binary operators. ****SDG 12 – Responsible Consumption and Production.**	K4	6
8.	**Inheritance**:** Write a C++ program to perform operator overloading on strings. ****SDG 10 – Reduced Inequalities**	K4	6
9.	**Polymorphism**:** Write a C++ program to perform type conversions using operator overloading. ****SDG 16 – Peace, Justice and Strong Institutions.**	K4	6
10.	**File Handling**:** Write a C++ program to implement file handling: create, write, and read data from a file. ****SDG 17 – Partnerships for the Goals**	K3	6

Course Outcome	**CO1:** Demonstrate the use of basic C++ input/output operations and control structures to manage program flow.	K2
	CO2: Apply different function types and parameter passing techniques to modularize programs.	K3
	CO3: Implement object-oriented concepts such as classes, member functions, and arrays within classes.	K3
	CO4: Utilize constructors and operator overloading to enhance object functionality.	K4
	CO5: Perform file handling operations for creating, writing, and reading data in C++ applications.	K4

Mapping of CO's with PO's and PSO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	2	2	1	3	3	3	2
CO2	3	2	3	3	3	2	2	2	1	3	3	3	3
CO3	3	2	3	3	3	2	2	2	1	3	3	3	3
CO4	3	2	3	3	3	2	2	2	1	3	3	3	3
CO5	3	1	3	2	2	1	1	2	1	3	2	3	2

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. S. Bhuvaneswari	**Verified By HOD: Dr. B. K. Jaleesha**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University) , Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	

M.Sc. Mathematics LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA2E01	**NUMERICAL ANALYSIS**	**DSE THEORY**	**II**	**60**	**4**	**Y**	**-**	**3**

Objective:
To equip students with numerical methods for solving ordinary and partial differential equations, enhancing problem-solving and computational skills. The course links applications of these methods to real-world challenges

S. No	Course Content	Knowledge Levels	Sessions
I	**Numerical solutions to ordinary differential equation**:** Numerical solutions to ordinary differential equation – Power series solution – Pointwise method – Solution by Taylor's series – Taylor's series method for simultaneous first order differential equations – Taylor's series method for Higher order Differential equations – Predictor – Corrector methods – Milne's method – Adam – Bashforth method. ****SDG 4 – Quality Education.** **Chapter 11: Sections 11.1 to 11.6 and Sections 11.8 to 11.20.**	K2, K3, K4	12
II	**Picard and Euler Methods**:** Picard's Method of successive approximations – Picard's method for simultaneous first order differential equations – Picard's method for simultaneous second order differential equations – Euler's Method – Improved Euler's method – Modified Euler's Method. ****SDG 9 – Industry, Innovation and Infrastructure.** **Chapter 11: Sections 11.7 to 11.12**.	K2, K3, K4, K5	12
III	**Runge – Kutta Method**:** Runge's method – Runge - Kutta methods – Higher order Runge-Kutta methods Runge - Kutta methods for simultaneous first order differential equations – Runge Kutta methods for simultaneous second order differential equations. ****SDG 7 – Affordable and Clean Energy.** **Chapter 11: Sections 11.13 to 11.17**.	K2, K3, K4, K5	12
IV	**Numerical Solutions to Partial Differential Equations**:** Introduction Difference Quotients – Geometrical representation of partial differential quotients – Classifications of partial differential equations – Elliptic equation – Solution to Laplace's equation by Liebmann's iteration process. ****SDG 11 – Sustainable Cities and Communities.** **Chapter 12: Sections 12.1 to 12.6**.	K2, K3, K4	12

V	**Numerical Solutions to Partial Differential Equations**:** Poisson equation – its solution – Parabolic equations – Bender – Schmidt method – Crank – Nicholson method – Hyperbolic equation – Solution to partial differential equation by Relaxation method. ****SDG 13 – Climate Action.** **Chapter 12: Sections 12.7 to 12.10**.	K2, K3, K4	12

Course Outcome	**CO1:** Demonstrate the use of Taylor series, Predictor–Corrector, and multi-step methods for solving ordinary differential equations numerically.	K2, K3, K4
	CO2: Apply Picard's method, Euler's method, and its variations to approximate solutions of first- and second-order differential equations.	K2, K3, K4, K5
	CO3: Implement Runge – Kutta methods of various orders for solving higher-order and simultaneous ordinary differential equations.	K2, K3, K4
	CO4: Utilize finite difference approximations and iteration methods to solve elliptic partial differential equations such as Laplace's equation.	K2, K3, K4
	CO5: Apply numerical techniques such as Bender–Schmidt, Crank–Nicholson, and relaxation methods for solving parabolic, hyperbolic, and Poisson equations.	K2, K3, K5

LEARNING RESOURCES	
Text Books	1. V.N. Veda Murthy and Ch. S.N. Iyengar, Numerical Methods, Vikas Publishing House Pvt Ltd.,1998.
Reference Books	1. S.S. Sastry, Introductory methods of Numerical Analysis, Prentice of India, 1995. 2. C.F. Gerald, and P.O. Wheathy, Applied Numerical Analysis, Fifth Edition, Addison Wesley, 1998. 3. M.K. Venkatraman, Numerical methods in science and technology, National Publishers Company,1992. 4. P. Kandasamy, K. Thilagavathy, K. Gunavathy, Numerical Methods, S. Chand & Company, 2003.
Website Link	1. https://www.youtube.com/watch?v=SKL4I-BkQ9k&list=PLhSp9OSVmeyKQu9bO27NN_2wIyiHUX2-f&index=2&pp=iAQB
L – Lecture T – Tutorial P – Practical C - Credit	

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Mapping of CO's with PO's and PSO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	2	2	1	3	3	3	2
CO2	3	2	3	3	3	2	2	2	1	3	3	3	3
CO3	3	2	3	3	3	2	2	2	1	3	3	3	3
CO4	3	2	3	3	3	2	2	2	1	3	3	3	3
CO5	3	1	3	2	2	1	1	2	1	3	2	3	2

Course Designed By: Mrs. A. Kalai Vanitha.	**Verified By HOD: Dr. B. K. Jaleesha**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University) , Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	

M.Sc. Mathematics LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA2E02	**COMPUTATIONAL MATHEMATICS**	**DSE THEORY**	**II**	**60**	**4**	**Y**	**-**	**3**

Objective:
The course aims to provide students with a strong foundation in computational techniques essential for solving mathematical problems arising in pure and applied contexts. It focuses on equipping learners with the skills to apply numerical methods, optimization strategies, and computational algorithms for solving linear algebraic systems, differential equations, and real-world modelling problems. It further aims to nurture problem-solving ability, analytical thinking, and hands-on computational skills required for advanced study, research, and professional practice.

S. No	Course Content	Knowledge Levels	Sessions
I	**Computational Linear Algebra**:** Gaussian elimination, LU decomposition-Eigenvalues & eigenvectors computation-Numerical methods for solving linear systems (Jacobi, Gauss-Seidel)-Applications in data science and engineering. ****SDG 9 – Industry, Innovation and Infrastructure.**	K3	12
II	**Numerical Approximation & Interpolation**:** Polynomial interpolation (Lagrange, Newton's)-Curve fitting, least squares approximation-Numerical differentiation and integration (Trapezoidal, Simpson's rule)-Applications to approximation of experimental data. ****SDG 3 – Good Health and Well-Being.**	K3	12
III	**Numerical Solutions of Differential Equations**:** Euler's method, Modified Euler, Runge-Kutta methods- Finite difference methods for ODEs and PDEs-Stability and convergence of numerical schemes-Applications in modelling population growth, heat/diffusion equations. ****SDG 13 – Climate Action.**	K3	12
IV	**Optimization Techniques**:** Linear programming problems (Simplex, Big-M, Two-phase)-Non-linear optimization methods (Gradient Descent, Newton-Raphson)-Dynamic programming basics-Applications in economics, operations research, and engineering. ****SDG 8 – Decent Work and Economic Growth.**	K4	12
V	**Computational Applications**:** Monte Carlo simulation and numerical experiments-Applications in finance, image processing, and machine learning basics. ****SDG 4 – Quality Education.**	K3	12

Course Outcome	**CO1:** Apply computational techniques to solve linear algebra and system of equations problems.	K2
	CO2: Implement algorithms for numerical methods and optimization using software tools.	K3
	CO3: Model real-world problems through differential equations and apply numerical schemes for solutions.	K3
	CO4: Use computational mathematics tools for interpolation, curve fitting, and approximation.	K4
	CO5: Apply computational techniques in data analysis, simulation, and interdisciplinary domains.	K4

Learning Resources	
Text Books	1. S.S. Sastry – Introductory Methods of Numerical Analysis, PHI. 2. K. Atkinson – An Introduction to Numerical Analysis, Wiley. 3. Grewal B.S. – Numerical Methods in Engineering & Science, Khanna Publishers. 4. Steven C. Chapra & Raymond P. Canale – Numerical Methods for Engineers, McGraw Hill.
Reference Books	1. Burden & Faires – Numerical Analysis, Cengage. 2. Jain, Iyengar, Jain – Numerical Methods for Scientific and Engineering Computation, New Age. 3. Taha, H.A. – Operations Research: An Introduction, Pearson. 4. Mark Newman – Computational Physics, CreateSpace.
Website Link	1. https://nptel.ac.in/courses/111/107/111107105/ 2. https://nptel.ac.in/courses/111/106/111106135/ 3. https://www.youtube.com/playlist?list=PLbMVogVj5nJQiVxS4gCkzSOkR9P0g3rbi 4. https://nptel.ac.in/courses/111/105/111105039/ 5. https://www.youtube.com/playlist?list=PLUl4u3cNGP61O7HkcF7UImpM0cR_XgXhg
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	2	1	1	1	–	2	3	2	1
CO2	3	2	3	2	2	1	–	1	–	2	3	2	2
CO3	3	2	3	2	3	1	1	1	–	2	3	2	3
CO4	3	2	3	2	3	2	1	2	–	3	3	3	3
CO5	3	2	3	2	3	2	1	2	–	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. S. Bhuvaneswari	**Verified By HOD: Dr. B. K. Jaleesha**
Checked By CDC: Mrs. C. Magila	**Approved By: : Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University) , Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	

M.Sc., MATHEMATICS LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA2E03	**RESEARCH TOOLS AND TECHNIQUES**	**DSE THEORY**	**II**	**60**	**4**	**Y**	**-**	**3**

Objective:

The objective of this course is to equip students with foundational knowledge and practical skills in mathematical research methodology. It aims to develop a structured understanding of how to identify research problems, formulate hypotheses, select appropriate tools for data collection, and apply analytical techniques to interpret data within mathematical contexts. The course also emphasizes the documentation and communication of research findings using professional standards. In addition, it fosters employability by enhancing logical reasoning, analytical ability, and mathematical thinking, which are essential for competitive examinations, academic research, and professional careers in mathematics and related fields.

Unit	Course Content	Knowledge Levels	Sessions
I	**Foundations of Mathematical Research**:** Research Process in Mathematics – Steps in Designing Mathematical Research – Characteristics and Scope of Mathematical Research. ****SDG 4 – Quality Education.** **Chapter 1: Sections 1.1 to 1.5, Chapter 2: Section 2.1.**	K1, K2, K3	12
II	**Research Problem and Mathematical Variables**:** Identification of Research Problems in Pure and Applied Mathematics – Variables and Types: Independent, Dependent, Controlled – Mathematical Contexts for Variable Classification. ****SDG 9 – Industry, Innovation and Infrastructure.** **Chapter 2: Sections 2.2 to 2.5**.	K1, K2, K3, K4	12
III	**Hypothesis Formulation and Research Tools**:** Hypothesis: Definition, Types, and Testing – Sampling Techniques in Mathematical Studies – Tools for Data Collection: Surveys – Case Studies – Computational Models. ****SDG 16 – Peace, Justice and Strong Institutions.** **Chapter 3: Sections 3.1 to 3.6, Chapter 4: Sections 4.1 to 4.4.**	K2, K3, K4, K5	12
IV	**Data Analysis and Interpretation**:** Quantitative and Symbolic Data Analysis – Interpretation of Mathematical Data and Research Outcomes – Use of Mathematical Software for Data Processing. ****SDG 12 – Responsible Consumption and Production.** **Chapter 5: Sections 5.1 to 5.5.**	K3, K4, K5	12
V	**Mathematical Research Methods and Practices**:** Descriptive or Survey Methods – Experimental Approaches – Mathematical Modeling – Documentation and Presentation of Research – Report Writing and Referencing. ****SDG 17 – Partnerships for the Goals.** (Chapter 6: Sections 6.1 to 6.4, Chapter 7: Sections 7.1 to 7.3).	K4, K5	12

Course Outcome	**CO1:** Understand and explain the key components of the mathematical research process, including problem identification, design, and planning.	K1, K2, K3
	CO2: Identify different types of research variables and formulate well-defined mathematical research problems.	K1, K2, K3, K4
	CO3: Develop testable hypotheses, apply appropriate sampling methods, and select suitable tools for collecting data in mathematical studies.	K2, K3, K4, K5
	CO4: Analyze and interpret data using mathematical techniques and software tools, and draw logical conclusions from research findings.	K3, K4, K5
	CO5: Demonstrate enhanced analytical thinking, problem-solving skills, and employability-related competencies through exposure to research-based applications and competitive exam questions.	K4, K5

LEARNING RESOURCES	
Text Books	1. *Research Methodology: Tools and Techniques*, Bridge Center, 2015, **Dr. Prabhat Pandey & Dr. Meenu Mishra Pandey**.
Reference Books	1. Ackoff, Russell L. (1961). *The Design of Social Research*, University of Chicago Press, Chicago. 2. Allen, T. Harrell (1978). *New Methods in Social Research*, Praeger Publications, New York.
Website Link	1. https://www.youtube.com/watch?v=sOg2yVzpPtE
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO 3
CO1	3	3	2	3	2	–	–	2	–	–	3	1	2
CO2	3	3	2	3	3	–	–	–	–	–	3	3	3
CO3	3	2	3	3	3	–	1	2	–	3	3	3	3
CO4	3	2	3	3	3	–	–	2	–	3	3	3	3
CO5	3	3	3	3	3	2	2	3	2	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. A. Kalai Vanitha.	**Verified By HOD: Dr. B. K. Jaleesha.**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University) , Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	

M.Sc., MATHEMATICS LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA1ED1	**MATHEMATICS FOR LIFE SCIENCES**	**EDC THEORY**	**I**	**45**	**3**	**Y**	**-**	**2**

Objective:

The course aims to introduce students to the application of mathematical models in life sciences, focusing on cell growth, microbial population dynamics, enzyme kinetics, and biological interaction systems. It enables students to apply concepts of differential equations, exponential growth and decay, and statistical methods to analyze biological phenomena, thereby bridging the gap between mathematics and biological sciences.

Unit	Course Content	Knowledge Levels	Sessions
I	**Cell Growth**:** Cell Growth - Exponential growth and Decay – Determination of growth or decay rates- The method of least squares – Nutrient Uptake by a cell –Inhomogeneous Differential equations. ****SDG 3 – Good Health and Well-Being.**	K3	9
II	**Growth of a Microbial colony**:** Growth in a Chemo stat – Interacting Populations – Mutation and Reversion in Bacterial growth. ****SDG 6 – Clean Water and Sanitation.**	K4	9
III	**Enzyme Kinematics**:** The Michaelis–Menten Theory – Enzyme Substrate – Inhibitor system – Cooperative dimmer – Allosteric enzymes – Other allosteric theories**.** ****SDG 12 – Responsible Consumption and Production.**	K4	9
IV	**Hemoglobin and Advanced Enzyme Kinetics****: The Cooperative dimmer – Allosteric enzymes – Other allosteric theories. ****SDG 3 – Good Health and Well-Being.**	K4	9
V	**Applications in Biotechnology & Medicine**:** Hemoglobin – Graph theory and Steady state Enzyme Kinetics – Enzyme – Substrate – Modifier system – Enzyme Substrate – Activator system. ****SDG 15 – Life on Land.**	K5	9

Course Outcome	**CO1:** Apply exponential growth and decay models to analyze biological processes such as cell growth and nutrient uptake.	K3
	CO2: Use the method of least squares and solve inhomogeneous differential equations in biological contexts.	K3
	CO3: Model microbial colony growth, chemostat processes, and bacterial mutation/reversion using mathematical techniques.	K4
	CO4: Interpret and analyze enzyme kinetics using Michaelis–Menten theory and allosteric models.	K4
	CO5: Apply graph theory and steady-state enzyme kinetics concepts to systems involving enzyme–substrate interactions.	K5

LEARNING RESOURCES	
Text Books	1. S. I. Rubinow, Introduction Mathematical Biology, Dover publications, New York, 1975.
Reference Books	1. Erin N. Bodine, Suzanne Lenhart, and Louis J. Gross – *Mathematics for the Life Sciences*, Princeton University Press. 2. Leah Edelstein-Keshet – *Mathematical Models in Biology*, SIAM.
Website Link	1. https://youtu.be/y4XaMefY0h8 2. https://youtu.be/sHCrBTuTdx0 3. https://youtu.be/Qe3cN6N2t24 4. https://youtu.be/I-WMCLLI2QY 5. https://youtu.be/5xp9lI_fXDo
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	3	3	2	2	2	2	3	3	3	3
CO2	3	2	3	3	3	2	2	2	2	3	3	3	3
CO3	3	2	3	3	3	2	2	3	2	3	3	3	3
CO4	3	3	3	3	3	2	2	3	2	3	3	3	3
CO5	3	3	3	3	3	2	2	3	3	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Ms. A. SOWMIYA	**Verified By HOD: Dr. B. K. Jaleesha**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University), Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	

M.Sc., MATHEMATICS LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA1ED2	**MATHEMATICS FOR SOCIAL SCIENCES**	**EDC THEORY**	**I**	**45**	**3**	**Y**	**-**	**2**

Objective:

To develop logical thinking skills through the study of propositional logic and set theory, this course introduces the foundational concepts of the real number system, equations, inequalities, relations, and functions. It further explores various types of real-valued functions, their properties, and graphical representations. Students will also gain an understanding of the definitions, properties, and applications of logarithmic, exponential, and trigonometric functions. In addition, the course provides knowledge of matrices and determinants, including algebraic operations, row operations, and echelon forms.

Unit	Course Content	Knowledge Levels	Sessions
I	**Propositional Logic and set Theory**:** Propositional Logic Propositional Logic -Open propositions and quantifiers - Arguments and Validity - Set Theory. ****SDG 4 – Quality Education.**	K2, K3	9
II	**Functions**:** The real number system - Solving equations and inequalities; linear and quadratic equations -Review of relations and functions. ****SDG 9 – Industry, Innovation, and Infrastructure.**	K3	9
III	**Real valued functions**:** Real valued functions and their properties -Types of functions and inverse of a function - Polynomials, zeros of polynomials, rational functions and their graphs. ****SDG 8 – Decent Work and Economic Growth.**	K3, K4	9
IV	**Logarithmic, Exponential, Trigonometric Functions**:** Definition and basic properties of logarithmic, exponential, trigonometric functions and their graph. ****SDG 7 – Affordable and Clean Energy.**	K3	9
V	**Matrices and determinant**:** Definition of a matrix -Matrix Algebra -Types of matrices - Elementary row operations - Row echelon form and reduced row echelon form of a matrix. ****SDG 11 – Sustainable Cities and Communities.**	K3, K4	9

Course Outcome	**CO1:** Interpret and apply concepts of propositional logic, quantifiers, and set theory in solving logical and mathematical problems.	K2, K3
	CO2: Solve linear, quadratic equations and inequalities; understand relations and functions.	K3

	CO3: Classify and analyze different types of real-valued functions and their inverses; represent them graphically.	K3, K4
	CO4: Evaluate and apply logarithmic, exponential, and trigonometric functions in mathematical and real-world contexts.	K3
	CO5: Perform matrix algebra operations, determine matrix forms, and apply row operations to solve problems.	K3, K4

LEARNING RESOURCES	
Text Books	1. Mathematics for Social Sciences, Dr. Berhanu Bekele, Ato Mulugeta Naizghi
Reference Books	1. Frank S. Budnick – *Applied Mathematics for Business, Economics, and the Social Sciences*, McGraw-Hill Education. 2. M. Anthony and N. Biggs – *Mathematics for Economics and Finance: Methods and Modelling*, Cambridge University Press.
Website Link	1. https://youtu.be/2Vvs9hU3pBI?si=6T5muuvZ2H90Idlk 2. https://youtu.be/cxHQHobGq8g *3.* https://youtu.be/zhvuvssNwj8
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	2	2	2	2	2	3	2	3
CO2	3	3	2	3	3	2	2	2	2	3	3	3	3
CO3	3	3	2	3	3	2	2	2	2	3	3	3	3
CO4	3	3	3	3	3	2	2	2	2	3	3	3	3
CO5	3	3	3	3	3	2	2	2	2	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Ms. A. SOWMIYA	**Verified By HOD: Dr. B. K. Jaleesha**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University), Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.		
		Ms. B. Dilshad M.Sc. Assistant Manager, State Bank of India, Mangalore.

M.Sc., MATHEMATICS LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA2ED3	**STATISTICS FOR LIFE AND SOCIAL SCIENCES**	**EDC THEORY**	**II**	**45**	**3**	**Y**	**-**	**2**

Objective:
The course aims to introduce fundamental concepts of statistics and their applications in life and social sciences. Students will learn techniques for data collection, organization, presentation, and interpretation. It also covers the basics of probability theory, measures of central tendency, and statistical reasoning in social science research, enabling learners to make informed decisions based on data analysis.

Unit	Course Content	Knowledge Levels	Sessions
I	**Foundations of Statistics and Logic**:** Definitions, and Scope of Statistics -Approach to Data Collection - Introduction to Set Theory I & II -Concepts of Logic. ****SDG 4 – Quality Education.**	K1, K2	9
II	**Data Presentation and Descriptive Statistics**:** Diagrammatic Presentation of Data -Frequency Distribution - Graphical Presentation of Data - Measures of Central Tendency. ****SDG 9 – Industry, Innovation and Infrastructure.**	K2, K3	9
III	**Probability and Distributions**:** Probability Theory I&II - Permutation Theorem -Combination - Binominal Distribution. ****SDG 3 – Good Health and Well-being.**	K2, K3	9
IV	**Statistical Inquiries and Research Methodology**:** Nature and Importance of Statistical Inquiries - Basic Research Methodology I & II. ****SDG 16 – Peace, Justice and Strong Institutions.**	K2, K3	9
V	**Social Statistics and Scientific Outlook**:** Nature of Science -Some Basic Concepts in Social Statistics. ****SDG 10 – Reduced Inequalities.**	K1, K2	9

Course Outcome	**CO1:** Explain the basic definitions, scope, and significance of statistics, and apply logical and set-theoretic concepts to data analysis.	K1, K2
	CO2: Organize and present data diagrammatically and graphically, and compute measures of central tendency.	K2, K3
	CO3: Apply probability theory, permutations, combinations, and binomial distribution in solving problems.	K2, K3
	CO4: Demonstrate understanding of the importance of statistical inquiries and apply basic research methodology in life and social sciences.	K2, K3

	CO5: Interpret the nature of science and explain key concepts in social statistics for practical applications.	K1, K2

LEARNING RESOURCES	
Text Books	1. BASIC STATISTICS FOR SOCIAL SCIENCES, Dr. Henry Obasogie (Course Reviewer) – Benson Idahosa University Dr. Moses Etila Shaibu (Course Editor) – NOUN
Reference Books	1. Osuala, E.C. (1982). Introduction to Research Methodology. Awka Rd Onitsha, Nigeria: Africana-Fep Publisher Limited. 2. Okoro, E. (2002). Quantitative Techniqes in Urban Analysis. Ibadan: Kraft Books Ltd. Kerlinger, Fred N. (1964). . 3. Foundations of Behavioural Research. New York: Holt, Rinehart and Winton. Whitney, F.L. (1968). 4. The Elements of Research. New York: Prentice- Hall.
Website Link	1. https://youtu.be/xxpc-HPKN28. 2. https://youtu.be/XZo4xyJXCak. 3. https://www.youtube.com/watch?v=9FtHB7V14Fo&list=PL5102DFDC6790F3D0&pp=0gcJCWUEOCosWNin.
L – Lecture **T – Tutorial** **P – Practical** **C - Credit**	

Mapping of CO's with PO's and PSO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	2	2	2	2	3	2	2
CO2	2	3	3	2	3	2	1	2	2	3	3	3	2
CO3	3	2	3	3	3	2	1	2	2	3	3	3	3
CO4	2	3	3	3	3	2	2	3	3	2	2	2	3
CO5	2	2	2	2	2	1	3	2	3	2	2	2	2

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Ms. A. Sowmiya	**Verified By HOD: Dr. B. K. Jaleesha.**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University) , Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	**Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	

M.Sc., MATHEMATICS LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25PMA2ED4	**GAME THEORY AND STRATEGY**	**EDC THEORY**	**II**	**45**	**3**	**Y**	**-**	**2**

Objective:

The objective of this course is to equip students with the fundamental principles, concepts, and analytical methods of game theory to model and solve strategic decision-making problems. Students will learn to analyze competitive situations, identify optimal strategies, and apply various methods, including graphical and mapping techniques, for games with and without saddle points. Emphasis will be placed on both theoretical understanding and practical application in real-world decision-making contexts.

Unit	Course Content	Knowledge Levels	Sessions
I	**Game, Strategy and Saddle Point**:** Introduction-Description of a game of strategy- Relations among expectations- Saddle points - Game with perfect information's. ****SDG 16 – Peace, Justice and Strong Institutions. Chapter 1**	K1, K2	9
II	**The Fundamentals**:** Game without saddle points-mixed strategies - Graphical representation of mixed strategies – the minimax theorem – optimal mixed strategy – graphical representation of minimax theorem and proof of minimax theorem. ****SDG 9 – Industry, Innovation, and Infrastructure. Chapter 2**	K2, K3	9
III	**Properties of Optimal Strategies**:** Many optimal strategies – some properties of an optimal strategies – convex set of optimal strategies - operation on games – dominated strategies – all strategies active. ****SDG 8 – Decent Work and Economic Growth. Chapter 3 (Section 3.1 to 3.6)**	K3, K4	9
IV	**Method of Solving games**:** Solving for optimal strategies – Guess and verify – Examination of submatrices – Successive approximations – Graphical solutions of 3 x 3 games. ****SDG 12 – Responsible Consumption and Production. Chapter 5 (Section 5.1 to 5.5)**	K3, K4	9
V	**Mapping method for solving games with constraints**:** Mapping method for solving games – solution of reconnaissance game by mapping method. ****SDG 11 – Sustainable Cities and Communities. Chapter 5 (Section 5.6 to 5.8)**	K3, K4, K5	9

Course Outcome	**CO1:** Explain the fundamental concepts of game theory, strategies, and saddle points.	K1, K2
	CO2: Apply minimax theorem and mixed strategies to solve games without saddle points using graphical methods.	K2, K3
	CO3: Analyze the properties of optimal strategies and identify dominated strategies in various game scenarios.	K3, K4
	CO4: Solve games using methods such as guess and verify, submatrix examination, successive approximations, and graphical solutions for 3×3 games.	K3, K4
	CO5: Use the mapping method to solve games with constraints and apply it to reconnaissance games.	K3, K4, K5

LEARNING RESOURCES	
Text Books	1. Melvin Dresher, Game of Strategy Theory and Application, Prentice-Hall - Inc, USA, 1961
Reference Books	1. Kanti Swarup, P. K. Gupta and Man Mohan, ―Operations Research, Eighth Edition, Sultan Chand & Sons, New Delhi, 1999. 2. S. Hillier and J. Liebermann, Operations Research, Sixth Edition, Mc Graw Hill Company, 1995. 3. J. K. Sharma, Operations Research problems and solution, Third edition, Macmillan Publishers India Ltd, India, 2012. 4. Guillermo Owen, Game Theory, 2nd edition, Academic Press, 1982. 5. Philip D. Staffin, Game Theory and Strategy, The Mathematical Association of America, USA, 1993.
Website Link	1. https://youtube.com/playlist?list=PLDlJ2nw7.
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of CO's with PO's and PSO's:

(Correlation: 3 – High, 2 – Medium, 1 – Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	1	2	2	1	2	3	2	2
CO2	3	2	3	2	3	2	1	2	1	3	3	3	3
CO3	3	2	3	3	3	2	2	2	2	3	3	3	3
CO4	3	2	3	3	3	2	1	2	1	3	3	3	3
CO5	3	2	3	3	3	2	1	3	2	3	3	3	3

Course Designed By: Mrs. B. Deepa	**Verified By HOD: Dr. B. K. Jaleesha.**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

09/10/2025 **Dr. V. Muthulakshmi,** Professor, Department of Mathematics, Periyar University, Salem- 11.	09/10/25 **Dr. Smita. S. Nagouda M.Sc., B.Ed., M.Phil., Ph.D.** Associate Professor, School of Mathematical Needs, School of Sciences, Christ (Deemed to be University) , Bengaluru.	9/10/25 **Dr. B. Ganga M.Sc., M.Phil., P.G.D.C.A., Ph.D.** Associate Professor and Head, Department of Mathematics Providence College for Women, Coonoor
09/10/2025 **Mr. S. Ganesh Gurubaran, M.S (IT & Management)** Senior Tech Analyst, HDFC Bank, Old Airport Road, Bengaluru.	 **Ms. B. Dilshad M.Sc.** Assistant Manager, State Bank of India, Mangalore.	