

SYLLABUS

FOR

M.Sc., MATHEMATICS

(for the candidates admitted from the academic year 2026-2027 on wards)

RAJAH SERFOJI GOVT COLLEGE (AUTONOMOUS), THANJAVUR-5
POST GRADUATE COURSES

SUBJECT: MATHEMATICS

(Applicable to the Students admitted from the academic year 2026-2027 onwards)

SEM	CODE	COURSE	TITLE	HRS / WEEK	MARKS		TOTAL	EXAM HOURS	CREDIT
			I SEMESTER		IA	AE			
I	B1PMAC1	CC1	Abstract Algebra	6	25	75	100	3	6
	B1PMAC2	CC2	Real Analysis	6	25	75	100	3	6
	B1PMAC3	CC3	Ordinary Differential Equations	6	25	75	100	3	6
	B1PMAC4	CC4	Advanced Graph Theory	6	25	75	100	3	6
		EC-1	<i>Will be Chosen from the List of Electives</i>	6	25	75	100	3	6
		TOTAL		30			500		30
			II SEMESTER						
II	B2PMAC5	CC5	Linear Algebra	6	25	75	100	3	6
	B2PMAC6	CC6	Measure Theory and Integration	6	25	75	100	3	6
	B2PMAC7	CC7	Partial Differential Equations	6	25	75	100	3	6
	B2PMAC8	CC8	Programming in C++ and Latex	6	25	75	100	3	6
		EC2	<i>Will be Chosen from the List of Electives</i>	6	25	75	100	3	6
		TOTAL		30			500		30
			III SEMESTER						
III	B3PMAC9	CC9	Classical Dynamics	6	25	75	100	3	6
	B3PMAC10	CC10	Topology	6	25	75	100	3	6
	B3PMAC11	CC11	Complex Analysis	6	25	75	100	3	6
	B3PMAC12	CC12	Research Methodology	6	25	75	100	3	6
		EC3	<i>Will be Chosen from the List of Electives</i>	6	25	75	100	3	6
		Internship / Industrial activity		-	-	-	-	-	2
		TOTAL		30			500		32

			IV SEMESTER						
IV	B4PMAC13	CC13	Functional Analysis	6	25	75	100	3	6
	B4PMAC14	CC14	Advanced Numerical Analysis	6	25	75	100	3	6
	B4PMAC15	CC15	<i>Project Work</i>	6	25	75	100	3	6
		EC4	<i>Will be Chosen from the List of Electives</i>	6	25	75	100	3	6
	B4PMASE1	SEC1	Programming in Python	3	25	75	100	3	3
	B4PMASE2	SEC2	Programming in Python Practical	3	25	75	100	3	3
			Extension Activity						1
		TOTAL		30			600		31
	GRAND TOTAL						2000		123
			Number of Papers	Credit					
		Core courses	15	90					
		Elective course	4	24					
		Internship/Industrial activity		2					
		Skill Enhance	2	6					
		Extension Activity		1					
		Total	21	123					

(For students admitted from 2026- 2027)

Title of the Course		ABSTRACT ALGEBRA					
Paper Number		CORE 1					
Category	Core	Year	I	Credits	6	Course Code	B1PMAC1
		Semester	I				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		5	1	-	6		
Pre-requisite		UG level Modern Algebra					
Objectives of the Course		To introduce the concepts and to develop working knowledge on class equation, solvability of groups, finite abelian groups, linear transformations, real quadratic forms.					
Course outline		UNIT-I: Another Counting Principle - Class equation for finite groups and its applications - Sylow's theorems (For theorem 2.12.1, second proof only).					
		UNIT-II : Solvable groups - Direct products - Finite abelian groups - Modules					
		UNIT-III : Polynomial rings – polynomials over the rational field - polynomials over commutative rings					
		UNIT-IV : Linear Transformations: Canonical forms –Triangular form - Nilpotent transformations.					
		UNIT-V: Trace and transpose – Hermitian , unitary, normal transformations, real quadratic form.					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved (To be discussed during the Tutorial hour)					
Skills acquired from the course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill					
Recommended Text		I.N. Herstein. Topics in Algebra (II Edition) Wiley Eastern Limited, New Delhi, 1975. UNIT-I: Chapter 2: Sections 2.11 and 2.12 (Omit Lemma 2.12.5) UNIT-II : Chapter 5 : Section 5.7 (Lemma 5.7.1, Lemma 5.7.2, Theorem 5.7.1) Chapter 2: Section 2.13 and 2.14 (Theorem 2.14.1 only) Chapter 4: Section 4.5 UNIT-III : Chapter 3: Sections 3.9, 3.10, 3.11 UNIT-IV : Chapter 6: Sections 6.4, 6.5 UNIT V : Chapter 6 :Sections 6.8, 6.10 and 6.11 (Omit 6.9)					

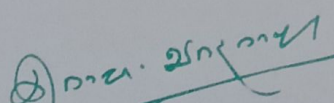
(For students admitted from 2026- 2027)

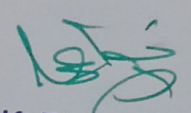
Reference Books	1. M. Artin, Algebra, Prentice Hall of India, 1991. 2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, Basic Abstract Algebra(II Edition) Cambridge University Press, 1997. (Indian Edition) 3. I.S.Luther and I.B.S.Passi, Algebra, Vol. I –Groups(1996); Vol.II Rings, Narosa Publishing House , New Delhi, 1999 4. D.S.Malik, J.N. Mordeson and M.K.Sen, Fundamental of Abstract Algebra, McGraw Hill (International Edition), NewYork. 1997. 5. N.Jacobson, Basic Algebra, Vol. I & II W.H.Freeman (1980);also published by Hindustan Publishing Company, New Delhi.
Web resources	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics , http://www.opensource.org , www.algebra.com

Course Outcomes:

Students will be able to

- CO1:** Recall basic counting principle, define class equations to solve problems, explain Sylow's theorems to find number of Sylow subgroups.
- CO2:** Define direct products, examine the properties of finite abelian groups, define modules, define solvable groups.
- CO3:** Define similar transformations, define invariant subspace, explore the properties of triangular matrix, to find the index of nilpotence to decompose a space into invariant subspaces, to find invariants of linear transformation, to explore the properties of nilpotent transformation relating nilpotence with invariants.
- CO4:** Define Jordan, canonical form, Jordan blocks, define rational canonical form, define companion matrix of polynomial, find the elementary divisors of transformation, apply the concepts to find characteristic polynomial of linear transformation.
- CO5:** Define trace, define transpose of a matrix, explain the properties of trace and transpose, to find trace, to find transpose of matrix, to prove Jacobson lemma using the triangular form, define symmetric matrix, skew symmetric matrix, adjoint, to define Hermitian, Unitary, Normal transformations and to verify whether the transformation is Hermitian, Unitary and Normal.


CONTROLLER OF EXAMINATIONS
 RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)
 THANJAVUR-613 005.


Dr.K. ELANGO VAN
 Head & Associate Professor
 Department of Mathematics
 Rajah Serfoji Govt College (Autonomous)
 Thanjavur - 613005

(For students admitted from 2026- 2027)

Mapping of Cos with Pos and PSOs :

PO	Pos						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

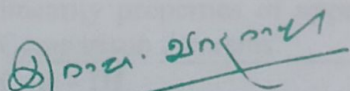
Maximum Marks: 75

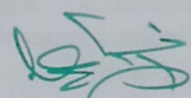
Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

Part C: $3 \times 10 = 30$ (Three out of Five - One question from each unit)


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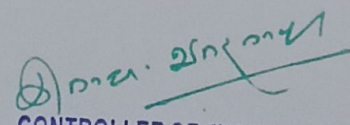

Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

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Title of the Course		REAL ANALYSIS					
Paper Number		CORE 2					
Category	Core	Year	I	Credits	6	Course Code	BIPMAC2
		Semester	I				
Instructional Hours per week		Lecture	Tutorial	Lab Practice		Total	
		5	1	-		6	
Pre-requisite		UG level Real Analysis					
Objectives of the Course		To work comfortably with functions of bounded variation, Riemann-Stieltjes Integration, convergence of infinite series, infinite product and uniform convergence and its inter play between various limiting operations.					
Course outline		Unit – I Functions of bounded variation - Introduction –Properties of monotonic functions – Functions of bounded variation –Total variation -Additive property of total variation - Total variation on $[a,x]$ as a function of x - Functions of bounded variation expressed as the difference of two increasing functions – Continuous functions of bounded variation. Infinite Series: Absolute and conditional convergence- Dirichlet's test and Abel's test – Rearrangement of series -Riemann's theorem on conditionally convergent series.					
		Unit – II The Riemann-Stieltjes Integral-Introduction-Notation- The definition of the Riemann -Stieltjes integral - Linear Properties -Integration by parts –Change of variable in a Riemann- Stieltjes integral – Reduction to a Riemann Integral– Euler's summation formula-monotonically increasing integrators ,Upper and lower integrals - Additive and linearity properties of upper, lower integrals -Riemann's condition - Comparison theorems.					
		Unit – III The Riemann- Stieltjes Integral - Integrators of bounded variation-Sufficient conditions for the existence of Riemann- Stieltjes integrals-Necessary conditions for the existence of RS integrals- Mean value theorems - integrals as a function of the interval -Second fundamental theorem of integral calculus- Change of variable –Second Mean Value Theorem for Riemann integral-Riemann- Stieltjes integrals depending on a parameter – Differentiation under integral sign – Lebesgue criteriaon for existence of Riemann integrals.					
		Unit – IV Infinite Series and infinite Products – Double sequences – Double series- Rearrangement theorem for double series-A sufficient condition for equality of iterated series - Multiplication of series – Cesaro summability - Infinite products. Power series - Multiplication of power series - The Taylor's series generated by a function - Bernstein's theorem - Abel's limit theorem - Tauber's theorem					
		Unit – V Sequences of Functions – Point wise 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					

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	Riemann - Stieltjes integration – Non-uniform Convergence and Term-by-term Integration-Uniform convergence and differentiation - Sufficient condition for uniform convergence of a series - Mean convergence. Chapter 9: Sections 9.1 to 9.6, 9.8, 9.9, 9.10, 9.11, 9.13.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/ GATE/ TNPSC/ others to be solved (To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Tom M. Apostol : Mathematical Analysis, 2nd edition, Addison Wesley Publishing Company Inc. New York, 1974 Unit – I : Chapter 6 : Sections 6.1 to 6.8 & Chapter 8 : Sections 8.8, 8.15, 8.17, 8.18 Unit – II : Chapter 7 : Sections 7.1 to 7.14 Unit – III : Chapter 7 : Sections 7.15 to 7.26. Unit – IV : Chapter 8 : Sections 8.20, 8.21 to 8.26 & Chapter 9 : Sections 9.14, 9.15, 9.19, 9.20, 9.22, 9.23. Unit – V : Chapter 9: Sections 9.1 to 9.6, 9.8, 9.9, 9.10, 9.11, 9.13.
Reference Books	1. Bartle, R.G. Real Analysis, John Wiley and Sons Inc., 1976. 2. Rudin, W. Principles of Mathematical Analysis, 3rd Edition McGrawHill Company, New York, 1976. 3. Malik S.C. and Savita Arora Mathematical Analysis, Wiley Eastern Limited New Delhi, 1991. 4. Sanjay Arora and Bansilal, Introduction to Real Analysis, SatyaPrakashan, New Delhi, 1991. 5. Gelbaum, B.R. and J. Olmsted, Counter Examples in Analysis, Holden day. San Francisco, 1964. 6. A.L. Gupta and N.R. Gupta, Principles of Real Analysis, Pearson Education, (Indian print) 2003 7. Topology Of Metric Space By S. Kumersan
Web resources	1. http://mathforum.org 2. http://ocw.mit.edu/ocwweb/Mathematics 3. http://www.opensource.org, www.mathpages.com


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Course Outcomes:

Students will be able to

CO1:Analyze and evaluate functions of bounded variation and Rectifiable Curves..

CO2: Describe the concept of Riemann-Stieltjes integral and its properties.

CO3:Demonstrate the concept of step function, upper function, Lebesgue function and their integrals.

CO4:Construct various mathematical proofs using the properties of Lebesgue integrals and establish the Levi monotone convergence theorem

CO5: Formulate the concept and properties of inner products, norms and measurable functions

Mapping of Cos with POs and PSOs :

PO	Pos						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

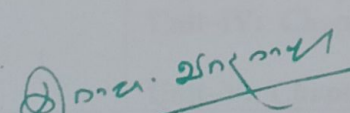
Maximum Marks: 75

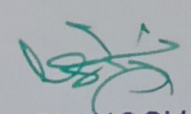
Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

Part C: $3 \times 10 = 30$ (Three out of Five - One question from each unit)


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ORDINARY DIFFERENTIAL EQUATIONS							
Title of the Course		CORE 3					
Paper Number		B1PMAC3					
Category	Core	Year	I	Credits	6	Course Code	
		Semester	I				
Instructional Hours Per Week		Lecture	Tutorial		Lab Practice	Total	
		5	1		--	6	
Pre-requisite		UG level Calculus and Differential Equations					
Objectives of the Course		To develop strong background on 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					
Course Outline		Unit-I: Linear Equations with Constant Coefficients The second order homogeneous equation – Initial value problems for second order equations - Linear dependence and independence - A formula for the Wronskian .					
		Unit-II: Linear Equations with Constant Coefficients The non homogeneous equation of order two-Homogeneous and non-homogeneous equation of order n.					
		Unit-III: Linear Equations with Variable Coefficients Wronskian and linear dependence – reduction of the order of a homogeneous equation – homogeneous equation with analytic coefficients-The Legendre equation.					
		Unit-IV: Linear Equations with Regular Singular Points Euler equation-Second order equations with regular singular points-Exceptional cases – Bessel Function.					
		Unit-V:Existence and Uniqueness of Solutions to First Order Equations Equation with variable separated – Exact equation – method of successive approximations – the Lipschitz condition-convergence of the successive approximations and the existence theorem.					
Recommended Texts		E.A.Coddington - <i>An Introduction to Ordinary Differential Equations</i> , Prentice - Hall of India Private Limited New Delhi - 2005. Unit-I: Chapter 2 : Sections 1 to 5 Unit-II: Chapter 2 : Sections 6 to 10 Unit-III: Chapter 3 : Sections 4 to 8 Unit-IV: Chapter 4: Sections 1 to 4 and 6 to 8 (Omit sections 5 and 9) Unit-V: Chapter 5: Sections 1 to 6 (Omit Sections 7 to 9)					
Reference Books		1. Williams E.Boyce and Richard C. DiPrima, Elementary differential equations and boundary value problems, John Wiley and sons, New York, 1967. 2. George F Simmons, Differential equations with applications and historical notes, Tata McGraw Hill, New Delhi, 1974. 3. N.N. Lebedev, Special functions and their applications, Prentice Hall of India, New Delhi, 1965. W.T.Reid. Ordinary Differential Equations, John Wiley and Sons, New York, 1971					

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**Web resources and
e-Learning Source**

<http://mathforum.org><http://ocw.mit.edu/ocwwweb/Mathematics>

Course Outcomes

Students will be able to

CO1: Establish the qualitative behavior of solutions of systems of differential equations.

CO2: Recognize the physical phenomena modeled by differential equations and dynamical systems.

CO3: Analyze solutions using appropriate methods and give examples

CO4: Formulate Green's function for boundary value problems

CO5: Understand and use various theoretical ideas and results that underlie the mathematics in this course.

Mapping of Cos with Pos and PSOs:

PO	Pos						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	1	3	3	3	2	1
CO5	3	1	2	3	2	3	3	2	1

Question Paper Pattern

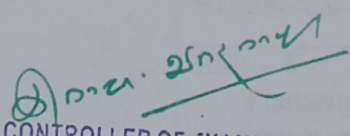
Maximum Marks: 75

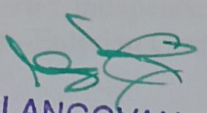
Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

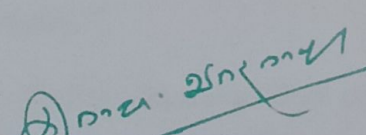
Part C: $3 \times 10 = 30$ (Three out of Five - One question from each unit)

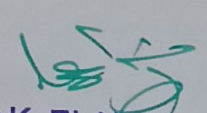

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Title of the Course		ADVANCED GRAPH THEORY					
Paper Number		CORE 4					
Category	Core	Year	I	Credits	6	Course Code	B1PMAC4
		Semester	I				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		5	1	-	6		
Pre-requisite		Basic concepts of Graph theory					
Objectives of the Course		Graph Theory is a growing field of Mathematics with applications in almost all the fields. This contains the beauty of abstract mathematics and applied mathematics. This is one of the most important Research areas. • To attain basic knowledge of operations on graphs and connectivity. • To have sound knowledge about Trees, Eulerian and Hamiltonian Graphs. • To obtain the Practical knowledge about Matchings, Planar & Non planar Graphs					
Course outline		Unit – I Graphs: Basic concepts - Paths and connectedness - Automorphism of a simple graph - Line graphs – Operations on graphs.					
		Unit – II Directed graphs: Basic concepts – Tournaments. Connectivity: Introduction - Vertex cuts and Edge cuts – Connectivity and Edge - connectivity.					
		Unit – III Trees: Definition, Characterization and Simple Properties – Centers and Centroids Counting Number of spanning Trees.					
		Unit – IV Independent Sets and Matchings: Vertex Independent Sets and Vertex Coverings – Matching and Factors –Eulerian Graphs – Hamiltonian Graphs.					
		Unit – V Planarity: Planar and Non planar graphs – Euler formula and its consequences - and Non planar Graphs - Dual of a Plane graph.					


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Recommended Text	A Textbook of Graph Theory, R.Balakrishnan and K. Ranganathan, Springer, New Delhi. Unit – I : Chapter 1 (Sec 1.4- 1.7) Unit – II : Chapter 2 (Sec 2.1&2.2) & Chapter 3 (Sec 3.0 - 3.2) Unit – III : Chapter 4 (Sec 4.1 - 4.3) Unit – IV : Chapter 5 (Sec 5.1&5.3) & Chapter 6 (Sec6.1&6.2) Unit – V : Chapter 8 (Sec 8.1-8.4)
Reference Books	1. J.A. Bondy and U. S.R.Murty, Graph Theory with Applications, Springer (2002). 2. V.K. Balakrishnan, Theory and Problems of Graph Theory, Schaum's outlines series, Mc Gra Hill, New Delhi.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics ,

Course Outcomes:

Students will be able to

CO1: Remember the knowledge of operations on graphs and connectivity.

CO2: Understand the knowledge of Connectivity in graphs.

CO3: Analyze knowledge about Trees, Eulerian and Hamiltonian Graphs.

CO4: Analyze the Independent sets and Matchings.

CO5: Evaluate the Planar and Non planar graphs.

Mapping of Cos with Pos and PSOs:

PO	Pos						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	2	3	3	2	2	3	2	1
CO2	2	3	3	3	2	3	3	2	1
CO3	3	2	3	2	2	3	3	2	1
CO4	3	2	2	3	2	2	3	2	1
CO5	3	3	2	2	3	3	3	2	1

Question Paper Pattern

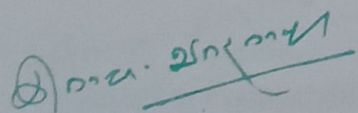
Maximum Marks: 7

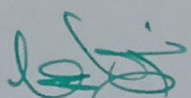
Examination Duration: 3 Hours

Part A: 10x 2 = 20 (Two Questions from each unit)

Part B: 5x5 = 25 (Either / Or type – One question from each unit)

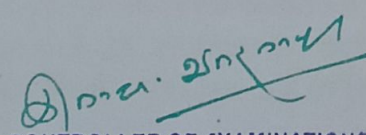
Part C: 3x10 = 30 (Three out of Five – One question from each unit)

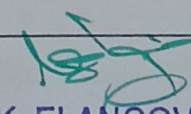

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Title of the Course		LINEAR ALGEBRA					
Paper Number		CORE 5					
Category	Core	Year	I	Credits	6	Course Code	B2PMAC5
		Semester	II				
Instructional Hours per week		Lecture	Tutorial	Lab Practice		Total	
		5	1	-		6	
Pre-requisite		Basic concepts of Linear Algebra					
Objectives of the Course		1. The objective of this course is to develop a strong foundation in linear algebra that provide a basic for advanced studies not only in mathematics but also in other branches like engineering, physics and computers, etc. 2. Particular attention is given to canonical forms of linear transformations, diagonalizations of linear transformations, matrices and determinants.					
Course outline		Unit – I Linear transformations: Linear transformations – Isomorphism of vector spaces – Representations of linear transformations by matrices – Linear functionals.					
		Unit – II Algebra of polynomials: The algebra of polynomials – Polynomial ideals - The prime factorization of a polynomial – Determinant functions.					
		Unit – III Determinants: Permutations and the uniqueness of determinants – Classical adjoint of a (square) matrix – Inverse of an invertible matrix using determinants – Characteristic values – Annihilating polynomials.					
		Unit – IV Diagonalization: Invariant subspaces – Simultaneous triangulations – Simultaneous diagonalization – Direct - sum decompositions – Invariant direct sums – Primary decomposition theorem.					
		Unit – V The Rational and Jordan forms: Cyclic subspaces – Cyclic decompositions theorem (Statement only) – Generalized Cayley – Hamilton theorem - Rational forms – Jordan forms.					
Extended Professional Component (is a part of internal component only, Not to be Included in the		Real life application related to the above topics in various fields. (To be discussed during the Tutorial hour)					


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 THANJAVUR-613 005.


 Dr.K. ELANGO VAN
 Head & Associate Professor
 Department of Mathematics
 Rajah Serfoji Govt. College (Autonomous)
 Thanjavur - 613005

For students admitted from 2026- 2027)

Recommended Text	Linear Algebra - Kenneth M Hoffman and Ray Kunze, 2nd Edition, Prentice –Hall of India Pvt. Ltd, New Delhi, 2013. UNIT I : Chapter 3 (Sections 3.1 to 3.5) UNIT II : Chapters 4 and 5 (Sections 4.1, 4.2, 4.4, 4.5 and 5.1, 5.2) UNIT III : Chapters 5 and 6 (Sections 5.3, 5.4 and 6.1 - 6.3) UNIT IV : Chapters 6 (Sections 6.4 - 6.8) UNIT V : Chapter 7 (Sections 7.1 - 7.3)
Reference Books	1.M.Artin, “<i>Algebra</i>”, Prentice Hall of India Pvt.Ltd.,2005. 2.S.H. Friedberg, A.J. Insel and L.E Spence, “<i>Linear Algebra</i>”, 4th Edition, Prentice-Hall of India Pvt.Ltd., 2009. 3.I.N. Herstein, “<i>Topics in Algebra</i>”, 2nd Edition, Wiley Eastern Ltd, New Delhi, 2013. 4.J.J. Rötman, “<i>Advanced Modern Algebra</i>”, 2nd Edition, Graduate Studies in Mathematics, Vol. 114, AMS, Providence, Rhode Island, 2010. 5.G. Strang, “<i>Introduction to Linear Algebra</i>”, 2nd Edition, Prentice Hall of India Pvt. Ltd,2013.
Website and e-Learning Source	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics,

Course Outcomes:

Students will be able to

CO1: Recall the Linear transformations

CO2: Explain the algebra of polynomial ideals.

CO3: Make use of Permutations and the uniqueness of determinants.

CO4: Discover the Simultaneous triangulations and diagonalization.

CO5: Discuss the Rational forms and Jordan forms. Mapping of Cos with Pos and PSOs:

Mapping of Cos with Pos and PSOs:

PO	Pos						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	1	3	3	3	2	1
CO5	3	1	2	3	2	3	3	2	1

Question Paper Pattern

Maximum Marks:

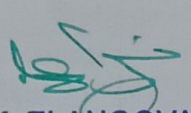
Examination Duration: 3Hours

Part A: 10 × 2 = 20 (Two questions from each unit)

Part B: 5 × 5 = 25 (Either / Or type—One questions from each unit)

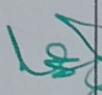
Part C: 3 × 10 = 30 (Three out of Five—One questions from each unit)

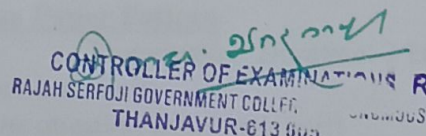
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THANJAVUR-613 005.


Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		MEASURE THEORY AND INTEGRATION					
Paper Number		CORE 6					
Category	Core	Year	I	Credits	6	Course Code	B2PMAC6
		Semester	II				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre-requisite		Real Analysis					
Objectives of the Course		1. To study a basic course in Lebesgue Measure and Integration a study of inequalities and the L^p -spaces. 2. To study signed measures and the Hahn Decomposition theorems, Fubini's theorem and Random – Nikodym theorem.					
Course Outline		UNIT-I : Measure on the Real Line: Lebesgue Outer Measure – Measurable Sets – Regularity – Measurable Function – Borel and Lebesgue Measurability.					
		UNIT-II : Integration of Functions of a Real Variable: Integration of Non - negative Functions – The General Integral – Integration of Series – Riemann and Lebesgue Integrals.					
		UNIT-III : Inequalities and the L^p Spaces: The L^p spaces – Convex functions – Jensen's Inequalities – The Inequalities of Holders and Minkowski.					
		UNIT-IV : Convergence in Measure – Almost Uniform Convergence – Singed Measures and Hahn Decomposition – The Jordan Decomposition.					
		UNIT-V: Measurability in a Product Space – The Product Measure and Fubini's Theorem. The Radon – Nikodym Theorem.					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Skills acquired from this course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill					


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Dr.K. ELANGO VAN
 Head & Associate Professor
 Department of Mathematics
 Rajah Serfoji Govt. College (Autonomous)
 Thanjavur - 613005

(For students admitted from 2026- 2027)

Recommended Text	G. De Barra, Measure Theory and Integration, Addition-Wesley Publishing Company (1971). UNIT I : Chapter 2 (sections 2.1 to 2.5) UNIT II : Chapter 3 (sections 3.1 to 3.4) UNIT III : Chapter 6 (sections 6.1 to 6.4) UNIT IV : Chapter 7 (sections 7.1 , 7.2) & Chapter 8 (sections 8.1, 8.2) UNIT V : Chapter 10 (sections 10.1, 10.2) & Chapter 8 (section 8.3)
Reference Book	[1] Inder K. Rana, An Introduction to Measure and Integration, Narosa Publishing House, New Delhi, 1997. [2] M.E. Munroe, Measure and Integration, Second Edition, Addition – Wesley Publishing Company, 1971. [3] P.K. Jain, V.P Gupta, Lebesgue Measure and Integration, New Age International Pvt. Ltd. Publishers, New Delhi, 1986 (Reprint 2000) [4] Richard L. Wheeden and Andoni Zygmund, Measure and Integral: An Introduction to Real Analysis, Marcel Dekker Inc 1977.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics , http://www.opensource.org , http://en.wikipedia.org

Course Outcome

Students will be able to

CO1: Discuss the Measure on the Real Line. They will be able to capture the need for the modern integration theory.

CO2: Analyze the Riemann and Lebesgue Integrals.

CO3: Observe that the idea of Inequalities and the L^p Spaces.

CO4: Discuss about the importance of Convergence in Measure and Singed Measures.

CO5: Apply the Product Measure in Fubini's theorem and Radon Nikodyn theorem.

Mapping of Cos with Pos and PSOs :

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

Maximum Marks: 75

Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

Part C: $3 \times 10 = 30$ (Three out of Five - One question from each unit)

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Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

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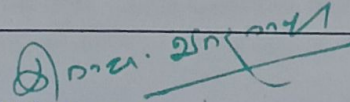
Title of the Course		PARTIAL DIFFERENTIAL EQUATIONS					
Paper Number		CORE 7					
Category	Core	Year	I	Credits	6	Course Code	B2PMAC7
		Semester	II				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre-requisite		UG level Calculus and Partial Differential Equations					
Objectives of the Course		1.Familiarize the students with the fundamental concepts of Partial differential equations which will be used as background knowledge for the specialized courses in any field 2. This course provides an introduction to the study and solution methods of solving Heat, Wave, Laplace, Diffusion Equations and Integral Transforms					
Course Outline		UNIT-I : First order P.D.E – Curves and Surfaces – Genesis of First order P.D.E. – Classification of Integrals – Linear Equation of the First Order.					
		UNIT-II : Pfaffian Differential Equations – Compatible Systems – Charpit's Method – Jacobi's Method – Integral surfaces through a given curve.					
		UNIT-III : Second order P.D.E: Genesis of second order P.D.E. – Classification of second order P.D.E. One - Dimensional wave Equation – Vibrations of an Infinite string – Vibrations of a semi – Infinite string - Vibrations of string of finite length.					
		UNIT-IV : Vibrations of a string of finite Length (Method of separation of variables) Laplace's Equation : Boundary value problems – Maximum and Minimum principles – The Cauchy problem – The Dirichlet problem for the upper Half plane – The Neumann problem for the upper Half plane.					
		UNIT-V: The Dirichlet interior problem for a circle – The Dirichlet Exterior problem for a circle – The Neumann problem for a circle – The Dirichlet problem for a Rectangle – Harnack's Theorem – Laplace's Equation – Green's Functions.					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					


Dr.K. ELANGOVAN


Dr.K. ELANGOVAN

Head & Associate Professor
Department of Mathematics

Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005


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Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	T.Amaranath, An Elementary Course in Partial Differential Equations, Narosa publishing House, New Delhi, 1997. UNIT I : Chapter -1 (Section 1.1 – 1.4) UNIT II : Chapter -1 (Section 1.5 – 1.9) UNIT III : Chapter -2 (Section 2.1 – 2.3.3) UNIT IV : Chapter -2 (Section 2.3.5 – 2.4.5) UNIT V : Chapter -2 (Section 2.4.6 – 2.4.11)
Reference Book	1. M.D. Raisinghania Advanced Differential Equations S. Chand and Company Ltd., New Delhi, 2001 2. K. Sankara Rao, Introduction to Partial Differential Equations, Second edition– Prentice–HallofIndia, New Delhi 2006 3. J.N. Sharma & K. Singh Partial Differential Equations for Engineers & Scientists, Narosa Publishing House, 2001 4. R. Dennemeyer, Introduction to Partial Differential Equations and Boundary value Problems, McGraw Hill Book Company, New York, 1968. 5. Ian n . Sneddon – elements of partial differential equations – dover publications, inc.mineola, newyork, 2006.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwwweb/Mathematics , http://www.opensource.org , http://en.wikipedia.org

Course Outcome

Students will be able to

CO1: Discuss the Measure on the Real Line. They will be able to capture the need for the modern integration theory.

CO2: Analyze the Riemann and Lebesgue Integrals.

CO3: Observe that the idea of Inequalities and the L^p Spaces.

CO4: Discuss about the importance of Convergence in Measure and Singed Measures.

CO5: Apply the Product Measure in Fubini's theorem and Radon Nikodyn theorem.

Mapping of Cos with Pos and PSOs :

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

Maximum Marks: 75

Examination Duration: 3 Hours

Part A: 10 x 2 = 20 (Two Questions from each unit)

Part B: 5 x 5 = 25 (Either / Or type – One question from each unit)

Part C: 3 x 10 = 30 (Three out of Five - One question from each unit)

(For students admitted from 2026- 2027)

Title of the Course		PROGRAMMING IN C++ AND LATEX						
Paper Number		CORE 8						
Category	Core	Year	I	Credits	6	Course Code	B2PMAC8	
		Semester	II					
Instructional Hours		Lecture		Tutorial		Lab Practice		Total
Per week		5		1		--		6
Pre-requisite		Basic Knowledge of Numerical Methods and C Language						
Objectives of the Course		Train the students to develop analytical thinking and the study of stability analysis .Provide the knowledge of C++ language and enable the students to write object oriented, platform independent and interactive program. To learn and create Latex file.						
Course Outline		UNIT I: Beginning with C++ - Applications of C++ - Simple programs – Structure of C++program – creating the source file – compiling and linking – tokens: Expressions and control structures – Keywords – identifiers – Basic data types – User defined data types – derived data types. UNIT II: Declaration of variables – reference variable – Operation in C++ - Manipulators – Type cast Operator– Expressions and Implicit conversions – Operator overloading Operator precedence – Control structures. UNIT III: Functions in C++ - Introduction – main function – Functions prototyping – Call by reference – Return by reference – In line function – Default arguments – Constant arguments – Function over Loading – Friend and virtual functions UNIT IV: LATEX:Introduction – Simple typesetting – Fonts – Type size – The document –Page style – page numbering – Formatting length – Parts of a document – Dividing the document- Bibliography. UNIT V: Typesetting Mathematics – Basics – Custom commands . More on Mathematics –Single Equations - Group Equations- Mathematics miscellany.- Delimiters – Matrices						
Recommended Text		1. E. Balagurusamy (2018),Object-Oriented Programming with C++, TataMcGrawHill,7thEdition UNIT I: Chapter 2 (Sec 2.1 – 2.8) & Chapter 3 (Sec 3.1 – 3.7) UNIT II: Chapter 3 (Sec 3.13 – 3.24) UNIT III: Chapter 4 (Sec 4.1 – 4.10) 2. LATEX Tutorials, A PRIMER Indian TEX Users Group, Trivandrum, India (2003). UNIT IV: Tutorial I and II UNIT V: Tutorial VIII (Section: 8.1 -8.2, 8.3 , 8.4 (Sec : 4.1- 4.3)						

Dr.K. ELANGO VAN

Head & Associate Profess

Department of Mathemat

Rajah Serfoji Govt. College (Aut

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Reference Books	1. Robert Lafore (2019), Object Oriented Programming in C++, Pearson Education, 4th Edition. 3. Rajesh K.Shukla (2009), Object Oriented Programming in C++, Wilsey India Pvt. Ltd, 1st Edition. 2. Guide to LATEX, fourth edition, Helmut Kopka, Patrick W.Daly 3. https://www.overleaf.com/learn/latex/Beamer#Reference_guide
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Course Outcome

Students will be able to

CO1: Implement numerical methods in computer programming using C++ language.

CO2: Compute solutions of interpolation problems and exhibit the knowledge of program execution and debugging of C++.

CO3: Apply various methods to solve transcendental and polynomial equations and illustrate the components of C++ programming.

CO4 : Apply the knowledge to learn and create Latex file.

CO5 : Analyze the Latex commands to large files and evaluate mathematical derivations and structures using Latex

Mapping of Cos with Pos and PSOs:

PO	Pos						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

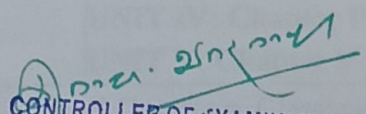
Maximum Marks: 75

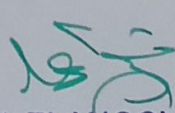
ExaminationDuration:3Hours

Part A: $10 \times 2 = 20$ (Two Question from each unit)

Part B : $5 \times 5 = 25$ (Either / Or type – One question from each unit)

Part C: $3 \times 10 = 30$ (Three out of Five –One question from each unit)


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Dr.K. ELANGO VAN
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(For students admitted from 2026- 2027)

Title of the Course		CLASSICAL DYNAMICS					
Paper Number		CORE 9					
Category	Core	Year	II	Credits	6	Course Code	B3PMAC9
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Objectives of the Course		To study the basic concept from the theory of Virtual Work , Energy and Momentum. 1. To study the Lagrange's equations 2.To understand the concepts of Integral of Motion. 3 To observe Rayleigh's dissipation function and Impulsive Motion 4 To learn more about Hamilton's Equations and Hamilton's principle					
Course Outline		UNIT I: Introductory Concepts – Generalized Co-ordinates – Constraints – Virtual Work –Energy and Momentum.					
		UNIT II: Lagrange's equations – Derivation of Lagrange's Equation– Integral of Motion.					
		UNIT III: Small application of Lagrange's equation – Rayleigh's dissipation function - Impulsive Motion – Gyroscopic System – Velocity Dependable Potential.					
		UNIT IV: Hamilton's Equations - Hamilton's principle - Hamilton's equations – Other Variational Principles.					
		UNITV: Hamilton-Jacobytheory-Hamilton'sprinciplefunction- TheHamiltonJacobi equation - Separability.					
Recommended Text		Donald T.Greenwood, Scope and Treatment as in Classical Dynamics, PHI Pvt. Ltd., New Delhi, 1985. UNIT I: Chapter I (Sec 1.2 -1.5) UNIT II: Chapter II (Sec 2.1 -2.3) UNIT III: Chapter III (Sec3.1-3.4) UNIT IV: Chapter IV (Sec4.1-4.3) UNIT V: Chapter V (Sec 5.1 -5.3)					
Reference Book		H.Goldstein, Classical Mechanics (2 nd edition), Narosa Publishing House, New Delhi.					
Website and e-Learning Source		http://mathforum.org , http://ocw.mit.edu/ocwwweb/Mathematics , Dr.K. ELANGO VAK Head & Associate Profes					

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Course Outcome

Students will be able to

CO1: Demonstrate the knowledge of core principles in mechanics.

CO2: Interpret and consider complex problems of classical dynamics in a systematic way.

CO3: Apply the variation principle for real physical situations.

CO4: Explore different applications of these concepts in the mechanical and electromagnetic fields.

CO5: Describe and apply the concept of Angular momentum, Kinetic energy and Moment of inertia of a particle.

Mapping of Cos with Pos and PSOs:

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

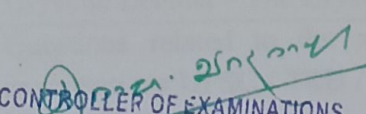
Maximum Marks: 75

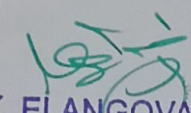
Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either/ Or type—One question from each unit)

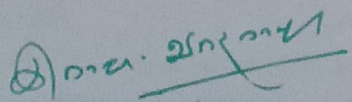
Part C: $3 \times 10 = 30$ (Three out of Five – One question from each unit)

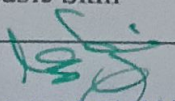

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Dr.K. ELANGOVAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		TOPOLOGY					
Paper Number		CORE 10					
Category	Core	Year	II	Credits	6	Course Code	B3PMAC10
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre-requisite		Real Analysis					
Objectives of the Course		To study topological spaces, continuous functions, connectedness, compactness, countability and separation axioms.					
Course Outline		UNIT-I : Topological spaces : Topological spaces – Basis for a topology – The order topology – The product topology on $X \times Y$ – The subspace topology – Closed sets and limit points.					
		UNIT-II : Continuous functions: Continuous functions – the product topology – The metric topology.					
		UNIT-III : Connectedness: Connected spaces- connected subspaces of the Real line – Components and local connectedness.					
		UNIT-IV : Compactness : Compact spaces – compact subspaces of the Real line – Limit Point Compactness – Local Compactness.					
		UNIT-V: Countability and Separation Axiom: The Countability Axioms – The separation Axioms – Normal spaces – The Urysohn Lemma – The Urysohn metrization Theorem					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Skills acquired from this course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill					


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 THANJAVUR-613 005.


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 Department of Mathematics
 Rajah Serfoji Govt. College (Autonomous)
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Recommended Text	James R. Munkres, <i>Topology</i> (2 nd Edition) Pearson Education Pvt. Ltd., Delhi-2002 (Third Indian Reprint) UNIT-I : Chapter 2 : Sections 12 to 17 UNIT-II : Chapter 2 : Sections 18 to 21 (Omit Section 22) UNIT-III : Chapter 3 : Sections 23 to 25. UNIT-IV : Chapter 3 : Sections 26 to 29. UNIT-V : Chapter 4 : Sections 30 to 34.
Reference Books	1. J. Dugundji, <i>Topology</i> , Prentice Hall of India, New Delhi, 1975. 2. George F. Simmons, <i>Introduction to Topology and Modern Analysis</i> , McGraw Hill Book Co., 1963 3. J.L. Kelly, <i>General Topology</i> , Van Nostrand, Reinhold Co., New York 4. L. Steen and J. Subhash, <i>Counter Examples in Topology</i> , Holt, Rinehart and Winston, New York, 1970. 5. S. Willard, <i>General Topology</i> , Addison - Wesley, Mass., 1970
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics , http://www.opensource.org , http://en.wikipedia.org

Course Outcome

Students will be able to

CO1: Define and illustrate the concept of topological spaces and the basic definitions of open sets, neighbourhood, interior, exterior, closure and their axioms for defining topological space.

CO2: Understand continuity, compactness, connectedness, homeomorphism and topological properties.

CO3: Analyze and apply the topological concepts in Functional Analysis.

CO4: Ability to determine that a given point in a topological space is either a limit point or not for a given subset of a topological space.

CO5: Develop qualitative tools to characterize connectedness, compactness, second countable, Hausdorff and develop tools to identify when two are equivalent (homeomorphic).

Mapping of Cos with Pos and PSOs :

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

Examination Duration: 3 Hours

Maximum Marks: 75
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THANJAVUR-610005

Part A: 10 x 2 = 20 (Two Questions from each unit)

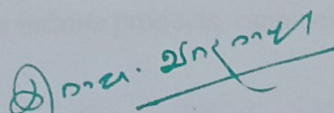
Part B: 5 x 5 = 25 (Either / Or type – One question from each unit)

Part C: 3 x 10 = 30 (Three out of Five - One question from each unit)

Dr. K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 610005

(For students admitted from 2026- 2027).

Title of the Course		COMPLEX ANALYSIS					
Paper Number		CORE 11					
Category	Core	Year	II	Credits	6	Course Code	B3PMAC11
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre-requisite		UG level Complex Analysis					
Objectives of the Course		To Study Cauchy integral formula, local properties of analytic functions, general form of Cauchy's theorem and evaluation of definite integral and harmonic functions					
Course Outline		UNIT-I: Cauchy's Integral Formula: The Index of a point with respect to a closed curve – The Integral formula – Higher derivatives. Local Properties of analytical Functions: Removable Singularities-Taylor's Theorem – Zeros and poles – The local Mapping – The Maximum Principle.					
		UNIT-II: The general form of Cauchy's Theorem : Chains and cycles- Simple Continuity - Homology - The General statement of Cauchy's Theorem - Proof of Cauchy's theorem - Locally exact differentials- Multiply connected regions.					
		UNIT-III: Evaluation of Definite Integrals and Harmonic Functions: Evaluation of definite integrals - Definition of Harmonic function and basic properties - Mean value property - Poisson formula.					
		UNIT-IV : Harmonic Functions and Power Series Expansions: Schwarz theorem - The reflection principle - Weierstrass theorem – Taylor's Series – Laurent series .					
		UNIT-V: Partial Fractions and Entire Functions: Partial fractions - Infinite products – Canonical products – Gamma Function- Jensen's formula – Hadamard's Theorem					


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THANJAVUR-613 005.


Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

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Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Lars V. Ahlfors, <i>Complex Analysis</i> , (3 rd edition) McGraw Hill Co., New York, 1979 UNIT-I: Chapter 4 : Section 2 : 2.1 to 2.3 & Chapter 4 : Section 3 : 3.1 to 3.4 UNIT-II: Chapter 4 : Section 4 : 4.1 to 4.7 UNIT-III: Chapter 4 : Section 5 : 5.3 & Chapter 4 : Sections 6 : 6.1 to 6.3 UNIT-IV: Chapter 4 : Sections 6: 6.4 and 6.5 & Chapter 5 : Sections 1: 1.1 to 1.3 UNIT-V: Chapter 5 : Sections 2: 2.1 to 2.4 & Chapter 5 : Sections 3: 3.1 and 3.2
Reference Books	2. H.A. Presfly, <i>Introduction to complex Analysis</i> , Clarendon Press, oxford, 1990. 3. J.B. Conway, <i>Functions of one complex variables</i> Springer - Verlag, International student Edition, Naroser Publishing Co.1978 4. E. Hille, <i>Analytic function Theory</i> (2 vols.), Gonm& Co, 1959. 5. M.Heins, <i>Complex function Theory</i> , Academic Press, New York,1968.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwwweb/Mathematics , http://www.opensource.org , http://en.wikipedia.org

Course Outcome

Students will be able to

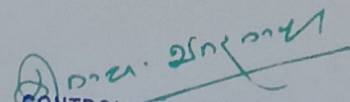
CO1: Analyze and evaluate local properties of analytical functions and definite integrals.

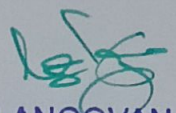
CO2: Describe the concept of definite integral and harmonic functions.

CO3: Demonstrate the concept of the general form of Cauchy's theorem

CO4: Develop Taylor and Laurent series .

CO5 Explain the infinite products, canonical products and jensen's formula .


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Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

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Mapping of Cos with Pos and PSOs :

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

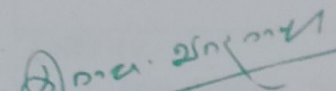
Maximum Marks: 75

Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

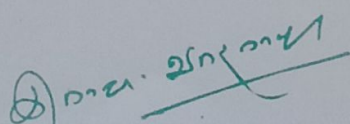
Part C: $3 \times 10 = 30$ (Three out of Five - One question from each unit)

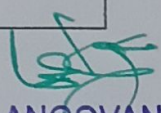

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RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.


Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		RESEARCH METHODOLOGY					
Paper Number		CORE 12					
Category	Core	Year	II	Credits	6	Course Code	B3PMAC12
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		—	6
Objectives of the Course		Objectives of the Course :					
		This course is to help researchers and students of the science in our discipline to prepare manuscripts that will have a high probability of being accepted for publication and of being completely understood when they are published.					
Course Outline		UNIT-I : Research - Research Process- Research Design					
		UNIT-II : Research Problem-Variables and Their Types - Formulation of Hypothesis					
		UNIT-III : Sampling- Tools of Data Collection					
		UNIT-IV : Data Analysis- Interpretation of Data - Research Methods					
		UNIT-V: Descriptive or Survey Method - Experimental Method- Research Proposal – Research Report					
Recommended Text		1.RESEARCH METHODOLOGY: TOOLS AND TECHNIQUES Dr. Prabhat Pandey Dr. Meenu Mishra Pandey © Bridge Center, 2015 UNIT-I : Chapter 1,2 and chapter 3 UNIT-II : Chapter 4,5 and Chapter 6 UNIT-III : Chapter 7 and Chapter 8 UNIT-IV : Chapter 9 , 10 and Chapter 11 UNIT-V : Chapter 12, 13, 14 and Chapter 15					
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 Publication: New York.					
Website and e-Learning Source		http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics ,					


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 RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)
 THANJAVUR-613 005.


Dr.K. ELANGO VAN
 Head & Associate Professor
 Department of Mathematics
 Rajah Serfoji Govt. College (Autonomous)
 Thanjavur - 613005

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Course Outcome

Students will be able to

CO1: Make use of variety of Teaching - learning strategies, Instructional Designs in higher education.

CO2: Apply the domain knowledge of teaching and technology in Lecture, Seminar, Symposium, Panel Discussion,

CO3: Understand the Team Teaching, Project and workshop.

CO4: Evaluate identify the effective teaching methods for classroom management.

CO5: Demonstrate pursuit of knowledge as a character formation and interpersonal skills.

Mapping of Cos with Pos and PSOs :

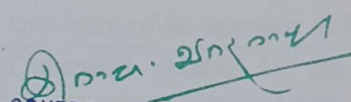
PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

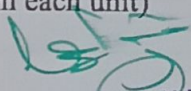
Question Paper Pattern

Maximum Marks: 75

Examination Duration: 3 Hours

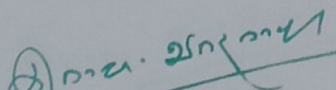
Part A : $5 \times 15 = 75$ (Five out of Eight – Must one question from each unit)


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THANJAVUR-613 005.


Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		FUNCTIONAL ANALYSIS					
Paper Number		CORE 13					
Category	Core	Year	II	Credits	6	Course Code	B4PMAC13
		Semester	IV				
Instructional Hours , per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre-requisite		Elements of Real Analysis					
Objectives of the Course		To provide students with a strong foundation in functional analysis, focusing on spaces, operators and fundamental theorems. To develop student's skills and confidence in mathematical analysis and proof techniques.					
Course Outline		UNIT-I : Banach Spaces: The definition and some examples – Continuous linear transformations – The Hahn-Banach theorem .					
		UNIT – II: The natural imbedding of N in N^{**} - The open mapping theorem – The conjugate of an Operator.					
		UNIT-III: Hilbert Spaces: The definition and some simple properties – Orthogonal complements – Ortho normal sets – The conjugate space H^* .					
		UNIT-IV: The adjoint of an operator–self-adjoint operators-Normal and unitary operators – Projections.					
		UNIT-V: Finite-Dimensional Spectral Theory: Matrices – Determinants and the spectrum of an operator –The spectral theorem.					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Skills acquired from this course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill					


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RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)
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Dr.K. ELANGO
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Rajah Serfoji Govt. College (Autonomous)
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Recommended Text	G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Education (India) Private Limited, New Delhi, 1963. UNIT-I : Chapter 9:Sections 46-48 UNIT-II : Chapter 9:Sections 49-51 UNIT-III : Chapter 10:Sections 52-55 UNIT-IV : Chapter 11:Sections 56-59 UNIT-V : Chapter 12:Sections 60-63
Reference Books	1. W.Rudin, Functional Analysis, McGraw Hill Education (India) Private Limited, New Delhi, 1973. 2. B.V. Limaye, Functional Analysis, New Age International, 1996. 3. C. Goffman and G. Pedrick, First course in Functional Analysis, Prentice Hall of India, New Delhi, 1987. 4. E. Kreyszig, Introductory Functional Analysis with Applications, John Wiley & Sons, New York, 1978. 5. M. Thamban Nair, Functional Analysis, A First course, Prentice Hall of India, New Delhi, 2002.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwwweb/Mathematics , http://www.opensource.org , http://en.wikiopedia.org

Course Outcome

Students will be able to

CO1: Understand the Banach spaces and Transformations on Banach Spaces.

CO2: Prove Hahn Banach theorem and open mapping theorem.

CO3: Describe operators and fundamental theorems.

CO4: Validate orthogonal and orthonormal sets.

CO5: Analyze and establish the regular and singular elements.

Mapping of Cos with Pos and PSOs :

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

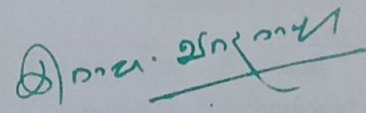
Maximum Marks: 75

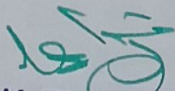
Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

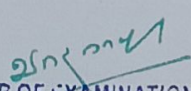
Part C: $3 \times 10 = 30$ (Three out of Five - One question from each unit)


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RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.


Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		ADVANCED NUMERICAL ANALYSIS					
Paper Number		CORE 14					
Category	Core	Year	II	Credits	6	Course Code	B4PMAC14
		Semester	IV				
Instructional Hours , per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre-requisite		Numerical Analysis					
Objectives of the Course		1.To know the theory behind various numerical methods 2.To apply these methods to solve mathematical problems					
Course Outline		UNIT-I : Iteration methods based on a second degree Equations - Muller method – Chebyshev method – Polynomial Equations – Birge - Vieta method – Bairstow method – Graffe's root Squaring method .					
		UNIT – II: System of Linear Algebraic Equations and Eigen value problems - Direct method – Triangularization method – Cholesky method – Partition method – Iteration methods: Jacobi iteration method – Gauss- Seidal iteration method – Successive Over Relaxation (SOR) method – Eigen values and Eigen vectors – Bounds on Eigen values.					
		UNIT-III: Interpolation and Approximation - Hermite interpolation – Piecewise and Spline interpolation. Bivariate interpolation – Lagrange Bivariate interpolation– Newton's bivariate interpolation for equispaced points Least squares approximation - Gram-Schmidt Orthogonalization process.					
		UNIT-IV: Numerical Differentiation - Method based on interpolation – Methods based on finite differences - Length – Extrapolation methods – Numerical integration – Romberg integration.					
		UNIT-V: Ordinary Differential Equations: Numerical methods – Euler's method - Backward Euler's method – Mid-point Euler's method – Simple step methods – Runge kutta methods.					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Skills acquired from this course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill					


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 RAJAH SERFOJI GOVERNMENT COLLEGE
 THANJAVUR-613 005.


 Dr.K. ELANGO VAN
 Head & Associate Professor
 Department of Mathematics
 Rajah Serfoji Govt. College (Autonomous)
 Thanjavur - 613005

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Recommended Text	M.K. Jain, S.R.K. Iyengar, R.K. Jain, Advanced Numerical Methods, New Age International Limited Publishers by 2009. (Fifth Edition) UNIT I : Chapter 2 (Sec 2.4-2.9) UNIT II : Chapter 3 (Sec 3.2 – 3.5 & 3.6) UNIT III: Chapter 4 (Sec 4.5–4.7, 4.9) UNIT IV: Chapter 5 (Sec 5.2, 5.4, 5.10) UNIT V : Chapter 6 (Sec 6.3, 6.4)
Reference Book	S.C. Chapra, and P.C. Raymond, Numerical Methods for Engineers, Tata McGraw Hill, New Delhi (2000).
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics , http://www.opensource.org , http://en.wikipedia.org

Course Outcome

Students will be able to

- CO1:** Solve algebraic and transcendental equations using various methods and study The rate of convergence of those problems
- CO2:** Solve System of Linear Algebraic equations using direct methods.
- CO3:** Solve algebraic equations and differential equations using the techniques of Interpolation like Lagrange and Hermite Interpolation etc.
- CO4:** Perform Numerical Differentiation by interpolation methods.
- CO5:** Find the numerical value of the derivative of various functions using Euler's and Runge kutta methods.

Mapping of Cos with Pos and PSOs :

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

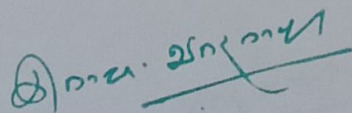
Maximum Marks: 75

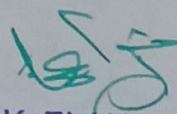
Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

Part C: $3 \times 10 = 30$ (Three out of Five - One question from each unit)


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Rajah Serfoji Govt. College (Autonomous)
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(For students admitted from 2026- 2027)

Title of the Course		PROGRAMMING IN PYTHON					
Paper Number		SEC1					
Category	SEC	Year	II	Credits	3	Course Code	B4PMASE1
		Semester	IV				
Instructional Hours, per week		Lecture		Tutorial	Lab Practice		Total
		2		1	--		3
Objectives of the Course		1. To Understand fundamental program in concepts of Python programming 2. To study basic programming concepts and packages for data analysis. 3. To study about structure and Loop. 4. To gain inputs in Data structure, plotting & Visualisation.					
Course Outline		UNIT-I: Introduction to Python- Features of Python-Identifiers - Reserved Keywords - Variables Comments in Python – Input , Output and Import Functions – Operators Data Types and Operations– int, float, complex, Strings, List, Tuple, Set, Dictionary - Mutable and Immutable Objects – Data Type Conversion t					
		UNIT-II : Flow Control - conditional (if), alternative (if-else), if- else if.-else, nested if - Loops for, while, break, continue, pass; Functions: Functions, Modules and Exception Handling Functions Definition, Function Calling, Function Arguments (Required, Keyword, Default), Recursion					
		UNIT-III : Built-in Modules - Creating Modules - Import statement-Locating modules-Name spaces and Scope-Packages in Python File Handling: Opening, Closing, Writing, Reading and deleting Exceptions Handling: Built-in Exceptions Exception handling, Exception with arguments, Raising an Exception - User defined Exceptions - Assertions in Python					
		UNIT-IV : Object Oriented Programming: Class Definition, Object Creation, Built-in Attribute Methods, Encapsulation, Data Hiding, Inheritance, Multi-Level Inheritance, Polymorphism (Method Overriding, Operator Overloading)					
		UNIT-V: GUI Programming :Introduction – Tkinter Widgets – Label – Message Widget – Entry Widget – Text Widget – tk Message Box– Button Widget–Radio Button- Check Button–List box Frames _ Top-level Widgets – Menu Widget					

(For students admitted from 2026- 2027)

Skills acquired from this course	Knowledge, Problem Solving ,Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Taming Python By Programming, Dr. Jeeva Jose, Khanna Publishing, 2019. Unit I: Chapter1 &2 Unit II: Chapter3 – 3.1to 3.4 and Chapter 4 Unit III : Chapter 5–5.1-5.5. & 5.8 ;Chapter6–6.1 to 6.7 and Chapter8. Unit IV: Chapter7 Unit V: Chapter12-12.1, 12.2 – 12.2.1 to 12.2.12
Reference Books	1. Introduction to Problem solving using Python - E.Balagurusamy – TMH – First Edition - 2015 2. ChSatyanarayana, M Radhika Mani,BN Jagadesh- Python Programming- Cengage, New Delhi.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics ,

Course Outcome

Students will be able to

CO 1: Demonstrate the understanding of basic programming terminologies and packages of python language.

CO2: Will gain knowledge on concepts and packages for data analysis, modeling and visualization in python language.

CO3: In depth understand in about structure and LÖÖ

CO 4 : In depth Understanding about OOP.

CO5: Gain inputs in GUI programming.

Mapping of Cos with Pos and PSOs:

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

Maximum Marks: 75

Examination Duration:3Hours

Part A:10 x 2 = 20 (Two Questions from each unit)

Part B:5 x 5 = 25 (Either / Or type – One question from each unit)

Part C:3 x 10 = 30 (Three out of Five - One question from each unit)

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Rajah Serfoji Govt College (Autonomous)
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(For students admitted from 2026- 2027)

Title of the Course		PROGRAMMING IN PYTHON - PRACTICAL					
Paper Number		SEC2					
Category	SEC	Year	II	Credits	3	Course Code	B4PMASE2
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
						3	3
Objectives of the Course		1. To Understand fundamental programming concepts of Python programming 2. To study basic programming concepts and packages for data analysis,.					
Course Outline		1. Write a Python program to find the value of Triple Integral 2. Write a python program to find the solution of simultaneous linear equations. 3. Write a Python program to find the nth derivatives. 4. Python program to find nth derivative with and without Leibnitz rule. 5. Write a python program to solve partial differential equations. 6. Write a program to input and multiply two matrices 7. Write a program to compute Eigen value and Eigen vector of a given 3X3 matrix using Numpy 8. Write a python program to determine the intersection point of two lines. 9. Create a program that performs the Fourier transform of a given function. You can use the FFT algorithm to implement this. 10. Create a program that visualizes mathematical functions and data using the Matplotlib library. The program should be able to create line plots, scatter plots, bar charts, and other types of visualizations					
Recommended Text							
Reference Books							

Question Paper Pattern

Maximum Marks: 75

Examination Duration: 3 Hours

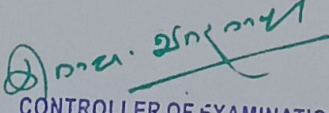
Answer All The Questions

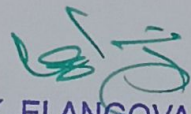
1 X 15 = 15Marks

2 x 25 = 50Marks

Record = 5 Marks

Viva voce = 5


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 THANJAVUR-613 005.


Dr. K. ELANGO VAN
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 Department of Mathematics
 Rajah Serfoji Govt. College (Autonomous)
 Thanjavur - 613005

SYLLABUS

FOR

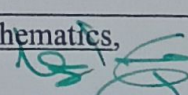
LIST OF ELECTIVE COURSES

(for the candidates admitted from the academic year 2026-2027 onwards)

List of Elective Papers

Course code	Title of the Paper
BPMAECA	Mathematical Programming
BPMAECB	Theory Of Numbers
BPMAECC	Mat Lab
BPMAECD	Programming in C++ and Latex Lab
BPMAECE	Programming in Scilab
BPMAECF	Cryptography
BPMAECG	Stochastic Process
BPMAECH	Differential Geometry
BPMAECI	Mathematical Statistics
BPMAECJ	Fuzzy Sets and their Applications
BPMAECK	Probability Theory
BPMAECL	Random Process

(For students admitted from 2026- 2027)

Title of the Course		MATHEMATICAL PROGRAMMING					
Paper Number		ECIA					
Category	EC	Year	I	Credits	6	Course Code	BPMAECA
		Semester	I				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		5	1	-	6		
Objectives of the Course		To create an engineering design methodology using a mathematical formulation of a design problem to support selection of the optimal design among alternatives.					
Course outline		Unit – I: Primal – dual pair in matrix form – Duality theorems – Complementary Slackness theorem (Statement only) – Dual Simplex method.					
		Unit – II: Games without saddle points – Mixed strategies – Graphic solution $2 \times n$ and $m \times 2$ Games – Dominance property – Arithmetic method for $n \times n$ Games .					
		Unit – III: Inventory control –Types of Inventories –Cost associated with inventories – The Concept of EOQ–Deterministic Inventory Problems with No Shortages					
		Unit = IV: Deterministic Inventory Problem with Shortages - EOQ problem with price break – Multi item deterministic problems.					
		Unit – V: Formulating Non linear Programming problem – General Non linear Programming problem - Constrained Optimization with equal constraints					
Recommended Text		Operations Research by Kanti Swarup, P K .Gupta and Manmohan – Sultan Chand & Sons Educational publishers New Delhi. Unit – I : Chapter 5 (Sec.5.3 – 5.6 & Sec 5.9) Unit – II : Chapter 17 (Sec 17.5 – 17.8) Unit – III : Chapter 19 (Sec 19.1 – 19.2, 19.6, & 19.9 – 19.10) Unit – IV : Chapter 19 (Sec 19.11 – 19.13) Unit – V : Chapter 27 (Sec 27.1 – 27.4)					
Reference Books		1.Kamdy A. Taha, Operations Research, Macmillan Publishing Company, 4th Edition. 2.Prem Kumar Gupta and D.S. Hira, Operations Research: An Introduction, S. Chand & Company Ltd, New Delhi (2004)					
Website and e-Learning Source		http://mathforum.org , http://ocw.mit.edu/ocwwweb/Mathematics ,  Dr. K. ELANGO					

Dr.K. ELANGO VAN

Head & Associate Professor
Department of Mathematics

Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

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THANJAVUR-613 005

(For students admitted from 2026- 2027)

Course Outcome

Students will be able to

CO1: Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems.

CO2: understand the fuzzy set by compare it with crisp set and basic operations of fuzzy.

CO3: gain sound knowledge about set operations.

CO4: analyze the fuzzy arithmetic.

CO5: enlightened to construct the fuzzy sets with multiple experts.

Mapping of Cos with Pos and PSOs:

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	2	3	3	2	2	3	2	2
CO2	2	3	3	3	2	3	2	2	2
CO3	3	2	3	2	2	3	2	3	2
CO4	3	2	2	3	2	2	3	2	3
CO5	3	3	2	2	3	3	2	2	3

Question Paper Pattern

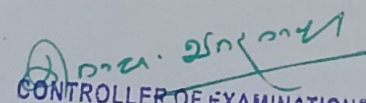
Maximum Marks: 75

Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

Part C: $3 \times 10 = 30$ (Three out of Five - One question from each unit)


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THANJAVUR-613 005.


Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		THEORY OF NUMBERS					
Paper Number		EC1B					
Category	EC	Year	I	Credits	6	Course Code	BPMAECB
		Semester	I				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		5	1	--	6		
Objectives of the Course		1. To expose the students to the fascination, facts and touch in the world of numbers. 2. To highlight some of the Applications of the Theory of Numbers.					
Course Outline		UNIT I : Fundamentals of Congruence's: Basic properties of Congruence's – Residue Systems – Solving Congruence's: Linear Congruence's – The Theorems of Fermat and Wilson Revisited. UNIT II : The Chinese Remainder Theorem – Polynomial Congruence's. Arithmetic functions: Combinatorial study of $\Phi(n)$ – Formulae for $d(n)$ and $\sigma(n)$ – Multiplicative Arithmetic functions – The mobius Inversion formula. UNIT III : Quadratic Residues: Euler's criterion – The Legendre symbol – The Quadratic reciprocity law – Applications of the Quadratic reciprocity law. UNIT IV : Sums of Squares: sums of two squares – Sums of Four Squares – Elementary Partition theory: Graphical representation – Euler's partition theorem – Searching for partition identities. UNIT V: Partition Generating Function: Infinite products as Generating functions –Identities between infinite series and Products. Partitions Identities : History and Introduction – Euler's Pentagonal number theorem.					
Extended Professional Component(is a part of internal component only ,Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Recommended Text		[1] George E. Andrews, Number theory, Dover Publication, INC, New York, Reprint 2013. UNIT I : Chapter 4 (sections 4.1, 4.2) and Chapte5 (sections 5.1, 5.2)					

Dr.K. ELANGO VAN

Head & Associate Professor

Department of Mathematics

Rajah Serfoji Govt. College (Auton

Thanjavur - 613005

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	UNIT II: Chapter 5 (sections 5.3,5.4) and Chapter 6(sections 6.1 to 6.4) UNIT III : Chapter 9 (sections 9.1 to 9.4) UNIT IV : Chapters 11 and 12 UNIT V : Chapter 13 and Chapter 14 (sections 14.1, 14.2)
Reference Books	[1] Dr. Sudhir Pundir and Dr. Rimple Pundir, Theory of Numbers, First Edition, Pragasiprakashan Publications, 2006. [2] Gareth A. Jones and J. Mary Jones, Elementary Number Theory, Springer Verlag, Indian Reprint, 2005. [3] David M. Burton, Elementary Number theory, 6 th edition, McGraw Hill, 2007. [4] J. William, Fundamentals of Number Theory, Leveque, Addison-Wesley Publishing Company, Phillipines, 1977.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics ,

Course Outcome

Students will be able to

CO1: Basic properties of congruence's and solving congruence's.

CO2: Basic properties of congruence's and solving congruence's.

CO3: Identify the Legendre symbol and applications of the quadratic reciprocity law.

CO4: Evaluate the Sums of Squares and elementary partition theory.

CO5: Discuss the Partition generating function and partitions identities.

Mapping of Cos with Pos and PSOs:

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

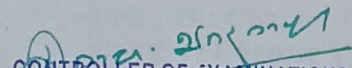
Maximum Marks: 75

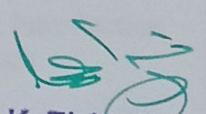
Examination Duration: 3Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

Part C: $3 \times 10 = 30$ (Three out of Five – One question from each unit)


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Dr.K. ELANGO VAN
 Head & Associate Professor
 Department of Mathematics
 Rajah Serfoji Govt. College (Autonomous)
 Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		MATLAB					
Paper Number		EC1C					
Category	EC	Year	I	Credits	6	Course Code	BPMAECC
		Semester	I				
Instructional Hours per week	Lecture		Tutorial		Lab Practice		Total
	5		1		--		6
Objectives of the Course		To develop the practical skills to solve Mathematical problems using MATLAB. To enable the students to learn many of MATLAB commands and how to use them in programming.					
Course Outline		Unit I: Introduction – Basics of MATLAB, Input – Output, File types – Platform dependence – General commands. Unit II: Interactive Computation: Matrices and Vectors – Matrix and Array operations – Creating and Using Inline functions – Using Built-in Functions and On-line Help – Saving and loading data – Plotting simple graphs. Unit III: Programming in MATLAB: Scripts and Functions – Script files – Functions files-Language specific features – Advanced Data objects. Unit IV: Applications – Linear Algebra – Curve fitting and Interpolation – Data analysis and Statistics – Numerical Integration – Ordinary differential equations – Nonlinear Algebraic Equations. Unit V: Graphics: Basic 2-D Plots–Using sub plot to Layout multiple graphs - 3 – D Plots– Handle Graphics – Saving and printing Graphs – Errors.					
Extended Professional Component(is a part of internal component only ,Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Recommended Text		Rudra Pratap, Getting Started with MATLAB – A Quick Introduction for Scientists and Engineers, Oxford University Press, 2003. UNIT I: Chapter I (1.1 – 1.6) UNIT II: Chapter III (3.1 – 3.5) UNIT III : Chapter III (3.6-3.8) UNIT IV: Chapter IV (4.1 – 4.4) UNIT V: Chapter V (5.1 - 5.3)					

25/01/2024

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Head & Associate Prof

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Reference Books	1. William John Palm, Introduction to Matlab7 for Engineers, McGraw-Hill Professional, 2005. 2. Dolores M. Etter, David C. Kuncicky, Introduction to MATLAB7, Prentice Hall, 2004
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwwweb/Mathematics ,

Course Outcome

Students will be able to

CO1: Based on the programs for higher degrees and solving Linear programming problems.

CO2: Solving equation of higher degrees using Bisection method.

CO3: Solving system of equations by matrix method and find the eigen values, eigen vectors of a matrix of order 4 by 4 and system of non-linear equations and Gauss Jacobi iteration Method.

CO4: Creating and plotting 2-D and 3-D graphs and find the integration using Simpsons 3/8 rule.

CO5: Solving ordinary differential equations using Runge- Kutta Fourth order method.

Mapping of Cos with Pos and PSOs:

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

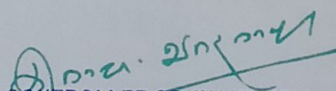
Maximum Marks: 75

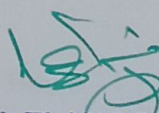
Examination Duration: 3Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

Part C: $3 \times 10 = 30$ (Three out of Five – One question from each unit)


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RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.


Dr. K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		PROGRAMMING IN C++ AND LATEX - LAB					
Paper Number		EC2D					
Category	EC	Year	I	Credits	6	Course	BPMAECD
		Semester	II			Code	
Instructional Hours per week		Lecture		Tutorial	Lab Practice	Total	
					6	6	
Objectives of the Course		To Understand fundamental programming concepts of C++ and Latex & observe basic programming concepts and packages for data analysis.					
Course Outline		1. Write a function in C++ to generate a Fibonacci Series o f ‘n’ Number. 2. Develop a program in C++ for finding the largest of any three given numbers using Macro Definition. 3. How to find the nCr value which returns the factorial of a given number using the function call in the expression? 4. Write a program in C++ using function overloading to read two matrices of different data such as integers and floating – point numbers. Find out the sum of the above two matrices separately and display the total sum of these arrays individually. 5. Write an object – oriented program in C++ to read an integer number and find the sum of the all digits until it reduces to a single digit using constructor, destructor, default constructor and inline member functions. 6. Develop a program in C++ to add two complex numbers and display all the three number. 7. Use operator overloading write a program in C++ to demonstrate function by students result. 8. Create a Latex document for the given Mathematical Expression. 9. Create a Latex document that contains the following: Title – Author’s name –Abstract – Introduction– Sections – Tables and Bibliography. 10. Construct a Latex document using sums, integrals and limits.					

Question Paper Pattern

Maximum Marks: 75

Examination Duration: 3 Hours

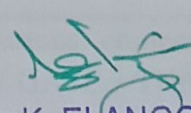
Answer All The Questions

1 X 15 = 15 Marks

2 x 25 = 50 Marks

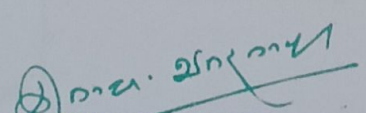
Record = 5 Marks

Viva voce = 5


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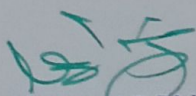
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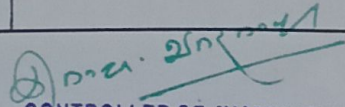
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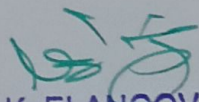

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(For students admitted from 2026- 2027)

Title of the Course		PROGRAMMING IN SCI LAB					
Paper Number		EC2E					
Category	EC	Year	I	Credits	6	Course Code	BPMAECE
		Semester	II				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Objectives of the Course		1. To make the students learn the art of typing mathematics text on their own. 2. To inculcate professional training required to become a scholar in mathematics.					
Course Outline		UNIT I : An Introduction to Scilab: Introduction – Getting Started- Using Scilab as a calculator - Basic Elements of Scilab as a Programming Language - Input and output of Mathematical values in Scilab - Suppressing the display of output - Dynamic nature of variable in Scilab - Functions to manage complex numbers – Booleans. UNIT II: Matrices: Vectors - Operations on Vectors – Element-wise product or dot product (.*)-, division of vectors, - power of vectors (.^)- - Two-dimensional matrices - Operations on matrices - Functions on matrices UNIT III: Scilab Programming: Branching statements – Looping statements - The while statement. UNIT IV: Plotting: The 2-dimensionalplot – Contour plot - The 3-dimensional plot (Surface plot) - Titles, axis, legends and Style options. UNIT V: Polynomials in Scilab: Defining polynomials - Matrices of polynomials - Operations on polynomials or matrices of polynomials - Evaluation of polynomials.					
Extended Professional Component(is a part of internal component only ,Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					


Dr.K. ELANGOVA
Head & Associate Prof.


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 THANJAVUR-613 005.


Dr.K. ELANGO VAN
 Head & Associate Professor
 Department of Mathematics
 Rajah Serfoji Govt. College (Autonomous)
 Thanjavur - 613005

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Recommended Text	1. Dr. AKHILESHKUMAR PROGRAMMING USING SCILAB,THEORY & PRACTICALS. Copyrights reserved with the author-2022 UNIT I : Chapter 1 (Sections 1.1 to 1.4) UNIT II : Chapter 2 (Sections 2.1 to 2.2) UNIT III : Chapter 3 (Sections 3.1 to 3.2) UNIT IV : Chapter 5 (Sections 5.1 to 5.4) UNIT V : Chapter 7 (Sections7.1 to 7.4)
Reference Books	1. Computing in Scilab, Chetana Jain, Cambridge University press Publication, New Delhi. 2. SCILAB:A Beginner's approach, Anil Kumar Verma, Cengage Learning India Pvt. Ltd., Uttar Pradesh.
Website and e-Learning Source	https://scilab.in/ , https://www.scilab.org/scilab-for-beginners-tutorial/ , https://swayam.gov.in/

Question Paper Pattern

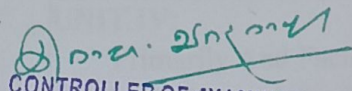
Maximum Marks: 75

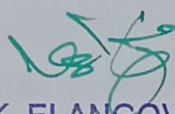
Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

Part C: $3 \times 10 = 30$ (Three out of Five – One question from each unit)


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Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		CRYPTOGRAPHY					
Paper Number		EC2F					
Category	EC	Year	I	Credits	6	Course Code	BPMAECF
		Semester	II				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Objectives of the Course		To provide deeper understanding into cryptography, its specification to networks and counter measures. To explain various approaches to Encryption Techniques and Message Authentication Codes. It is familiarize Digital Signature Standard and provide solutions for their issues with cryptographic techniques for secure communications of two parties over an insecure channel.					
Course Outline		UNIT I: Cryptography -Some Simple Crypto systems–Enciphering Matrices.					
		UNIT II : Public Key- The Idea of Public Key Cryptography – RSA- Discrete Log					
		UNIT III: Primarily And Factoring – Pseudo primes – The rho Method –Fermat factorization and factor bases.					
		UNIT IV: Primarily And Factoring- The Continued Fraction Method – The Quadratic Sieve Method.					
		UNIT V: Elliptic Curves – Basic facts - Elliptic Curve Crypto systems– Elliptic curve Primality Test.					
Extended Professional Component(is a part of internal component only ,Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Recommended Text		Neal Koblitz, A Course in Number Theory and Cryptography, Springer, Second Edition. UNIT I: Chapter 3 (Sec 3.1, 3.2) UNIT II: Chapter 4 (Sec 4.1 – 4.3) UNIT III: Chapter 5 (Sec 5.1 –5.3) UNIT IV: Chapter 5 (Sec 5.4, 5.5) UNIT V: Chapter 6 (Sec 6.1 –6.3)					

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Reference Books	H.C.A.VanTilborg, An Introduction to Cryptography, Kluwer Academic Publishers, Boston/ Dordrecht/Lancaster, 1988.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwwweb/Mathematics ,

Course Outcome

Students will be able to

CO1: Recall the basic concepts of the enciphering and deciphering messages, enciphering matrices and digraphs.

CO2: Defining private and public key crypto-systems, applying RSA algorithm and Discrete Log.

CO3: Explaining Pseudo primes, Euler Pseudo prime, Analyzing Factor base and Fermat Factorization method.

CO4: Evaluating continued Fraction method and Quadratic sieve method.

CO5: Design a security solution for a given application.

Mapping of Cos with Pos and PSOs:

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

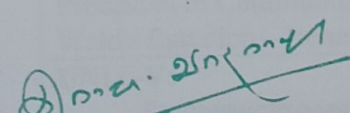
Maximum Marks: 75

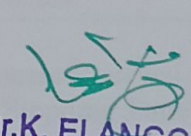
Examination Duration: 3Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

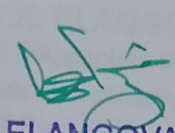
Part C: $3 \times 10 = 30$ (Three out of Five – One question from each unit)


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RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.


Dr.K. ELANGOVAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613 005

(For students admitted from 2026- 2027)

Title of the Course		STOCHASTIC PROCESSES					
Paper Number		EC3G					
Category	EC	Year	II	Credits	6	Course Code	BPMAECG
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Objectives of the Course		1. To study the basic concept from the theory of Markov chain and their properties. 2. To study the states in Markov chain in discrete state 3. To understand the concepts of Renewal Process, Theorems and Equations 4. To learn more about several queuing models with time series and their Performance Measures.					
Course Outline		UNIT-I : Stochastic processes: Some notions - Introduction- Specification of stochastic processes – stationary processes – Martingales– Difference equation: Differentiable-Difference equations. Markov chain - Definition and examples – High transition probabilities.					
		UNIT-II : Generalization of independent Bernoulli trials: sequence of chain dependent trails – Classification of states and chain: Determination of higher transition probabilities – Stability of Markov system – Graph theoretic approach – Markov chain with denumerable number of states.					
		UNIT-III : Markov processes with discrete state space: Poisson process and its extensions: Poisson process – Poisson process and related distributions – Generalizations of Poisson process – Birth death process.					
		UNIT-IV : Renewal Processes and Theory -Renewal Process-Renewal Processes in Continuous Time-Renewal Equation- Stopping Time: Wald's Equation – Renewal Theorems					
		UNIT-V: Stochastic Processes in Queuing system: General concepts– The queuing model M/M/1 : Steady state behavior. Transient behavior of M/M/1 model – Birth and death processes - The model M/M/S.					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					


Dr.K. ELANGO VAN
Head & Associate Professor

(For students admitted from 2026-2027)

Recommended Text	Scope and Treatment as in Stochastic Processes, J. Medhi, Wiley Eastern Limited. UNIT-I : Chapter 2 (Sec2.1-2.4),&Chapter3(Sec3.1,3.2) UNIT-II : Chapter 3 (Sec3.3-3.8) UNIT-III : Chapter 4 (Sec4.1-4.4) UNIT-IV : Chapter 6 (Sec: 6.1-6.5) UNIT-V : Chapter 10 (Sec 10.1- 10.3, 10.4 (only10.4.1, 10.4.2, 10.4.2.1))
Reference Books	1. A First course in Stochastic Process, S.Kqrlinand M.Taylor, Second Edition, Academic Press, New york (1975). 2. ElementsofAppliedStochasticprocesses,U.N.Bhrt,2 nd edition, Wiley, New York(1968)
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics ,

Course Outcome

Students will be able to

CO1:Understand the deviations involving conditional probability distributions and conditional expectations.

CO2: Classify the classes of states in Markov chain and characterize the class.

CO3:To solve the derivation of the differential equations for time continuous Markov processes with discrete state space.

CO4:Understand the Renewal processes.

CO5:Using the queuing theory models of time series in Statistics.

Mapping of Cos with Pos and PSOs:

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

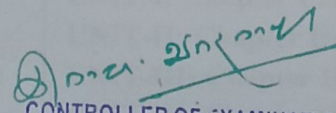
Maximum Marks: 75

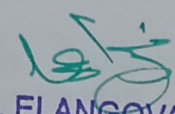
Examination Duration:3 Hours

Part A:10 ×2= 20 (Two Questions from each unit)

Part B: 5×5= 25 (Either/ Or type—One question from each unit)

Part C:3× 10=30(Three out of Five – One question from each unit)


CONTROLLER OF EXAMINATIONS
RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.


Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026-2027)

Title of the Course		DIFFERENTIAL GEOMETRY					
Paper Number		EC3H					
Category	EC	Year	II	Credits	6	Course Code	BPMAECH
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre-requisite		Linear Algebra concepts and Calculus					
Objectives of the Course		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					
Course Outline		UNIT-I: Space curves: Definition of a space curve–Arc length– tangent – normal and bi-normal – curvature and torsion .					
		UNIT-II : Intrinsic properties of a surface: Content between curves and surfaces – tangent surface -involute and evolutes – Intrinsic equations – Fundamental Existence Theorem for space curves - Helies					
		UNIT-III : Intrinsic properties of a surface: Definition of a surface – curves on a surface – Surface of revolution – Helicoids – Metric.					
		Unit IV: Direction coefficients – families of curves – Isometric correspondence – Intrinsic properties.					
		UNIT-V : sGeodesics: Geodesics – Canonical geodesic equations – Normal property of geodesics- Existence Theorems - Geodesic parallels – Geodesics curvature- Gauss- Bonnet Theorem – Gaussian curvature- surface of constant curvature.					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Skills acquired from this course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill UNIT-I: Chapter I : Sections 1 to 5. UNIT-II: Chapter I: Sections 6 to 9. UNIT-III: Chapter II: Sections 1 to 5. UNIT-IV: Chapter II: Sections 6 to 9. UNIT-V: Chapter II :Sections 10 to 18.					

(For students admitted from 2026- 2027)

Recommended Text	T.J. Willmore, <i>An Introduction to Differential Geometry</i> , Oxford University Press, (17 th Impression) New Delhi 2002. (Indian Print)
Reference Books	1. Struik, D.T. <i>Lectures on Classical Differential Geometry</i>, Addison – Wesley, Mass. 1950. 2. Kobayashi.S.and Nomizu.K. <i>Foundations of Differential Geometry</i>, Inter science Publishers, 1963. 3. Wilhelm Klingenberg: <i>A course in Differential Geometry</i>, Graduate Texts in Mathematics, Springer-Verlag 1978. 4. J.A.Thorpe <i>Elementary topics in Differential Geometry</i>, Under-graduate Texts in Mathematics, Springer - Verlag 1979.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics , http://www.opensource.org , www.physicsforum.com

Course Outcome

Students will be able to

CO1: Explain space curves, Curves between surfaces, metrics on a surface, fundamental form of a surface and Geodesics.

CO2: Evaluate these concepts with related examples.

CO3: Compose problems on geodesics.

CO4: Recognize applicability of developable.

CO5: Construct and analyze the problems on curvature and minimal surfaces.

Mapping of Cos with Pos and PSOs:

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

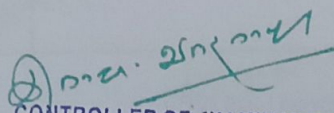
Maximum Marks: 75

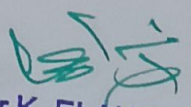
Examination Duration: 3 Hours

Part A: 10 x 2 = 20 (Two Questions from each unit)

Part B: 5 x 5 = 25 (Either / Or type – One question from each unit)

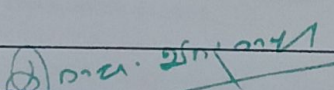
Part C: 3 x 10 = 30 (Three out of Five - One question from each unit)

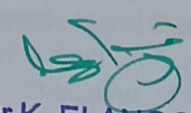

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 THANJAVUR-613 005.


 Dr. K. ELANGO VAN
 Head & Associate Professor
 Department of Mathematics
 Rajah Serfoji Govt. College (Autonomous)
 Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		MATHEMATICAL STATISTICS					
Paper Number		EC3I					
Category	EC	Year	II	Credits	6	Course Code	BPMAECI
		Semester	III				
Instructional		Lecture		Tutorial		Lab Practice	Total
Hours per week		5		1		--	6
Objectives of the Course		To study probability mass/density functions, mathematical expectations, moment generating functions, marginal and conditional distributions, some special distributions, limiting distribution and the Central Limit Theorem. The basic knowledge on statistics at UG level. After completing this course, the student will be able to understand mathematical expectations, marginal and conditional distributions, the gamma and chi-square distributions, the t & F distributions and their applications, moment generating function technique and the Central Limit Theorem.					
Course Outline		UNIT I: The probability function – Random variables – Probability density function – Distribution function – Mathematical expectation – Special Mathematical Expectations – Chebyshev's Inequality.					
		UNIT II: Conditional probability – Marginal and conditional distributions. Some special distributions: The Binomial, Trinomial and Multinomial distributions–The Poisson distribution					
		UNIT III: The Gamma and Chi-Square Distributions – The Normal distribution- Distributions of functions of random variables - Sampling theory – Transformations of variables of the discrete type.					
		UNIT IV:					


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 Head & Associate Professor
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 Rajah Serfoji Govt. College (Autonomous)
 Thanjavur - 613005

(For students admitted from 2026- 2027)

Recommended Text	[1] Robert V. Hogg and Allen T. Craig, Introduction to Mathematical Statistics (Fourth Edition). UNIT I: Chapter 1 (Sections 1.4 – 1.7, 1.9-1.11) UNIT II : Chapters 2 and 3 (Sections 2.1, 2.2 and 3.1, 3.2) UNIT III : Chapters 3 and 4 (Sections 3.3, 3.4 and 4.1, 4.2) UNIT IV : Chapter 4 (Sections 4.4, 4.6-4.8) UNIT V : Chapters 5 (Sections 5.1, 5.3-5.5)
Reference Books	1. M.Fisz, Probability theory and Mathematical statistics, John Wiley & sons, New York, 1963. 2. E.J.Dudewicz and S.N.Mishra, Modern Mathematical Statistics, John Wiley & sons, New York, 1988. 3. V.N.Rohatgi, An introduction to Probability theory and Mathematical statistics, Wiley Eastern Limited, New Delhi, 1988.
Website and e-Learning Source	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics, http://www.opensource.org, www.physicsforum.com

Course Outcome

Students will be able to

CO1: Find the Mathematical expectation, Special mathematical expectations and Chebyshev's Inequality.

CO2: Demonstrate the Conditional probability and Binomial, Poisson distribution

CO3: Compute the Gamma and Chi-Square Distributions.

CO4: Analyze the t and F distribution and The distributions of X and $nS^2/2$.

CO5: Evaluate the Limiting moment generating functions and discuss the Central limit theorem.

Mapping of Cos with Pos and PSOs:

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

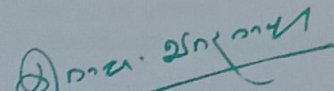
Maximum Marks: 75

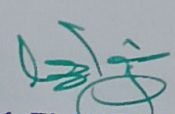
Examination Duration: 3Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

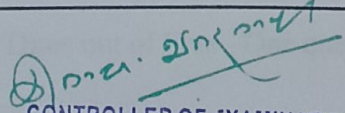
Part C: $3 \times 10 = 30$ (Three out of Five – One question from each unit)

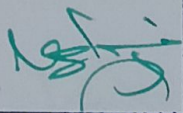

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 THANJAVUR-613 005.


Dr.K. ELANGO VAN
 Head & Associate Professor
 Department of Mathematics
 Rajah Serfoji Govt. College (Autonomous)
 Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		FUZZY SETS AND THEIR APPLICATIONS						
Paper Number		EC4J						
Category	EC	Year	II	Credits	6	Course Code	BPMAECJ	
		Semester	IV					
Instructional Hours per week		Lecture		Tutorial		Lab Practice		Total
		5		1		--		6
Pre-requisite		Basics of Set Theory concepts						
Objectives of the Course		This course introduces advanced topics in Linear and non-linear Programming						
Course Outline		Unit I Fuzzy sets: Fuzzy sets – Basic types – Basic concepts - Characteristics – Significance of the paradigm shift – Additional properties of α - Cuts						
		Unit II Fuzzy Sets Versus CRISP Sets: Representation of Fuzzy sets – Extension principle of Fuzzy sets – Operation on Fuzzy Sets – Types of Operation – Fuzzy complements.						
		Unit III Operations on Fuzzy Sets: Fuzzy intersection – t-norms, Fuzzy unions – t conorms – Combinations of operations –Aggregation operations.						
		Unit IV Fuzzy Arithmetic: Fuzzy numbers – Linguistic variables – Arithmetic operation on intervals – Lattice of Fuzzy numbers						
		Unit V Constructing Fuzzy Sets: Methods of construction: An overview – Direct methods with one expert – Direct method with multiple experts – indirect method with multiple experts and one expert–Construction from sample data.						
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)						


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 Rajah Serfoji Govt. College (Autonomous)
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Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	G.J. Klir, and Bo Yuan, Fuzzy Sets and fuzzy Logic: Theory and Applications, Prentice Hall of India Ltd., New Delhi, 2005. Unit I : (Chapter 1: Sections 1.3 to 1.5 and Chapter 2: Sections 2.1) Unit II : (Chapter 2: Sections 2.2 to 2.3 and Chapter 3: Sections 3.1 to 3.2) Unit III : (Chapter 3: Sections 3.3 to 3.6) Unit IV : (Chapter 4: Sections 4.1 to 4.4) Unit V : (Chapter 10: Sections 10.1 to 10.7)
Reference Books	1. H.J.Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers, Chennai, 1996. 2. A. Kaufman, Introduction to the Theory of Fuzzy Subsets, Academic Press, New York, 1975. 3. V. Novak, Fuzzy Sets and Their Applications, Adam Hilger, Bristol, 1969.
Website and e-Learning Source	http://mathforum.org http://ocw.mit.edu/ocwwweb/Mathematics

Course Outcome

Students will be able to

CO1: learn the basic concepts of fuzzy sets and characters.

CO2: understand the fuzzy set by compare it with crisp set and basic operations of fuzzy.

CO3: gain sound knowledge about set operations.

CO4: analyze the fuzzy arithmetic.

CO5: enlightened to construct the fuzzy sets with multiple experts.

Mapping of Cos with Pos and PSOs :

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	3	3	3	3	3	3	3	3
CO2	3	2	2	1	2	2	3	2	3
CO3	3	3	3	2	3	3	3	3	3
CO4	3	1	3	3	3	3	3	2	3
CO5	3	2	3	3	3	3	3	3	3

Question Paper Pattern

Maximum Marks: 75

Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

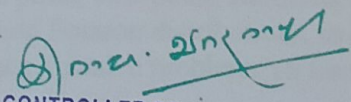
Part C: $3 \times 10 = 30$ (Three out of Five - One question from each unit)

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THANJAVUR-613005.

Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		PROBABILITY THEORY					
Paper Number		EC4K					
Category	EC	Year	II	Credits	6	Course Code	BPMAECK
		Semester	IV				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Objectives of the Course		To introduce axiomatic approach to probability theory, to study some statistical characteristics, discrete and continuous distribution functions and their properties, characteristic function and basic limit theorems of probability.					
Course Outline		UNIT-I : Random Events and Random Variables: Random events – Probability axioms – Combinatorial formulae – conditional probability– Bayes Theorem–Independent events– Random Variables – Distribution Function–Joint Distribution– Marginal Distribution – Conditional Distribution					
		UNIT-II: Parameters of the Distribution: Expectation-Moments–The Chebyshev Inequality –Absolute moments– Order parameters – Moments of random vectors					
		UNIT-III: Characteristic functions : Properties of characteristic functions – Characteristic functions and moments – semi0invariants – characteristic function of the sum of the independent random variables – Determination of distribution function by the Characteristic function – Characteristic function of multidimensional random vectors – Probability generating functions.					
		UNIT-IV : Some Probability distributions: One point , two point, Binomial – Polya–Hyper geometric–Poisson(discrete) distributions – Uniform – normal gamma – Beta –					
		UNIT-V: Limit Theorems: Stochastic convergence–Bernaulli law of large numbers–Convergence of sequence of distribution functions – Levy - Cramer Theorems – De Moivre's -Laplace Theorem – Poisson, Chebyshev, Khintchine Weak law of large numbers – Lindberg Theorem					


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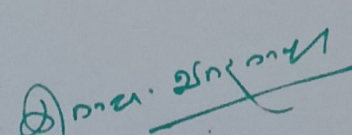
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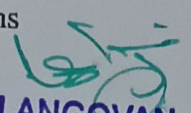
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	M.Fisz, Probability Theory and Mathematical Statistics, John Wiley and Sons, New York, 1963. UNIT-I : Chapter 1: Sections 1.1 to 1.7 & Chapter 2: Sections 2.1 to 2.7 UNIT-II : Chapter 3: Sections 3.1 to 3.6 UNIT-III: Chapter 4: Sections 4.1 to 4.7 UNIT-IV : Chapter 5: Section 5.1 to 5.9 UNIT-V : Chapter 6: Sections 6.1 to 6.4, 6.6 to 6.8
Reference Books	1. R.B. Ash, Real Analysis and Probability, Academic Press New York, 1972 2. K.L. Chung, A course in Probability, Academic Press, New York, 1974. 3. R. Durrett, Probability: Theory and Examples, (2 nd Edition) Duxbury Press, New York, 1996. 4. V.K. Rohatgi, An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi, 1988.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics , http://www.opensource.org , http://www.probability.net

Course Outcome

Students will be able to

- CO1:** To define Random Events, Random Variables, to describe Probability, to apply Bayes, to define Distribution Function, to find Joint Distribution function, to find Marginal Distribution and Conditional Distribution function, to solve functions on random variables.
- CO2:** To define Expectation, Moments and Chebyshev Inequality, to solve Regression of the first and second types.
- CO3:** To define Characteristic functions, to define distribution function, to find probability generating functions, to solve problems applying characteristic functions
- CO4:** To define One point, two-point, Binomial distributions, to solve problems of Hyper geometric and Poisson distributions, to define Uniform, normal, gamma, Beta distributions, to solve problems on Cauchy and Laplace distributions


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CO5: To discuss Stochastic convergence, Bernaulli law of large numbers, to elaborate Convergence of sequence of distribution functions, to prove Levy - Cramer Theorems and De Moivre's-Laplace Theorems, to explain Poisson, Chebyshev, Khintchine Weak law of large numbers, to explain and solve problems on Kolmogorov Inequality and Kolmogorov Strong Law of large numbers.

Mapping of Cos with Pos and PSOs:

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

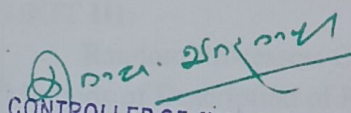
Maximum Marks: 75

Examination Duration: 3 Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

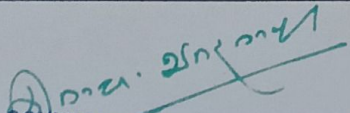
Part C: $3 \times 10 = 30$ (Three out of Five - One question from each unit)


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Head & Associate Professor
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Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026- 2027)

Title of the Course		RANDOM PROCESS					
Paper Number		EC4L					
Category	EC	Year	II	Credits	6	Course Code	BPMAECL
		Semester	IV				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Objectives of the Course		1. Probability Rules: Teach basic axioms, set theory, and discrete/continuous random variables. 2. Multiple Variables: Explain joint distributions, expected values, and moments. 3. Spectral Analysis: Estimate power spectral density and autocorrelation functions.					
Course Outline		UNIT I: Random Variables: Discrete and continuous random variables – Probability Function – Probability Density Function – Cumulative Distribution Function (cdf) –Properties of cdf $F(x)$ – Special Distribution – Discrete Distribution – Continuous Distribution.					
		UNIT II: Two-Dimensional Random Variables –Probability Function of (X,Y) – Joint Probability Density Function – Properties of $F(x,y)$ - Marginal and conditional distributions – Independent RVs – Random Vectors -Functions of Random Variables: Function of One Random Variable – One Function of Two Random Variables - Two Functions of Two Random Variables.					
		UNIT III: Random Processes: Classification of Random Process – Methods of Description of Random Process – Special Classes of Random Process -Stationary –Analytical Representation of Random Process –Auto-correlation and Cross-Correlation Function and its Properties.					
		UNIT IV: Ergodicity – Mean-Ergodic Process – Mean-Ergodic Theorem – Correlation Ergodic Process – Distribution Ergodic Process – Power Spectral Density function – Properties of Power Spectral Density function– Systems in the form of Convolution – Unit Impulse Response of the System – Properties.					
		UNIT V: Special Random Process: Poisson Process – Probability Law for the Poisson Process $\{X(t)\}$ – Second order Probability Function of a Homogeneous Poisson Process - Mean and Autocorrelation of Poisson Process – Properties of Poisson Process – Markov Process – Markov Chain – Classification of States of a Markov Chain.					
Extended		Questions related to the above topics, from various competitive					


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Professional Component(is a part of internal component only ,Not to be included in the External Examination question paper)	examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Recommended Text	T. Veerarajan , Probability, Statistics and Random Processes, TataMc Graw-Hill Publishing Company Ltd. (2006). UNITI: Chapter2(Page36–54) UNIT II: Chapter2 (Page58–62 &89– 93) UNITIII:Chapter7(Page338–360) UNIT IV:Chapter7(Page360 –393) UNITV:Chapter8 (Page434– 465)
Reference Books	1. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 4th Edition, New Delhi, 2002. 2. Miller. S.L. and Childers. D.G., -Probability and Random Processes with Applications to Signal Processing and Communications ", Academic Press, 2004. 3. Ibe, O.C., " Fundamentals of Applied Probability and Random Processes ", 1st Indian Reprint, Elsevier, 2007.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics ,

Course Outcome

Students will be able to

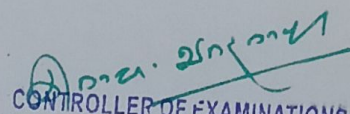
CO1: Build the knowledge of random variables and functions on it.

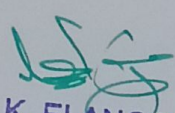
CO2: To understand the basic concepts of one- and two-dimensional random variables and to introduce some standard distributions applicable to real life phenomenon.

CO3: To understand the basic concepts of random processes which are widely used in IT fields.

CO4: To understand the concept of correlation and spectral random processes.

CO5: Students attain a clear understanding random process and Ergodic Process.


CONTROLLER OF EXAMINATIONS
RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)
THANJAVUR-613 005.


Dr.K. ELANGO VAN
Head & Associate Professor
Department of Mathematics
Rajah Serfoji Govt. College (Autonomous)
Thanjavur - 613005

(For students admitted from 2026- 2027)

Mapping of Cos with Pos and PSOs:

PO	POs						PSOs		
CO	1	2	3	4	5	6	1	2	3
CO1	3	1	3	2	3	3	3	2	1
CO2	2	1	3	1	3	3	3	2	1
CO3	3	2	3	1	3	3	3	2	1
CO4	1	2	3	2	3	3	3	2	1
CO5	3	1	2	3	3	3	3	2	1

Question Paper Pattern

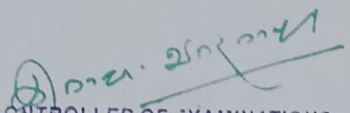
Maximum Marks: 75

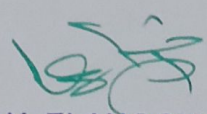
Examination Duration: 3Hours

Part A: $10 \times 2 = 20$ (Two Questions from each unit)

Part B: $5 \times 5 = 25$ (Either / Or type – One question from each unit)

Part C: $3 \times 10 = 30$ (Three out of Five – One question from each unit)


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