



**VIVEKANANDA COLLEGE**

TIRUVEDAKAM WEST, MADURAI DISTRICT - 625 234, TAMIL NADU

**Vision & Mission and PEOs, PSO's & POs**

**DEPARTMENT OF MATHEMATICS**

**Choice Based Credit System (CBCS)**

**and**

**Learning Outcomesbased Curriculum Framework  
(LOCF)**

## DEPARTMENT OF MATHEMATICS

**Vision:**

To raise a battalion of Maths graduates equipped with logical thinking and tender heart to serve our motherland as potential leaders in the manifold of national effort.

**Mission:**

Enriching the mental, emotional and intellectual facets of maths students to cope up with any career that they choose and to strive to attain perfection in life.

**Program Outcomes:****The Objective of this Programme is to**

P.No.	Programme Outcome	Description
PO1	Disciplinary Knowledge and Critical Thinking	Take informed actions after identifying the assumptions that frame our thinking and actions, checking out degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from perspectives.
PO2	Effective Communication and Digital Literacy	Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
PO3	Social Interaction and Problem Solving	Elicit views of others, mediate disagreements and help reach conclusions in group settings.
PO4	Effective Citizenship and Social Responsibility	Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering and life training.
PO5	Professional Ethics and Human Values	Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO6	Environment and Sustainability	Understand the issues of environmental contexts and Sustainable development.
PO7	Self –directed and life – long learning	Acquire the ability to engage in independent and life – long learning in the broadest context socio- technological changes

### Course Outcomes (Cos)

PART – III : <b>Course Theory</b>	Course Code: <b>05CT11</b>
Course Title: <b>ALGEBRA AND TRIGONOMETRY</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Define the basic concepts and get the knowledge about irrational and imaginary roots and transformations of equations.	K1
<b>CO 2</b>	Understand the basic concepts of reciprocal equations	K <sub>2</sub>
<b>CO 3</b>	find the approximate roots using Horner's method	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	To derive the expansions of $\sin\theta$ , $\cos\theta$ , $\tan\theta$ , $\sin n\theta$ , $\cos n\theta$ , $\tan n\theta$ , $\sin^n\theta$ , $\cos^n\theta$ .	K <sub>2</sub> , K <sub>3</sub>
<b>CO 5</b>	To understand the concept of the logarithm of complex numbers and to find the sum of trigonometric series using C+iS method summation of series.	K <sub>3</sub>

**K1**- Remembering      **K2** – Understanding      **K3** – Applying

PART – III : <b>Course Theory</b>	Course Code: <b>05CT12</b>
Course Title: <b>DIFFERENTIAL CALCULUS</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Define basic concepts and definitions of differentiation and explain the method of differentiation	K <sub>1</sub> , K <sub>2</sub>
<b>CO 2</b>	To get knowledge of successive differentiation and Leibnitz theorem.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 3</b>	Understand the concept of subtangent and subnormal which are important in physics and also the concept of envelope, a curve that is tangential to each one of a family of curves in a plane.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	To get the knowledge of radius of curvature ,which shows how a curve is almost part of a circle in a local region	K <sub>2</sub>
<b>CO 5</b>	Understand the concept of partial derivatives which are used in vector calculus and differential geometry.	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering      **K2** – Understanding      **K3** – Applying

PART – III : Course Theory	Course Code: <b>05CT21</b>
Course Title: <b>INTEGRAL CALCULUS</b>	

Upon successful completion of this course, the students will:

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Recall different formulae to find the integration of algebraic, rational, trigonometrical, exponential and logarithmic functions	K <sub>1</sub>
<b>CO 2</b>	Recognize the integration as the reverse process of differentiation	K <sub>2</sub>
<b>CO 3</b>	Compute the definite and indefinite integrals by using the techniques of integration	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Use the knowledge of multiple integrals for finding the volume and area	K <sub>2</sub> , K <sub>3</sub>
<b>CO 5</b>	Use integration to solve real world problems.	K <sub>3</sub>

**K1**- Remembering                      **K2** – Understanding                      **K3** – Applying

PART – III : Course Theory	Course Code: <b>05CT22</b>
Course Title: <b>ANALYTICAL GEOMETRY (3D) AND VECTOR CALCULUS</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Define basic concepts of coordinate system and planes. Equation of a straight line. Equation of a sphere. Basic concepts of vector differentiation and vector integration	K <sub>1</sub> , K <sub>2</sub>
<b>CO 2</b>	Know about the relation between the direction ratios and direction cosines of a line, different forms of the equation of a plane, equation of a straight line and equation of a sphere.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 3</b>	Find the angle between two planes, angle between a line and a plane, shortest distance between two lines and circle of intersection of two spheres.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Know about divergence and curl of a vector, solenoidal and irrotational vectors, Laplacian operator.	K <sub>2</sub>
<b>CO 5</b>	Get the knowledge of Green's theorem, Stoke's theorem and Gauss divergence theorem and application these theorems.	K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering                      **K2** – Understanding                      **K3** – Applying

**Vision & Mission, PEOs, PSOs and POs**

<b>PART – III : Allied Theory</b>	<b>Course Code: 05AT01</b>
<b>Course Title: ANCILLARY MATHEMATICS – I</b>	

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

<b>No.</b>	<b>Course Outcome</b>	<b>Knowledge Level (according to Bloom's Taxonomy)</b>
<b>CO 1</b>	Understand the expression of trigonometric functions and its hyperbolic functions.	K <sub>1</sub> , K <sub>2</sub>
<b>CO 2</b>	Acquire knowledge in solving problems in differential equations up to second order.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 3</b>	Acquire knowledge in solving problems in integral equations up to triple integral.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Understand the concepts involved in vector operators and its related problems.	K <sub>2</sub>
<b>CO 5</b>	Acquire knowledge in vector integration on basic theorems and its related problems.	K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering      **K2** – Understanding      **K3** – Applying

<b>PART – III : Course Theory</b>	<b>Course Code: 05AT02</b>
<b>Course Title: ANCILLARY MATHEMATICS – II</b>	

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

<b>No.</b>	<b>Course Outcome</b>	<b>Knowledge Level (according to Bloom's Taxonomy)</b>
<b>CO 1</b>	Understand the formation of differential equations and its different forms.	K <sub>1</sub> , K <sub>2</sub>
<b>CO 2</b>	Acquire knowledge in solving problems in differential equations of first order.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 3</b>	Acquire knowledge in solving problems in differential equations of higher order.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Understand the concepts involved in differential equations of homogeneous forms.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 5</b>	Acquire knowledge in solving problems in simultaneous differential equations and total differential equations.	K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering      **K2** – Understanding      **K3** – Applying

<b>PART – III : Allied Theory</b>	<b>Course Code: 05AT03</b>
<b>Course Title: ANCILLARY MATHEMATICS – III</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Understand the partial differential equations and solving its first order problems.	K <sub>1</sub> , K <sub>2</sub>
<b>CO 2</b>	Acquire knowledge in solving problems in different types of partial differential equations.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 3</b>	Acquire knowledge in Laplace transforms and its applications.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Acquire knowledge in Inverse Laplace transforms and its applications.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 5</b>	Acquire knowledge in Fourier series, Odd and Even functions and its related problems.	K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering      **K2** – Understanding      **K3** – Applying

<b>PART – III : Course Theory</b>	<b>Course Code: 05CT51</b>
<b>Course Title: STATISTICS</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Define the basic concepts of correlation and regression line. And also study the basic theorems.	K <sub>1</sub> ,K <sub>2</sub>
<b>CO 2</b>	Understand the concept of Probability, random variables and Boole's inequality.	K <sub>2</sub>
<b>CO 3</b>	Understand the concepts in Some special distributions and its applications.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Illustrate sampling and Testing of Hypothesis & apply the t-test, f-test.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 5</b>	Apply Chi-square test for population variance and goodness of fit.	K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering      **K2** – Understanding      **K3** – Applying

PART – III : Course Theory	Course Code: <b>05CT52</b>
Course Title: <b>MODERN ALGEBRA</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Understand the Relations and Mappings	K1
<b>CO 2</b>	Understand the groups and its properties	K <sub>2</sub>
<b>CO 3</b>	Apply the group properties in Order of an element	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Understand the Isomorphism and apply in its theorems	K <sub>2</sub>
<b>CO 5</b>	Apply the group properties in Rings and its elementary properties.	K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering                      **K2** – Understanding                      **K3** – Applying

PART – III : Course Theory	Course Code: <b>05CT53</b>
Course Title: <b>REAL ANALYSIS</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Understand the concepts of sets and its properties of elements.	K <sub>1</sub>
<b>CO 2</b>	Obtain the concepts of Open & Closed sets and its properties.	K <sub>2</sub>
<b>CO 3</b>	Develop the concepts about the metric on sets, spaces and functions.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Examine the concepts of metric on connected spaces and its applications.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 5</b>	Evaluate the concepts on compact metric spaces and its applications.	K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering                      **K2** – Understanding                      **K3** – Applying

<b>PART – III : Course Theory</b>	Course Code: <b>05CT54</b>
Course Title: <b>STATICS</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Remember the parallelogram law, triangle law, Lami's theorem and resolved parts.	K <sub>1</sub> , K <sub>2</sub>
<b>CO 2</b>	Explain the concept of like and unlike parallel forces, condition of equilibrium, Varignon's theorem and couples.	K <sub>1</sub> , K <sub>2</sub>
<b>CO 3</b>	Interpret the concept of system of coplanar forces and equation to the line of action of the resultant and apply it to various problems.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Illustrate the concept of Friction, laws of friction and equilibrium of a body and rough inclined plane and apply these concept problems	K <sub>2</sub> , K <sub>3</sub>
<b>CO 5</b>	Understand the concept of equilibrium of strings, equation of common catenary and geometrical properties of catenary apply it to various problems.	K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering

**K2** – Understanding

**K3** – Applying

<b>PART – III : Course Theory</b>	Course Code: <b>05EP5A</b>
Course Title: <b>LINEAR PROGRAMMING</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Gain basic concept ideas of LPP and forming mathematical model and solving LPP by graphically.	K <sub>1</sub> , K <sub>3</sub>
<b>CO 2</b>	Obtain the optimal solution for more than two variables in LPP by using simplex method.	K <sub>2</sub>
<b>CO 3</b>	Apply dual problem method to reduce the complexity of solving LPP.	K <sub>2</sub>
<b>CO 4</b>	Learning various method to solve transportation problem and find feasible and optimal solution.	K <sub>3</sub>
<b>CO 5</b>	Acquire fundamental knowledge and to find the optimal solution for assignment problem and game theory.	K <sub>3</sub>

**K1**- Remembering

**K2** – Understanding

**K3** – Applying



<b>PART – III : Course Theory</b>	Course Code: <b>05EP5B</b>
Course Title: <b>COMBINATORICS</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Relate and apply sum and product rules.	K1, K3
<b>CO 2</b>	Analyze and solve problems related to Permutation and Combination.	K3
<b>CO 3</b>	Make use of Inclusion-Exclusion Principle to solve problems on generalized permutation and combination	K3
<b>CO 4</b>	Demonstrate ordinary and exponential generating functions	K2
<b>CO 5</b>	Solve Problems using Recurrence Relations.	K3

**K1**- Remembering                      **K2** – Understanding                      **K3** – Applying

<b>PART – III : Course Theory</b>	Course Code: <b>05CT61</b>
Course Title: <b>LINEAR ALGEBRA</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Understand the basics concept in vector space and linear transformation.	K <sub>1</sub> ,K <sub>2</sub>
<b>CO 2</b>	Define inner product space & develop the concepts of vector inner product spaces in orthogonal and orthogonal complement.	K <sub>1</sub> , K <sub>3</sub>
<b>CO 3</b>	Explain the theory of matrices and different types and also apply to solve the inverse of a matrix and rank of a matrix.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Define simultaneous linear equation and apply to it in eigen values & eigen vectors.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 5</b>	Illustrate the matrix of a linear transformation and apply the bilinear forms and quadratic forms.	K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering                      **K2** – Understanding                      **K3** – Applying

<b>PART – III : Course Theory</b>	Course Code: <b>05CT62</b>
Course Title: <b>COMPLEX ANALYSIS</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Understand the basics in transformations or mappings on complex field among two different fields.	K <sub>1</sub>
<b>CO 2</b>	Obtain the Cauchy Riemann equations on analytic functions and its applications for some standard theorems.	K <sub>2</sub>
<b>CO 3</b>	Develop the concepts in Cauchy theorems in complex integrations and its applications.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Analysis the series expansions of different types and the concepts of singularities with its applications.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 5</b>	Evaluate the concepts of residues on analytic functions and the development of contour theorems using residues.	K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering

**K2** – Understanding

**K3** – Applying

<b>PART – III : Course Theory</b>	Course Code: <b>05EP61A</b>
Course Title: <b>GRAPH THEORY</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Remember the basic definitions like Graphs, Sub graphs, Degree of a vertex, Covering and Independent sets	K <sub>1</sub> , K <sub>2</sub>
<b>CO 2</b>	Facts and idea by the Degree sequence, Graphic sequence, connectedness of a graph.	K <sub>1</sub> , K <sub>2</sub>
<b>CO 3</b>	Giving description to the concept of Eulerian and Hamiltonian graphs and apply it to find whether the given graph is Eulerian or Hamiltonian.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Understand the concept of Matching apply it to prove the theorem like Halls marriage theorem.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 5</b>	Classify the concept of Colourability and chromatic number and apply it to solve problems like Four Colour Problem.	K <sub>2</sub> , K <sub>3</sub>

**K1**- Remembering

**K2** – Understanding

**K3** – Applying

<b>PART – III : Course Theory</b>	Course Code: <b>05EP6B</b>
Course Title: <b>CRYPTOGRAPHY</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Recall the fundamentals of cryptography	K1
<b>CO 2</b>	Demonstrate standard cryptographic algorithms used to analyze confidentiality, integrity and authenticity.	K2,K3
<b>CO 3</b>	List and Identify the security issues in the network, key distribution and management schemes.	K1, K3
<b>CO 4</b>	Design encryption techniques to secure data in transit networks.	K3
<b>CO 5</b>	Evaluate security mechanisms in theory of networks	K3

**K1**- Remembering                      **K2** – Understanding                      **K3** – Applying

<b>PART – III : Course Theory</b>	Course Code: <b>05EP62A</b>
Course Title: <b>OPERATION RESEARCH</b>	

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
<b>CO 1</b>	Remembering fundamental concepts of stock and its types and get more ideas about solving deterministic and probabilistic inventory model.	K1
<b>CO 2</b>	Understanding the different types queuing systems and its classifications.	K <sub>1</sub> , K <sub>2</sub>
<b>CO 3</b>	Construct the network diagram and applying network models in diverse simple real life problems.	K <sub>2</sub> , K <sub>3</sub>
<b>CO 4</b>	Apply Sequencing techniques for processing of jobs by machines in systematic manner.	K <sub>3</sub>
<b>CO 5</b>	Use the replacement policy methods, to estimate the replacement time when the value of money does not change with time and changes with time.	K <sub>3</sub>

**K1**- Remembering                      **K2** – Understanding                      **K3** – Applying

<b>PART – III : Course Theory</b>	<b>Course Code: 05EP6D</b>
<b>Course Title: FUZZY SETS</b>	

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

<b>No.</b>	<b>Course Outcome</b>	<b>Knowledge Level (according to Bloom's Taxonomy)</b>
<b>CO 1</b>	Explain the concept of fuzzy sets and crisp sets in brief	K2, K3
<b>CO 2</b>	Define operations and relations in fuzzy sets	K1
<b>CO 3</b>	Demonstrate the operations on fuzzy sets	K2
<b>CO 4</b>	Analyze the relationship among fuzzy measures	K3
<b>CO 5</b>	Apply fuzzy theory in Engineering, Management and Medicine	K3

**K1**- Remembering

**K2** – Understanding

**K3** – Applying