DAWARAKA DOSS GOVERDHAN DOSS VAISHNAV COLLEGE
(AUTONOMOUS)

DEPARTMENT OF MATHEMATICS WITH COMPUTER APPLICATIONS
(B.Sc. Mathematics with Computer Applications)
Programme Code : 36

CURRICULUM AND SCHEME OF EXAMINATIONS
Choice Based Credit System (CBCS)
(with effect from the academic year 2021-2022)

Signature of the HOD

Head
Department of Mathematics with
Computer Application
Dwaraka Doss Goverdhan Doss
Vaishnav College (Shift II)
Arumbakkam, Chennai-600 106.

Signature of the Principal

Dr.S.Santhosh Baboo, M.Sc., Ph.D.
Principal
Dwaraka Doss Goverdhan Doss
Vaishnav College (Autonomous)
Arumbakkam, Chennai-600 106.

COURSE STRUCTURE

FIRST SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext.Marks	Total
Part – I	Language Paper -I	5	3	40	60	100
Part - II	English Paper -I	4	3	40	60	100
Part - III	Core Paper-I: Algebra and Trigonometry	5	4	40	60	100
	Core Paper-II: Differential Calculus	4	4	40	60	100
	Core Paper-III: Programming with Python	9	4	40	60	100
	Core Paper-IV: Python Programming – Lab		4	40	60	100
Part - IV	Basic Tamil/Adv. Tamil/ Non Major Elective -I	1	2	40	60	100
	Soft Skills -I	2	3	50	50	100

SECOND SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext.Marks	Total
Part – I	Language Paper -II	5	3	40	60	100
Part - II	English Paper -II	5	3	40	60	100
Part - III	Core Paper-V: Analytical Geometry	4	4	40	60	100
	Core Paper-VI: Integral Calculus and Vector Analysis	5	4	40	60	100
	Core Paper-VII: Java and Data Structures	9	4	40	60	100
	Core Paper-VIII: Data Structures using Java – Lab		4	40	60	100
Part - IV	Basic Tamil/Adv. Tamil/ Non Major Elective -II	1	2	40	60	100
	Soft Skills -II	1	3	50	50	100

THIRD SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext.Marks	Total
Part – I	Language Paper -III	5	3	40	60	100
Part - II	English Paper -III	5	3	40	60	100
Part - III	Core Paper-IX: Differential Equations	5	4	40	60	100
	Core Paper-X: Operating Systems	4	4	40	60	100
	Allied Paper- I-Probability and statistics-I	9	5	40	60	100
Part - IV	Environmental Studies	1		EXAM IN THE IV SEMESTER		
	Soft Skills -III	1	3	50	50	100
	Extra disciplinary		2			

FOURTH SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext.Marks	Total
Part – I	Language Paper -IV	5	3	40	60	100
Part - II	English Paper -IV	5	3	40	60	100
Part - III	Core Paper-XI: Integral Transforms	4	4	40	60	100
	Core Paper-XII: Discrete Mathematics	5	4	40	60	100
	Allied Paper- II-Probability and statistics-II	9	5	40	60	100
	Internship		2			
Part - IV	Environmental Studies	1	2	40	60	100
	Soft Skills -IV	1	3	50	50	100
	Extra disciplinary		2			
	Value added course		2			

FIFTH SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext.Marks	Total
Part - III	Core Paper-XIII: Algebraic Structures	6	4	40	60	100
	Core Paper -XIV: Real Analysis-I	6	4	40	60	100
	Core Paper-XV: Mechanics	6	4	40	60	100
	Core Paper – XVI: Operations Research	6	4	40	60	100
	Core Paper - XVII: Web Technology	6	4	40	60	100
	Core Paper - XVIII: Web Technology – Lab		4	40	60	100
	Project		2			
Part - IV	Value Education		2	40	60	100
	Value added course		2			

SIXTH SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext.Marks	Total
Part - III	Core Paper-XIX: Linear Algebra	6	4	40	60	100
	Core Paper -XX: Real Analysis-II	6	4	40	60	100
	Core Paper-XXI: Functions of Complex variables	6	4	40	60	100
	Core Paper-XXII: Machine Learning with R	5	5	40	60	100
	Core Paper-XXIII: Open Source Technologies	7	5	40	60	100
	Core Paper-XXIV: Open Source Technologies – Lab		5	40	60	100
Part - V	Extension Activity		1			

Extra Disciplinary Course

- Financial Mathematics with R
- Numerical Methods

Project

Tally Table:

Subject	No. of Subjects	Total Marks	credits
Core – Theory Papers	24	2400	99
Allied Papers	2	200	10
Language	4	400	12
English	4	400	12
Soft skills	4	400	12
Non Major electives/ Basic Tamil	2	200	4
Environmental Science	1	100	2
Value Education	1	100	2
Extension Activity	1	100	1
Internship	1		2
Project	1		2
Value added course	2		4
Grand Total	39	3900	162

- 40 % CIA is applicable to all subjects except JOC, COP and SWAYAM courses which are considered as extra creditcourses.
- The students are advised to complete a **SWAYAM-MOOC** before the completion of the 3rd semester and the course completed should certificate be submitted to the HOD. Two credits will be given to the candidateswho have successfullycompleted.
- A **Field Trip** preferably relevant to the course should be undertaken every yea

Components of Continuous Internal Assessment

Components		Marks	Total
Theory			
CIA I	50	(50+50 = 100*.3)	50
CIA II	50	30	
Generic Activity		10	
Attendance		5	

Question paper pattern for End Semester Examinations

Knowledge Level	Section	Marks
K1	Section A Answer all the 10 Questions.	10x2 = 20 Marks
K2	Section B Answer all the 5 Questions (Each unit 2 questions either or pattern)	5x7 =35Marks
K3 and K4	Section C Q.No.16 is compulsory. Remaining two questions either or pattern.	3x15 = 45 Marks
	Total	**100 Marks**

- Question Paper pattern for Continuous Assessment Test, Modes of assessment for Generic activity and Value added course :

CIA Tests -I	Multiple choice questions
CIA- II	Descriptive: Section A: 7 x 2 = 14 (Answer any 7 out of 10) Section B: 3 x 7 = 21 (Answer any 3 out of 5) Section C : 1 x 15 = 15 (Answer any 1 out of 3) Total - 50 marks
Generic Activity	Conducting Seminars or Micro projects or Group discussion or Problem solving or Assignments.
Value Added Course	Conducting Group discussion or Paper Presentation or Seminars or viva.

FIRST SEMESTER

(SYLLABUS)

Course Title: Core Paper-I: Algebra and Trigonometry

…….

Course Code : 2 1 3 6 1 0 1	**Credits 04**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course objectives

- **To know about various methods to find the roots of the polynomial equations.**
- **To develop the ability to use binomial, exponential and logarithmic series.**
- **To develop the skills of the students in the area of matrices.**
- **To acquire the basic knowledge of circular and hyperbolic trigonometric functions,**
- **To understand how to separate a complex function into its real and imaginary parts and also various methods for the summation of series.**

Course Outcomes: At the end of the course, students will be able to

CO1	Evaluate summation of series using binomial, exponential and logarithmic series
CO2	Evaluate the sum of the powers of the given equation and also the relation between the roots and coefficients of an equation
CO3	Solve polynomial equations using Newton's Method and Horner's Method, Compute inverse of the matrix using Cayley Hamilton theorem and also obtain eigen values and eigen vectors of different types of matrices.
CO4	Expand $\sin\boldsymbol{\theta}$, $\cos\boldsymbol{\theta}$ and $\tan\boldsymbol{\theta}$ in terms of $\boldsymbol{\theta}$, $\sin n\boldsymbol{\theta}$, $\cos n\boldsymbol{\theta}$ in multiples of $\boldsymbol{\theta}$
CO5	Classify relation between circular and hyperbolic functions and solve problems using hyperbolic & inverse – hyperbolic functions

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	Theory of Equations: Polynomial equations with Imaginary and irrational roots- Relation between rootsand coefficients- Symmetric functions of roots in terms of coefficients. Reciprocal equations - Standard form -Increase or Decrease the roots of the given equation -Removal of terms Approximate solutions of roots of polynomials by Newton's method, Horner's method.	**12**	**CO1**
2.	Summation of Series: Binomial- Exponential -Logarithmic series (Theorems without proof)	**12**	**CO2**
3.	Symmetric- Skew Symmetric- Hermitian- Skew Hermitian- Orthogonal Matrices- Eigen values & EigenVectors- Similar matrices- Cayley - Hamilton Theorem, Diagonalization.	**12**	**CO3**
4.	Expansions of powers of sin θ, cos θ - Expansions of $\cos^n \theta$, $\sin^n\theta$, $\cos^m \theta\sin^n \theta$. Expansions of sin nθ, cos nθ, tan nθ - Expansions of tan $(\theta_1+\theta_2 +...+\theta_n)$ - Expansions of sin x, Cos x, tan x in terms of x- Sum of roots of trigonometric equations – Formation of equation withtrigonometric roots.	**15**	**CO4**
5.	Hyperbolic functions-Relation between circular and hyperbolic functions- Formulas in hyperbolicfunctions – Inverse hyperbolic functions. Inverse function of exponential functions – Values of Log (u+iv) - Complex index. Sums of Trigonometric series – Applications of binomial, exponential, logarithmic and Gregory'sseries - Difference method.	**12**	**CO5**

Text Book:

1. T.Natarajan, K.S.Ganapathy,Viswanathan Publication 2007.Unit – 1 and 2.
2. Algebra, Volume II byT. K. ManicavachagomPillay ,T.Natarajan ,K.S.Ganapathy, ViswanathanPublication 2008.Unit – 3, 4 and 5.
3. Trigonometry by P. Duraipandian and KayalalPachaiyappa, Muhil Publishers.

Reference books:

1. Algebra by S. Arumugam (New Gama publishing house, Palayamkottai).
2. Algebra and Trigonometry, Volume I and II by P.R.Vittal, V.Malini (Margham Publishers).
3. Trigonometry, Calculus, Dr. P.R. Vittal, Margham Publications, Chennai.
4. Trigonometry by T.K. Manickavachagam Pillay.S.Viswanathan (Printers and Publishers) Pvt. Ltd.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation0

FIRST SEMESTER
(SYLLABUS)

Course Title: Core Paper-II: Differential Calculus

……

Course Code : 2 1 3 6 1 0 2	**Credits 04**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course objectives

- **To develop the ability to use Leibnitz Rule**
- **To know about the method to find the maxima and minima**
- **To develop the skills of the students in the area of Curvature**
- **To learn methods and techniques of finding asymptotes.**

Course Outcomes: At the end of the course, students will be able to

CO1	Evaluate the nth derivative Using Leibnitz Rule
CO2	Finding the maxima and minima for the functions of two variables
CO3	Calculate the Envelope, Evolute, radius of curvature and circle of curvature
CO4	Finding the angle between radius vector and tangent.
CO5	Calculate the asymptotes of the curve

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	Successive differentiation - n^{th} derivative- standard results – Trigonometrical transformation – formation of equations using derivatives - Leibnitz's theorem and its applications Chapter 3 section 1.1 to 1.6, 2.1 and 2.2	**12**	**CO1**
2.	Total differential of a function – special cases – implicit functions - partial derivatives of a function of two functions - Maxima and Minima of functions of two variables- Lagrange's method of undetermined multipliers. Chapter 8 : Section 1.3 to 1.5 and 1.7, Section 4, 4.1 and 5.	**12**	**CO2**
3.	Envelopes – method of finding envelopes – Curvature- circle, radius and centre of curvature- Cartesian formula for radius of curvature – coordinates of the centre of curvature – evolute-and involute - radius of curvature and centre of curvature in polar coordinates – p-r equation Chapter 10 Section 1.1 to 1.4 and Section 2.1 to 2.7	**12**	**CO3**
4.	Polar coordinates - angle between the radius vector and the tangent – slope of the tangent in the polar coordinates – the angle of intersection of two curves in polar coordinates- polar sub tangent and polar sub normal – the length of arc in polar coordinates. Chapter 9 Section 4.1 to 4.6	**12**	**CO4**
5.	Definition-Asymptotes parallel to the axes – special cases – another method for finding asymptotes -asymptotes by inspection – intersection of a curve with an asymptote. Chapter 11 - Section 1 to 7.	**12**	**CO5**

Text Book:

1. "Calculus", Volume - 1 by S. Narayanan and T.K. Manicavachagompillay S.Viswanathan publishers – 2006.

Reference books:

1. Calculus, Dr. P.R. Vittal & Dr. V. Malini, Margham Publications, Chennai.

2. Calculus by Thomas and Fenny, Pearson Publication. Calculus by Stewart

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation0

FIRST SEMESTER

(SYLLABUS)

Course Title: Core Paper-III: Programming with Python

…….

Course Code : 2 1 3 6 1 0 3	**Credits 04**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course objectives

- **To make students understand the concepts of PYTHON programming.**
- **To apply the OOPs concept in PYTHON programming.**
- **To make the students learn best practices in PYTHON programming.**

Course Outcomes: At the end of the course, students will be able to

CO1	Understand the concept of operators, data types in python programming.
CO2	Understand control statements and Looping
CO3	Apply the concept of functions in python programming.
CO4	Understand the concept of formatting operator and strings
CO5	Analyze the structures of list, tuples and maintaining dictionaries

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	Basics of Python Programming: Features – History – Future – Python Interpreter and Interactive Mode – Writing and Executing First Python Programme – Values and Types – Data Types – Operators and Expressions – Operations on Strings – Type Conversion – Comments – Functions and Modules. Chapter 2: Section 2.1 – 2.22	12	CO1
2.	Control Flow Statements: Introduction to Decision Control Statements – Conditional Branching –Loops Structures – Nested Loops – Break – Continue – Pass – Else Statement Used with Loops. Chapter 3: Section 3.1 – 3.8	12	CO2
3.	Functions: Introduction – Defining a function– Function Call – Variable Scope and Lifetime – Fruitful Function –Lambda – Function Composition – Documentation Strings –Recursive Functions Chapter 4: Section 4.1 – 4.8, 4.10 (Omit 4.9)	12	CO3
4.	Strings: Concatenating, Appending, and Multiplying Strings – Immutable – Formatting Operator – Built-in String Methods and Functions – Slice Operation – Comparing Strings – Iterating String. Lists, Tuples and Dictionaries: Sequence – Lists. Chapter 5: Section 5.1 – 5.5, 5.8, 5.9 (Omit 5.6, 5.7) Chapter 6: Section 6.1 to 6.2	12	CO4
5.	Lists, Tuples and Dictionaries: Tuple – Dictionaries File Handling: Opening and Closing Files – Reading and Writing Files. Error and Exception Handling: Introduction – Handling Exceptions. Chapter 6: Section 6.4 to 6.5 (Omit 6.3) Chapter 7: Section 7.4, 7.5 Chapter 8: Section 8.1, 8.2	12	CO5

Text Book:

1. "Problem Solving and Programming with Python", by ReemaThareja (Second Edition, 2019, OXFORD University Press)

Reference books:

1. Problem Solving and Python Programming" by Mr. Ashok NamdevKamthane and Mr.Amit Ashok Kamthane (McGraw Hill Education (India) Private Limited).
2. "Python Programming" by Ch.Sathyanarayana, M.Radhika

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	0	0	3	2	3	1	2
CO2	1	2	2	0	0	2	1	2	3	3
CO3	3	1	2	0	0	1	2	3	2	2
CO4	2	3	1	0	0	2	2	1	2	1
CO5	3	2	2	0	0	1	1	2	1	3

3-Strong Correlation 2- Medium Correlation 1- Low Correlation

FIRST SEMESTER

(SYLLABUS)

Course Title: Core Paper-IV: Python Programming – Lab
Course Code : 2 1 3 6 1 0 5

Write a Python Program for the following

1. Compute the Area and Circumference of a Circle
2. To find the greatest among three numbers
3. Program to calculate roots of a quadratic equation
4. Determine the given number is an Armstrong number
5. Compute the G.C.D. of two

Numbers 6. Sum the series:
$1/1+2^2/2+3^2/3+\ldots+n^2/n$

7. Finding Factorial of a number
8. To print the Fibonacci Series using recursion
9. Count the occurrences of a character in a string
10. Program to reverse a string
11. Calculate distance between two points
12. To add two matrices
13. Print a histogram of frequencies of characters occurring in a message
14. Generate Floyd's triangle.
15. Implement Tower of Hanoi problem

FIRST SEMESTER
(SYLLABUS)
Course Title: Part IV Paper: Non – Major Elective-I

……

Course Code : 2 1 3 6 1 0 4	**Credits 02**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 1.30Hrs.	**ESE Marks : 50**

Course objectives

- **On taking this course the student will be able to attain solid foundation for preparing to Competitive exams.**
- **To enhance the Quantitative aptitude and problem solving skills.**

Course Outcomes: At the end of the course, students will be able to

CO1	Solve real time problems on Ratio and Proportion.
CO2	Determine percentages effectively.
CO3	Expound Profit and loss and Discounts
CO4	Compute Simple Interest, and Compound Interest through secondary data.
CO5	Efficiently solve equations and problems on Ages and Numbers.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	Ratio and Proportion	12	CO1
2.	Percentages	12	CO2
3.	Profit and Loss, Discounts	12	CO3
4.	Simple Interest and Compound interest	12	CO4
5.	Solutions of Simultaneous equations, Problems on Ages and Numbers.	12	CO5

Text Book:

1. Quantitative Aptitude- R.S. Agarwal.

Reference books:

1. Analytical Reasoning by M K Panday.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation0

SECOND SEMESTER

(SYLLABUS)

Course Title: Core Paper-V: Analytical Geometry

……

Course Code : 2 1 3 6 2 1 0	**Credits 04**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course objectives

- **To gain knowledge in evaluating chord of contact, polar equation.**
- **To develop the concept of system of planes, angle between the line and plane.**
- **To develop the idea of the equation of sphere and cone.**

Course Outcomes: At the end of the course, students will be able to

CO1	Understand the concept of equation of straight line, circle, conic, chord and tangent, normal equations of hyperbola
CO2	Solve the problems in System of Planes - Length of the perpendicular – Orthogonal projection
CO3	Estimate the angle between the line and plane, coplanar lines and shortest distance to skewness.
CO4	Understand the concept of equation of sphere and its applications
CO5	Understand the concept of equation of cone and its types

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	Chord of contact – polar and pole, conjugate points and conjugate lines. Polar coordinates: General polar equation of straight line – Polar equation of a circle on A_1A_2 as diameter, Equation of a straight line, circle, conic – Equation of chord, tangent, normal.Equations of the asymptotes of a hyperbola.	12	CO1
2.	Introduction – System of Planes - Length of the perpendicular – Orthogonal projection.	12	CO2
3.	Representation of line – angle between a line and a plane- co-planar lines- shortest distance to skewlines- Length of the perpendicular- intersection of three planes	12	CO3
4.	Equation of a sphere - general equation - section of a sphere by a plane - equation of the circle - tangent plane - angle of intersection of two spheres- condition for the orthogonality -radical plane.	13	CO4
5.	Equation of a cone with vertex as origin, Equation of a quadric cone given the vertex and the guiding curve, Condition for a general equation of second degree to represent a cone, equation of right circular cone given the vertex, axis and semi vertical angle, equation of the enveloping cone of a sphere with centre at origin.	12	CO5

Text Book:

1. Analytical Geometry of 2D by P.Durai Pandian- Muhil publishers for Unit – 1
2. Analytical Solid Geometry of 3D by Shanthi Narayan and Dr.P.K. Mittal-S.Chand& Co.Pvt.Ltd.- for Unit – 2 to 5

Reference books:

1. Trigonometry by T.K. Manickavachagam Pillay. S.Viswanathan (Printers and Publishers) Pvt. Ltd.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation0

SECOND SEMESTER

(SYLLABUS)

Course Title: Core Paper-VI: Integral Calculus and Vector Analysis

……

Course Code : 2 1 3 6 2 1 1	**Credits 04**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course objectives

- **To develop the ability to use Reduction formula**
- **To know about the method to find the Volume**
- **To develop the skills of the students in the Indefinite Integral.**
- **To learn methods and techniques of solving line and surface Integral.**

Course Outcomes: At the end of the course, students will be able to

CO1	Evaluate the Integral using Reduction formula
CO2	Calculate Area and Volume using double and triple Integral
CO3	Evaluate the Indefinite Integral using the properties of Beta and Gamma function.
CO4	Calculate directional derivatives, Curl, divergence.
CO5	Solve Line and Surface Integral using Greens, stokes and Gauss theorem

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	Reduction formulae–Types, $\int x^n e^{ax} dx$, $\int x^n cosaxdx$, $\int x^n sinaxdx$, $\int cos^n xdx$, $\int sin^n xdx$, $\int sin^m x cos^n xdx$, $\int tan^n xdx$, $\int cot^n xdx$, $\int sec^n xdx$, $\int cosec^n xdx$, $\int$ (log x)dx -Bernoulli'sformula. Chapter 1 Section 13, 13.1 to 13.10,14,15.1.	**12**	**CO1**
2.	Multiple Integrals- definition of the double integrals- evaluation of the double integrals- double integrals in polar coordinates – triple integrals – applications of multiple integrals – volumes of solids of revolution – areas of curved surfaces – change of variables – Jacobians. Chapter 5 Section 1, 2.1, 2.2, 3.1, 4, 6.1, 6.2, 6.3, 7 Chapter 6 Section 1.1, 1.2, 2.1 to 2.4	**12**	**CO2**
3.	- infinite integral –definitions – recurrence formula of Gamma mma-functions - relation between Beta and Gamma functions. Evaluation of double and triple integrals using Beta gamma functions.	**12**	**CO3**
4.	Introduction - directional derivative- Gradient- divergence- curl- Laplacian Differential Operator. Chapter 2 Sections 2.1 - 2.13.	**13**	**CO4**
5.	Line, surface and volume integrals - Integral Theorems - Gauss, Greens and Stokes (Without proof) –Problems. Chapter 3 Sections 3.1 to 3.6 and Chapter 4 Sections 4.1 to 4.5.	**12**	**CO5**

Text Book:

1. "Calculus",Vol-II by S.Narayanan and T.K.Manicavachagampilla S. Viswanathanpublishers– 2007 for Unit 1, Unit 2, Unit 3.
2. "Vector Analysis" by P.Duraipandian and KayalalPachaiyappa, S.ChandFor Unit 4,Unit 5.

Reference books:

1. Integral Calculus and differential equations: Dipak Chatterjee (TATA McGrawHill Publishing companyLtd.).
2. Vector Algebra and Analysis by Narayanan and T.K.Manickvachagam PillayS .Viswanathan Publishers.
   Vector Analysis: Murray Spiegel (Schaum Publishing Company, NewYork).

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation

SECOND SEMESTER

(SYLLABUS)

Course Title: Core Paper-VII: Java and Data Structures

……

Course Code : 3 6 2 1 2	**Credits 04**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course objectives

- **Explaining the concept of data structures and its applications.**
- **Structuring the Applications of Arrays, Searching Techniques.**
- **Emphasizing the types of Linked Lists and Polynomials.**
- **Explaining the Types of Trees.**
- **Elaborating the concepts of Graphs, Dijkstra's Shortest Path**

Course Outcomes: At the end of the course, students will be able to

CO1	Knows the reason about the evolution of Java its development. Study the basic of Java and to develop code. Importance of Java comparing the other language.
CO2	Develop program using constructors and its types. Definition of inheritance and Writing programmed related to it. Differentiate string class and string buffer.
CO3	Concept of packages, interface, threads. Implementing the concept Exception handling various application. Significance of exception handling. Life cycle of thread.
CO4	To Demonstrate the Definition and Classification of Arrays. To elaborate the operations and applications of Stack. To impart the applications of Queues and operations on the Queues.
CO5	To elaborate the Addition of Polynomials. To study the Operations on Linked Lists. Representation of Binary Trees and Tree Traversal. To Point out the Importance of Graphs, Traversals and Algorithms.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	History and Evolution of Java - Features of Java - Object Oriented Concepts Bytecode - Lexical Issues- Data Types – Variables-Type Conversion and Casting-Operators - Arithmetic Operators-Bitwise - Relational Operators - Assignment Operator -The conditional Operator - Operator Precedence- Control Statements - Arrays.	**12**	**CO1**
2.	Classes - Objects - Constructors - Overloading method - Static and fixed methods - Inner Classes - String Class- Overriding methods - Using super-Abstract class - this keyword – finalize() method – Garbage Collection.	**12**	**CO2**
3.	Packages - Access Protection - Importing Packages - Interfaces - Exception Handling - Throw and Throws-The Java Thread Model- Creating a Thread and Multiple Threads - Thread Priorities Synchronization-Inter thread Communication - Deadlock - Suspending, Resuming and stopping threads– Multithreading-I/O Streams - File Streams – Applets	**12**	**CO3**
4.	Data Structures: Definition of a Data structure – primitive and composite Data Types, Arrays, Operations on Arrays, Order lists. Stacks – Operations on stack - Applications of Stack - Infix to Postfix Conversion – Evaluation of postfix expression; Recursion. Queues - Circular Queue - Operations on Queues, Queue Applications.	**13**	**CO4**
5.	Singly Linked List -Operations, Application -Representation of a Polynomial, Polynomial Addition; Doubly Linked List OperTrees: Binary Trees – definitions ations. Tree Traversals, Graph - Definition, Types of Graphs - Graph traversal.	**12**	**CO5**

Text Book:

1. E.Balagurusamy, "*Programming with Java: A Primer*", Tata McGraw Hill 2014, 5th Edition.
2. Mark Allen Weiss, "*Data Structures and Algorithms Analysis in C++*", Person Education 2014,
   4th Edition.

Reference books:

1. Herbert Schildt, "*JAVA 2: The Complete Reference*", McGraw Hill, 2018, 11th Edition.
2. Aho, Hopcroft and Ullman, "*Data Structures and Algorithms*", Pearson Education 2003.
3. S. Sahni, "*Data Structures, Algorithms and Applications in JAVA*", Universities Press 2005, 2nd Edition.

Mapping of Course Outcomes to Program Outcomes:

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

3- Strong Correlation 2- Medium Correlation 1- Low Correlation

SECOND SEMESTER

(SYLLABUS)

Course Title: Core Paper-VIII: Data Structures using Java – Lab
Course Code: 36214

List of Exercises:

1. Write a Java program to implement the Stack ADT using a singly linked list.
2. Write a Java program to implement the Queue ADT using a singly linked list.
3. Write a Java program that reads an infix expression, converts into postfix form
4. Write a Java program to evaluate the postfix expression (use stack ADT).
5. Write a Java program to an Insert, delete an element into a binary search tree.
6. Write a Java program to search for a key element in a binary search tree.
7. Write a Java program for the implementation of BFS for a given graph.
8. Write a Java program for the implementation of DFS for a given graph

SECOND SEMESTER
(SYLLABUS)
Course Title: Non – Major Elective Paper II-Functional Mathematics-II

…… …….

Course Code : 21 3 6 2 1 3	**Credits 02**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 1.30 Hrs.	**ESE Marks : 50**

Course objectives

- **On taking this course the student will be able to attain solid foundation for preparing to Competitive exams.**
- **To enhance the Quantitative aptitude and problem solving skills.**

Course Outcomes: At the end of the course, students will be able to

CO1	Acquire skills of Solving Problems on Time & work and Pipes and Cisterns
CO2	Determine Time and Distance, Relative speeds efficiently.
CO3	solve problems on Area and volume of 3 dimensional objects
CO4	Untangle problems on Polygons, their interior angle and diagonals
CO5	expound problems on Stocks and shares.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	Time and work – Pipes and cisterns- Problem	12	CO1
2.	Time and Distance, Relative speeds- Problems on Races, Boats andTrains.	12	CO2
3.	Mensuration – Problems	12	CO3
4.	Polygons – Interior angles- Number of diagonals- Regular Polygons-Problems	12	CO4
5.	Stocks and Shares – Problems	12	CO5

Text Book:

1. Quantitative Aptitude- R.S. Agarwal.
2. Functional Mathematics, M. Sivananda Rani, Margham Publications, Chennai.

Reference books:

Analytical Reasoning by M K Panday

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlat

THIRD SEMESTER

(SYLLABUS)

Course Title: Core Paper – IX Differential Equations

…….

Course Code : 2 1 3 6 3 2 0	**Credits 04**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course Objective:

- **To solve first order Ordinary differential equations**
- **To evaluate particular integrals of special forms**
- **To solve non homogeneous simultaneous linear differential equations**
- **To compute complete, singular and general integrals of partial differential equations**
- **To apply Charpits method**

Course Outcomes: At the end of the course, students will be able to

CO1	Solve linear differential equation and Demonstrate Bernoulli's equation and exactness of first order differential equations
CO2	Exhibit Clairaut's form and solve linear differential equations with constant coefficients
CO3	Apply variation of parameter method to solve second order differential equations
CO4	Demonstrate Partial differential equations and its solutions
CO5	Implement Charpit's method

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**Ordinary Differential Equations:** Concept of existence and uniqueness . Variable separable-Homogeneous Equation-Non-Homogeneous Equations of first degree in x and y-Linear Equation-Bernoulli's Equation-Exact differential equations. Chapter 2: Section 1 to 6.	**12**	**CO1**
2.	**Equation of first order but not of higher degree:** Equation solvable for dy/dx- Equation solvable for y- Equation solvable for x-Clairauts form- Linear Equations with constant coefficients-Particular integrals e^{ax}, $\sin a$, $\cos ax$, x^m, Ve^{ax} $where\ V\ is$ $\sin ax$ or $\cos ax$ or x^m . Chapter 4: Section 1, 2.1, 2.2, 3.1, Chapter 5: Section 4.	**12**	**CO2**
3.	Simultaneous linear differential equations- Linear Equations of the Second Order -Complete solution in terms of a known integrals-Reduction to the Normal form- Change of the Independent Variable -Method of Variation of Parameters. Chapter 6: Section- 6 ,Chapter 8:Section- 1,2,3,4.	**11**	**CO3**
4.	**Partial differential equation:** Formation of PDE by Eliminating arbitrary constants and arbitrary functions-complete integral-singular integral-General integral- Lagrange's Linear Equations Pp+Qq=R. Chapter 12: Section- 1, 2, 3.1, 3.2, 4.	**15**	**CO4**
5.	Special methods - Standard forms - Charpit's Methods - Related problems Chapter 12: Section-5.1, 5.2, 5.3, 5.4, 6.	**10**	**CO5**

TEXT BOOK:

"Differential Equations and its applications", by
S.Narayanan, T.K.Manikavachagam Pillay –- S.Viswanathan (Printers and Publishers) Pvt. Ltd(2006).

Reference books:

1. Mathematics for B.Sc-Branch-I Volume –III by P.Kandasamy ,K.Thilagavathy S.Chand Publications.
2. Differential equations with applications and historical notes by George F.Simmons, 2nd Ed,TataMcgraw Hill Publications .
3. Differential Equations by ShepleyL.Ross, 3 rdEd ,JohnWiely and sons 1984.4
4. Differential Equations by N.P.Bali,Laxmi Publications Ltd,New Delhi-2004. Ordinary and Partial differential Equation by Dr.M.D.Raisinghania ,S.Chand.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation

THIRD SEMESTER

(SYLLABUS)

Course Title: Allied Paper- PROBABILITY AND STATISTICS – I

…….

Course Code : 2 1 3 6 3 2 2	**Credits 05**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course Objective:

Students will acquire knowledge of

- The laws of Probability and Baye's theorem.
- Measures of Location, Dispersion, Correlation and Regression
- The Discrete and Continuous Probability Distribution

Course Outcomes: At the end of the course, students will be able to

CO1	Illustrate and describe sample spaces and events for random experiments. and calculate probabilities of event in discrete sample spaces and conditional probabilities of events using Baye's theorem.
CO2	Calculate the expected value of a probability distribution, obtain moments and its generating function and also obtain probability generating function
CO3	Apply the concepts of characteristic function and Chebychev's Inequality and demonstrate the theorems related to convergence in probability
CO4	Study the relationship between two or more variables
CO5	Illustrate the concept of a probability distribution and sketch the same to real world problems involving various distributions like Binomial, Poisson and Normal distribution, Uniform distributions Geometric, Exponential, Gamma, Beta distributions and identify the Inter relationship between distributions.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**UNIT-I:**Concept of sample space – Events – Definition of Probability (classical, Statistical & Axiomatic) – Addition and Multiplication laws of Probability for 2 events – Extension of Addition and Multiplication laws of events (Statement only) – Independence – Conditional Probability – Baye's theorem - Simple Problems	12	CO1
2.	**UNIT- II:** Random Variables (Discrete and Continuous) Distribution function- Expected values and Moments- Moment generating function – Probability generating function- Examples	12	CO2
3.	**UNIT–III:** Characteristic function- Uniqueness and Inversion theorems (Statements and applications only)- Cumulants - Chebychev's Inequality – Simple Problems. Convergence in probability, Weak Law of large numbers with numerical examples, Central Limit Theorem	11	CO3
4.	**UNIT-IV:** Concepts of bivariate distributions- Correlation and Regression- Linear Prediction- Rank Correlation coefficient, Intra class correlation coefficient, Concepts of partial and multiple correlation coefficients- Simple problems.	15	CO4
5.	**UNIT-V:** Standard Distributions – Bernoulli Distribution, Binomial- Poisson- Normal- Uniform distributions- Geometric- Exponential- Gamma -Beta distributions- Inter relationship between distributions.	10	CO5

TEXT BOOK:

Elements of Mathematical Statistics, by S.C.Gupta &V.K.Kapoor, Sultan Chand & Sons, New Delhi.

Reference books:

1. Hogg R.V. & Craig A.T. (1988) : Introduction to Mathematical Statistics, McMillan.
2. Mood A.M. &Graybill F.A. &Boes D.G. (1974): Introduction to theory of Statistics,McGraw Hill.
3. Snedecor G.W. & Cochran W.G(1967) : Statistical Methods, Oxford and IBH.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation

THIRD SEMESTER

(SYLLABUS)

Course Title: Core Paper – X Operating Systems

…….

Course Code : 2 1 3 6 3 2 1	**Credits 04**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course Objective:

- To state the services provided to the user and hardware by operating system.
- To learn the mechanisms of OS to handle processes and threads and their communication.
- To communicate with the process through system calls.
- To define deadlocks and identify its presence in the system.
- To design appropriate memory management scheme.
- To explores various techniques of allocating memory to processes.
- To discuss file system including access methods, file locking, and directory structures.
- To describe the details of implementing local file systems and directory structures
- To discuss the goals and principles of protection in a modern computer system.

Course Outcomes: At the end of the course, students will be able to

CO1	Describe the basic structure and functionality of operating system. Inter process communication.
CO2	Allocation of process through scheduling algorithms. Define critical section problems and its usage.
CO3	Prevention of multiple process execution through the concept of semaphores. Apply the deadlock handling mechanisms to solve the given problem. Understand various techniques of allocating memory to processes.
CO4	Understand the strategies of memory management schemes and the usage of virtual memory. Apply suitable page replacement algorithms to avoid thrashing. Understand the structure and organization of the file system
CO5	Understand the principles of protection and security mechanisms

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**Unit 1** Introduction: Views-Types of system- OS Structure-Operations-Services-Interface-systemcalls -system structure-system design and implementation process management ;process -process scheduling-interprocess communication. CPU scheduling; CPU schedulers-Scheduling criteria-scheduling algorithm	**12**	**CO1**
2.	**Unit 2** Process Synchronization: Critical-Section Problem Synchronization Hardware Semaphores-Classical Problems of Synchronization Monitors. Deadlocks: Characterization- Methods for Handling Deadlocks Deadlock Prevention- Avoidance-Detection-Recovery.	**12**	**CO2**
3.	**Unit 3** Memory Management: Hardware- Address Binding–Address Space Dynamic Loading and Linking– Swapping – Contiguous Allocation-Segmentation - Paging– Structure of the Page Table.	**11**	**CO3**
4.	**Unit 4** Virtual Memory Management: Demand Paging- Page Replacement Algorithms-Thrashing. File System: File Concept Access Methods-Directory and Disk Structure-Protection-File System Structures-Allocation Methods-Free Space Management.	**15**	**CO4**
5.	**Unit 5** I/O Systems: Overview- I/O Hardware- Application I/O Interface-Kernel I/O Subsystem-Transforming I/0 Requests to Hardware Operations-Performance. System Protection: Goals-Domain-Access matrix. System Security: The Security Problem- Threats–Encryption- User Authentication.	**10**	**CO5**

TEXT BOOK:

Abraham Silberschatz, Peter B Galvin, Gerg Gagne, "*Operating System Concepts*", Wiley India Pvt.Ltd. 2018, 9th Edition.

Reference books:

1. William Stallings, "*Operating Systems Internals and Design Principles*", Pearson, 2018, 9th Edition.
2. Andrew S. Tanenbaum, Herbert Bos, "*Modern Operating Systems*", Pearson 2014, 4th Edition.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation

FOURTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XI **Integral Transforms**

…….

Course Code : 2 1 3 6 4 2 7	**Credits 04**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course Objective:

- **To understand Laplace Transform**
- **To apply Laplace transform to solve differential equations**
- **To analyse Fourier series and its applicability**
- **To compute Fourier Transform**
- **To apply Z Transforms to difference equations**

Course Outcomes: At the end of the course, students will be able to

CO1	Analyse Laplace transform and the conditions of existence of Laplace transform
CO2	Implement the Laplace transform technique to solve differential equations
CO3	Study the expansion of periodic functions using Fourier Series
CO4	Demonstrate the Fourier transform and its properties
CO5	Apply Z transform for difference equations

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**Unit I:** The Laplace Transforms-Definitions-Sufficient conditions for the existence of the Laplace transform(without proof)-Laplace transform of periodic functions-some general theorems-evaluation of integrals using Laplace transform-Problems. Chapter 5: Section-1 to 5.	**12**	**CO1**
2.	**Unit II:** The inverse Laplace Transforms- Applications of Laplace Transforms to ordinary differential equations with constant co-efficients and variable co-efficients, simultaneous equations and equations involving integrals-Problems. Chapter 5: Section-6 to 12.	**12**	**CO2**
3.	**Unit III:** Fourier series- Expansion of periodic functions of period 2π-Expansion of even and odd functions, Half range Fourier series-Change of intervals –Problems. Chapter 6: Section-1 to 6	**11**	**CO3**
4.	**Unit IV:** Fourier Transform- Infinite Fourier Transform(Complex form) – Properties of Fourier Transform – Fourier cosine and Fourier sine Transform – Properties – Parseval's identity – Convolution theorem - Problems. Chapter 6: Section-8 to 15.	**15**	**CO4**
5.	**Unit V:** Z Transforms: Definition of Z-Transform and its properties - Z-Transforms of some basic functions- Formation of difference equations – Solution of difference equations using Z – transform- Examples and simple problems	**10**	**CO5**

TEXT BOOK:

1. "Calculus-Volume III" – S.Narayanan and T.K.ManicavachagamPillai. (Ananda Book Depot)
2. "Engineering Mathematics for Semester III- Third Edition – T.Veerarajan (Tata McGraw-Hill Publishing Company Ltd, New Delhi) (for Unit-V)

Reference books:

1. Engineering Mathematics Volume III – P.Kandasamy and others (S.Chand and Co.)
2. Advanced Engineering Mathematics- Stanley Grossman and William R.Devit.
3. Engineering Mathematics III-A.Singaravelu, Meenakshi Agency, Chenani, 2008

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation

FOURTH SEMESTER

(SYLLABUS)

Course Title: Allied Paper II- PROBABILITY AND STATISTICS – II

……

Course Code : 2 1 3 6 4 2 9	**Credits 05**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course Objective:

Students will acquire knowledge

- To provide the foundation of statistical analysis used in varied application of Sampling methods
- Tests of significance and testing of hypothesis.

Course Outcomes: At the end of the course, students will be able to

CO1	Identify a statistic and point out its importance in application and summarize the theoretical aspect of normal and non-normal populations.
CO2	Explain the bound for defining most efficient estimates derived from Rao Cramer inequality and compare the process of finding interval estimation with the process of finding point estimation.
CO3	Fit best approximation for a given set of data and also compare and analyze whether two sets of data are coming from same population or different population
CO4	Analyze the variability of samples under the given distributions and also obtain its confidence intervals
CO5	Point out the existence of most powerful test by summarizing the theoretical aspects of Neymann Pearson result.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**UNIT-I:** Sampling Distributions – Concept of Standard error – Sampling distribution based on normal distribution- t, z, Chi Square and F distributions.	**12**	**CO1**
2.	**UNIT- II** Point estimation – Concepts of unbiasedness – consistency – efficiency and sufficiency- Cramer Rao inequality – Methods of estimation- Maximum likelihood- moments - minimum square and their properties (Statement only).	**12**	**CO2**
3.	**UNIT–III:** Test of significance – Standard error- Large sample test, Exact test based on normal, t, chi-square and F idistribution with respect to population mean/means, proportion/proportions, variance and correlation coefficient. Test of independence of attributes based on contingency tables- Goodness of fit based on chi-square.	**11**	**CO3**
4.	**UNIT-IV:** Analysis of Variance: One way, two way classification concepts &Problems. Interval estimation – Confidence intervals for population mean/means- Proportion/proportions and variances based on t, Chi-Square and F.	**15**	**CO4**
5.	**UNIT-V:** Test of hypothesis- Type I and II errors- Power of test – Neymann Pearson lemma- Likelihood ratio test-concepts of most powerful test- statements and results only-simple problems, Concept of p-value, Power of test.	**10**	**CO5**

TEXT BOOK:

Elements of Mathematical Statistics, by S.C.Gupta &V.K.Kapoor, Sultan Chand & Sons, New Delhi.

Reference books:

1. Hogg R.V. & Craig A.T. (1988): Introduction to Mathematical Statistics, McMillan.
2. Mood A.M. &Graybill F.A. &Boes D.G. (1974): Introduction to theory of Statistics,McGraw Hill.
3. Snedecor G.W. & Cochran W.G(1967) : Statistical Methods, Oxford and IBH.
4. Hoel P.G. (1971) : Introduction to Mathematical Statistics, Wiley.
5. Wilks S.S. Elementary Statistical Analysis, Oxford and IBH.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation

FOURTH SEMESTER

(SYLLABUS)

Course Title: Core Paper XII- DISCRETE MATHEMATICS

…….

Course Code : 2 1 3 6 4 2 8	**Credits 04**
L:T:P:S :	**CIA Marks : 50**
Exam Hours : 03	**ESE Marks : 50**

Course Objective:

Students will acquire knowledge

- To apply tools and ideas in Mathematics for solving Applied Problems.
- To Evaluate Boolean functions and to express a logic sentence in terms of predicates, quantifiers, and logical connectives.

Course Outcomes: At the end of the course, students will be able to

CO1	Analyse the divisibility of integer and also representation of
CO2	Apply Boolean algebra concepts in disjunctive and conjunctive normal form
CO3	Identifying, designing and analyzing circuits, logical gates and combinatorial circuits
CO4	Demonstrate recursive function and classify homogeneous and non-homogeneous linear recurrence relations
CO5	Demonstrate Proportional logic and Predicate logic

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**UNIT-I:** Integers: Set, some basic properties of integers, Mathematical induction, divisibility of integers, representation of positive integers Chapter 1 - Sections 1.1 to 1.5	**12**	**CO1**
2.	**UNIT- II:** Boolean algebra &Applications: Boolean algebra, two element Boolean algebra, Disjunctive normal form, Conjunctive normal form Chapter 5 - Sections 5.1 to 5.4	**12**	**CO2**
3.	**UNIT–III:** Application, Simplification of circuits, Designing of switching circuits, Logical Gates and Combinatorial circuits. Chapter 5 - Section 5.5, 5.6	**11**	**CO3**
4.	**UNIT-IV:** Recurrence relations and Generating functions: Sequence and recurrence relation, Solving recurrence relations by iteration method, Modeling of counting problems by recurrence relations, Linear (difference equations) recurrence relations with constant coefficients, Generating functions, Sum and product of two generating functions, Useful generating functions, Combinatorial problems. Chapter 6 - Section 6.1 to 6.6	**15**	**CO4**
5.	**UNIT-V:** Proportional logic and Predicate logic: Proportional logic, Adequate system of connectivies, Translation of sentences in a Natural Language into Statement Formula, Logical validity of arguments, Predicate Logic, Negation of a statement obtained by qualification of a predicate, Logical operations on predicates or quantified predicates, Symbolization of sentences by using predicates, Quantifiers and connectives, Logical validity of arguments. Chapter 8 - Sections 8.1, 8.5 to 8.8 (Omit Section 8.2 to 8.4)	**10**	**CO5**

TEXT BOOK:

"Introduction to Discrete Mathematics", 2nd edition, 2002 by
M.K. Sen and B. C. Chakraborty, Books and Allied Private Ltd., Kolkata.

Reference books:

1. Discrete mathematics for computer scientists and mathematicians by J. LMertt, AbrahamKendel and T. P. Baker prentice-hall, India.
2. Discrete mathematics for computer scientists by John Truss- Addison Wesley.
3. Elements of Discrete Mathematics, C. L. Liu, New York McGraw- Hill, 1977.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation

FIFTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XIII ALGEBRAIC STRUCTURES

……

Course Code: 2 1 3 6 5 3 5	**Credits 05**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

Course Objective:

- Students will acquire knowledge about the concepts of Sets, Groups and Rings.

Course Outcomes: At the end of the course, students will be able to

CO1	Summarize the structure of Group, Subgroups and Demonstrate operations satisfying various properties in group structure.
CO2	Explain normal subgroups, quotient groups, homomorphism, automorphism and demonstrate with an example.
CO3	Explain Cayley's theorem, the permutations groups with an example.
CO4	Define Rings, some special classes of rings with an example and Explain ideals and quotient Rings
CO5	Illustrate Imbedding of Integral domain over Field and demonstrate the Euclidean Rings.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	Introduction to groups- Subgroups- cyclic groups and properties of cyclic groups- Lagrange'sTheorem- A counting principle. Chapter 2 Section 2.4 and 2.5.	**12**	**CO1**
2.	Normal subgroups and Quotient group- Homomorphism- Automorphism. Chapter 2 Section 2.6 to 2.8.	**12**	**CO2**
3.	Cayley's Theorem- Permutation groups. Chapter 2 Section 2.9 and 2.10.	**11**	**CO3**
4.	Definition and examples of ring- Some special classes of rings- homomorphism of rings- Ideals andquotient rings- More ideals and quotient rings. Chapter 3 Section 3.1 to 3.5.	**15**	**CO4**
5.	The field of quotients of an integral domain- Euclidean Rings- The particular Euclidean ring. Section 3.6to 3.8.	**10**	**CO5**

TEXT BOOK:

"Topics in Algebra" – I. N. Herstein, Wiley Eastern Ltd.

Reference books:

1.Modern Algebra by M.L.Santiago, McGraw Hill Education India pvt Ltd.
2.Modern Algebra by S. Arumugam and others, New Gamma publishing House, Palayamkottai.
3.Modern Algebra by Visvanathan Nayak, Emerald Publishers, Reprint 1992.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1 - Low Correlation

FIFTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XIV Real Analysis-I

…….

Course Code: 2 1 3 6 5 3 6	**Credits 05**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

Course Objective:

- To make the students capable of analysing any given sequence and series
- To calculate limit superior, limit inferior and the limit of a sequence
- To learn certain proof techniques and write precise proof of theorems
- To recognize alternating, conditionally convergent and absolutely convergent series

Course Outcomes: At the end of the course, students will be able to

CO1	Describe the fundamental properties of the real numbers that lead to the formal development of real analysis and recognize the basic properties of the field of real numbers, cardinality of a sets.
CO2	Demonstrate the concepts of limits in sequences and examine the basic principles of convergence and conditions of the convergent, divergent of a sequence.
CO3	Estimate the limit superior, limit inferior, limit of a sequence and explain Cauchy sequence.
CO4	Construct mathematical proofs of convergence test of a sequence and distinguish between conditional convergence and absolute convergence. Explain and demonstrate the basic concepts of absolute convergence of a sequence and derive the 'test for convergence' using summation by parts.
CO5	Explain the Euclidian distance function and the geometric meaning of each of the metric space properties and point out whether a given distance function is a metric.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**Unit I:** Sets and Functions: Sets and elements- Operations on sets- functions- real valued functions- equivalence- countability - real numbers- least upper bounds.	12	CO1
2.	**Unit II:** Sequences of Real Numbers: Definition of a sequence and subsequence- limit of a sequence- convergent sequences- divergent sequences- bounded sequences- monotone sequences	12	CO2
3.	**Unit III:** Operations on convergent sequences- operations on divergent sequences- limit superior and limit inferior- Cauchy sequences.	11	CO3
4.	**Unit IV:** Series of Real Numbers: Convergence and divergence- series with non-negative terms- alternating series- conditional convergence and absolute convergence- tests for absolute convergence- series whose terms form a non-increasing sequence- the class l^2 .	15	CO4
5.	**Unit V:** Limits and Metric Spaces: Limit of a function on a real line-. Metric spaces - Limits in metric spaces. Continuous Functions on Metric Spaces: Function continuous at a point on the real line-Reformulation- Function continuous on a metric space.	10	CO5

TEXT BOOK:

"Methods of Real Analysis": Richard R. Goldberg (Oxford and IBH Publishing Co.).

Reference books:

1. Principles of Mathematical Analysis by Walter Rudin,TataMcGrawHill.
2. Mathematical Analysis Tom M Apostol, Narosa Publishing House.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1 - Low Correlation

FIFTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XV MECHANICS

…….

Course Code: 2 1 3 6 5 3 7	**Credits 05**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

Course Objective:

Students will acquire knowledge about

- Particles or body in rest under the given forces.
- Forces, equilibrium of a particle and centre of mass of various bodies.
- The motion of bodies under the influence of forces.
- Rectilinear motion of particles, Projectiles, Impact and Moment of Inertia of Particles

Course Outcomes: At the end of the course, students will be able to

CO1	Recall the basic definitions of forces, Newtons laws of motion, Distinguish problems under moments, parallel forces and couples.
CO2	Explain Equilibrium of a rigid body under three coplanar forces, Centre of mass, hanging body in equilibrium and demonstrate problems under hanging strings.
CO3	Recall the basic definitions of work, conservative field of force, power, simple harmonic motion and demonstrate problems under work, Simple harmonic motion
CO4	Recall concepts of projectiles, differentiate time of flight, horizontal range in an inclined plane and evaluate problems under Impact.
CO5	Define circular motion, central orbits, Explain moment of Inertia of simple bodies and theorems of parallel and perpendicular axes and evaluate various problems under moments of Inertia

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**Unit 1** Force- Newtons laws of motion - resultant of two forces on a particle- Equilibrium of a particle.Forces on a rigid body – moment of a force – general motion of a rigid body- equivalent systems offorces – parallel forces – forces along the sides of a triangle – couples. Chapter 2 - Section 2 .1 , 2.2 , Chapter 3 - Section 3.1. Chapter 4 - Section 4 .1 to 4.6.	**12**	**CO1**
2.	**Unit 2** Resultant of several coplanar forces- equation of the line of action of the resultant- Equilibrium of arigid body under three coplanar forces . Centre of mass – finding mass centre – a hanging body in equilibrium,Hanging strings- equilibrium of a uniform homogeneous string – suspension bridge Chapter 4 - Section 4.7 to 4.9 Chapter 6 - Section 6.1 to 6.3. Chapter 9 - Section 9.1, 9.2.	**12**	**CO2**
3.	**Unit 3** Kinematics -Basic units – velocity – acceleration- coplanar motion . Work, Energy and power – work – conservative field of force – power – Rectilinear motion under varying Force: Simple harmonic motion (S.H.M.) – S.H.M. along a horizontal line- S.H.M. along a vertical line Chapter 1 - Section 1.1 to 1.4 Chapter 11 - Section 11.1to 11.3 ,Chapter 12 - Section 12.1 to 12.3	**11**	**CO3**
4.	**Unit 4** Projectiles -Forces on a projectile- projectile projected on an inclined plane. Impact: Impulsive force - impact of sphere - impact of two smooth spheres – impact of a smooth sphereon a plane – oblique impact of two smooth spheres Chapter 13 - Section 13.1,13.2 Chapter 14 - Section 14.1, 14.5	**15**	**CO4**
5.	**Unit 5** Circular motion – Conical pendulum – simple pendulum – central orbits - general orbits - central orbits-conic as centered orbit. Moment of inertia, Perpendicular and parallel axes theorem Chapter 15 - Section 15.1, 15.2, 15.6 Chapter 16 - Section 16.1 to 16.3 Chapter 17 -Section 17.1, 17.1.1	**10**	**CO5**

TEXT BOOK:

"Mechanics" by P. Duraipandian ,LaxmiDuraipandian , MuthamizhJayapragasham, S. Chandand Co limited 2008 .

Reference books:

1. Dynamics – K. ViswanathaNaik and M. S. Kasi, Emerald Publishers.
2. Dynamics – A. V. Dharmapadam, S. Viswanathan Publishers.
3. Mechanics – Walter Grenier

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1- Low Correlation

FIFTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XVI OPERATIONS RESEARCH

……

Course Code: 2 1 3 6 5 3 8	**Credits 05**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

Course Objective:

Students will acquire knowledge about

- To formulate and analyzing the Linear Programming Problem from the real-world problems.
- Develop mathematical skills to analyze and solve network models arising from a wide range of applications.
- The student get knowledge about the scope and application of operations research in business and industry.

Course Outcomes: At the end of the course, students will be able to

CO1	Able to formulate linear programming problems and solve using Graphical, Simplex method.
CO2	Able to analyze and solve Transportation using appropriate method.
CO3	Able to analyze and solve Assignment problems and Game theory.
CO4	Able to design and solve Networks Models using CPM, PERT.
CO5	Estimate optimum solution for sequencing problems.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**Unit 1: Linear programming** – Formulation – Graphical solution – Simplex method – Simpleapplications. Big-M method.	12	CO1
2.	**Unit 2: Linear programming -** Principle of Duality – Primal – Dual relation - Dual simplex method – Simple applications. **Transportation Problem**: Finding initial solution by North West Corner Rule – Vogel'sApproximation method and Matrix minimum method – Procedure for finding optimalsolution – Both minimisation and maximisation cases – Unbalanced and degeneratetransportation problems.	12	CO2
3.	**Unit 3: Assignment Problem**: Formulation – Minimisation cases – procedure for gettingoptimum solution – Unbalanced problem – Maximisation problem – Problems withrestrictions. **Game Theory**: Two Person Zero-Sum game with saddle point – without saddle point –dominance rule – Solving 2 x n or m x 2 game by graphical method.	11	CO3
4.	**Unit 4: Networks**: Rules for network construction – Critical Path Method - Time calculationsin PERT – PERT algorithm (Crashing excluded) – Related problems.	15	CO4
5.	**Unit 5: Sequencing Problem** – n jobs through 2 machines – n jobs through 3 machines – n jobsthrough m machines. Graphical method.	10	CO5

TEXT BOOK:

P.K. Gupta and D. S. Hira, Operations Research, S. Chand & Co.

Reference books:

1. *KanthiSwaroop, P.K. Gupta,Manmohan*,Operations Research –Sultan Chand & sons.
2. *H.A. Taha*, Operations Research Prentice Hall of India, New Delhi
3. *Sundaresan, Ganapathy Subramanian, Ganesan.*,Resource Management Technique – Meenakshi Agency.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1 - Low Correlation

FIFTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XVII WEB TECHNOLOGY

…….

Course Code: 2 1 3 6 5 3 9	**Credits 05**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

Course Objective:

- To build web applications using HTML Graphics, CSS and JavaScript for client-side script technologies.
- Detailed description for Internet Domains and establishing Connectivity Internet.
- Structuring the HTML tags, Lists, Tables, Frames, Forms and Forms elements.
- Emphasizing the DHTML Style Sheets, Linking a Style Sheet and Web page designing.
- Explaining the concepts of JavaScript, Functions and Looping constructs.
- Elaborating the concept of JavaScript Document Object Model and Cookies

Course Outcomes: At the end of the course, students will be able to

CO1	To Demonstrate Internet Basic concepts and Internet Domains To Study about Internet Server Identities To impart the concepts of Establishing Connectivity on the Internet
CO2	To classify the HTML Tags. To impart Lists, Frames and Tables and its attributes. To study the Graphics, Forms and Forms Elements.
CO3	To elaborate CSS Style Sheets and Element of the Style. To impart Linking a style sheet to a html documents and Web page designing.
CO4	Representation of JavaScript Data types, Control and Looping and Functions. To point out the knowledge about the Dialog Boxes.
CO5	Representation of JavaScript Document Object Model and Event Handling. To point out Form objects, User Defined Object and Cookies.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**Unit 1** Introducing PHP – Basic development Concepts – Creating first PHP Scripts – Using Variable and Operators – Storing Data in variable – Understanding Data types – Setting and Checking variables	**12**	**CO1**
2.	**Unit 2** Data types – Using Constants – Manipulating Variables with Operators.Controlling Program Flow: Writing Simple Conditional Statements - Writing More Complex Conditional Statements	**12**	**CO2**
3.	**Unit 3** Repeating Action with Loops – Working with String and Numeric Functions.Working with Arrays: Storing Data in Arrays – Processing Arrays with Loops and Iterations.	**11**	**CO3**
4.	**Unit 4** Using Arrays with Forms - Working with Array Functions – Working with Dates and Times Using Functions and Classes: Creating User-Defined Functions - Creating Classes – Using Advanced OOP Concepts.	**15**	**CO4**
5.	**Unit 5** Working with Files and Directories: Reading Files-Writing Files- Processing Directories.	**10**	**CO5**

TEXT BOOK:

1. "*PHP A Beginner's Guide*", VikramVaswani, Tata McGraw Hill 2008.

Reference books:

1. Steven Holzner , "*The PHP Complete Reference*", Tata McGraw Hill, 2007.
2. Steven Holzer , "*Spring into PHP*", Tata McGraw Hill 2011, 5thEdition.

Mapping of Course Outcomes to Program Outcomes:

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

3- Strong Correlation 2- Medium Correlation 1- Low Correlation

FIFTH SEMESTER

(SYLLABUS)

Course Title: Core Practical– XVIII WEB TECHNOLOGY LAB

Course Code: 2 1 3 6 5 4 0	**Credits 02**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

List of Practicals

1. Write a PHP program which adds up columns and rows of given table
2. Write a PHP program to compute the sum of first n given prime numbers
3. Write a PHP program to find valid an email address
4. Write a PHP program to convert a number written in words to digit.
5. Write a PHP script to delay the program execution for the given number of seconds.
6. Write a PHP script, which changes the colour of the first character of a word
7. Write a PHP program to find multiplication table of a number.
8. Write a PHP program to calculate Factorial of a number.

FIFTH SEMESTER

(SYLLABUS)

PROJECT

Course Code: 2 1 3 6 5 4 1	**Credits 02**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: - (internal Viva-Voce)	**ESE Marks : 50**

Students have to undergo project during the fifth semester and are required to submit the report towards end of the fifth semester.

SIXTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XIX LINEAR ALGEBRA

…….

Course Code: 2 1 3 5 6 4 2	**Credits 05**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

Course Objective:

- Students will acquire knowledge about the Vector Spaces, Dual spaces, Inner product spaces and linear transformations

Course Outcomes: At the end of the course, students will be able to

CO1	Define vector space, Linear span, linearly independent and dependent with illustrations, explain the existence theorem for basis of finitely generated vector space and evaluate dimension of vector space.
CO2	Explain linear transformation, dual spaces, demonstrate Rank – Nullity theorem with an illustration.
CO3	Demonstrate and evaluate minimal polynomial, matrix of a linear transformation, Eigen values and Eigen vectors of linear transformation.
CO4	Define Norm, Inner Product Space, Discuss orthogonal and orthonormal basis, Explain the Gram-Schmidt Orthogonalizations process, and construct orthogonal and orthonormal basis for a given basis.
CO5	Discuss adjoint operators and their properties with an illustration.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**Unit – I: Vector spaces** Vector spaces, subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vector space, Dimensions, Quotient space and its dimension.	12	CO1
2.	**Unit- II**: **Homomorphism and Isomorphism of Vector Spaces** Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Dual Spaces, Null Space, Range space of a linear transformation, Rank - Nullity Theorem.	12	CO2
3.	**Unit–III: Algebra of Linear Transformation** Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations.	11	CO3
4.	**Unit – IV: Inner Product Spaces** Inner product spaces and norms, Cauchy-Schwarz inequality, Orthogonal sets and Basis, Orthonormal basis, Gram-Schmidt orthogonalization process, Orthogonal complements, Bessel's inequality.	15	CO4
5.	**Unit – V: Adjoint Operators and their Properties** The adjoint of a linear operator, Least squares approximation, Minimal solutions to systems of linear equations, Normal, Self - adjoint, Unitary and orthogonal operators and their properties.	10	CO5

TEXT BOOK:

Friedberg, Stephen H., Insel, Arnold J., & Spence, Lawrence E. (2003). Linear Algebra (4th ed.). Prentice-Hall of India Pvt. Ltd. New Delhi

Reference books:

1. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
2. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.
3. Andrilli, S., & Hecker, D. (2016). Elementary Linear Algebra (5th ed.). Academic Press, Elsevier India Private Limited.
4. Kolman, Bernard, & Hill, David R. (2001). Introductory Linear Algebra with Applications (7th ed.). Pearson Education, Delhi. First Indian Reprint 2003.
5. Lay, David C., Lay, Steven R., & McDonald, Judi J. (2016). Linear Algebra and its Applications (5th ed.). Pearson Education.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1 - Low Correlation

SIXTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XX: REAL ANALYSIS-II

…….

Course Code: 2 1 3 6 6 4 3	**Credits 05**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

Course Objective:

- **To write clear and precise proof of theorems.**
- **Introduce the concepts of Riemann integrable and properties of Riemann integrable.**
- **To identify the correct theorems to deal with unknown problems.**

Course Outcomes: At the end of the course, students will be able to

CO1	Examine the continuity of a functions via open and closed sets and give the definition of concepts related to metric spaces, such as continuity, compactness, completeness and connectedness
CO2	Describe about bounded, unbounded sets and distinguish between compact and complete metric spaces.
CO3	Determine the Riemann integrability of a bounded function, identify the size of a sets by outer measure and choose the Riemann integral properties to find the value of the integrals.
CO4	*Demonstrate the usage of the Mean Value Theorem, Fundamental theorem of Calculus to problems in the context of real analysis and* Roll's theorem, Mean value theorem for differentiable functions.
CO5	Distinguish between point wise and uniform convergence of a sequence of functions and illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability, and integrability.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**Unit I:** Continuous Functions on Metric Spaces: Open sets- closed sets- Discontinuous function on R^1. Connectedness, Completeness and Compactness: More about open sets- Connected sets.	12	CO1
2.	**Unit II:** Bounded sets and totally bounded sets -Complete metric spaces- compact metric spaces, continuous functions on a compact metric space, continuity of inverse functions, uniform continuity.	12	CO2
3.	**Unit III:** Calculus: Sets of measure zero, definition of the Riemann integral, -properties of Riemann integral.	11	CO3
4.	**Unit IV:** Derivatives- Rolle's theorem, Law of mean, Fundamental theorems of calculus.	15	CO4
5.	**Unit V:** Taylor's theorem- Pointwise convergence of sequences of functions, uniform convergence of sequences of functions.	10	CO5

TEXT BOOK:

Richard R. Goldberg. Methods of Real Analysis. Oxford and IBH Publishing Co)

Reference books:

1. Principles of Mathematical Analysis by Walter Rudin,TataMcGrawHill.
2. Mathematical Analysis Tom M Apostal,Narosa Publishing House.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1 - Low Correlation

SIXTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XXI FUNCTIONS OF COMPLEX VARIABLES

…….

Course Code: 2 1 3 6 6 4 4	**Credits 05**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

Course Objective:

- Explain the fundamental concepts of the functions of a complex variable and their role in modern mathematics and applied contexts**.**
- Demonstrate understanding by analysing, proving and explaining concepts from complex analysis.
- Relate the algebraic and geometric properties of conformal mappings, and apply these to determine the properties of analytic functions.
- Calculate series expansions for analytical complex-valued functions, evaluate contour integrals and definite integrals.

Course Outcomes: At the end of the course, students will be able to

CO1	Derive Cauchy Riemann equation and identify analytic functions.
CO2	Discuss Bilinear transformation and various standard transformations.
CO3	Evaluate value of the function using Cauchy's integral theorem.
CO4	*Represent the given function in a series form valid in a domain.*
CO5	Evaluate Improper real integrals using residues.

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**Unit 1** Analytic Functions: Functions of a Complex Variable – Limit- Theorems on Limits – Continuous functions- Differentiability – Cauchy – Riemann equations – Analytic functions- Harmonic functions – Conformal mapping. Chapter 1 – sec 2.1 to 2.9.	**12**	**CO1**
2.	**Unit 2** Bilinear Transformations: Elementary transformations – Bilinear transformations – Cross ratio- Fixed Points of Bilinear Transformations – Mapping by Elementary Functions - The Mapping $w = z^2$, z^n, n is a positive integer, $w = e^z$, sin z, cos z. Chapter 3 – sec 3.1 to 3.4 , Chapter 5 – sec 5.1 to 5.5	**12**	**CO2**
3.	**Unit 3** Complex Integration – definite integral – Cauchy's Theorem – Cauchy's integral formula – Higher derivatives. Chapter 6 – sec 6.1 to 6.4	**11**	**CO3**
4.	**Unit 4** Series expansions – Taylor's series – Laurent's Series – Zeroes of analytic functions- Singularities. Chapter 7 – 7.1 to 7.4	**15**	**CO4**
5.	**Unit 5** Residues – Cauchy's Residue Theorem – Evaluation of definite integrals. Chapter 8 – 8.1 to 8.3.	**10**	**CO5**

TEXT BOOK:

"Complex Analysis" by S.Arumugam, Thangapandi Isaac, A.Somasundaram, SciTech publications (India) Pvt Ltd,2002.

Reference books:

1. Complex variables and Applications (Sixth Edition) by James Ward Brown and Ruel V.Churchill, Mc.Grawhill Inc.
2. Complex Analysis by P.Duraipandian, Kayalak Pachaiyappa, S.Chand & Co Pvt.Ltd.
3. Complex Analysis,T.K.Manickavachagom Pillay, S.Viswanathan Publishers Pvt. Ltd.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1 - Low Correlation

SIXTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XXII MACHINE LEARNING WITH R

…….

Course Code: 2 1 3 6 6 4 5	**Credits 05**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

Course Objective:

- To understand the need for machine learning for various problem solving
- To understand the latest trends in machine learning
- To design appropriate machine learning algorithms for problem solving

Course Outcomes: At the end of the course, students will be able to

CO1	Differentiate various learning approaches, and to interpret the concepts of supervised learning, unsupervised learning
CO2	Understand Bayesian Decision theory and Multivariate Method
CO3	Apply Clustering & Regression techniques
CO4	*Understand Neural Networks and Multilayer Perceptrons*
CO5	Understand local models, Assessing and Comparing Classification Algorithms

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**UNIT 1:** INTRODUCTION TO MACHINE LEARNING Machine learning – examples of machine learning applications – Learning associations – Classification – Regression Unsupervised learning – Supervised learning- Learning class from examples- PAC learning – Noise, model selection and generalization – Dimension of supervised machine learning algorithm.	12	CO1
2.	**UNIT-II:** DECISION THEORY Bayesian Decision theory – Introduction – Classification – Discriminant function – Bayesian networks -Association rule - Parametric Methods – Introduction – Estimation -Classification - Regression – Multivariate Methods – Data Parameter estimation - Classification – Complexity – Features – Dimensionality Reduction – Analysis – Multidimensional scaling – Linear discriminant analysis.	12	CO2
3.	**UNIT-III:** CLUSTERING & REGRESSION Clustering – Mixture densities – k-means clustering – Supervised Learning after clustering – Hierarchical clustering – Nonparametric Methods – Density estimation – Generalization of multivariate data – Classification – Regression – Smoothing models – Decision Trees – Univariate trees – Multivariate trees – Learning rules from data – Linear Discrimination.	11	CO3
4.	**UNIT-IV:** MULTILAYER PERCEPTRONS Structure of brain – Neural networks as a parallel processing - Perceptron – Multilayer perceptron – Back propagation- Training procedures – Tuning the network size – Learning time.	15	CO4
5.	**UNIT-V:** LOCAL MODELS Competitive learning -Adaptive resonance theory – Self organizing map – Basis functions – Learning vector quantization – Assessing and Comparing Classification Algorithms – Combining Multiple Learners – Reinforcement Learning.	10	CO5

TEXT BOOK:

1. Ethem alpaydin, “Introduction to Machine Learning”, MIT Press,2004.
2. Tom Mitchell, “Machine Learning”, McGraw Hill, 1997.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1 - Low Correlation

SIXTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XXIII OPEN SOURCE TECHNOLOGIES

…….

Course Code: 2 1 3 6 6 4 6	**Credits 05**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

Course Objective:

- To provide a basic idea of Open source technology, their software development process
- To understand the role and future of open source software.
- To understand the use of open source software in the industry
- To understand the impact of legal, economic and social issues for such software

Course Outcomes: At the end of the course, students will be able to

CO1	Learn the basics, principals and standards of using open source software.
CO2	Understand about Licenses, copy right, Copy left, Patent.
CO3	Understand the strategies by applying different case studies like APACHE, Linux and Mozilla
CO4	*Starting and Maintaining of Open source software.*
CO5	Understand the Open source ethics. Impact of open source technology Difference between Open source and Closed source

S.NO	CONTENTS OF MODULE	Hrs	COs
1.	**Unit 1** Introduction – Why Open Source – Open Source –Principles, Standards Requirements, Successes – Free Software – FOSS – Internet Application Projects	12	CO1
2.	**Unit 2** Open source – Initiatives, Principles, Methodologies, Philosophy, Platform, Freedom, OSSD, Licenses – Copy right, Copy left, Patent, Zero Marginal Technologies, Income generation opportunities, Internalization	12	CO2
3.	**Unit 3** Case Studies – Apache, BSD, Linux, Mozilla (Firefox), Wikipedia, Joomla, GCC, Open Office.	11	CO3
4.	**Unit 4** Open Source Project –Starting, Maintaining –Open Source – Hardware, Design, Teaching & Media	15	CO4
5.	**Unit 5** Open Source Ethics – Open Vs Closed Source – Government – Ethics – Impact of Open source Technology – Shared Software – Shared Source	10	CO5

TEXT BOOK:

1. .Kailash Vadera, Bhavyesh Gandhi, "*Open Source Technology*", Laxmi Publications Pvt Ltd 2012, 1st Edition

REFERENCE BOOKS:

1. Fadi P. Deek and James A. M. McHugh, "*Open Source: Technology and Policy*", Cambridge Universities Press 2007.

Mapping of Course Outcomes to Program Outcomes:

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

3-Strong Correlation 2- Medium Correlation 1 - Low Correlation

SIXTH SEMESTER

(SYLLABUS)

Course Title: Core Paper – XXIII OPEN SOURCE TECHNOLOGIES LAB

…….

Course Code: 2 1 3 6 6 4 7	**Credits 02**
L: T:P:S :	**CIA Marks : 50**
Exam Hours: 03	**ESE Marks : 50**

LIST OF EXERCISES

1. Study and usage of Libre Office Suite – Writer, Calc& Impress
2. Text Processing with PERL
3. Simple Applications using PHP
4. Simple Applications using Python
5. Image editing using GIMP

EXTRA DISCIPLINARY COURSE

Course Title: FINANCIAL MATHEMATICS WITH R

CREDITS :02 (Internal Exam only)

Course objectives

To enhance the basic knowledge in computational methods in financial Services via R Programming

Units	CONTENTS OF MODULE
1.	Operators, Data structure, Functions, Control statements, Graphics, Reading and writing data
2.	Statistical Analysis with R, Basic statistics, Probability distribution and random numbers, hypothesis testing, Regression Analysis, yield curve analysis using principal component analysis
3.	Time series analysis with R-Preparation of time series data, before applying for models, The application of the AR model, Application of the time series analysis to finance
4.	Interest Rate Swap and Discount Factor, Interest rate swap , Pricing of interest rate swaps and the derivation of discount factors , Valuation of interest rate swaps and their risk.
5.	Discrete time model- Tree model- Single period binomial model, Multi period binomial model. .

Books for Reference:

1. R Programming and Its Applications in Financial Mathematics by Shuichi Ohsaki , Jori Ruppert- Felsot , Daisuke Yoshikawa , CRC Press , a Science publishers book.

Learning Quantitative Finance with R Dr. Param jeet, Prashant vats, Packt Publishing Ltd.

EXTRA DISCIPLINARY COURSE

Course Title: NUMERICAL METHODS

CREDITS :02 (Internal Exam only)

Course objectives

On taking this course the student will be able to grasp the basic elements of Numerical methods and error analysis. Compute Numerical Solution of Differentiation and Integration problems.

Units	CONTENTS OF MODULE
1.	Interpolation with unequal intervals-Divided differences and Newton's divided difference formula for interpolation and Lagrange's formula for interpolation-Lagrange's method
2.	Numerical differentiation-Derivatives using Newton's forward and backward difference formula, stirling's formula,divided difference formula,Maxima and minima.
3.	Numerical integration-General quadrature formula,Trapezoidal rule,Simpson's one-third rule, simson's three eigthth rule, weddle's rule.
4.	Difference equation-Linear homogeneous and non homogeneous difference equation with constant coefficient,particular integral for ,,sinkx,coskx,
5.	Numerical solution of ODE(first order only)-Taylor's series method,Euler's method,Modified Euler's method,Runge-kutta method fourth order only,predictor-corrector method-milne's method,Adams-Bashforth method. .

.

Recommended Text Book:

1. P. Kandasamy & K. Thilagavathy, K.Gunavathi, *Numerical Methods,* S. Chand & Co.

Reference Books1

1. **S** .Arumugam, A.Thangapaandi, A.Somasundaram, Numerical Methods Second edition ,

2.M.K.Jain, S.R.K.Iyengar, R.K.Jain, *Numerical methods for scientific and Engineering Computation* , Sixth edition (2012) ,New age International

Publishers, New Delhi.

3. H.C. Saxena, *Finite Differences and Numerical Analysis*, Fifteenth edition (2000), S.Chand&Co, New Delhi.