"Dissemination of Education for Knowledge, Science and Culture"
- Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College, Kolhapur (Autonomous)

DEPARTMENT OF MATHEMATICS

B.Sc. Part - II
Semester-III & IV

SYLLABUS

Under Choice Based Credit System

to be implemented from Academic Year 2022-23

B. Sc. Part-II

Paper No.	Course code	Title of Old Paper	Title of New Paper	Percentage of Change (%)	No. of Credits
Semester I					
III	DSC - 1003C	Differential and Integral Calculus	Number Theory and Integral Calculus	50%	4
Semester II					
IV	DSC - 1003D	Discrete Mathematics and Integral Transform	Discrete Mathematics and Integral Transform	40%	4
	SEC	Analytic Geometry and GeoGebra and Theory Of Equations	Analytic Geometry with Desmos andGeoGebra and Theory Of Equations	10%	4

Computational Mathematics Lab- DSC 1003C(PR) Total Credit 08

Course code	Title of the course	Instructions Lectures /Week	Duration of term end exam	Marks [End of academic year]	Credit
CCPM II	Number Theory and Integral Calculus and Discrete Mathematics and Integral Transform	4	3 hours	50%	4
CCPM III	Introduction to Scilab and C Language	4	3 hours	50%	4

B.Sc. Part II Semester: III

MATHEMATICS-DSC-1003C
Mathematics-Paper-III
Number Theory and Integral Calculus
Theory: 72 Hours (90 lectures of 48 minutes)- Credits-4 (Marks-100)

Section I: Number Theory

Course Outcomes:

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

CO1: Use mathematical induction and understand the logic and methods behind the major proofs in Number Theory.

CO2: Describe the method of solving the linear Diophantine equation

CO3: Determine GCD and LCM by using the Euclidean algorithm.

CO4: Understand the definition of congruence and be familiar with number theoretic functions.

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	**Divisibility theory in the integers:** Well ordering principle, Mathematical Induction, The Division Algorithm, The Greatest Common Divisor, Least common multiple, The Euclidean Algorithm, The Diophantine Equation ax + by = c and its examples.	10	1
Module 2	**Prime and their Distribution:** Definition of prime number, The Fundamental Theorem of Arithmetic , $\sqrt{2}$ is irrational, Euclid Theorem	09	1
Module 3	**Theory of congruences**: Definition of Congruence , basic properties of congruence, Fermat's Theorem examples on Fermat's theorem, Wilson's theorem (statement only) ,examples on Wilson's theorem	08	1
Module 4	**Number – Theoretic Function:** The Sum and Number of Divisors and its examples, The Greatest Integer Function Euler's Phi-Function , Some Properties of the Phi-Function and its examples	09	1

Reference Books:

1) David M. Burton – Seventh Edition , Elementary Number Theory, Mcgraw Hill Education
2) Ivan Niven ,H. Zuckerman , Fifth edition , An Introduction to the theory of Numbers , Wiley

Section II: Integral Calculus

Course Outcomes:

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

CO1: Acquire the information about beta, gamma function and evaluate it in various problems

CO2: Apply Leibnitz rule for differential under integral sign

CO3: Learn definition of Fourier Series, Odd and Even Functions, Half range series.

CO4: Use the knowledge of double and triple integrals for finding area and volume

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	**Beta and Gamma Functions:** Definition of Gamma function, Basic Properties of Gamma function, Examples on Gamma functions Definition of Beta function, Basic Properties of Beta function, Examples on Beta functions, Relation between Beta and Gamma function	10	1
Module 2	**Differentiation under Integral Sign and error function:** Case of constant limits of integration, Problem involving one parameter, problems involving two parameters, Leibnitz rule for differential under integral sign and examples, Definition of error function, complementary error function. basic properties of error function.	10	1
Module 3	**Multiple Integral** Double Integration: Method of evaluation and related examples, (Cartesian, Polar Form), change of order of integration, Change of variable, Examples of triple integral.	08	1
Module 4	**Fourier Series:** Periodic functions, Even and Odd functions, Fourier Series Expansion of elementary functions, (Over the different ranges $[-\pi, \pi]$,$[0,2\pi]$,$[-c, c]$,$[0,2c]$) Fourier Sine and Cosine series expansion, Half Range series expansion.	08	1

Recommended Book:

1. Shanti Narayan, Integral Calculus, S. Chand and Company, New Delhi.
2. J.K.Goyal, K.P.Gupta, Laplace and Fourier Transforms, A Pragati Edition (2016)
3. G.V. Kumbhojkar and H.V. Kumbhojkar – Engineering Mathematics ,Nirali Publication
4. Dr.S .Shrenadh, Integral Transform, S. Chand Prakashan
5. P. N. and J. N. Wartikar, Elements of Applied Mathematics.

B.Sc. Part II Semester: IV

MATHEMATICS-DSC-1003D
Mathematics-Paper-IV
Discrete Mathematics and Integral Transform
Theory: 72 Hours (90 lectures of 48 minutes)- Credits-4 (Marks-100)
Section I: Discrete Mathematics

Course Outcomes:

After studying this course student will able to

CO1: Understand Recurrence Relation, Generating functions and solving problems involvingrecurrence equations.

CO2: Understand basic concept of graph theory to apply in various fields.

CO3: Formulate Recurrence Relations to solve problems involving an unknown sequence.

CO4: Familiarize with the types of graphs, types of paths and their properties

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	**Recurrence relation:** Models of Recurrence Relations- Compound Interest, Tower of Hanoi, Bit Strings, Fibonacci Numbers (Counting Rabbits) , linear recurrence relation with constant coefficients, homogeneous solutions & examples, particular solutions and total solutions ,Examples .	10	1
Module 2	**Generating functions** Generating functions, Basic properties of generating functions, applications to solving recurrence relations and Examples	08	1
Module 3	**Basics of Graph Theory:** Graph-Vertices, Edges, Types of Edges- Simple, Parallel, Loop, Simple graph, Multi graph, Pseudo graph, Degree of A vertex- Even and odd Vertex, Isolated, Pendant Vertex, Finite and Infinite Graphs, Adjacent vertices, Undirected Graph And Directed Graph/Digraph, In-degree and Out-Degree of Vertex, Handshaking Lemma	10	1
Module 4	**Paths and Circuits:** Walks-open & close, length of walk, trail, Paths, simple path, length of path, Circuit, cycle, Subgraph-Spanning subgraph (Edge Disjoint, Vertex Disjoint), Operations of graph (Union, Intersection, Complement, Ring Sum), Connected Graphs and components, Disconnected Graphs,	08	1

	Isomorphic Graph, Types of Graph - Complete, Regular, Bipartite, Complete Bipartite		

Reference book :

1. Hari Kishan & Shiv Raj Pundir, Discrete Mathematics, Pragati Prakashan, 2013
2. Susanna S. Epp, Discrete Mathematics with Applications,PWS Publishing Company, 1995.

S. Lipschurtz, M. Lipson: Discrete Mathematics, Schaums Outlines

Section II: Integral transforms

Course Outcomes:

After studying this course student will able to

CO1: recognize the different methods of finding Laplace transforms and Fourier transforms of different functions.

CO2: explain the applications and the usefulness of these special functions.

CO3: Determine Fourier transform, Relation between Laplace and Fourier Transform.

CO4: apply the knowledge of Laplace transforms, Fourier transforms and Finite Fourier transforms in finding the solutions of differential equations

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	**Laplace Transform.** Laplace Transform: Definitions; Piecewise continuity, Function of exponential order, Function of class A, Existence theorem of Laplace transform. Laplace transform of standard functions. First shifting theorem and Second shifting theorem and examples, Change of scale property and examples, Laplace transform of derivatives and examples, Laplace transform of integrals and examples. Multiplication by power of t and examples. Division by t and examples. Laplace transform of periodic functions and examples. Laplace transform of Heaviside's unit step function.	10	1
Module 2	**Inverse Laplace Transform and application :** Definition Standard results of inverse Laplace transform, Examples, First shifting theorem and Second shifting theorem and examples. Change of scale property and Inverse Laplace of derivatives, examples. The Convolution theorem and Multiplication by S, examples. Division by S, inverse Laplace by partial fractions, examples, Solving linear differential equations with constant coefficients by Laplace transform.	10	1
Module 3	**Fourier Transform** The infinite Fourier transform and inverse: Definition examples Infinite Fourier sine and cosine transform and examples. Definition: Infinite inverse Fourier sine and cosine transform and examples. Relationship between Fourier transform and Laplace transform. Change of Scale Property and examples. Modulation theorem. The Derivative theorem. Extension theorem. Convolution theorem and examples.	08	1

Module 4	**Finite Fourier Transform and Inverse, Fourier Integrals:** Finite Fourier sine and cosine transform with examples. Finite inverse Fourier sine and cosine transform with examples. Fourier integral theorem. Fouriersine and cosine integral (without proof) and examples.	08	1

1. J.K.Goyal, K.P.Gupta, Laplace and Fourier Transforms, A Pragati Edition (2016).

Reference Books:

1. Dr.S.Shrenadh, Integral Transform, S. Chand Prakashan.
2. B Davies, Integral Transforms and Their Applications, Springer Science Business Media LLC(2002)

MATHEMATICS LAB: DSC-1003C (Practical) Credits: 08 Marks: 100

Core Course Practical In Mathematics (CCPM-II)

Number Theory, Integral Calculus, Discrete Mathematics and Integral Transform (Marks: 50) Credits 04

1) Euclidean Algorithm
2) Diophantine Equations
3) Fermat's and Wilson's theorem
4) Euler-phi function
5) Beta & Gamma Function-I
6) Beta & Gamma Function-II
7) Multiple Integral
8) Laplace Transform
9) Inverse Laplace Transform
10) Infinite Fourier Transform
11) Finite Fourier Transform
12) Fourier Series
13) Recurrence Relation
14) Boolean Algebra
15) Types of Graph
16) Walk and cycles

Core Course Practical In Mathematics (CCPM-III) Introduction to Scilab and C Language (Marks 50) credits 04

1) Introduction to Scilab
2) Matrix
3) Accessing elements of Matrices
4) Sub Matrix
5) Advanced Matrix operation
6) Polynomial
7) Plotting graphs
8) Introduction to Scilab Programming
9) Numerical Methods to find the root of the given function
10) Interpolation
11) Numerical solution of Ordinary Differential Equations -I- Euler's and Euler's Modified Method
12) Numerical solution of Ordinary Differential Equations -II- Runge Kutta Method
13) Numerical Integration-I Trapezoidal Rule
14) Numerical Integration-II Simpson's Rule
15) Numerical Methods for solution of System of linear equations-I Gauss Jordan
16) Numerical Methods for solution of System of linear equations-I Gauss Seidel

Reference Books:

1) Shanti Narayan; Dr. P. K. Mittal, Differential Calculus, S. Chand Publishing
2) S. V. Kumbhokar, G.V. Kumbhojkar, Advanced Calculus, Nirali Pubilcation
3) N. Piskunov, Differential And Integral Calculus, MIR Publisher, MOSCOW.
4) Scilab- A hand on Introduction by Satish Anniger
5) Goyal and Gupta: Integral Transform, Krishna Publication, Meerut.
6) Goyal : Integral Transform, Vikas Publishing House.
7) S. Lipschutz, M.Lipson: Disrete Mathematics, Schaums Outline

Skill Enhancement Course
Skill enhancement Experiments

(4 Credits) Analytic Geometry with Desmos or GeoGebra

1. Find roots of equations.
2. To Find maxima and minima of given equation.
3. To calculate the approximate limiting value of given equations
4. To check given function is continuous or not?

Reference Book:

1. G. B. Thomson, R. L. Finney, Calculus, 9th Edition, Pearson Education, Delhi, 2005.
2. H. Anton, I. Bivens and S. Davis, Calculus, John Wiley and Sons (Asia) P. Ltd., 2002.

Theory of Equations

1. Polynomial: Definition, representation and its extreme values

2. Relation between Roots and

coefficients 3.Solution of

Reciprocal and Binomial

equations. **Reference Books:**

1. W. S. Burnside, A. W. Panton, The theory of Equations, Dublin University Press, 1954.
2. C. C. McDuffee, Theory of Equations, John Wiley and Sons Inc., 1954.

SCHEME OF MARKING (THEROY)

Sem.	DSC	Marks	Evaluation	Sections	Answer Books	Standard of passing
III	1003C	80	Semester wise	Two sections each of 40 marks	As per Instruction	35% (28 marks)
IV	1003D	80	Semester wise	Two sections each of 40 marks	As per Instruction	35% (28marks)

SCHEME OF MARKING (CIE) Continuous Internal Evaluation

Sem.	DSC	Marks	Evaluation	Sections	Answer Books	Standard of passing
III	1003C	20	Concurrent	-	As per Instruction	35% (7 marks)
IV	1003D	20	Concurrent	-	As per Instruction	35% (7 marks)

SCHEME OF MARKING (PRACTICAL)

Sem.	DSC	Marks	Evaluation	Sections	Standard of passing
III AND IV	1003C 1003D	100	Annual	As per Instruction	35% (35 marks)

***A separate passing is mandatory**

Nature of Theory Question Paper

***Instructions*: 1) All the questions are *compulsory*.**
*2) Answers to the two sections should be written in **same** answer book.*
*3) Figures to the right indicate **full** marks.*
*4) Draw neat labeled diagrams **wherever** necessary.*
5) Use of log table/calculator is allowed.

SECTION-I

Time : 2 hours **Total Marks: 35**

Q.1. A.Choose correct alternative. **5**

i)
A) B) C) D)

ii)
A) B) C) D)

iii)
A) B) C) D)

iv)
A) B) C) D)

v)
A) B) C) D)

Q. 1. B. Fill in the blanks 07

i)
ii)

Q.2. Attempt any two. **16**

A)
B)
C)

Q.3. Attempt any Three **12**

a)
b)
c)
d)
e)
f)