Kristu Jayanti College

AUTONOMOUS Bangalore

Accredited 'A' Grade by NAAC | An Institution Managed by CMI Fathers

DEPARTMENT OF COMPUTER SCIENCE

Bachelor of Science [B Sc. (CSMS)]
B Sc. (Computer Science, Mathematics, Statistics)
Curriculum 2014 -17 Batch

http://www.kristujayanti.edu.in

CURRICULUM OVERVIEW

1. **Aim**

The programme aims to make student equip with the knowledge background required to be a successful career/higher studies in the field of Mathematics, Statistics and Computer Science.

2. **Eligibility**

A student should have passed 10 + 2 or equivalent academic stream.

3. **Credits**

A student has to earn a total of 140 credits for the successful completion of the programme.

Part	Category	Category Description	Hours per week	Credits	Total credits	Semester
I	Language	Theory	4	3	12	I,II,III,IV
	English	Theory	4	3	12	I,II,III,IV
II	Major (Core)	Theory	5	4	92	I,II,III,IV,V,VI
		Practical/Project	2	1	13	I,II,III,IV,V,VI
			4	3	3	VI
III	Non – Core	-	2	1	3	I,II,IV
IV	Life Skill Education (LSE)	-	3	2	2	I
V	NSS/NCC/ Certificate Program/ Extra- Curricular/ Co-curricular and Social Outreach	-	-	3	3	I, II, III,IV

Note :

In case of Part V – one credit is equal to 20 hours.

4. **Attendance**

1. A student should have 85 percentage of attendance in each course
2. Any student who is not complying to this requirement will not be allowed to appear for End Semester Examination

5. **Passing Criteria**

- No minimum pass mark for CIA
- ESE (End Semester Examination) alone 35% - (35 marks out of 100 / 21 marks out of 60)
- (ESE + CIA) aggregate 40 % or 40 marks out of 100
- Student has to get pass mark in non -core course of the respective semester to get Overall "Pass" status.
  ESE alone 35% - (32 marks out of 90 / 16 marks out of 45) and (ESE + CIA) aggregate 40% or 20 marks out of 50

- Student should achieve the total number of 140 Credits for the UG programme.

6. Specialization / Electives

Electives are not offered for this programme.

7. Orientation & Bridge Programmes

Orientation Programme

Orientation is offered at the beginning of the programme. It basically includes sessions as mentioned below:

- Campus Culture
- Introduction to the Programme and Syllabus
- Soft Skills
- Basic Computing
- English Communication
- Basic Electronics
- Introduction to Programming

Bridge Programme

Bridge courses are offered on different subjects in order to cop up with the syllabus of the programme.

I Semester

- Basic Problem Solving Techniques

II Semester

- Basic Mathematics
- Project Designing Tools

8. Value Added Courses / Certificate Courses

Value Added Courses

II Semester

- MS Excel

III Semester

- SPSS

IV Semester

- PL/SQL & Database Connectivity

Certificate Courses

V Semester

- Quantitative Aptitude

VI Semester

- Advanced Java

9. Internship / Project

The student has to undergo two projects during the programme.

10. Skill Development Activities

The Computer Academy offers provisions for students to be a part of the different technical communities which aims at the skill development in the respective domain. The various communities include:

- Coding and Debugging
- IT Quiz
- IT Manager
- Electronics
- Mathematics
- Statistics
- Designing
- Event Management

11. Co-curricular Activities

The department has an auspicious club namely "Computer Academy" which organizes the various activities like:

- Synchronize: Intra collegiate IT Fest
- Xactitude: Inter collegiate IT Fest
- Galaxia: Science Exhibition
- Industrial Visit
- Guest Lecture
- Workshop

12. Any Other Activities

- Computer Literacy Programme
- Social Outreach Programme

13. Program Matrix

Abbreviations

ESE - End Semester Examination
CIA - Continuous Internal Assessment
MC - Major Core
MC Lab - Major Core Laboratory
NC - Non Core
Lang - Language

* A Pass marks in the non core course is mandatory but marks secured for the same is not considered for grand total/grade/class
** Non-core subjects (Marks are not added to the total).
*** Vernacular languages syllabus is available in the college library.

SEMESTER I

Course Code	Course Title	Course Type	Hrs / Week	Credits	CIA	ESE	Max Marks
13ENG1201	English I	Lang	4	3	40	60	100
13AEN1201	II Language : Additional English***	Lang	4	3	40	60	100
14HIN1201	II Language : Hindi ***						
13KAN1201	II Language : Kannada***						
13CSC1201	Computer Science I - Programing in C	MC	5	4	40	60	100
13CSC12L1	Computer Science Practical I - Programing in C Practical	MC Practical	2	1	20	30	50
13STS1201	Statistics I - Basic Statistics	MC	5	4	40	60	100
13STS12L1	Statistics Practical I - Basic Statistics Practical	MC Practical	2	1	20	30	50
13MAT1201	Mathematics I - Calculus and Analytical Geometry	MC	5	4	40	60	100
13NHU0102	Indian Constitution **	NC	2	1	5*	45*	50*
Total			**29**	**21**	**240**	**360**	**600**

SEMESTER II

Course Code	Course Title	Course Type	Hrs / Week	Credits	CIA	ESE	Max Marks
13ENG2201	English II	Lang	4	3	40	60	100
13AEN2201	II Language : Additional English***	Lang	4	3	40	60	100
13HIN2201	II Language : Hindi ***						
13KAN2201	II Language : Kannada***						
13CSC2201	Computer Science II - Data Structures	MC	5	4	40	60	100
13CSC22L1	Computer Science Practical II - Data Structures Practical	MC Practical	2	1	20	30	50
13STS2201	Statistics II - Probability Distributions	MC	5	4	40	60	100
13STS22L1	Statistics Practical II - Probability Distributions Practical	MC Practical	2	1	20	30	50
13MAT2201	Mathematics II - Algebra and Differential Calculus	MC	5	4	40	60	100
13NCS0101	Computer Fundamentals **	NC	2	1	5*	45*	50*
Total			**29**	**21**	**240**	**360**	**600**

SEMESTER III

Course Code	Course Title	Course Type	Hrs / Week	Credits	CIA	ESE	Max Marks
13ENG3201	English III	Lang	4	3	40	60	100
13AEN3201	II Language : Additional English***	Lang	4	3	40	60	100
13HIN3201	II Language : Hindi ***						
13KAN3201	II Language : Kannada***						
13CSC3201	Computer Science III – Java Programming	MC	5	4	40	60	100
13CSC32L1	Computer Science Practical III - Java Programming Practical	MC Practical	2	1	20	30	50
13STS3201	Statistics III - Statistical Inference I	MC	5	4	40	60	100
13STS32L1	Statistics Practical III - Statistical Inference I Practical	MC Practical	2	1	20	30	50
13MAT3201	Mathematics III - Algebra, Differential Calculus, Improper Integrals and Linear Programming	MC	5	4	40	60	100
13MAT3202	Mathematics IV- Algebra, Differential Equations, Laplace Transforms and Fourier Series	MC	5	4	40	60	100
Total			**32**	**24**	**280**	**420**	**700**

SEMESTER IV

Course Code	Course Title	Course Type	Hrs / Week	Credits	CIA	ESE	Max Marks
13ENG4201	English IV	Lang	4	3	40	60	100
13AEN4201	II Language : Additional English***	Lang	4	3	40	60	100
13HIN4201	II Language : Hindi ***						
13KAN4201	II Language : Kannada***						
13CSC4201	Computer Science IV - DBMS & Visual Programming	MC	5	4	40	60	100
13CSC42L1	Computer Science Practical IV- DBMS Practical	MC Practical	2	1	20	30	50
13STS4201	Statistics IV - Statistical Inference II	MC	5	4	40	60	100
13STS42L1	Statistics Practical IV - Statistical Inference II Practical	MC Practical	2	1	20	30	50
13MAT4201	Mathematics V - Real and Complex Analysis	MC	5	4	40	60	100
13MAT4202	Mathematics VI - Total and Partial Differential Equations, Particle Dynamics and Numerical Analysis	MC	5	4	40	60	100
13NHU0101	Environment Studies & Civic Sense **	NC	2	1	5*	45*	50*
Total			**34**	**25**	**280**	**420**	**700**

SEMESTER V

Course Code	Course Title	Course Type	Hrs / Week	Credits	CIA	ESE	Max Marks
13CSC5201	Computer Science V- Software Engineering	MC	5	4	40	60	100
13CSC5202	Computer Science VI - Operating System Concepts and UNIX /LINUX	MC	5	4	40	60	100
13CSC52L1	Computer Science Practical VI - UNIX /LINUX Practical	MC Practical	2	1	20	30	50
13STS5201	Statistics V - Sampling Theory	MC	5	4	40	60	100
13STS52L1	Statistics Practical V - Sampling Theory Practical	MC Practical	2	1	20	30	50
13STS5202	Statistics VI - Statistical Methods for Quality Management	MC	5	4	40	60	100
13STS52L2	Statistics Practical VI - Statistical Methods for Quality Management Practical	MC Practical	2	1	20	30	50
13MAT5201	Mathematics VII - Geometry of Space Curves and Vector Calculus	MC	5	4	40	60	100
Total			**31**	**23**	**260**	**390**	**650**

SEMESTER VI

Course Code	Course Title	Course Type	Hrs / Week	Credits	CIA	ESE	Max Marks
13CSC6201	Computer Science VII - Internet Technology	MC	5	4	40	60	100
13CSC62P1	Computer Science VIII - Enterprise Computing Project Using .Net Technology	MC Project	4	3	40	60	100
13STS6201	Statistics VII - Design of Experiments and Applied Statistics	MC	5	4	40	60	100
13STS62L1	Statistics Practical VII – Design of Experiments and Applied Statistics Practical	MC Practical	2	1	20	30	50
13STS6202	Statistics VIII - Operations Research	MC	5	4	40	60	100
13STS62L2	Statistics Practical VIII - Operations Research Practical	MC Practical	2	1	20	30	50
13MAT6201	Mathematics VIII - Matrices, Linear Algebra, Calculus of Variations and Fourier Transforms	MC	5	4	40	60	100
Total			**28**	**21**	**240**	**360**	**600**

Credit Structure

Semester	1	2	3	4	5	6	**Total**
Credits	21	21	24	25	23	21	**135**
Life Skill Education - Part IV							**2**
NCC/NSS/Certificate Program/Extracurricular/ Co-curricular - Part V							**3**
						Total Credits	**140**

Subject Description

Computer Science I	Programming in C
Computer Science II	Data Structures
Computer Science III	Java Programming
Computer Science IV	DBMS & Visual Programming
Computer Science V	Software Engineering
Computer Science VI	Operating System Concepts and UNIX /LINUX
Computer Science VII	Internet Technology
Computer Science VIII	Project
Mathematics I	Calculus and Analytical Geometry
Mathematics II	Algebra and Differential Calculus
Mathematics III	Algebra, Differential Calculus, Improper Integrals and Linear Programming
Mathematics IV	Algebra, Differential Equations, Laplace Transforms and Fourier Series
Mathematics V	Real and Complex Analysis
Mathematics VI	Total and Partial Differential Equations, Particle Dynamics and Numerical Analysis
Mathematics VII	Geometry of Space Curves and Vector Calculus
Mathematics VIII	Matrices, Linear Algebra, Calculus of Variations and Fourier Transforms
Statistics I	Basic Statistics
Statistics II	Probability Distributions
Statistics III	Statistical Inference I
Statistics IV	Statistical Inference II
Statistics V	Sampling Theory
Statistics VI	Statistical Methods for Quality Management
Statistics VII	Design of Experiments and Applied Statistics
Statistics VIII	Operations Research

SEMESTER I

13ENG1201 ENGLISH I

Credits: 3 **Total: 60 Hours**

Objectives:

- To attune young minds to concerns and issues which have a broad and wide scope of use and application to life.
- To cut across the history of creative expression in focusing primarily on the core values that governs human lives.

UNIT 1: Prose **15 hrs**

On Saying Please- A G Gardiner; Are the Rich Happy- Stephen Leacock; The Lost Child- Mulk Raj Anand; Mrs.Packletide's Tiger- Saki; Lamb to the Slaughter -Roald Dahl.

UNIT 2: Poetry **15 hrs**

On His Blindness- John Milton; The Village Schoolmaster - Oliver Goldsmith; The Solitary Reaper -William Wordsworth; Ozymandias- P.B.Shelley; La Belle Dame Sans Merci- John Keats.

UNIT 3: Remedial Grammar **15 hrs**

Subject-Verb Agreement-Tenses-Do-Forms-Active and Passive Voices-Use of Negatives-Prepositions-Vocabulary.

UNIT 4: Communication Skills **15 hrs**

Understanding Communication-Greeting and Introducing-Making Requests-Asking for and Giving Permission-Offering Help-Giving Instructions and Directions.

References:

Glendinning, Eric H. and Beverly Holmstrom (2008*), Study Reading: A Course in Reading Skills for Academic Purposes*, New Delhi: CUP.

Joan Van Emden and Lucinda Becker Palgrave. *Effective Communication for Arts and Humanities Students.* Macmillan.

Langan, John (1996). *College Writing Skills*. McGraw Hills.

Murphy,Raymond.(1998), *Intermediate English Grammar*.New Delhi: CUP.

Wren & Martin (2001),*English Grammar & Composition*. S.Chand & Company Ltd.

13CSC1201 COMPUTER SCIENCE I: PROGRAMMING IN C

Credits: 4 **Total: 60 Hours**

Objective:

Make the students aware of the nuances of programming and how to implement it by using C language.

UNIT 1: Introduction 10 hrs

Introduction to Programming Concepts - Types of programming languages; Software; Classification of software, application software and system software; Structured programming; Algorithms and flowcharts with examples.

Introduction to C - History of C; Structure of a C program; The C character set; Constants; Variables and keywords; Types of constants and variables.

UNIT 2: Instructions & Control Structures 13 hrs

C Instructions - Type declaration and arithmetic instructions; Integer and float conversions: Type conversion in assignment; Operators in C: Arithmetic operators, Logical operators, relational operators, bitwise operators; Hierarchy of operators; Input-Output statements in C: Formatted and unformatted.

Control Structures - Decision control structures; ternary operators; switch-case control structure; Loop control structures: while; do-while; for loop; break statement; Continue statement; go to statement.

UNIT 3: Arrays & Functions 14 hrs

Arrays - One dimensional, two dimensional and multidimensional arrays, declaration; initialization and array manipulations; Sorting: Bubble sort; String: Basic concepts; String manipulation programs.

Functions - Definition and prototyping; types of functions; types of arguments; recursion; passing arrays to functions; storage class in C: automatic; register; external and static variables.

UNIT 4: Pointers, Structures and Unions 12 hrs

Pointers - Definition; notation; pointers and arrays; array of pointers and functions: call by value and call by reference; Pointers to pointers.

Structures and Unions - Definition; declaration; accessing structure elements; Array of structure; Pointers and structures; Unions: definition; declaration; accessing union elements, typedef; enum bit fields.

UNIT 5: Preprocessor and Files 11 hrs

C Preprocessor - Types of C preprocessor directives; Macros; File Inclusion.

Files - File opening modes; Text and Binary files; High level and Low level operations on files; Command Line Arguments.

Text Books:

Balagurusamy.E. *Programming in ANSI C*. (2nd ed.). Tata McGraw Hill.

Yashavant Kanetkar, *Let Us C*, (4th ed.). BPB Publications.

References:

Brian Kernighan**,** Dennis Ritchie.(1988). *The C Programming Language,* Prentice Hall.
Herbert Cooper. *Spirit of C,* Jaico Publishing House, New Edition.
K.N.King. *C Programming – A modern Approach* (2nd ed.). W.W.Norton Company.
Rajaraman.V. *Fundamentals of Computers* (2nd ed.).Prentice Hall India Limited. (for UNIT 1).
S. Byron Gottfried. *Programming with C,* Tata McGraw-Hill.
Stephen G. Kochan. (2005). *Programming in C,* Pearson.
Steve Oualline .(2010). *Practical C Programming,* O'reilly.
Yashavant Kanetkar .(2003). *Exploring C,* BPB publishers.

13CSC12L1 COMPUTER SCIENCE PRACTICAL I: PROGRAMMING IN C PRACTICAL

Credit: 1 **Total: 30 Hours**

Part A

1. Write a C program to generate and print first N Fibonacci numbers.
2. Write a C program to find the GCD and LCM of two integer numbers.
3. Write a C program that reverses given integer number and checks whether the number is palindrome or not.
4. Write a C program to find whether a given number is prime number or not.
5. Write a C program to read a string and check whether it is palindrome or not.
6. Write a C program to find the factorial of a number using function.
7. Write a C program to find if a character is alphabetic or numeric or special character.
8. Write a C program to accept a sentence and convert all lowercase characters to uppercase and vice-versa.

Part B

9. Write a C program to input numbers and to find mean variance and standard deviation.
10. Write a C program to find the roots of the given quadratic equation using switch case.
11. Write a C program to compute the sum of even numbers and the sum of odd numbers.
12. Write a C program to find the length of a string without using built-in function.
13. Write a C program to reverse the string using pointers.
14. Write a C program to accept different goods with the number, price and date of purchase and display them using structures.
15. Write a C program to read two matrices and perform addition and subtraction of two matrices.
16. Write a C program to copy one string to another using pointer.

Evaluation Criteria.

Criteria	Marks
Writing any two programs from the given three questions. (The questions will be one from part – A and two from part B).	5 x 2 = 10
Executing the written two programs.	7.5 x 2 = 15
Viva Voice	5
Total Marks	30

13STS1201 STATISTICS I: BASIC STATISTICS

Credits: 4 **Total: 60 Hours**

Objectives

- To acquaint students with basic concepts in Statistics.
- To introduce elementary statistical methods of data analysis.

UNIT 1: Univariate Data Analysis 15 hrs

Basic concepts- Population, sample, variable and attributes; Types of data- qualitative, quantitative, nominal, ordinal, cross sectional, discrete and continuous; Types of scales– ratio and interval; Frequency distribution; Graphical presentation– Histogram, Frequency curve, Ogives, Stem and leaf chart, Tukey's box plot; Measures of central tendency or Location, Dispersion, Moments, Skewness and Kurtosis- properties and applications.

UNIT 2: Bivariate Data Analysis 15 hrs

Related variables, Scatter diagram; Karl Pearson's correlation coefficient and its properties; Spearman's Rank correlation coefficient; Curve fitting - Principle of least squares; Fitting of linear equation, quadratic, power and exponential curves; Simple linear regression analysis; Coefficient of determination and its interpretation.

UNIT 3: Probability 12 hrs

Basic concepts - Random experiments, sample space, events; Classical, empirical and axiomatic approaches to probability; Properties of probabilities; Additive law, Conditional probability, multiplicative law, independence of events; Bayes theorem and its applications.

UNIT 4: Random Variables 10 hrs

Discrete and continuous random variables; Probability mass function and probability density function; Distribution function and its properties; Two dimensional random variables – joint, marginal and conditional distributions; Transformation of one dimensional random variable.

UNIT 5: Mathematical Expectation 08 hrs

Expectation, variance and moments of one and two dimensional random variables; Conditional expectation, covariance and correlation coefficient; Independence of random variables; Addition and multiplication theorem of expectation; Mean and variance of a linear combination of random variables; Moment generating function (m.g.f) and its properties.

Text Books:

Chandra, T. K. and Chatterjee, D. (2001). *A First Course in Probability*. (1st ed.). New Delhi: Narosa Publishing house.

Gupta, S.C and Kapoor, V.K. (2009). *Fundamentals of Mathematical Statistics*, New Delhi: Sultan Chand and Sons.

Reference:

Agarwal, B.L. (1998). *Programmed Statistics*. (2nd ed.). New Age International.
Arora. (2007). *Quantitative Aptitude Statistics*, New Delhi: Sultan Chand and Sons.
Bhat, B.R. (1999). *Modern Probability theory – An introductory text book*. (3rd ed.). New Age International.
Freund, J.E. (1999). *Mathematical Statistics*. (5th ed.). New Delhi: Prentice Hall India.
Gupta, S.C. (1999). *Fundamental of Statistics*.(5th ed.). Himalaya Publishing House.
Ross Sheldon, *A First Course in Probability*. (6th ed.). Macmillan.
Ruma Falk. (2003). *Understanding Probability and Statistics – A Book of Problems*. University Press.
Spieger, M.R. (1980). *Theory and Problems of Probability and Statistics*. London: Schaum's Outline Series, McGraw Hill.

Note: Scientific calculator is allowed.

13STS12L1 STATISTICS PRACTICAL I: BASIC STATISTICS PRACTICAL

Credit: 1 **Total: 30 Hours**

Part A

1. Construction of frequency distribution and graphical presentation.
2. Problems based on measures of central tendency I (AM, GM, HM and weighted means).
3. Problems based on measures of central tendency II (median and mode and partition values).
4. Problems based on measures of dispersion I (range, mean deviation and quartile deviation).
5. Problems based on measures of dispersion II (standard deviation and coefficient of variation).
6. Problems based on moments, measure of skewness and kurtosis.

Part B

7. Fitting first and second degree curves by the method of least squares.
8. Fitting exponential and geometric curves by the method of least squares.
9. Problems based on correlation and regression.

Part C

10. Computation of probabilities using combinatorial method, addition and multiplicative rules and Bayes theorem.
11. Problems based on univariate probability distribution – expectation, moments, skewness and kurtosis.
12. Problems based on bivariate probability distribution – marginal and conditional distributions (computation of moments, conditional expectation and correlation coefficient).

Evaluation Criteria

Theory

Unit nos.	Topic	Hours of teaching	2 marks	7 marks	15 marks	Total marks in question paper*
1	Univariate Data	15	3	2	1	35
2	Bivariate Data	15	2	2	1	33
3	Probability	12	3	2	1	35
4	Random variables	10	2	1	1	26
5	Mathematical	8	2	1	1	26
Total hours and marks		60	24	56	75	155

(* including choices)

Practical:

Q1 Based on Part A&B

Q2 Based on Part B&C

Q3 Based on Part C&A

Sl. No.	Particulars	Maximum Marks
1.	Answer any 2 questions out of 3	12.5*2 = 25
2.	Viva Voce	5
Total Marks		30

Note: Scientific calculator is allowed.

13MAT1201 MATHEMATICS I: CALCULUS AND ANALYTICAL GEOMETRY

Credits: 4 **Total: 60 Hours**

Objective:

The course aims to develop and strengthen the foundation of calculus and its methods including partial differentiation and higher order derivatives and integrals and to offer a simple and elegant approach to the study of analytical geometry in 3 dimensions by combining vector and cartesian methods.

UNIT 1: Differential Calculus -I 20 hrs

Successive differentiation- nth derivatives of functions, Leibinitz theorem and its applications; partial differentiation- first and higher order derivatives, differentiation of homogeneous functions, Euler's theorem, total derivatives and total differential, differentiation of implicit and composite functions, Jacobians.

UNIT 2: Integral Calculus-I 10 hrs

Reduction formulae for $\int \sin^n x\,dx$, $\int \cos^n x\,dx$, $\int \tan^n x\,dx$, $\int \cot^n x\,dx$, $\int \sec^n x\,dx$, $\int \operatorname{cosec}^n x\,dx$, $\int \sin^n x \cos^n x\,dx$; differentiation under the integral sign.

UNIT 3: Analytical Geometry of three dimensions (Lines and Planes) 20 hrs

Direction cosines of a line (as component of unit vector), directions ratios, angle between two lines, area of a triangle and volume of a tetrahedron with given vertices, equation of a line in different forms, parallel and perpendicular conditions, intersection of two lines, perpendicular from a point to a line, reflection of a point in a line.

Equation of a plane in different forms, perpendicular from a point to a plane, reflection of a point in a plane, angle between two plane, line of intersection of two planes, plane coaxal with given planes, plane bisecting the angle between two planes, angle between a line and a plane, coplanarity of two lines, shortest distance between two lines.

UNIT 4: Analytical Geometry of three dimensions(Sphere, Cylinder, Cone) 10 hrs

Equation of the sphere in general and standard forms, equation of a sphere with ends of a diameter, tangent plane to a sphere, orthogonality of spheres, standard equations of right circular cone and right circular cylinder.

Text Books:

Shanti Narayan.S and Mittal, P.K. (2008), *Differential Calculus,* S. Chand & Co. Ltd.

Shanti Narayan.S and Mittal, P.K. (2000), *Integral Calculus,* S. Chand & Co. Ltd.

Shanti Narayan.S, *Elements of Analytical Solid Geometry,* S.Chand and Co. Ltd.

References:

Maurice D Weir, Joel Hass, Frank R Giordano: Thomas' *Calculus*. (11th ed.). (Pearson).

Apostol,T.M, *Calculus,*Volume I & II .Wiley India.

Bali.N.P,*Golden Integral Calculus,* Laxmi Publications (P) Ltd

Bali.N.P,*Golden Solid Geometry,* Laxmi Publications (P) Ltd.

Note : Scientific calculator is allowed.

SEMESTER II

13ENG2201 ENGLISH II

Credits: 3 **Total: 60 Hours**

Objectives:

- To develop the ability to get student's ideas across clearly to an audience, both in speech and in writing
- To help students develop important practical skills.

UNIT 1: Prose & Poetry 30 hrs

Food -J B S Haldane; A Devoted Son -Anita Desai; Love is a Fallacy -Max Schulman; Night Train at Deoli-Ruskin Bond; Incident of the French Camp - Robert Browning; A Passerby - Robert Bridges; Snake – D H Lawrence; Matilda - Hilaire Belloc; Stopping by Woods on a Snowy Evening -Robert Frost; The Speaking Tree (The Times of India) 2 extracts; Human Rights (Extensive Reading).

UNIT 2: Functional Communication 16 hrs

Essential English Grammar-Presentation Skills & Paper presentation-Note Taking-Report Writing-Letter Writing-Filling Challan, Bank forms & Application forms.

UNIT 3: Media Awareness 14 hrs

Kinds of News-Who and Which News gets Prominence?-Who Controls the News?-Types of Radio Programmes-Types of Television Programmes-Elements of Advertising-Use of blog.

References:

Glendinning, Eric H. and Beverly Holmstrom (2008), *Study Reading: A Course in Reading Skills for Academic Purposes*, New Delhi: CUP.

Joan Van Emden and Lucinda Becker Palgrave. *Effective Communication for Arts and Humanities Students.* Macmillan.

Murphy,Raymond.(1998), *Intermediate English Grammar*.New Delhi: CUP.

Langan, John (1996). *College Writing Skills*. McGraw Hills.

Wren &Martin (2001),*English Grammar & Composition*. S.Chand & Company Ltd.

13CSC2201 COMPUTER SCIENCE II: DATA STRUCTURES

Credits: 4 **Total: 60 Hours**

Objective:

To inculcate knowledge on implementing Data Structure concepts using C.

UNIT 1: Introduction to Data Structures 14 hrs

Introduction - Definition; Classification of data structures, primitive and non-primitive; Operations on data structures.

Pointers - Definition; Accessing the address of a variable; Declaring and initializing pointers; Accessing a variable through its pointer.

Dynamic Memory Allocation – Define static and dynamic memory allocation; Memory allocation functions, malloc, calloc, free and realloc.

Recursion - Definition; Types; Recursion in C; Writing Recursive Programs, binomial coefficient, Fibonacci series, gcd, towers of hanoi.

UNIT 2: Searching and Sorting 14 hrs

Searching - Basic searching techniques, sequential search, binary search ; Iterative and recursive methods; Comparison between sequential and binary search.

Sorting - Definition; Different types, bubble sort, selection sort, insertion sort, merge sort, quick sort, heap sort.

UNIT 3: Stack and Queue 12 hrs

Stack - Definition; Array representation of stack; Operations on stack; Polish notation; Reverse polish notation; Applications of stack, conversion of an infix arithmetic expression to postfix, evaluation of postfix expression.

Queue - Definition; Array representation of queue; Types of queue, simple queue, circular queue, double ended queue, priority queue, operations on all types of queues.

UNIT 4: Linked List 10 hrs

Definition; Components of linked list; Representation of linked list; Advantages and disadvantages of linked list; Types of linked list, singly linked list, doubly linked list, circular linked list, circular doubly linked list; Operations on singly linked list, creation, insertion, deletion, search and display.

UNIT 5: Tree 10 hrs

Tree - Definition, binary Tree, complete binary tree, binary search tree, heap; Tree terminology, root, node, degree of a node ,degree of a tree, terminal nodes, non terminal nodes, siblings, level, edge, path, depth, parent node, ancestors of a node; Binary Tree, array and linked representation of binary tree; Creation of binary tree; Traversal of binary tree, preorder, inorder, postorder; Variations of binary tree, binary search tree(BST); Heap, insertion and deletion of a node.

Text Books:

Kamthane Ashok. (2009), *Introduction to Data Structures in C*. (1st ed.). Pearson.

Langsam Yedidyah, Augenstein J Moshe,Tenenbaum M Aaron. (2010), *Data Structures Using C and C++*. (2nd ed.). New Delhi, PHI Learning Private Ltd.

References:

Balagurusamy .E. (2013). *Data Structures Using C*,(1st ed.). McGraw Hill Education.

Gilberg F Richard , Forouzan A Behrouz. (2007). *Data Structures : A Pseudocode Approach with C*. (2nd ed.), Cengage Learning.

Horowitz Ellis, Sahni Sartaj, Freed Anderson Susan. (2008). *Data Structures Using C*. (2nd ed.). Universities Press.

Kanetkar P Yeshwant.(2009).*Understanding pointers in C* (4th ed.). New Delhi, BPB Publications.

Kanetkar Yashavant.(2010). *Data Structures Through C,* (2nd ed.). New Delhi,BPB Publication.

Lipschutz Seymour.(2010). *Data Structures with C*. (1st ,ed.). Tata McGraw - Hill Education.

Tremblay Paul Jean, Sorenson Paul.(2001). *An Introduction to Data Structures with Application*.(2nd ,ed.).Tata McGraw - Hill Education.

13CSC22L1 COMPUTER SCIENCE PRACTICAL II: DATA STRUCTURES PRACTICAL

Credit: 1 **Total: 30 Hours**

Part A

1. Write a C program to find the Binomial Coefficient using recursion.
2. Write a C program to simulate the working of Towers of Hanoi problem for N disks, print the moves taken by the problem using recursion.
3. Write a C program to search for the greatest and smallest element in an array of integers using sequential search.
4. Write a C program to search for an element in an array using Binary Search.
5. Write a C program to sort a list of N elements using Bubble sort technique.
6. Write a C program to sort a list of N elements of integer type using Selection sort technique.

Part B

7. Write a C program to sort a list of N elements using Merge sort technique.
8. Write a C program to sort a list of N elements of integer type using Quick Sort technique.
9. Write a C program to demonstrate the working of a stack using an array. The elements of the stack may be integers. Operations to be supported are 1.PUSH, 2.POP 3.DISPLAY. The program should print appropriate messages for STACK overflow, Underflow. Use separate functions to detect these cases.
10. Write a C program to convert and print a given valid fully parenthesized infix arithmetic expression to postfix expression.
11. Write a C program to simulate the working of linear Queue using an array. Provide the operations QINSERT, QDELETE and QDISPLAY. Check the queue status for empty and full.
12. Write a C program to simulate the working of a Circular queue using an array. Provide the operations CQINSERT, CQDELETE and CQDISPLAY. Check the Circular Queue status for empty and full.
13. Using dynamic variables and pointers write a C program to construct a singly linked list consisting of the following information in each node. Roll No (Integer), Name (Character String) .The Operations to be supported are:
    a. LINSERT - Inserting a node in the front of the list and after a node.
    b. LDELETE - Deleting the node based on Roll no.
    c. LSEARCH - Searching a node based on Roll no.
    d. LDISPLAY - Displaying all the nodes in the list.
14. Write a C program to implement the operations of a Queue using linked list.
15. Using dynamic memory allocation, construct a Binary Search Tree of integers. Write C functions to do the following:
    Given a KEY, Perform a search in Binary search tree. If it is found display Key found else insert the Key in the Binary search tree.
    While constructing the Binary search tree do not add any duplicate.
    Display the tree using all the traversal methods.

Evaluation Criteria.

Criteria	Marks
Writing any two programs from the given three questions. (The questions will be one from part – A and two from part B).	5 x 2 = 10
Executing the written two programs.	7.5 x 2 = 15
Viva Voce	5
Total Marks	30

13STS2201 STATISTICS II: PROBABILITY DISTRIBUTIONS

Credits: 4 **Total: 60 Hours**

Objectives:

- To provide an insight in analyzing probability distributions and the laws governing them.
- To introduce sampling distributions.

UNIT 1: Discrete Probability Distributions 15 hrs

Uniform, Bernoulli, Binomial, Poisson, Geometric, Negative Binomial and Hypergeometric distributions- mean, variance, moments and m.g.f; Recursive relations for probabilities and moments of Binomial and Poisson distributions; Additive property of Binomial, Poisson, Geometric and Negative Binomial distributions; Lack of memory property of Geometric distribution; Poisson approximations to Binomial Distributions and Binomial approximation to Hypergeometric distribution.

UNIT 2: Continuous Probability Distributions 15 hrs

Uniform, Exponential, Gamma and Beta distributions - definition through p.d.f., mean, variance, moments and m.g.f; Additive property of Exponential and Gamma variates; Lack of memory property of Exponential distribution; Normal distribution and its properties; Cauchy and Weibull distribution - definition through p.d.f, properties and uses.

UNIT 3: Basic concepts of random sample 06 hrs

Definition of random sample, statistic and parameter, sampling distribution and standard error; Sampling distribution of mean, variance under normality assumptions.

UNIT 4: Sampling Distributions 15 hrs

Definition of Chi square, t and F distributions through p.d.f.- their properties, uses; Sampling distribution of Chi square, t and F statistics under normality assumptions; Statement of interrelations between Chi square, t and F statistics; Independence of sample mean and variance in random sampling from Normal distribution.

UNIT 5: Limit Theorems 09 hrs

Chebychev's inequality- proof and its use in approximating probabilities; Convergence in probability; Convergence of Binomial, Poisson, Gamma distributions to Normal distributions; Statements of Weak Law of Large Numbers and Central Limit theorems – applications.

Texts Books:

Chandra, T. K. and Chatterjee, D. (2001). *A First Course in Probability*. (1st ed.). New Delhi: Narosa Publishing house.

Gupta, S.C and Kapoor, V.K. (2009). *Fundamentals of Mathematical Statistics*, New Delhi: Sultan Chand and Sons.

References:

Agarwal, B.L. (1998). *Programmed Statistics*. (2nd ed.). New Age International.
Elhance, D.W. and Veena Elhance. (1997). *Practical Problems in Statistics*.(1st Ed). Kitab Mahal.
Freund J.E. (2001), *Mathematical Statistics*, Prentice Hall.
Goon, A.M. and Gupta, M.K. (2001), *Fundamental of Statistics II*. (7th ed.).World Press.
Hogg and Craig. (1995). *Introduction to Mathematical Statistics*, Pearson Education.
Miller, et.al. (2008). *Mathematical Statistics with Applications*. (7th ed.). New Delhi, Prentice Hall of India.
Spiegel Murray, Larry. (2010).*Statistics*, MGH.
Spieger, M.R. (1980). *Theory and Problems of Probability and Statistics*, Schaum's Outline Series, London: McGraw Hill.

Note : Scientific calculator is allowed.

13STS22L1 STATISTICS PRACTICAL II: PROBABILITY DISTRIBUTIONS PRACTICAL

Credit: 1 **Total:30 Hours**

Part A

1. Computation of probabilities based on Binomial Distribution, fitting of Binomial distribution and computation of expected frequencies.
2. Computation of probabilities based on Poisson Distribution, fitting of Poisson distribution and computation of expected frequencies
3. Computation of probabilities based on Negative Binomial Distributions, fitting of Negative Binomial distributions and computation of expected frequencies
4. Computation of probabilities based on Geometric, Hyper-geometric, discrete Uniform Distribution, fitting of discrete Uniform distribution and computation of expected frequencies

Part B

5. Computations involving Normal Distribution.
6. Fitting of Normal distribution by area method and computing expected frequencies
7. Computation of probabilities based on rectangular and exponential Distribution.

Part C

8. Applications of Chebychev's inequality.
9. Applications of Central Limit Theorem.
10. Construction of sampling distribution of sample mean
11. Construction of sampling distribution of sample variance.

Evaluation Criteria

Theory

Unit nos.	Topic	Hours of teaching	2 marks	7 marks	15 marks	Total marks in question paper*
1	Discrete Probability Distributions	15	4	2	1	37
2	Continuous Probability Distributions	15	3	2	1	35
3	Basic concepts of random sample	6	2	1	-	11
4	Sampling distributions	15	1	2	2	46
5	Limit theorems	9	2	1	1	26
Total hours and marks		60	24	56	75	155

(* including choices)

Practical:

Q1 Based on Part A&B

Q2 Based on Part B&C

Q3 Based on Part C&A

Sl. No.	Particulars	Maximum Marks
1.	Answer Any 2 questions out of 3	12.5*2 = 25
2.	Viva Voce	5
Total Marks		30

Note: Scientific calculator is allowed.

13MAT2201 MATHEMATICS II: ALGEBRA AND DIFFERENTIAL CALCULUS

Credits: 4 **Total: 60 Hours**

Objective:

Unit 1 aims at stimulating the interest of the student in abstract algebra. In Units 2 & 3, the study of differential calculus is taken forward with a strong emphasis on the properties of arcs. Some techniques of solving ordinary differential equations of first order are dealt with in Unit 4.

UNIT 1: Group Theory-I 15 hrs

Recapitulation of the definition and standard properties of groups; Order of an element, properties related to order of an element; Cyclic groups, properties of cyclic groups; Coset decomposition of a group, modulo relation, index of a group; Lagrange's theorem and consequences.

UNIT 2: Differential Calculus-II 18 hrs

Polar coordinates, angle between the radius vector and the tangent, angle of intersection of curves, polar sub tangent and polar subnormal, perpendicular form pole on the tangent;
Pedal equation, derivatives of an arc in Cartesian and polar forms, curvature of plane curves, formula for radius of curvature in Cartesian, parametric, polar and pedal forms, centre of curvature, evolutes.

UNIT 3: Differential Calculus-III 12 hrs

Concavity, convexity, points of inflexion, singular points, asymptotes, envelopes, tracing of standard cartesian, parametric and polar curves (Astroid, folium of Descartes, catenary, cycloid, cardioid, lemniscates, equiangular spiral).

UNIT 4: Differential Equations -I 15 hrs

Solution of ordinary differential equations of first order and first degree:
i) Variable separable and reducible to variable separable forms.
ii) Homogeneous and reducible to homogeneous forms.
iii) Linear equations, Bernoulli equation and those reducible to these.
iv) Exact equations, equation reducible to exact form with standard integrating factors.
Equations of first order and higher degree (solvable for p); Clairaut's equation; Singular solution; Geometrical meaning; Orthogonal trajectories in cartesian and polar forms.

Text Books:

Herstein, I.N.(1991). *Topics in Algebra*, (4th ed.). New Delhi: Vikas Publishing House.
Bronson, Richard and Costa, Gabriel. *Schaum's Outline of Differential Equations*. (3rd ed.). Mc Graw Hill.

References:

Fraleigh.J.Bm. *A First Course in Abstract Algebra*, Addison-Wesley.
Shantinarayan.S. *Differential Calculus*. S. Chand & Co., Ltd.
Simmons, George.F. *Differential Equations with Applications and Historical Notes*. McGraw-Hill International Edition.

Note: Scientific calculator is allowed.

SEMESTER III

13ENG3201 ENGLISH III

Credits: 3 **Total: 60 Hours**

Objectives:

- To develop student's proficiency in the language and develop their communication skills.
- To equip learners with skills for self-learning.

UNIT 1: Prose & Poetry **24 hrs**

Life Doesn't Frighten Me -Maya Angelou; Letters: Letter from a Concentration Camp,Letter to Scottie-F Scott Fitgerald; Kabuliwalah-Rabindranath Tagore; The Shroud -Munshi Premchand; Forum-William Shakespeare; Writing a Curriculum Vitae-Wislawa Szymborska.

UNIT 2: Play **15 hrs**

Lady Windermere's Fan- Oscar Wilde.

UNIT 3: Writing Skills **21 hrs**

Applying for Passport-Comprehension-Letters to the Editor-Dialogue Writing-Story Writing.

References:

Bevington, David (2002).*Shakespeare*.Oxford: Blackwell, ISBN 0-631-22719-9.
Connecticut : Greenwood Press. ISBN 978-0-313-30325-8.
Lupton, Mary Jane (1998). *Maya Angelou: A Critical Companion*. Westport,
Macmillan Publishing (published January 1952). ISBN 978-0-02-615920-3.
Murphy,Raymond.(1998), *Intermediate English Grammar*.New Delhi: CUP.
Tagore Rabindranath (1952). *Collected Poems and Plays of Rabindranath Tagore*.
Wren &Martin (2001),*English Grammar & Composition*. S.Chand & Company Ltd.

13CSC3201 COMPUTER SCIENCE III: JAVA PROGRAMMING

Credits: 4 **Total: 60 Hours**

Objective:
To inculcate knowledge on the architecture-neutral nature of java which enables us to write applications once and run anywhere anytime forever.

UNIT 1: Introduction to Java **04 hrs**
History; Java and the Internet; Fundamentals of Object-Oriented Programming; Object-Oriented Paradigm; Basic Concepts of Object-Oriented Programming; Benefits of Object-Oriented Programming; application of Object-Oriented Programming; Java Evolution; History; Features; How Java differs from C and C++; Overview of Java; simple Java program; Structure; platform-independent nature of java; Java Development Kit (JDK); Java interpreter; Byte Code; Java Virtual Machine.

UNIT 2: Features of Java **06 hrs**
Data types; variables; operators and expressions; programming structure; Operators and Expressions; Decision-Making and Branching: if; if..else; nested if; switch; ?: operator; Looping: while; do; for – Jumps in Loops - Labeled Loops; Array – types of Arrays.

UNIT 3: Classes, Inheritance, Packages and Interfaces **16 hrs**
Classes - Class fundamentals; methods; naming conventions; declaring objects; Access specifiers; Final; static; abstract. Native. Volatile; synchronized. Introduction to Constructors; Command Line arguments.
Inheritance - Single; Multilevel inheritance; Method Overriding-Dynamic method dispatch; Abstract classes, usage of super; abstract; final keywords .
Package - Define package; CLASS PATH; access protection; importing packages. Lang-Package - Wrapper classes; Util Package:-Date; calendar; Random; IO packages:-File input stream and output stream.
Interfaces - Defining a package; CLASSPATH; Defining an Interface; Implementing interfaces; Variables in interfaces; Extending interfaces; Implementing interface.

UNIT 4: Exception Handling, Multi-threading, Applets and Event Handling **22 hrs**
Exception Handling - Fundamental of Exception; Exception types; using try & catch; multiple catch; nested try; throw; finally; built-in exception; user-defined exception
Multithreading; Thread fundamentals; priorities; creating thread using thread class and Runnable interface.
Applet- Basics; Applet Architecture; Applet life cycle; Applet display methods; Repaint; Status window; passing parameters to applets; getDocumentBase() and getCodeBase(); Applet Context and showDocument().
Event handling – Event handling mechanisms; Delegation Event Model; Event classes; Sources of events; Event listener interfaces; handling mouse and keyboard events; Adapter classes; Inner classes.

UNIT 5: AWT & AWT Controls **12 hrs**
AWT-AWT classes; Window fundamentals; working with frame windows; Creating a frame window in an applet; Creating a windowed program; Displaying information within a window.

AWT Controls; Layout Managers and Menus – Control fundamentals; Labels; Buttons; Check Boxes; Check Box Group; Choice Control; Lists; Scroll Bar; Text Field; Text Area; Layout Managers; Menu Bars and Menus; Dialog Boxes; File Dialog; Handling events by extending AWT components.

Text Books:

Herbert Schildt. *The Complete Reference- Java*",(7th ed.), Tata McGraw-Hill Publishing Company Limited, NewDelhi.

Liang, Daniel.(2007). *Introduction to JAVA Programming*, (6th ed), Pearson Education.

Patrick Naughton.(1996). *The Java Handbook*, (1st ed.).Tata McGraw-Hill.

References:

Balagurusamy.E. *Programming with JAVA a Primer*, Tata McGraw-Hill Publishing Company Limited: NewDelhi.

Debasish Jana.(2005). *Java and Object-Oriented Programming Paradigm*, PHI.

Deitel and Deitel. *Java Programming*. Prentice Hall.

Deitel H M, Deitel P J . *Java – How to program*, Pearson Education Asia.

James Cohoon, Jack Davidson. *Java Program Design*, McGraw Hill International Edition.

John R. Hubbard . *Programming With Java*. (2nd ed), TMH.

Malik D S. *Java Programming*, Cengage Learning, India Edition.

Nageswara Rao.R. (2008). *CORE JAVA An Integrated Approach*, Dreamtech Press.

13CSC32L1 COMPUTER SCIENCE PRACTICAL III: JAVA PROGRAMMING PRACTICAL

Credit: 1 **Total: 30 Hours**

Part A

1. Write a Java Program to check whether two strings are equal or not.
2. Write a Java Program to reverse a string.
3. Write a Java Program to find the sum of digits of a given number.
4. Write a Java Program to display a multiplication table.
5. Write a Java Program to display all prime numbers between given ranges.
6. Write a Java Program to sort an array.
7. Write a Java Program to create object of tree set and use all the methods.
8. Write a Java Program to check all Math class functions.

Part B

9. Write a program to execute any Windows application (Like notepad, calculator etc).
10. Write a program to copy a file to another file using java IO package classes. Get the file names at run time and if the target file already exists then ask confirmation to overwrite and take necessary actions.
11. Use String Tokenizer class to split a string into tokens using different classes.
12. Write an Applet with a Text Field in which the user will be allowed to enter only numbers.
13. Create a Frame with 2 labels; at runtime display x and y coordinate of mouse pointer in the labels.
14. Create a Frame with three Scrolls; change the background color of the frame using RGB function with values of Scrolls (Use color Object to set the background of the frame).
15. Write a program that consists of a Frame with a ListBox and a TextBox. The text entered in the Text box should be displayed in the ListBox.

Evaluation Criteria.

Criteria	Marks
Writing any two programs from the given three questions. (The questions will be one from part – A and two from part B).	5 x 2 = 10
Executing the written two programs.	7.5 x 2 = 15
Viva Voice	5
Total Marks	30

13STS3201 STATISTICS III: STATISTICAL INFERENCE I

Credits: 4 **Total: 60 Hours**

.

Objective:

To introduce elementary level of inferential statistics.

UNIT 1: Point estimation **18 hrs**

Concepts of estimator, estimate and standard error of an estimator; Criteria for a good estimator- Sufficient statistics; statement of Neyman - Factorization theorem; Unbiasedness, Consistency, criteria for consistency; Invariance property of consistent estimator, Efficiency, Relative efficiency; Minimum Variance Unbiased Estimator; Fisher information function; Statement of Cramer – Rao inequality and its applications; mean squared error as a criterion for comparing estimators;

UNIT 2: Methods of Point Estimation **08 hrs**

Maximum likelihood estimator (m.l.e) and moment estimators; Properties and examples; Illustration of non-uniqueness and invariance property of m.l.e.

UNIT 3: Interval Estimation **12 hrs**

Concepts of confidence interval, confidence coefficient, shortest confidence interval; Pivotal quantity, methods of constructing confidence interval; Construction of confidence intervals for mean, difference between two means, variance and ratio of variances, proportions, difference of proportion and correlation coefficients.

UNIT 4: Testing of Hypothesis **12 hrs**

Statistical hypotheses - null and alternative, Simple and composite; Type-I and Type-II errors, size, power of the test, level of significance, test function, Power function; p-value and its interpretation.

UNIT 5: Construction of MP test **10 hrs**

Randomized and non-randomized tests; Most Powerful (MP) test; Statement of Neyman-Pearson Lemma and its applications.

Text Books:

Gupta, S.C and Kapoor, V.K. (2009). *Fundamentals of Mathematical Statistics*, New Delhi: Sultan Chand and Sons.

Goon, A. M., et al. (2001). *Fundamentals of Statistics Volume II*, World Press. (6^{th} ed.).

References:

Agarwal, B.L. (1998). *Programmed Statistics*, (2^{nd} ed.), New Age International.

Frank Harry, et. al. (2002), *Statistics*, Cambridge.

Hogg and Craig.(2011). *Introduction to Mathematical Statistics*, (6^{th} ed), Pearson Education.

Kendall, M.G., et. Al. (1996).*An Introduction to the Theory of Statistics*, Universal Book Stall.

Medhi, J. (2000). *Statistical Methods and Introductory Text*, New Age International (P) Ltd.

Mood, A.M. et.al., (1974). *Introduction To The Theory Of Statistics*.(10^{th} ed.).New York: McGraw Hill.

Rohatgi, V.K. and A.K. Md. EhsanesSaleh. (2002). *An Introduction to Probability Theory and Mathematical Statistics*, New York, John Wiley.
Yuan Shih Chow and Henry Teicher (2004). *Probability Theory*, (3rd ed.), Springer International Edition.

Note: Scientific calculator is allowed.

`

13STS32L1 STATISTICS PRACTICAL III: STATISTICAL INFERENCE I PRACTICAL

Credit: 1 **Total: 30 Hours**

List of Practical

Part A

1. Point estimation of parameters and obtaining estimates of standard error of estimates.
2. Comparison of estimators by plotting mean square error.
3. Estimation of parameters by method of maximum likelihood- discrete distribution.
4. Estimation of parameters by method of maximum likelihood- continuous distributions.
5. Estimation of parameters by method of moments.

Part B

6. Construction of confidence intervals-I (single mean, difference between two means,)
7. Construction of confidence intervals-II (variance, ratio of variances)
8. Construction of confidence intervals-III (proportions, difference of proportion, correlation coefficients)

Part C

9. Evaluation of probabilities of type-I and Type-II errors and Power of tests. (Based on binomial, Poisson, Uniform and Normal distribution).
10. Construction of the MP test and computation of power test based on binomial, Poisson and Normal distributions.

Scheme of Examination
Theory

Unit nos.	Topic	Hours of teaching	2 marks	7 marks	15 marks	Total marks in question paper*
1	Point Estimation	18	2	2	2	48
2	Methods of Point Estimation	8	2	2	-	18
3	Interval Estimation	12	2	1	2	41
4	Testing of Hypothesis	12	3	2	1	35
5	Construction of MP tests	10	3	1	-	13
Total hours and marks		60	24	56	75	155

(* including choices)

Practical:

Q1 Based on Part A&B

Q2 Based on Part B&C

Q3 Based on Part C&A

Sl. No.	Particulars	Maximum Marks
1.	Answer Any 2 questions out of 3	12.5*2 = 25
2.	Viva Voce	5
Total Marks		30

Note: Scientific calculator is allowed.

13MAT3201 MATHEMATICS III: ALGEBRA, DIFFERENTIAL CALCULUS, IMPROPER INTEGRALS AND LINEAR PROGRAMMING

Credits: 4 **Total: 60 Hours**

Objective:

Unit 1 provides further insights into theoretical abstract algebra. Unit 2 & 3 comprises the different methods of solving first order differential equations and evaluating improper integrals. The section on linear programming aims at introducing the student to optimization techniques.

UNIT 1: Group theory-II 15 hrs

Normal subgroup- definition, theorems, examples and problems; homomorphism and isomorphism of groups, kernel and image of a homomorphism, normality of the kernel; quotient group, fundamental theorem of homomorphism, properties related to isomorphism; permutation group, Cayley's theorem.

UNIT 2: Differential Calculus -IV 25 hrs

Definition of the limit of a function in $\epsilon - \partial$ form-continuity, types of discontinuities, properties of continuous functions on a closed interval (boundedness, attainment of bounds and taking every value between bounds), differentiability-differentiability implies continuity, converse not true, Rolle's theorem, Lagrange's and Cauchy's first mean value theorems, Taylor's theorem, Maclaurin's expansion, evaluation of limits by L'Hospital's rule, continuity and differentiability of functions of two and three variables-Taylor's theorem and expansions of functions of two variables, maxima and minima of functions of two variables, method of Lagrange's multipliers.

UNIT 3: Improper Integrals 10 hrs

Gamma and Beta functions-results following definitions, relations connecting the two functions, duplication formula, application to evaluation of integrals.

UNIT 4: Linear Programming 10 hrs

Linear inequalities and their graphs; statement of the linear programming problem in standard form, classification of solutions, solution of linear programming problems by graphical method, examples on the solution of linear programming problems in two and three variables by the simplex method.

Text Books:

Herstein, I.N.(1991). *Topics in Algebra* ,(4th ed.). New Delhi, Vikas Publishing House.
Bronson, Richard and Costa, Gabriel. *Schaum's Outline of Differential Equations*. (3rd ed.). Mc Graw Hill.
Kalavathy. S. *Operations Research,* East-West.

References:

Fraleigh.J.B. *A First Course in Abstract Algebra*, Addison-Wesley.
Simmons, George.F. *Differential Equations with Applications and Historical Notes*, McGraw-Hill International Edition.
Shantinarayan.S. *Integral Calculus*. S. Chand & Co., Ltd.
Swarup Kanti, Gupta.P.K, Man Mohan, *Operations Research*. S.(9th ed) Chand & Co., Ltd.

Note: Scientific calculator is allowed.

13MAT3202 MATHEMATICS IV: ALGEBRA, DIFFERENTIAL EQUATIONS, LAPLACE TRANSFORMS AND FOURIER SERIES

Credits: 4 **Total: 60 Hours**

Objective:
Unit 1 provides an extended exposure to an axiomatic treatment of mathematics. Unit 2 comprises the different methods of solving first order differential equations. The student is also introduced to Laplace Transforms and Fourier series.

UNIT 1: Rings, Integral Domains, Fields **20 hrs**
Rings- types of rings, properties of rings of integers modulo n, sub rings, ideal, principal and maximal ideal in a commutative ring-examples and standard properties, homomorphism and isomorphism, properties of homomorphism, quotient rings, integral domains, fields, properties following the definition, field is an integral domain-finite integral domain is a field.

UNIT 2: Differential Equations –II **18 hrs**
Second and higher order ordinary linear differential equations with constant coefficients-complementary function, particular integrals (standard types); Cauchy-Euler differential equation, simultaneous linear equations (two variables) with constant coefficients; solutions of second order ordinary linear differential equations with variable coefficients by the following methods:

i) When a part of the complementary function is given.
ii) Changing the independent variables.
iii) Changing the dependent variables.
iv) Variation of parameters.
v) When the equation is exact.

UNIT 3: Laplace Transforms **12 hrs**
Definition and basic properties, Laplace transform of some common functions and standard results, Laplace transform of periodic functions, Laplace transforms of derivatives and integrals of a function, Laplace transform the Heaviside function and Dirac delta function, convolution theorem, inverse Laplace transforms, Laplace transform method of solving ordinary linear differential equations of first and second order with constant coefficients.

UNIT 4: Fourier Series **10 hrs**
Periodic functions, Trigonometric Series, Fourier series of functions with period 2π and period 2L – Fourier Series of even and odd functions, Half-range cosine and sine series.

Text Books:
Herstein, I.N.(1991). *Topics in Algebra*, (4^{th} ed.). New Delhi, Vikas Publishing House.
Bronson, Richard and Costa, Gabriel. *Schaum's Outline of Differential Equations*, (3^{rd} ed.). Mc Graw Hill.
Spiegel, Murray. R. (1974). *Schaum's Outline of Advanced Calculus*, Mc Graw Hill.

References:

Fraleigh.J.B. *A First Course in Abstract Algebra*. Addison-Wesley.
Simmons, George.F. *Differential Equations with Applications and Historical Notes*, McGraw-Hill International Edition.
Brown J.W, Churchill R.V. *Fourier Series and Boundary value problems*. (Mc Graw Hill).

Note: Scientific calculator is allowed.

SEMESTER IV

13ENG4201 ENGLISH IV

Credits: 3 **Total: 60 Hours**

Objectives:

- To develop student's proficiency in the language and develop their communication skills
- To equip learners with skills for self-learning.

UNIT 1: Prose & Poetry **24 hrs**

I Have a Dream-Martin Luther King Jr.; Song of the Rain-Khalil Gibran; The Moustache - Guy de Maupassant; India's Heroes -Anonymous; Nightingale and the Rose-Oscar Wilde; Diary of Anne Frank-An Autobiographical Extract.

UNIT 2: Novel **16 hrs**

Bachelor of Arts - R K Narayan.

UNIT 3: Word Power & Writing Skills **10 hrs**

Exercise & Worksheets.

UNIT 4: Functional English **10 hrs**

Curriculum Vitae and Cover Letters-Precise writing-Facing an Interview-Kinds of Paragraph Writing.

References:

Bushrui, Suheil B.; Jenkins, Joe (1998). *Kahlil Gibran, Man and Poet: a New Biography*. Oneworld Publications. p.55. ISBN 978-1851682676.

Mendelsohn, Daniel.(2008). "The two Oscar Wildes". *How Beautiful It Is and How Easily It Can Be Broken: Essays By Daniel Mendelsohn*. New York: HarperCollins. p. 218. ISBN 978-0-06-145644-2.

Murphy, Raymond.(1998).*Intermediate English Grammar*.New Delhi: CUP.

Sales-Pontes, A Hilda (1983). *R.K. Narayan*. Atlantic Highlands. ISBN 978-0-391-02962-0.OCLC 10625411.

Wren &Martin (2001).*English Grammar & Composition*. S.Chand & Company Ltd.

13CSC4201 COMPUTER SCIENCE IV: DBMS & VISUAL PROGRAMMING

Credits: 4 **Total: 60 Hours**

Objective:

On successful completion of the course the students should have gained knowledge on data base designing and concepts of Data Base Management System and fundamentals of Visual Programming.

Database Management Systems

UNIT 1: Introduction and Data Models 08 hrs

Introduction: Basic Concepts, Data, Database, DBMS; Disadvantages of File Oriented Systems; Advantages of DBMS; Database Users; Database Languages; Characteristics Of Database; Role of DBA.

Data Models: Schemas and Instances; DBMS Architecture and Data Independence; Data Modeling Using the ER Model ,ER Model Concepts; Notation for ER Diagrams; Proper Naming of Schema Constructs; Relationship Types ; Degree of relationship; Introduction to Relational Model, Network Model and Hierarchical Model.

UNIT 2: RDBMS and SQL 12 hrs

RDBMS Concepts: Attributes, Tuple, Keys, Relationships; Relational Algebra Operations-Union, Intersection, Difference, Cartesian Product, Selection, Projection, Join, Division; Relational Calculus- Domain, Domain Integrity, Integrity Rules; Normalization And Its Properties -1NF,2NF,3NF.

DDL, DML and TCL Commands- Create Table/ Views/Index, Drop, Alter, Select, Insert, Delete, Update, Grant, Revoke, Commit; SQL Query – Sub Query, Nested Query; Joins- Natural, Inner, Outer Join.

MS-Access- Create Database; Creating Relationships; Create Query; Create Form; Create Report.

UNIT 3: Transaction Processing Concepts 10 hrs

Transaction Processing - Introduction; Transaction and System Concepts; Desirable Properties of Transactions; Schedules and Recoverability; Serializability of schedules; Transaction Support in SQL; Concurrency control techniques - Locking techniques for concurrency control.

Visual Programming

UNIT 4: Basic Programming Concepts 15 hrs

Introduction: Features of Visual Basic; IDE; Writing Small Programs. Program Constructs: Variables, Constants, Operators, User Defined Data Types, Arrays, Functions, Control Statements, Input Box, MsgBox.

Controls: Intrinsic Controls; Common Properties & Importance; Common Dialog Controls; Windows Common Controls; Advanced Controls.

UNIT 5: Procedures and Data Access 15 hrs

Control Arrays and User Defined Procedures: Creation; General Procedures and Event Procedure; Creating and Calling Functions; Scope of Procedures.

Handling Data Access- Visual Data Manager; Creating a Database; Data Control; Data Access Objects; RDO; ActiveX Objects. ODBC Connectivity; Data Reports.

Text Books: DBMS.

Elmasri & Navathe.(2003) .*Fundamentals of Database Systems*, Pearson Education.
Scott Ulman. *Oracle9i PL/SQL programming*,Tata McGraw-Hill.

References : DBMS

Date. C.J. *Introduction to database systems*. (6th ed.). Addision Wesley.
Ivan Bayross. (2008). *The Programming Languages of Oracle*.(3rd ed.). BPB Publications.
Patrick O'Neil.(2002). *Data Base Principles; Programming & Performance*,(2nd ed.). Academic Press.
Silberschataz , Korth, Sudarshan. *Database System Concepts*, McGraw Hill.
Sundarraman. *Oracle 9i programming A Primer*,(1st ed.). Pearson Education.

Text Books: Visual Programming.

Evangelus Petroutsos . *Mastering Visual Basic 6* ,Bpb Puhlnata.
Gurumit Singh. *Visual Basic 6.0,* Firewall Media.

References: Visual Programming.

Charles Petzold. *Windows Programming*, Microsoft Press.
Deitel. *Visual Basics 6: How To Program*, Pearson Education.
Garry Cornell. *Visual Basic 6*, Tmh.
Peter Norton's & Michael Groh.(1998). *Guide To Visual Basic 6*, Techmedia.
Paul Sheriff.(1999). *Visual Basic*, Phi.
Yashavant Kanetkar. *Visual C++ Programming*.

13CSC42L1 COMPUTER SCIENCE PRACTICAL IV: DBMS PRACTICAL

Credit: 1 **Total: 30 Hours**

Part A

1. STUDENT DETAILS DATABASE

The student details database has a table with the following attributes.
STUDENT (RegNo : number; Name : text; DOB : date ; Marks : number)
a) Remove the existing attribute marks from the table
b) Change the data type of regno from integer to string.
c) Add a new attribute PhoneNo to the existing table.
d) Enter 5 tuples into the table.
e) Display all the tuples in student table.
f) Display all the students who were born in 1980s.
g)Display all the students in alphabetical order of their names.

2. LIBRARY DATABASE

A library database has a table with the following attributes:
LIBRARY (BookId: number; Title : text; Author : text; Publisher : text; Year_Pub : number; Price: number (6,2))
a) Enter 5 tuples into the table.
b) Display the different publishers from the list.
c) Arrange the tuples in the alphabetical order of book titles.
d) List details of all the books whose price ranges between Rs. 100.00 and Rs.300.00
e) Display all the authors under a specific publisher.

3. EMPLOYEE SALARY DATABASE

The salary database of an organization has a table with the following attributes :
EMPSALARY (EmpCode : number; EmpName : text; DOB : date; Dept : text; Salary number(10,2))
a) Enter 5 tuples into the table.
b) Display the number of employees working in each department.
c) Find the sum of the salaries of all employees.
d) Find the sum and average of the salaries of employees of a particular department.
e) Find the highest salary that an employee draws.
f) Find the least salary that an employee draws.
g) Find the total salary for each department.
h) Increase the salary of those employees working for the computer department by Rs. 1000.
i)Display all employees increasing order of their age for a specific department.

Part B

4. INVENTORY DATABASE

An inventory database has the following tables
ITEM (ItemCode : number; ItemName : text; Price : number(10,2))
PURCHASE (ItemCode : number; Quantity : number)
a) Create the tables with the above attributes.
b) Enter 5 – 7 tuples into the tables.
c) List the items purchased

d) Display the total items purchased (listing must have the columns : ItemCode ItemName,Total,Quantity)
e) List the items which are not purchased by anyone.

5. BANK CUSTOMER DATABASE

A bank customer database has two tables CUSTOMER and ACCOUNT.
CUSTOMER (CustNo: number; CustName : text; City : text; AccNo : number ; Balance : number(10,2))
ACCOUNT (AccNo: number; AccType: text; Branch : text; AccStatus : text; ChequeFacility : text)
a) Create the above tables and specify the primary and foreign keys
b) Enter 5 – 8 tuples for each relation
c) List the customers from "Bangalore" who have cheque facility.
d) List all the customers whose balance is greater than 30000.00 and have an active account.
e) Find the current outstanding balance amount of branch "Malleswaram"

6. INSURANCE DATABASE

Consider the Insurance database given below. The primary keys are underlined and the data types are specified.
PERSON (DriverId: text; Name : text; Address : text)
CAR (RegNo: text; Model: text; Year: number)
OWNS (DriverId : text; RegNo: text)
ACCIDENT (ReportNo: number; AccDate: Date; Location: text)
PARTICIPATED (DriverId: text; RegNo: text; ReportNo: number; Dmg_Amt: number(10,2))
a) Create the above tables by specifying the primary and foreign keys.
b) Enter atleast five tuples for each relation
c) Update the damage amount for each car accident.
d) Add a new accident to the database.
e) Find the total number of people who owned cars that were involved in accidents in the year 2002.
f) Find the number of accidents in which cars belonging to a specific model were involved.
g) Display the owners and their car details.

7. ORDER PROCESSING DATABASE

Consider the following relations for an order processing database application in a company.
CUSTOMER(CustId: number; CustName: text; City: text)
CUSTORDER(OrderNo: number; OrderDate: date; CustId: number; OrderAmount: number)
ITEM (ItemNo : number; ItemName: text; UnitPrice number(10,2));
ORDER_ITEM(OrderNo: number; ItemNo: number; OrdItemQty : number)
WAREHOUSE(WarehouseNo: number; City: text)
SHIPMENT(OrderNo: number; WarehouseNo: number; ShipDate: date)
a) Create the above tables by properly specifying the primary keys and the foreign keys.
b) Enter atleast five tuples for each relation.
c) Produce a listing: CustName; no_of_orders;avg_order_amt; where the middle attribute is the total average order amount for that customer.

d) List the order_no for orders that were shipped from all the warehouses that the company has in a specific way.
e) Demonstrate the delete of itemno 10 from the ITEM table and make that field null in the ORDER_ITEM table.
f) List all the items ordered by a particular customer.

Evaluation Criteria.

Criteria	Marks
Writing any two programs from the given three questions. (The questions will be one from part – A and two from part B).	5 x 2 = 10
Executing the written two programs.	7.5 x 2 = 15
Viva Voce	5
Total Marks	30

13STS4201 STATISTICS IV: STATISTICAL INFERENCE II

Credits: 4 **Total: 60 Hours**

Objective:
To familiarize students with advance inferential statistics based on testing of hypothesis.

UNIT 1: Tests of significance 15 hrs
Test for the mean, equality of two means, variance and equality of two variances - large and small samples, Large sample tests for proportions, Test for correlation coefficients, test for regression coefficients; Fisher's Z-transformation and its applications.

UNIT 2: UMP and Likelihood Ratio Tests 12 hrs
Monotone Likelihood Ratio (MLR) property; Uniformly Most Powerful (UMP) test; Statement of the theorem on UMP tests for testing one sided hypothesis for distribution with MLR property; Likelihood Ratio Test (LRT), Properties.

UNIT 3: Analysis of Variance 15 hrs
Meaning and assumptions; Analysis of one-way, two-way classified data-expected mean squares, Analysis of two-way classified data with interaction and multiple but equal number of observations per cell (fixed effects model). Least significant difference.

UNIT 4: Sequential Testing 10 hrs
Sequential test; Wald's SPRT - Sequential tests for the mean of normal population (variance known) and for the proportion, approximate expressions for OC and ASN functions. (statement only).

UNIT 5: Non Parametric Tests 08 hrs
Non-parametric test; Run test for randomness; Sign test and Wilcoxon signed rank test for one and paired samples, Median test, Wald Wolfowitz run test, Mann- Whitney U test, Test for independence based on Spearman's rank correlation coefficient; Kolmogorov-Smirnov one and two sample tests; Chi square test for goodness of fit and independence of attributes.

Text Books:

Freund J.E. (2001). *Mathematical Statistics*, Prentice hall.

Gupta, S.C and Kapoor. V. K. (2001). *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons.

References:

Agarwal, B.L. (1998). *Programmed Statistics*. (2nd ed.). New Age International.

Bernstein and Stephan.(2000).*Elements of Statistics II: Inferential Statistics*. McGraw Hill.

Chandra, T. K. A. *First Course in Asymptotic Theory of Probability*, New Delhi, Narosa Publishing house.

Hogg and Craig. (2011). *Introduction To Mathematical Statistics*, (6th ed.), Pearson Education.

Kale. B.K. (1999). *A First Course On Parametric Inference*, New Delhi, Narosa Publishing House.

Kendall, M.G., et. al. (1996). *An Introduction to the Theory of Statistics*, Universal Book Stall.
Medhi, J. (2000). *Statistical Methods and Introductory Text*, New Age International (P) Ltd.
Rohatgi. V.K. and A.K. Md. EhsanesSaleh. (2002). *Introduction to Probability Theory and Mathematical Statistics*,New York, John Wiley.

Note: Scientific calculator is allowed.

13STS42L1 STATISTICS PRACTICAL IV: STATISTICAL INFERENCE II PRACTICAL

Credit:1 **Total: 30 Hours**

List of Practical

Part A

1. UMP test for the mean of normal distribution (with known variance) and power curve.
2. Test for single mean, equality of two means when variance is known and unknown (both for large and small samples).
3. Test for single proportion and equality of two proportions.
4. Test for single variance and equality of two variance under normality
5. Test for correlation coefficient.

Part B

6. ANOVA for one way classified data
7. ANOVA for two way classified data: single observation per cell.
8. ANOVA for two way classified data: multiple but equal number of observations per cell.

Part C

9. SPRT for proportions- OC and ASN.
10. SPRT for mean of normal distribution- OC and ASN.
11. Non parametric test-I (Sign test, Wilcoxon signed rank test, Run test, Median test)
12. Non parametric test-II (Wald Wolfowitz run test, Mann Whitney U test, Spearman's rank correlation coefficient, Kolmogorv-Smirnov Tests)
13. Chi square test for goodness of fit and independence of attributes.

Scheme of Examination
Theory

Unit nos.	Topic	Hours of teaching	2 marks	7 marks	15 marks	Total marks in question*
1	Test of significnace	15	3	1	2	43
2	UMP and LRT	12	2	2	1	33
3	Analysis of variance	15	2	1	2	41
4	Sequential Testing	10	3	2	-	20
5	Non Parametric Tests	8	2	2	-	18
Total hours and marks		60	24	56	75	155

(* including choices)

Practical:

Q1 Based on Part A&B
Q2 Based on Part B&C
Q3 Based on Part C&A

Sl. No.	Particulars	Maximum Marks
1.	Answer Any 2 questions out of 3	12.5*2 = 25
2.	Viva Voce	5
Total Marks		30

Note: Scientific calculator is allowed.

13MAT4201 MATHEMATICS V: REAL AND COMPLEX ANALYSIS

Credits: 4 **Total: 60 Hours**

Objective:

The course aims at familiarizing students with the basic theorems and techniques of real and complex analysis. This includes understanding the concept of convergence and its mathematical formalisms and acquiring knowledge of the special character and properties of functions of a complex variable.

UNIT 1: Sequences of Real Numbers 12 hrs

Definition of a sequence, bounded sequences, limit of a sequence, convergent, divergent and oscillatory sequence, monotone sequences and their properties, Cauchy's criterion.

UNIT 2: Series of Real Numbers 18 hrs

Definition of convergence, divergence and oscillation of series; properties of series of positive terms, geometric series, p-series, tests for convergence of series- comparison test, Cauchy's root test, D'Alembert test, Raabe's test; absolute and conditional convergence, D'Alembert test for absolute convergence, alternating series- Leibnitz test; summation of binomial, exponential and logarithmic series.

UNIT 3: Complex Analysis-I 18 hrs

Complex number, the complex plane, conjugate and modulus of a complex number, polar form, geometrical representation, Euler's formula $e^{i\theta} = \cos\theta + i \sin\theta$, functions of a complex variable, limit, continuity and differentiability, analytic functions, Cauchy – Riemann equations in Cartesian and polar forms, sufficient condition for analytic functions (in Cartesian form), standard properties of analytical functions, construction of analytical functions given real or imaginary parts-Milne-Thomson method; the complex line integral, examples and properties, Cauchy's integral theorem (proof using Green's theorem) and its direct consequences, Cauchy's integral formula for the function and the derivatives, application to evaluation of simple line integrals, Cauchy's inequality, Liouville's theorem, fundamental theorem of algebra.

UNIT 4: Complex Analysis-II 12 hrs

Transformations-definition of a conformal transformation, examples, discussion of the transformations $w=z^2$, $w = \sin z$, $w = \cos z$, $w = e^x$, $w = \cosh z$, the bilinear transformation, cross ratio property, bilinear transformation of circles and lines, problems.

Text Books:

Narayan, Shanti and Raisinghania, M. D. (1965).*Elements of Real Analysis,* (8^{th} ed.). New Delhi, S Chand& Co. Ltd

Churchill, R. V. and Brown, J W. (2003).*Complex Variables and Applications*. (7^{th} ed.). McGraw Hill Education

References:

Malik, S.C. and Arora, Savita.(1992). *Mathematical Analysis,* (2^{nd} ed.), New Delhi, New Age International.

Rudin, Walter. (2006). *Real and Complex Analysis*,(3^{rd} ed.), New Delhi, Tata McGraw Hill.

Ahlfors, L.V. (1979). *Complex Analysis*. (3^{rd} ed.). New York, McGraw Hill.

Note: Scientific calculator is allowed.

13MAT4202 MATHEMATICS VI: TOTAL AND PARTIAL DIFFERENTIAL EQUATIONS, PARTICLE DYNAMICS AND NUMERICAL ANALYSIS

Credits: 4 **Total: 60 Hours**

Objective:

The paper aims at developing a sound knowledge of the techniques of solution as well as application of partial differential equations and understanding and applying principles of particle dynamics to problem solving. An introductory module on Numerical analysis is also included.

UNIT 1: Total and simultaneous differential equations, Partial differential equations 20 hrs

Total differential equations, necessary condition for the equation $Pdx + Qdy + Rdz = 0$ to be integrable, simultaneous equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.

Formation of partial differential equations; solution of equations of first order-Lagrange's linear equation, standard types of first order non-linear partial differential equations, Charpit's method; solution of second order linear partial differential equations in two variables with constant coefficient by finding complementary function and particular integral.

UNIT 2: Particle Dynamics-I 15 hrs

Newton's Laws of motion, conservative forces and potential energy, definitions of work, kinetic energy and power; motion of a particle in a uniform force field-simple harmonic motion, two dimensional motion of projectiles.

UNIT 3: Particle Dynamics-II 15 hrs

Tangential and normal components of velocity and acceleration, radial and transverse components of velocity and acceleration, constrained motion of a particle under gravity along inside and outside of a circle; motion of a particle in a central force field - determination of orbit from central forces and vice versa.

UNIT 4: Numerical Analysis 10 hrs

Solution of algebraic and transcendental equations-bisection method, Newton Raphson method, Secant method, method of false position.

Numerical Solutions of non-homogeneous system of equations- Jacobi's and Gauss Seidel Methods.

Text Books:

Sneddon, I. N. *Elements of Partial Differential Equations*. New York, McGraw Hill.

Singh, Kaushal Kumar. (2011). *Text Book of Dynamics*, New Delhi: Phi Learning Pvt. Ltd

Sastry, S.S. (2005) .*Introductory Methods of Numerical Analysis*.(4th ed.). Phi Learning Pvt. Ltd.

References:

Ross, Shepley L. (1984).*Differential Equations*. (3rd ed.), Wiley India.
Chorlton, F. (1963). *Text Book of Dynamics*. London, Van Nostrand.
Jain M.K, Iyengar, S.R.K and. Jain R. K. *Numerical Methods for Scientific and Engineering Computation*, Wiley Eastern.

Note: Scientific calculator is allowed.

SEMESTER V

13CSC5201 COMPUTER SCIENCE V: SOFTWARE ENGINEERING

Credits: 4 **Total: 60 Hours**

Objective:
Software requirement capturing and developing; coding; testing and debugging applications; identifying testing technologies for project implementation and maintenance.

UNIT 1: The Product **04 hrs**
Evolution of software; Characteristics of software; Software applications; Components of software; Software myths; Software problems; Software reuse; Overview of risk management; Process visibility; Professional responsibility.

UNIT 2: The Process **05 hrs**
Definition of software engineering; Software engineering models-Waterfall model, Prototyping model, Spiral model.

UNIT 3: Project Management and Planning **20 hrs**
Management spectrum – people, product, process ,project; Metrics-Measures; Metrics and indicators; Types of metrics-Size oriented, Function-Oriented metrics, Metrics for software quality; Resources-human, hardware ,software resources; Software project estimation-Decomposition technique, LOC based estimation, Empirical estimation; COCOMO model; Risk management: Risk identification, Risk analysis, Risk projection, Risk assessment, Risk prioritization, Risk resolution, Risk monitoring and control; Project scheduling - Work tasks, Time line charts and CPM; Software quality assurance; Quality; Formal technical review and software reliability.

UNIT 4: Analysis Principles and Design Concepts **20 hrs**
Analysis Principles - Prototyping; Software requirement specification(SRS).
Analysis Modeling – Data modeling; Data flow diagram(DFD); Structured analysis.
Design Concepts and Principles – Design process; Design principles; Design concepts and effective modular design; Design steps; Data design; Object oriented design; Function oriented design; Interface design and procedural design.

UNIT 5: Software Testing and Maintenance **11 hrs**
Software Testing - The testing process; Test planning & strategies; Types of testing: Unit testing; Integration testing; System testing; Acceptance testing; Black box and White box testing and static verification.
Maintenance - Types of maintenance; Enhancing maintainability during development.

Text Books:
Roger S Pressman. *Software Engineering – A practitioner's Approach*. (5th ed.).Mc Graw – Hill International Edition.

References:
Ian Sommerville.(2002). *Software Engineering*.(6th ed.). Pearson Education Asia.
Pankaj Jalote.(1995). *An Integrated Approach to Software Engineering*, Narosa Publications.
Carlo Ghezzi, Mehdi Jazeryeri and Dino Mandrioli.(2002). *Fundamentals of Software*

Engineering, (2nd ed.). PHI Learning Private Limited.
James F Peters and Witold Pedryez.(2000). *Software Engineering – An Engineering Approach*. New Delhi, John Wiley and Sons.
Stephen R Schach. *Object-Oriented and Classical Software Engineering*.(5th ed.). McGraw-Hill.
Richard Fairley.(2001). *Software Engineering Concepts*, (6th ed.). Tata McGraw Hill edition.
Jon Fairclough.(1996). *Software Engineering*, Prentice Hall Press.
Peter A. Darnell and Philip E. Margolis.(1996). *A Software Engineering Approach*, Springer Verlag.

Note: Scientific calculator is allowed.

13CSC5202 COMPUTER SCIENCE VI: OPERATING SYSTEM CONCEPTS AND UNIX/LINUX

Credits: 4 **Total: 60 Hours**

Objective:

A general idea about Operating Systems and an in-depth knowledge of the Unix/Linux Operating System.

Operating System

UNIT 1: Introduction to Operating Systems 08 hrs

What is an operating system(OS)?; History of OS; Simple Batch Systems; Multi programmed Batched Systems; Time-Sharing Systems; Personal Computer Systems; Distributed Systems and Real –Time Systems; Operating System Structures- Command Interpreter System; Operating System Services; System Calls; System Programs.

UNIT 2: Process Management 16 hrs

Process Management: Process Concept; Process control Block; Process Scheduling; CPU Scheduling – Basic Concepts; Scheduling Algorithms – FIFO; RR; SJF; Multi-level; Multi-level feedback. Process Synchronization and deadlocks**:** The Critical Section Problem; Synchronization hardware; Semaphores; Classical problems; Critical Regions; Monitors; Deadlock: System model; Characterization; Dead lock prevention; Avoidance and Detection; Recovery from dead lock; combined approach to deadlock handling.

UNIT 3: Storage Management 10 hrs

Storage Management : Basic Concepts; Logical and Physical Address Space ; Swapping; Contiguous Allocation; Paging; Segmentation; Virtual Memory – Demand Paging; Page Replacement; Page Replacement Algorithms; Allocation of Frames; Thrashing and Demand Segmentation.

Unix / Linux Operating System

UNIT 4: Unix File System, Special Tools and Utilities and Process Management 13 hrs

History; Features; Architecture; File system: Boot Block; super block; Inode table; data block; storing and accessing files; directory and file related commands.
Special Tools and Utilities: Filters process; pipe and pipeline; process control; FORK; EXIT; WAIT & EXEC system call; Unix system calls and Library functions.
Process Management : Process state; data structure of a process; user v/s kernel mode; context of a process; background processes; process scheduling; process terminating and examining commands.

UNIT 5: System Administration and Shell Programming 13 hrs

User & supervisor privileges & facilities; accessing the file system; security issues Secondary storage management
Shell Programming : C Shells; shell variables; parameter shell commands; if; while; until; for; break; continue and simple programs. Unix System Communication Introduction: write; read; wall; mail commands.

Text Books:

Sumitabha Das. *UNIX Concepts and Applications*. (4th ed.), Tata McGraw-Hill Education.
Stallings Williams.(2005). *Operating Systems*, (2nd ed.), Prentice Hall.
Silberschartz Abraham, Galvin Baer Peter.(2000).*Operating System Concepts*. (5th & 6th ed.), John Wiley & Sons.

References:

Forouzan Behrouz, A. and Gilberg Richard, F. (2003). *UNIX and Shell Programming*, Brooks/Cole-Thomson Learning.
Sobell Mark, G. (1994). *UNIX System V: Practical Guide. Addison*-Wesley Professional.
Godbole Achyut, S .(2005). *Operating Systems with case studies in UNIX, (2nd ed.),* Tata McGraw-Hill Education.
Srimani, P. K. and Nasir, S. F. B. *Introduction to Unix Operating System*, Cambridge University Press India Pvt. Ltd.
Raymond Eric, S. (2009). *The art of UNIX programming*, Pearson Education.
Kernighan, B. W. and Robert, B. (1984). *The UNIX Programming Environment*. Prentice Hall.
Gandhi Meeta ,Shetty Tilak and Shah Rajiv. (1992). *Vijay Mukhi's the 'C' Odyssey: UNIX - the Open-boundless C",* Tech Publications.
Milenkovic Milan. (2001). *Operating Systems Concepts and Design*. (2nd ed.), Tata McGraw Hill Education.

Note: Scientific calculator is allowed.

13CSC52L1 COMPUTER SCIENCE PRACTICAL VI: UNIX/LINUX PRACTICAL

Credit: 1 **Total: 30 Hours**

Part A

1. Write a shell program to count the number of characters in a given string.
2. Write a shell program to count the number of vowels.
3. Write a shell program to find whether the given year is leap year or not.
4. Write a shell program to check whether given string is palindrome or not.
5. Write a shell program to display all the files in a current directory.
6. Write a shell program to find the factorial of a given number.
7. Write a shell program to print a string in a reverse order.
8. Write a Shell Script to print the multiplication table.
9. Write a menu based program to permit or remove read/write/execute permission of a file.
10. Write a shell program to compare two strings given by the user.

Part B

11. Write a menu driven shell script to implement the following UNIX commands:
    a) rm -r b) uniq c) tail d) cmp
12. Write a shell script to create a file and compress it using
    a) compress b) pack
13. Write a shell script to find a given pattern in a list of files of current directory using grep Command.
14. Write a shell script to generate the prime numbers between a lower and upper limit.
15. Write a shell script for sending and handling mail using write command.
16. Write a shell script to create two directories and store five files in one directory using the related commands and to transfer all the files to another directory.

Evaluation Criteria.

Criteria	Marks
Writing any two programs from the given three questions. (The questions will be one from part – A and two from part B).	5 x 2 = 10
Executing the written two programs.	7.5 x 2 = 15
Viva Voce	5
Total Marks	30

13STS5201 STATISTICS V: SAMPLING THEORY

Credits: 4 **Total: 60 Hours**

Objective:
To equip the students with different sampling techniques.

UNIT 1: Basic concepts in sampling 11 hrs
Population and sample; Need for sampling – complete enumeration vs sample surveys; probability and non-probability sampling-types, meaning, need and illustrations; Methods of drawing random samples-Lottery system, Use of random numbers; Bias, accuracy and precision of the estimates.

UNIT 2: Simple random sampling 14 hrs
Sampling with and without replacement; Unbiased estimators of population mean and total; Derivation of sampling variances; Sampling for proportions and total; Derivation of the variances of the estimators, unbiased estimators of the variance; confidence limits; Determination of sample size.

UNIT 3: Stratified random sampling 14 hrs
Need for stratification. Unbiased estimator of population mean and total; Derivation of the variance of the estimators and their estimation; Proportional, Optimum and Neyman allocations; Comparison of variances with SRSWOR; Estimation of gain in precision due to stratification.

UNIT 4: Systematic sampling and Cluster sampling 10 hrs
Systematic sampling- Advantages and limitations; Estimation of mean, total and variance of the estimator; Comparison with SRSWOR and stratified random sampling; Concept of circular systematic sampling. Cluster sampling- equal and unequal cluster sizes; Advantages and limitations; Unbiased estimator of population total, mean and variance of the estimator and unbiased estimator of the variance.

UNIT 5: Survey methods 11 hrs
Principal steps in a sample survey - Planning, execution, analysis and reporting stages; Requisites of a good questionnaire; Drafting of questionnaires and schedules and their pre-test; Pilot surveys; Non-sampling errors and simple methods of controlling them.
Applications to environmental studies; ecological sampling- plot sampling, transect sampling, point-quarter sampling, capture-recapture sampling.

Text Books:
Cochran, W. G (1984). *Sampling Techniques*, (3rd ed.). New Delhi, Wiley Eastern.
Gupta, S.C., and Kapur, V.K. (2001). *Fundamentals of Applied Statistics*, SC & sons.

References:
Goon, A. M., et al. (2001). *Fundamentals of Statistics Volume II*, (7th ed.), World Press.
Mukhopadhyay, P. (1996). *Sample Survey*, Kolkata, Calcutta Publishing House.
Murthy, M.N. (1967). *Sampling Theory and Methods*, Calcutta, Statistical Society, ISI.
Singh, D and Chaudhary, F.S.(1986). *Theory and Analysis of Sample Survey Design*, New Delhi, Wiley Eastern Limited, 1986

Sukhatme, P.V. et.al (1984). *Sampling Theory of Surveys with Applications*, New Delhi, Indian Society of Agricultural Statistics.

Note: Scientific calculator is allowed.

13STS52L1 STATISTICS PRACTICAL V: SAMPLING THEORY PRACTICAL

Credit: 1 **Total: 30 Hours**

List of Practical

Part A

1. Drawing random samples using random number tables (grouped and ungrouped cases) and listing of all possible SRSWR and SRSWOR from a given population and verifying that the estimators of the mean, total and the sampling variance of the estimator are unbiased.
2. Estimation of the proportion and the standard error of the estimator under SRSWR and SRSWOR design.
3. Estimation of sample size under SRSWOR.

Part B

4. Estimation of the mean, total and the sampling variance of the estimator under stratified random sampling. Allocation of sample size under stratified random sampling
5. Comparison of the precisions of the estimators under stratified random sampling with proportional and optimum allocations and that under SRSWOR. Estimation of gain in precisions due to stratification.
6. Drawing of random sample under systematic sampling and estimation of the mean and total and the standard error of the estimators.

Part C

Project work: survey proposal; design of questionnaires and their pretest; data collection; analysis and report.

Scheme of Examination

Theory

Unit nos.	Topic	Hours of teaching	2 marks	7 marks	15 marks	Total marks in question *
1	Basics of sampling	11	3	1	1	28
2	Simple random sampling	14	2	3	1	40
3	Stratified random	14	2	1	2	41
4	Systematic and cluster sampling	10	2	2		18
5	Survey methods	11	3	1	1	28
Total hours and marks		60	24	56	75	155

(* including choices)

Practical:

Q1 Based on Part A

Q2 Based on Part B

Q3 Based on Part A&B

Sl. No.	Particulars	Maximum Marks
1.	Answer Any 2 questions out of 3	12.5*2 = 25
2.	Viva Voce w.r.t part C	5
Total Marks		30

Note: Scientific calculator is allowed.

13STS5202 STATISTICS VI: STATISTICAL METHODS FOR QUALITY MANAGEMENT

Credits: 4 **Total: 60 Hours**

Objective:

To provide a sound understanding of statistical methods for quality control and improvement.

UNIT 1: Basic concepts of Statistical Quality Control 06 hrs

Quality assurance and management; Quality costs; Aims and objectives of statistical process control; Chance and assignable causes of variation; Statistical quality control, Process control, product control; Importance of statistical quality control in industry.

UNIT 2: Control charts for variables 16 hrs

Theoretical basis and practical background of control charts for variables; 3 sigma limits, warning limits and probability limits; Criteria for detecting lack of control; Derivation of control limits, construction and interpretation of mean, range and standard deviation charts; Natural tolerance limits and specification limits; Process capability studies.

UNIT 3: Control charts for attributes 12 hrs

Derivation of control limits, construction and interpretation of np chart, p chart, c and u charts; OC and ARL for variable and attribute charts.

UNIT 4: Product Control 16 hrs

Sampling inspection and 100 percent inspection; AQL, LTPD, Producer's risk and consumer's risk; Acceptance sampling; Sampling plans - single and double sampling plans by attributes; Derivation of OC, AOQ, ASN and ATI; Construction of single sampling plan by attributes given AQL, LTPD, consumers' risk and producers' risk.

UNIT 5: Reliability 10 hrs

Reliability concepts; Reliability of components and systems; Life distributions, reliability functions, hazard rate, common life distributions-Exponential, Gamma and Weibull; System reliability, Series and parallel.

Text Books:

Gupta, S.C. and Kapur, V.K. (2001). *Fundamentals of Applied Statistics*, SC & sons.
Mahajan, M. (2001). *Statistical Quality Control*, Dhanpat Rai & Co (p) ltd.

References:

Gerald,M.Smith.(2004). *Statistics Process Control and Quality Improvement*, (1st ed.),Pearson education.
Goon, A. M., et al. (2001). *Fundamentals of Statistics Volume II* ,(7th ed.), World Press.
Grant E. L. and Leavenworth R. S. (2004). *Statistical Quality Control*. (7th ed.), New York, McGraw Hill.
Montgomery D. C. (1985). *Introduction to Statistical Quality Control*, Wiley International edition.
Sinha,S.K. and Kale B.K. (1980). *Life Testing and Reliability*, New Delhi, New Age International.

Suddhendu. (1997). *Statistics of Quality Control – Sampling Inspection and Reliability*, New Age International.

Note: Scientific calculator is allowed.

13STS52L2 STATISTICS PRACTICAL VI: STATISTICAL METHODS FOR QUALITY MANAGEMENT PRACTICAL

Credit: 1 **Total: 30 Hours**

List of Practical

Part A

1. $\bar{X}$ and R chart (Standard values known and unknown).
2. $\bar{X}$ and s charts (Standard values known and unknown).
3. np and p charts (Standard values known and unknown).
4. c and u charts (standard values known and unknown).
5. OC and ARL for $\bar{X}$ and R charts

Part B

6. Drawing OC, ASN, ATI and AOQ curves for single sampling plan for attributes.
7. Construction of single sampling plan by attributes.
8. Drawing OC, ASN, ATI and AOQ curves for single sampling plan for attributes

Part C

9. System reliability evaluation.
10. Sketching reliability and hazard function

Scheme of Examination

Unit nos.	Topic	Hours of teaching	2 marks	7 marks	15 marks	Total marks in
1	Basics of SQC	6	2	1		11
2	Charts for variables	16	3	1	2	43
3	Control charts for attributes	12	2	2	1	33
4	Product Control	16	3	2	1	35
5	Reliability	10	2	2	1	33
Total hours and marks		60	24	56	75	155

(* including choices)

Practical:

Q1 Based on Part A&B

Q2 Based on Part B&C

Q3 Based on Part C&A

Sl. No.	Particulars	Maximum Marks
1.	Answer Any 2 questions out of 3	12.5*2 = 25
2.	Viva Voce	5
Total Marks		30

Note: Scientific calculator is allowed.

13MAT5201 MATHEMATICS VII: GEOMETRY OF SPACE CURVES & VECTOR CALCULUS

Credits: 4 **Total: 60 Hours**

Objective:

This course is designed to develop the intuitive understanding, theoretical knowledge, and computational skills necessary for the concepts of calculus of functions of several variables by combining vector differential calculus and vector integral calculus. The student is also introduced to calculus of variations.

UNIT 1: Integral Calculus II 10 hrs

Applications of integral calculus: computation of lengths of arcs, plane areas and surface area and volume of revolution for standard curves in Cartesian and polar forms.

UNIT 2: Geometry of Space Curves 15 hrs

Vector function of a single scalar variable, its interpretation as a space curve, derivative, tangent, normal and binormal vectors to a space curve, Serret-Frenet formula, simple geometric applications, finding curvature and torsion; vector function of two scalar variables, its interpretation as a surface, tangent plane and normal to a surface, normal line; parametric curves on the surface of cylinder and sphere, conversion to cylindrical and spherical polar coordinates.

UNIT 3: Vector Differential Calculus 15 hrs

Scalar field, gradient of a scalar field -geometrical meaning, directional derivatives, vector field, divergence and curl of a vector field, solenoidal and irrotational fields, scalar and vector potentials, Laplacian of a scalar field, vector identities, expressions for div f and curl f in orthogonal curvilinear coordinates and specialization to Cartesian, cylindrical and spherical polar coordinates.

UNIT 4: Line and Multiple Integrals & Integral Theorems 20 hrs

Definition of a line integral and basic properties, examples on evaluation of line integrals; definition of a double integral, evaluation of double integrals by change of order of integration and by change of variables, computation of plane and surface areas, volume underneath a surface and volume of revolution using double integral; definition of a triple integral and evaluation, change of variables, volume as a triple integral.

Green's theorem (without proof) in the plane -direct consequences of the theorem; Divergence theorem (without proof) - direct consequences of the theorem; Stokes theorem (without proof) - direct consequences of the theorem.

Text Books:

Shantinarayan, S. *Integral Calculus,* New Delhi,S. Chand.

Shantinarayan.S. and Mittal, P.K,(2011).*A Text Book on Vector Calculus*, New Delhi, S. Chand.

Spiegel, Murray. R. (1974). *Schaum's Outline of Advanced Calculus*, Mc Graw Hill.

References:

Sokolnikoff, I.S. *Advanced Calculus*, Mc Graw Hill.
Spiegel, Murray. R. *Schaum's Outline of Vector Analysis*, Mc Graw Hill.
Maurice D Weir, Joel Hass, Frank R Giordano Thomas' *Calculus,* (11^{th} ed.). Pearson.

Note: Scientific calculator is allowed.

SEMESTER VI

13CSC6201 COMPUTER SCIENCE VII: INTERNET TECHNOLOGY

Credits: 4 **Total: 60 Hours**

Objective:

On successful completion of the course, the student should be able to master the concepts of Internet technology and services.

UNIT 1: Fundamentals of Internet 10hrs

History; Internet addressing; Protocols: TCP/IP, HTTP; Domain name system; Intranet; URL; E-Mail; Directory services; News groups; Search engines.

UNIT 2: HTML 15 hrs

Introduction to Hyper text markup language; Structure of HTML document; Head elements; Basic text formatting; Presentational elements; Phrase elements; Lists; Nested Lists; Tables; Hyperlinks; Images; Image maps; Forms; Frames.

UNIT 3: Cascading Style Sheets (CSS) 15hrs

Introduction; Internal style sheet; External style sheet; Controlling text; Text formatting; Selectors; Box Model; Backgrounds; Tables; Lists.

UNIT 4: Java Script 15 hrs

Browser and document object; Scripts and HTML document.
Programming Fundamentals: Variables, Expressions and evaluation, Operators, Data type conversion; Conditional statements; Loops; Functions.
Built-in Objects: String, Date, Math, Array, Window; Events; Window and Document objects; Image object: Precaching images, Image rollovers; Forms and form elements; Form validation; Form enhancements.

UNIT 5: Introduction to XML 05 hrs

Introduction to XML; XML Syntax; Working with document type definitions; Introducing XML schemas.

Text Books:

Danny Goodman, Brendan Eich. (2007), *JavaScript Bible* ,(6th ed.),Wiley Publications.
DuckettJon.(2011).*HTML,XHTML,CSS and JavaScript*.NewDelhi:Wiley India,
Steven M.Schafer. (2010).*HTML, XHTML, and CSS Bible*(5th ed.).Wiley-Eastern Publishing Inc.

References:

Alexis Leon and Matews Leon, *Internet for Everyone*.NewDelhi:Vikas Publishing house Pvt.Ltd.
Elizabeth Castro.(2006).*HTML, XHTML, and CSS: Visual QuickStart Guide* (6th ed.).
Harley Hahn.*Internet Complete Reference.*
Krayank ,Habraken.*Internet 6 in 1*.NewDelhi :Prentice Hall of India Pvt.Ltd.
Pfaffenberger, Bryan.(2000).*HTML 4/4.01 Bible - with DHTML/XHTML and JavaScript*, India IDG .

Note: Scientific calculator is allowed.

13CSC62P1 COMPUTER SCIENCE VIII: ENTERPRISE COMPUTING PROJECT USING .NET TECHNOLOGY

Credits: 3 **Total: 60 Hours**

Guidelines:

- Students have to develop a project using any advanced technology.
- Project can be implemented live but need to be demonstrated at the time of examination.
- The Internal Assessment (IA) marks can be awarded by the guide by evaluating the performance of the student during the course of the project work.
- The students can do the project in a group (team) consisting of not more than 2.
- Each team must submit a project report.
- A report of each individual phase has to be submitted within the stipulated time to the concerned faculty.
- The individual report for each phase has to be submitted as mentioned below with time lengths.

1. Initialization phase: The initialization phase is the beginning of the project. In this phase, the idea for the project is explored and elaborated. The goal of this phase is to examine the feasibility of the project. Questions to be answered in the initiation phase include the following:
   - Why this project?
   - Is it feasible?
   - What should the results be?
   - What are the boundaries of this project (what is outside the scope of the project)?

   Time Length: 5 hours of project lab.

2. Definition phase: After the project plan (which was developed in the initialization phase) has been approved, the project enters the second phase: the definition phase. In this phase, the requirements that are associated with a project result are specified as clearly as possible.

   It is important to identify the requirements as early in the process as possible. The several categories of project requirements are:

   - Preconditions
   - Functional requirements
   - Operational requirements
   - Design limitations

   Time Length: 10 hours of project lab.

3. Design phase: The list of requirements that is developed in the definition phase can be used to make design choices. In the design phase, one or more designs are developed, with which the project result can apparently be achieved.
   Time Length: 10 hours of project lab.

4. Development phase: During the development phase, everything that will be needed to implement the project is arranged. The development phase is complete when implementation is ready to start.

Time Length: 25 hours of project lab.

5. Implementation phase: The project takes shape during the implementation phase. This phase involves the construction of the actual project result.
   Time Length: 5 hours of project lab.

6. Follow-up phase: Although it is extremely important, the follow-up phase is often neglected. During this phase, everything is arranged that is necessary to bring the project to a successful completion.
   Time Length: 5 hours of project lab.

- Marks allotment for project :
  Total (IA+EA) = 40+60
  Internal Assessment (Record + Attendance + Preparatory): 10+5+25.
  External Assessment (Viva + Demonstration): 20+40.

Note: Scientific calculator is allowed.

13STS6201 STATISTICS VII: DESIGN OF EXPERIMENTS AND APPLIED STATISTICS

Credits: 4 **Total: 60 Hours**

Objective:
To introduce various applications of statistics to the students.

UNIT 1: Design of Experiments 15 hrs
Principles of randomization, replication and local control; Completely randomized, randomized block and Latin square designs-layout, models, least squares estimates of parameters, hypotheses, test procedures and ANOVA tables; Efficiency of a design; Missing plot technique for RBD and LSD- Estimation of single missing observation.

UNIT 2: Factorial Experiments 13 hrs
2^2 and 2^3 factorials experiments- Main effects and interactions, their best estimates and orthogonal contrasts; Yates method of computing factorial effects; Total and partial confounding in a 2^3 factorial experiment with RBD layout.

UNIT 3: Demography 12 hrs
Sources of demographic data; Measurement of mortality- Crude, specific and standardized death rates, infant mortality rate, maternal mortality rate; Fecundity and fertility; Measurement of fertility- crude, age specific, general and total fertility rates; Measurement of population growth- natural growth rate, vital index; Reproduction rates; Life table- Components of a life table, central mortality rate, force of mortality and expectation of life, construction of a life table; Uses of a life table.

UNIT 4: Time Series 10 hrs
Components of Time series; Additive and multiplicative models; Measurement of trend by moving averages and by least square methods; Construction of seasonal indices by simple averages and ratio to moving averages.

UNIT 5: Index Numbers 10 hrs
Meaning and Applications, Price and quantity relatives, link and chain relatives; Construction of Index numbers: their computation and interpretation. Simple, aggregative and weighted average methods; Laspeyres, Paasche's, Marshall-Edgeworth's and Fisher's index numbers. Time and factor reversal tests, Consumer price index; problems involved in the construction of general and consumer price index number.

Text Books:
Gupta, S.C. and Kapoor. V.K. (2001). *Fundamentals of Applied Statistics,* New Delhi, Sultan Chand & Sons.
Montgomery. D.C. *Design and Analysis of experiments*, John Wiley.

References:
Agarwal, B.L. (1998). *Programmed Statistics*, (2nd ed.), New Age International.
Arora, P.N. (1999). *Statistics for Management*. S. Chand.
Chandan, J.S (1998). Statistics for Business and Economics, (1st Ed.).Vikas Publishing House.
Cochran, W. and Cox, G.M. Experimental Designs. New York: John Wiley.

Goon, A. M., et al. Fundamentals of Statistics Volume II, (6th Ed.). World Press.
Gupta. S.P. (2006). *Statistical Methods*. (4th Ed.). S. Chand.

Note: Scientific calculator is allowed.

13STS62L1 STATISTICS PRACTICAL VII: DESIGN OF EXPERIMENTS AND APPLIED STATISTICS PRACTICAL

Credit: 1 **Total: 30 Hours**

List of Practical

Part A

1. Analysis of CRD
2. Analysis of RBD and missing plot technique.
3. Analysis of LSD and missing plot technique.
4. Analysis of 2^2 and 2^3 factorial experiments with RBD layout.
5. Analysis of 2^3 factorial experiments with RBD layout. (Complete and partial confounding)

Part B

6. Computation of mortality rates.
7. Computation of fertility rates.
8. Computation of reproduction rates.
9. Construction of life table.

Part C

10. Determination of secular trend by moving averages and least squares methods.
11. Measurement of seasonal variation by simple averages and ratio to moving averages.
12. Construction of index number.
13. Test for consistency of index number.
14. Construction of consumer Price Index number – interpretation.

Scheme of Examination

Theory

Unit nos.	Topic	Hours of teaching	2 marks	7 marks	15 marks	Total marks in question paper*
1	Design of Experiments	15	3	2	1	35
2	Factorial Experiments	13	3	2	1	35
3	Demography	12	2	2	1	33
4	Time Series	10	2	1	1	26
5	Index Numbers	10	2	1	1	26
Total hours and marks		60	24	56	75	155

(* including choices)

Practical:

Q1 Based on Part A&B
Q2 Based on Part B&C
Q3 Based on Part C&A

Sl. No.	Particulars	Maximum Marks
1.	Answer Any 2 questions out of 3	12.5*2 = 25
2.	Viva Voce	5
Total Marks		30

Note: Scientific calculator is allowed.

13STS6202 STATISTICS VIII: OPERATIONS RESEARCH

Credits: 4 **Total: 60 Hours**

Objectives:
To equip the students with quantitative techniques for managerial decisions.

UNIT 1: Linear Programming Problem 15 hrs
Definition and scope of operations research (OR); Modeling and solution; Linear Programming problem (LPP) - definition, standard and canonical form; Formulation of LPP, basic feasible solution, degenerate and non-degenerate solution; Graphical solution; Simplex algorithm – criteria for unbounded, multiple and infeasible solution.

UNIT 2: Transportation and Assignment problem 12 hrs
Transportation problem: Mathematical formulation; finding an initial basis feasible solution by North West Corner Rule, Matrix Minima Method, Vogel's Approximation Method, Test for optimality by u-v method (MODI method); Problem of degeneracy and its resolution; Assignment problem: Mathematical formulation and Hungarian method.

UNIT 3: Queuing Theory 08 hrs
Basic elements; description of a queuing system and measures of effectiveness; Statement of steady state solution of M/M/1 queuing system; waiting time distributions; Little's formula; derivation of expressions for queue length, system size and waiting times; Description of M/M/C queuing system.

UNIT 4: Statistical Decision Theory and Game Theory 15 hrs
Statistical decision problem and essential elements; decision making under certainty, uncertainty and risk, decision tree; Game theory- basic concepts; Two person zero-sum game; Pure and mixed strategies; Maximin- Minimax principle, games with Saddle point; Dominance principle; games without Saddle point- mixed strategies, determination of optimum solution for (2x2) game; Solution of (2xn) and (mx2) games by graphical method.

UNIT 5: CPM and PERT 10 hrs
Basic elements of network, Drawing of project network; Project planning with CPM and PERT; Critical path calculation. Critical path, slack time and float; PERT three estimate approach; Calculation of probabilities of completing a project within a specified period.

Text Books:
Kantiswaroop, Manmohan and P.K.Gupta (2003). *Operations research*, Sultan Chand & Co.
Kalavathy S. (2008). *Operations research* ,(2nd ed.).Vikas Publishers.

References:
Taha, H.A. (2006). *Operations Research*. (7th ed.). New York, Macmillan.
Mustafi, C.K. (2006). *Operations Research methods and practices*, New Age. Pub.
Mital, K.V. (1996). *Optimization method*, New Age International.
Sharma and Anand. (2004). *Operations Research*. (1st ed.). Himalaya Publishing House.
Kapoor, V.K. (2007). *Operations Research*. Sultan Chand & Co.

Shenoy, G.V and Srivastava.(2005). *Operations Research*. (2nd ed.). New Age International.
Bronson and Richard. (2010). *Operations Research*. (2nd ed.). Tata Mcgraw Hill.
Gupta, P.K. and Hira, D.S. (2005). *Problems in Operations Research*, Sultan Chand & Co.

Note: Scientific calculator is allowed.

13STS62L2 STATISTICS PRACTICALVIII: OPERATIONS RESEARCH PRACTICAL

Credit: 1 **Total: 30 Hours**

List of Practical

Part A

1. Formulation of LPP
2. Solution of LPP by graphical method.
3. Solution of LPP involving using simplex algorithm.
4. Solution of LPP involving using Big M method.

Part B

5. Transportation problems
6. Assignment problems.
7. Queuing problem

Part C

8. Decision theory problems.
9. Game theory problems.
10. CPM and PERT.

Scheme of Examination
Theory

Unit nos.	Topic	Hours of teaching	2 marks	7 marks	15 marks	Total marks in question paper*
1	Linear Programming Problem	15	3	1	2	43
2	Transportation and Assignment problem.	12	3	2	1	35
3	Queuing Theory	8	2	2		18
4	Statistical Decision Theory and Game Theory	15	2	2	1	33
5	CPM and PERT	10	2	1	1	26
Total hours and marks		60	24	56	75	155

(* including choices)

Practical:

Q1 Based on Part A&B
Q2 Based on Part B&C
Q3 Based on Part C&A

Sl. No.	Particulars	Maximum Marks
1.	Answer Any 2 questions out of 3	12.5*2 = 25
2.	Viva Voce	5
Total Marks		30

Note: Scientific calculator is allowed.

13MAT6201 MATHEMATICS VIII: MATRICES, LINEAR ALGEBRA, CALCULUS OF VARIATIONS AND FOURIER TRANSFORMS

Credits: 4 **Total: 60 Hours**

Objective:

To understand several important concepts in matrix and linear algebra, a branch of mathematics that has wide-ranging applications in other disciplines To develop a basic understanding of Legendre's and Bessel's functions and Fourier transforms.

UNIT 1: Matrices 17 hrs

Elementary row and column transformations, equivalent matrices, finding the inverse of a non-singular matrix by elementary operations, rank of a matrix, invariance of rank under elementary transformations, determination of rank of a matrix by reducing it to the echelon and normal forms, homogeneous systems of m linear equations in n unknowns-consistency criterion, solution by elimination method; eigen values and eigen vectors of a square matrix-standard properties, Cayley-Hamiton theorem and applications.

UNIT 2: Linear Algebra 18 hrs

Vector space- examples, properties; subspaces, criterion for a subset to be a subspace; linear combination, linear independent and dependent subsets; basis and dimension-standard results, examples illustrating concepts and results; linear transformation, properties, matrix of a linear transformation, change of basis, range and kernel, rank nullity theorem, non-singular linear transformation, eigen values and eigenvectors of a linear transformation, interpretation in terms of matrices-examples illustrating the concepts.

UNIT 3: Calculus of Variations 12 hrs

Variation of a function f = f (x,y,y'), variation of the corresponding functional, extremal of a functional, variational problem, Euler's equation and its particular forms, examples, standard problems like geodesics, minimal surface of revolution, hanging chain, Brachistochrone problem.

UNIT 4: Fourier Transforms 13 hrs

The Fourier integral, complex Fourier transform, inverse transform-basic properties; transforms of derivative and the derivative of the transform; Fourier sine and cosine transforms and inverse transforms.

Text Books:

Narayan, Shanti. and Mittal P.K.(2005). *Text book of Matrices*. (11th ed.), New Delhi, S Chand and Co.

Krishnamurthy, V. K., Mainra, V. P. and Arora J. L.(2011).*An Introduction to Linear Algebra,* New Delhi, Oscar Publications.

Fox. C. *An Introduction to the Calculus of Variations,* Oxford University Press.

Bracewell, R.N. (1999).*The Fourier Transform and its Applications,* (3rd ed.).Mc Graw Hill.

References:

Vatssa, B. S. (2005). *Theory of Matrices*. (reprint), New Delhi, New Age International Publishers.
Saikia, Promode Kumar. (2009). *Linear Algebra*, Pearson Education.
Kreyszig, Erwin.(2011). *Advanced Engineering Mathematics*. (9th ed.), Wiley India Pvt. Ltd.

Note: Scientific calculator is allowed.

NON CORE COURSES

13NHU0102 INDIAN CONSTITUTION

1 Credit **TOTAL: 30 Hours**

Objectives:

- Enables the citizens to know their rights and duties
- Makes them an ideal citizen of India
- Helps them for their valuable contribution of nation building

UNIT 1: Introduction **06 hrs**

Constituent assembly, preamble, features of Indian constitution, fundamental duties, fundamental rights, methods of constitutional amendment, directive principles of state policy.

UNIT 2: Union Parliament **07 hrs**

Rajya Sabha- powers and functions, Loka Sabha- powers and functions, committees of the parliament, speaker. State legislature- Legislative council and legislative assembly – powers and functions

UNIT 3: Union Executive **07 hrs**

President, Prime Minister Powers and functions. Governor, Chief Minister- powers and functions. Union and state council of ministers. Coalition government

UNIT 4: Judiciary **05 hrs**

Features of Indian judiciary. Supreme court- powers and functions. High court- powers and functions. Public interest litigation

UNIT 5: Issues **05 hrs**

Indian federation- Centre and state powers, Indian secularism. Reservations in India, Social justice, Environmental protection, Human rights

References:

Austin, Granville (1999), *Indian constitution: cornerstone of a nation* New Delhi

Bakshi, P.M (2002), The Constitution of India – Universal Law publishers.

Basu, Durga Das (1995), *Introduction to the constitution of India* New Delhi: Prentice – hall of India Pvt.

Basu, Durga Das (2002), *Introduction to the Constitution of India* New Delhi: Wadhwa and Company Law Publishers.

Kabburi, S.K (2006), *Indian constitution-institutions and process.*

Kagzi, M.C. (2001), *The Constitutional of India Vol.1 & 2.*New Delhi: India law house.

Pylee, M.V (2002), C*onstitution Government and Politics* New Delhi: Universal Law publishing Co.Pvt.Ltd.

Raj, Hans (1998), *The Constitution of India*: New Delhi: Surjeet Publications.

13NCS0101 COMPUTER FUNDAMENTALS

1 Credit **Total: 30 Hours**

Objectives:

- To provide basic knowledge of Computer and its Usage.

UNIT 1: Introduction to Computers **05 hrs**

General features of a Computer – Generation of Computers - Personal Computer – Workstation – Mainframe Computer and Super Computers. Computer Applications – Data Processing – Information Processing – Commercial – Office Automation – Industry and Engineering – Healthcare – Education – Graphics and Multimedia.

UNIT 2: Computer Organization **05 hrs**

Central Processing Unit – Computer Memory – Primary Memory – Secondary Memory – Secondary Storage Devices – Magnetic and Optical Media – Input and Output Units – OMR – OCR – MICR – Scanner – Mouse - Modem.

UNIT 3: Computer Hardware and Software **10 hrs**

Machine language and high level language. Application software. Computer program. Operating system. Computer virus, antivirus and Computer security. Elements of MS DOS and Windows OS. Computer arithmetic. Binary, octal and hexadecimal number systems. Algorithm and flowcharts. Illustrations. Elements of database and its applications

UNIT 4: Microsoft Office **05 hrs**

Word processing and electronic spread sheet. An overview of MS WORD, MS EXCEL and MS POWERPOINT. Elements of BASIC programming. Simple illustrations

UNIT 5: Computer Networks **05 hrs**

Types of networks.LAN, Intranet and Internet.Internet applications. World wide web. E-mail, browsing and searching. Search engines. Multimedia applications

LIST OF PRACTICAL ASSIGNMENTS: (12 Sessions of 2 hours each)

System use, keyboard, mouse operations. Word pad and paint brush.
Creating a folder and saving a document – 2 sessions.
Simple MS. DOS commands – 1 Session
Windows operating system – icons, menus and submenus, my computer – 2 sessions
Desktop publishing – preparation of a document using MS.WORD – 2 sessions
Installation of a software, virus scanning – illustrations – 1 session.
Spreadsheet calculations using MS.EXCEL – 1 session.
BASIC programming – illustrations – 1 session.
Internet use.Surfing, browsing, search engines, E-mail. – 2 sessions.

References:

Alexis Leon and Mathews Leon (1999): *Fundamentals of information technology*, Leon Techworld Pub.
Archanakumar – *Computer Basics with office automation*, I.K. International Publishers.

Jain, S.K. (1999): *Information Technology* "O" level made simple, BPB Pub.
Jain, V.K. (2000): "O" Level Personal Computer Software, BPB Pub.
Rajaraman, V. (1999): *Fundamentals of Computers*, Prentice Hall India.
Sinha, *Computer Fundamentals*, BPB Pub.

13NHU0101 ENVIRONMENTAL STUDIES AND CIVIC SENSE

1 Credit **Total: 30 Hours**

Objectives:

- Understand the various aspects of Environment
- To harness the concern for the environment and its resources
- Comprehend the correlation between human population, social issues with that of environment

UNIT 1: Nature of Environmental Studies: 03 hrs

Definition, scope and importance, Multi - disciplinary nature of environmental studies, need for public awareness. Natural resources and associated problems: (a) Forest resources: Use and over-exploitation, deforestation timber extraction, mining, dams and their effects on forests and tribal people, (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. (d) Food resources: World food problems, changes caused by agriculture effects of modern agriculture, fertilizer-pesticide problems. (e) Energy resources: Growing energy needs, renewable and non -renewable energy sources, use of alternate energy sources. (f) Land resources: land as resources, and land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources equitable use of resources for sustainable lifestyles.

UNIT 2: Ecosystems 03 hrs

Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, Characteristic features, structure and function of the following ecosystem: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT 3: Biodiversity and its Conservation 03 hrs

Introduction-Definition: genetic, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option value, Biodiversity at global, national and local levels, India as a mega-diversity nation, Western ghat as a bio-diversity, Hot-spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife Conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ, Conservation of biodiversity.

UNIT 4: Environmental Pollution 05 hrs

Definition, causes, effects and control measures of: a) Air pollution b) Water pollution c) Soil pollution d) Marine pollution e) Noise pollution f) Thermal pollution g) Nuclear hazards., Solid waste management: causes, effects and control measures urban and industrial wastes, Role of an individual in prevention of pollution, Disaster management: folds, earthquake, cyclone and landslides, Tsunami.

UNIT 5: Social Issues, Human Population and Environment 06 hrs

From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns, Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation, consumerism and waste products, Environment protection Act, Air (Prevention and control of pollution) Act., Water (Prevention and control of pollution) Act., Wildlife protection act, Forest conservation Act, Issues involved in enforcement of environmental legislation public awareness. Population growth, variation among nations, Population explosion, Family welfare programme, Environment and human health, Value Education, Women and Child Welfare, Role of information technology in Environmental and human health.

CIVIC SENSE

Objectives:

- To sensitize students to the concept and practice of civic sense
- Understanding the pivotal role in the transformation of urban attitudes along with the local government for sustainable change
- Fortifying experiential understanding of initiating and sustaining good civic sense in the community

UNIT I: Introduction to Civic Sense / Social Ethics 03 hrs

Concept nature and scope of civic sense, need and importance of civic sense, inter-relation between civic sense, citizenship and community.

UNIT II: Issues of Promoting Civic Sense 03 hrs

Spitting, urinating and defecating in public, lettering, shop lifting, consuming alcohol in public, smoking in public, consuming drugs, mugging, vandalizing public property, vulgar graffiti on public spaces, loud and rude behavior, argumentativeness, lack of humility and conduct, general disregard to the law of the land, disrespect to elders, ragging, eve teasing, women subjugation, stalking, lack of traffic discipline, jay walking, honking without reason, willful noise pollution, road rage, use of cell phones while driving. Reporting Instances of Poor Civic Sense**:** Highlighting the manifestations and ramifications including the moral and the legal consequences of the victims and the accused. Preventive / precautionary measures for the innocent victims who are soft targets.

UNIT III: Promotion of Civic Sense 02 hrs

Role of educational institutions and media; the role of family / teachers, local self-Government and non-Government organization –

UNIT IV: Success stories signifying good Civic Sense within India and Foreign Countries 01 hr

UNIT V: Group Project **01 hr**

Sensitizing students to the practice and inculcation of civic sense.

References:

Agarwal, K.C., (2001) *Environmental Biology*, Nidi Publ. Ltd. Bikaner

Bharucha Erach, *The Biodiversity of India*, Mapin publishing Pvt. Ltd. Ahmedabad-

Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. (2001) Environmental Chemistry, Wiley Eastern Ltd.,

Heywood, Vh & Watson R.T. 1995 Global biodiversity Assement Cambridge Univ.

Jadhav H & Bhosle V.M. 1995 Environmental Protection and laws. Himalayas Pub. House Delhi, 284p

Mckinney M.L. & Schocl R.M. 1996 Environmental Science systems & Solutions Web.Enhanced edition 639p.