ST. TERESA'S COLLEGE, ERNAKULAM

(AUTONOMOUS)

Affiliated to Mahatma Gandhi University, Kottayam

CURRICULUM FOR

BACHELOR'S PROGRAMME IN

COMPUTER APPLICATIONS (TRIPLE MAIN)

Under Choice Based Credit & Semester System
& Outcome Based Education

(2018 Admissions)

BCA -B. Sc. COMPUTER APPLICATIONS (TRIPLE MAIN)

PROGRAM SPECIFIC OUTCOMES

PSO1: Associate the basic concepts of mathematical structures, and statistical principles with computer science.

PSO2: Articulate Computational principles, fostering future learning to conform with technological advancements.

PSO3: Analyze real world problems and integrate mathematical and statistical concepts to design computer-based solutions.

PSO4: Develop holistic professional growth with effective communication skills and economic consciousness to society.

PSO5: Formulate innovative solutions to socially committed, industry relevant and strategic research problems.

SEMESTER I

Course Code	Course Title	Credits	Course Type
EN1A01B18	Fine Tune Your English	4	Common Course I
CA1B01B18	Computer Fundamentals And Digital Principles	3	Core Course
CA1B02B18	Methodology Of Programming And C Language	3	Core Course
CA1BP01B18	Software Lab -I	2	Core Course
MT1B01B18	Discrete Mathematics & Trigonometry	3	Core Course
ST1B01B18	Descriptive Statistics	3	Core Course

SEMESTER I

COMMON COURSE I

EN1A01B18– FINE-TUNE YOUR ENGLISH

Credits: 4
Total Lecture Hours: 90
Course Outcomes:

CO1. Recognize the basics of English grammar

CO2. Choose the appropriate word classes

CO3. Identify common errors in the use of English language in various contexts

CO4. Apply the rules of grammar to comprehend, speak, and write grammatically correct English

CO5. Compose materials for business communication

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	2	2	2
CO2	1	2	2	2	2
CO3	1	1	1	2	1
CO4	1	3	2	3	1
CO5	1	2	2	3	2

Syllabus Content:

Module I **(18 Hours)**

The Sentence and its Structure.

How to Write Effective Sentences – Phrases:What are They? – The Noun Clauses – The Adverb Clause – "If All the Trees Were Bread and Cheese" – The Relative Clause – How Clauses are Conjoined

Module II **(18 Hours)**

Word-Classes and Related Topics

Understanding the Verb – Understanding Auxiliary Verbs – Understanding Adverbs – Understanding Pronouns – The Reflexive Pronoun – The Articles I – The Articles II – The Adjective – Phrasal Verbs – Mind your Prepositions

Module III **(18 Hours)**

To Err is Human

Concord – Errors – Common and Uncommon

Spelling and Pronounciation

Pronunciation: Some Tips – More Tips on Pronunciation – An awesome Mess? – Spelling Part II

Module IV (18 Hours)

Tense and Related Topics

'Presentness' and Present Tenses – The 'Presentness' of a Past Action – Futurity in English – Passivisation

Interrogatives and Negatives

Negatives – How to Frame Questions – What's What? – The Question Tag

Module V(18 Hours)

Conversational English

Some time expressions – Is John There Please?

Miscellaneous and General Topics

Reading

Letter Writing

In addition there will be an essay question on a general topic.

SEMESTER I

CORE COURSE

CA1B01B18 - COMPUTER FUNDAMENTALS AND DIGITAL PRINCIPLES

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Differentiate the different types of computers, Operating Systems and basics of Networks and Internet.

CO2: Illustrate the conversion between various number systems and the construction of binary code.

CO3: Design simplified logical expression for digital circuits

CO4: Describe the working of combinational and sequential circuits and construct digital circuits of medium complexity

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2
CO2	3	2	2	1	2
CO3	2	3	3	1	2
CO4	2	3	2	1	2

Syllabus Content:

Module I **(12 Hrs)**

Introduction: Functional units of a computer system, Different types of computers, Computer Software and Hardware, Types of software-System software and Application program.

Characteristic of computers. Input Devices – Keyboard, Mouse, Optical input devices, Output devices – Monitors and Printers, Primary& Secondary Memory

Module II **(15 hrs)**

Introduction to Operating Systems and Networking: Definition of an Operating System - Different types of PC Operating Systems. Computer Networks- categories of networks - LAN, WAN, MAN. The Internet - Working of Internet - Major Features of Internet.

Module III **(15 hrs)**

Number Systems: Base or radix ,Positional number system, Popular number systems(Decimal, Binary, Octal and Hexadecimal), Conversion-From one number system to another, Concept of binary addition and subtraction, Complements in binary number systems,1s Complement, 2s Complement and their applications, Signed magnitude form, BCD numbers- concept and addition, Parity.

Module IV **(15 hrs)**

Boolean Algebra and Gate Networks: Logic gates- AND, OR, NOT, NAND and NOR Truth tables and graphical representation, Basic laws of Boolean Algebra, Simplification of Expressions, De Morgans theorems, Dual expressions, Canonical expressions, Min terms and Max terms, SOP and POS expressions, Simplification of expression using K-MAP (up to 4 variables), Representation of simplified expressions using NAND/NOR Gates, Dont care conditions, XOR and its applications, parity generator and checker.

Module V **(15 hrs)**

Sequential and Combinational Logic. Flip flops- Latch, Clocked, RS, JK, T, D and Master slave , Adders-Half adder, Full adder(need and circuit diagram), Encoders, Decodes, Multiplexers and De-multiplexers (working of each with diagram), Analog to digital and digital to analog converters (Diagram and working principle), : Concept of Registers, Shift Registers, Counters.

SEMESTER I

CORE COURSE

CA1B02B18 - METHODOLOGY OF PROGRAMMING AND C LANGUAGE

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Develop an algorithm/flowchart to analyze and solve a computational problem

CO2: Develop legible* C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators

CO3: Develop legible C programs with arrays, structure or union for storing the data to be processed.

CO4: Construct memory efficient C programs by the application of pointers for array processing and parameter passing and files for input and output storage.

***Legible : Legibility of a program means the following,**

1. **Logic of the program should be clear and understandable.**
2. **Programming standards for indentation and formatting should be followed.**
3. **Naming conventions should be followed, while naming variables and program.**
4. **Concise comments should be provided wherever necessary.**

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	1	3
CO2	2	2	3	1	1
CO3	2	3	2	1	1
CO4	2	3	2	1	2

Syllabus Content:

Module I **(12 Hrs)**

Introduction to programming, Classification of computer languages, Language translators (Assembler, Compiler, Interpreter), Linker, Characteristics of a good programming language, Factors for selecting a language, Subprogram, Purpose of program planning, Algorithm, Flowchart, Pseudocode, Control structures (sequence, selection, Iteration), Testing and debugging.

Module II **(15 hrs)**

C Character Set, Delimiters, Types of Tokens, C Keywords, Identifiers, Constants, Variables, Rules for defining variables, Data types, C data types, Declaring and initialization of variables, Type modifiers, Type conversion, Operators and Expressions- Properties of operators, Priority of operators, Comma and conditional operator, Arithmetic operators, Relational operators, Assignment operators and expressions, Logical Operators, Bitwise operators.

Module III **(15 hrs)**

Input and Output in C – Formatted functions, unformatted functions, commonly used library functions, Decision Statements If, if-else, nested if-else, if-else-if ladder, break, continue, goto, switch, nested switch, switch case and nested if. Loop control-for loops, nested for loops, while loops, do while loop.

Module IV **(15 hrs)**

Array, initialization, array terminology, characteristics of an array, one dimensional array and operations, two dimensional arrays and operations. Strings and standard functions, Pointers, Features of Pointer, Pointer and address, Pointer declaration, void wild constant pointers, Arithmetic operations with pointers, pointer and arrays, pointers and two dimensional arrays.

Module V **(15 hrs)**

Basics of a function, function definition, return statement, Types of functions, call by value and reference. Recursion -Types of recursion, Rules for recursive function, direct and indirect recursion, recursion vs iterations, Advantages and disadvantages of recursion. Storage class, Structure and union, Features of structures, Declaration and initialization of structures, array of structures, Pointer to structure, structure and functions, typedef, bitfields , enumerated data types, Union, Dynamic memory allocation, memory models, memory allocation functions.

SEMESTER I

CORE COURSE

CA1BP01B18 - SOFTWARE LAB -I

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Analyze a computational problem and develop an algorithm/flowchart to find its solution

CO2: Develop legible* C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators.

CO3: Develop legible C programs with arrays, structure or union for storing the data to be processed.

CO4: Construct memory efficient C programs by the application of pointers for array processing and parameter passing and files for input and output storage.

***Legible : Legibility of a program means the following,**

1. **Logic of the program should be clear and understandable.**
2. **Programming standards for indentation and formatting should be followed.**
3. **Naming conventions should be followed, while naming variables and program.**
4. **Concise comments should be provided wherever necessary.**

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	1	3
CO2	2	2	3	1	1
CO3	2	2	2	1	1
CO4	2	2	2	1	2

Syllabus Content:

1. Programs to familiarize printf() and scanf() functions.
2. Programs Based on Decision statements , break, goto, continue, switch and Loop controls statements.
3. Programs Based on One dimensional and two dimensional arrays.
4. Programs on Strings and string handling functions.
5. Programs based on Pointers, operations on pointers, Arrays & Pointers,
6. Programs based on functions, Call by value, Call by reference, Recursion,
7. Programs based on structure and union, array of structures, Pointer to structure, structure and functions
8. Simple programs using pointers and malloc().

SEMESTER I

CORE COURSE

MT1B01B18 - DISCRETE MATHEMATICS & TRIGONOMETRY

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Explain the propositional Calculus in Mathematical Logic and apply various methods for proving theorems.

CO2: Discuss Set theory, Relations, Functions, ordered sets and lattices.

CO3: Derive the formulae involving the hyperbolic ratios and illustrate the separation of circular and hyperbolic functions into real and imaginary parts.

CO4: Apply C + iS method for the summation of an infinite series.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	1	2
CO2	3	2	2	1	2
CO3	3	2	2	1	2
CO4	3	1	2	1	1

Syllabus Content:

Module 1 **(20 hrs)**

Mathematical Logic:

Propositional logic, Propositional equivalences, Predicates and quantifiers, Rules of inference, Introduction to proofs.

Module 2 **(12 hrs)**

Set theory: Sets, set operations, functions

Module 3 **(20 hrs)**

Ordered sets & Lattices : Poset, Product set & order, Hasse diagrams of partially ordered sets, Minimal& Maximal, and First & Last point, Lattices, Lattices as partially ordered sets.

Module 4

Trigonometry : **(20 hrs)**

Circular and hyperbolic functions of a complex variable Separation into real and imaginary parts. Factorisation of x^n-1, x^n+1, $x^{2n} - 2x^n a^n \cos n + a^{2n}$. Summation of infinite series by C + iS method.

SEMESTER I

CORE COURSE

ST1B01B18 - DESCRIPTIVE STATISTICS

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Describe the basic concepts of Statistics.

CO2: Manage raw data by constructing tables and express them by diagrams and graphs.

CO3: Illustrate the fundamental characteristics of data

CO4: Evaluate the different types of Index numbers

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	1	1
CO2	3	2	2	1	2
CO3	2	2	3	2	2
CO4	2	2	3	2	1

Syllabus Content:

Module I **(20 hours)**

Introduction to Statistics, Population and Sample, Collection of Data, Various methods of data collection, Census and Sampling. Methods of Sampling – Simple Random Sampling– stratified sampling – systematic sampling (Method only), Types of data – quantitative, qualitative, Classification and Tabulation, Frequency Table, Diagrammatic representation – Bar diagram, pie diagram; pictogram and cartogram.

Module II **(20 hours)**

Measures of Central Tendency – Mean; Median; Mode; Geometric Mean; Harmonic Mean and Properties, Partition values- Quartiles, Deciles, Percentiles, Absolute and Relative measures of Dispersion – Range, Quartile Deviation, Box Plot, Mean Deviation, Standard Deviation, Coefficient of Variation.

Graphical representation – histogram, frequency polygon, frequency curve, ogives and stem and leaf chart.

Module III **(16 hours)**

Raw Moments, Central Moments, Inter Relationships (First Four Moments), Skewness – Measures – Pearson's, Bowley's and Moment Measure; Kurtosis- Measures of Kurtosis – Moment Measure, Measure based on partition values.

Module IV **(16 hours)**

Index Numbers – definition, limitations, uses, Simple Index Numbers; Weighted Index Numbers – Laspeyer's, Paasche's and Fisher's Index Numbers, Test of Index Numbers, Construction of Index Numbers, Cost of Living Index Numbers – Family Budget Method, Aggregate Expenditure Method.

SEMESTER II

Course Code	Course Title	Credits	Course Type
EN2A03B18	Issues That Matter	4	Common Course I
CA2B03B18	Database Management Systems	3	Core Course
CA2B04B18	Object Oriented Programming Using C++	3	Core Course
CA2BP02B18	Software Lab II	2	Core Course
MT2B02B18	Number Theory, Cryptography,Laplace Transforms & Conic Sections	3	Core Course
ST2B02B18	Probability And Random Variables	3	Core Course

SEMESTER II

COMMON COURSE I

EN2A03B18– ISSUES THAT MATTER

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1. Identify the major issues of contemporary significance

CO2. Discuss the consequences of war and refugee crisis with respect to the psychological dimension

CO3. Employ theoretical learning in classrooms to current developments in the world

CO4. Critique the diverse experiences both historical and contemporary to create a more informed vision of the future

CO5. Develop oneself as a conscious, concerned, conscientious human being

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	1	1	3	2
CO2	1	1	1	1	2
CO3	1	1	1	3	2
CO4	1	1	1	3	2
CO5	1	1	1	3	2

Syllabus Content:

Module 1 **(18 hours)**

"The Unsurrendered People" – Kenzaburo Oe

"The Old Prison" – Judith Wright

"War" – Luigi Pirandello

Module 2 **(18 hours)**

Persuasions on the Power of the Word:

"On Censorship" – Salman Rushdie

"Peril" – Toni Morrison

"The Burning of the Books" – Bertolt Brecht

"The Censors" – Luisa Valenzuela

Module 3 **(18 hours)**

"The Poisoned Bread" – Bandhu Madhav

"A Trip Westward" – Zitkala-Sa

"The Pot Maker" – Temsula Ao

Module 4 **(18 hours)**

"Does it Matter?" – Richard Leakey

"On Killing a Tree" – Gieve Patel

"Hagar: A Story of a Woman and Water" (Gift in Green (chapter 2)) – Sarah Joseph

Module 5 **(18 hours)**

"Understanding Refugeeism: An Introduction to Tibetan Refugees in India" – Mallica Mishra

"Refugee Blues" – W.H Auden

"The Child Goes to the Camp" (from Palestine's Children) – Ghassan Kanafani

SEMESTER II

CORE COURSE

CA2B03B18 - DATABASE MANAGEMENT SYSTEMS

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1 : Describe the fundamental concepts of databases.

CO2 :Construct an Entity-Relationship (ER) model and transform to relational schema.

CO3 :Develop queries for relational database in the context of practical applications.

CO4 :Design relational databases following the design principles and employ control and recovery techniques in transaction processing.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	2	1	2
CO2	1	3	2	1	2
CO3	1	2	2	1	3
CO4	1	3	3	1	3

Syllabus Content:

Module I: Introduction (12hrs)

Characteristics of the Database Approach–Database users -DBA ,Database Designers ,End users –Advantages of using the DBMS Approach–Data models, Schemas, and Instances–Three-Schema Architecture and Data Independence. DBMS Languages: DDL, DML –The Database System Environment: DBMS Component Modules.

Module II: Relational Model (16 hrs)

Entity Relationship Modeling: Introduction–Entity Types, Entity Sets, Attributes and Keys–Relationship Types, Relationship Sets, Roles, and Structural Constraints–Weak Entity Types–

Notation for ER diagrams–Sample ER diagrams. Relational Model concepts: Domains, Attributes, Tuples, and Relations–Characteristics of Relations–Relational Model Constraints and Relational Database Schemas: Domain Constraints, Key Constraints, Relational Database Schemas, Entity Integrity, Referential Integrity, and Foreign Keys .

Module III: SQL (14 hrs)

Data Types–Data Definition commands :CREATE, ALTER, DROP-Adding constraints in SQL–Basic SQL Queries :INSERT, SELECT, DELETE, UPDATE –Substring comparison using LIKE operator, BETWEEN operator–Ordering of rows–SQL set operations UNION, EXCEPT , INTERSECT –Complex Queries : Comparison involving NULL and Three-valued logic, Nested queries, EXISTS and UNIQUE functions, Renaming of attributes and Joining of tables, Aggregate functions, Grouping–Managing Views.

Module IV: Normalization and Indexing Structures for Files (15hrs)

Normalization: Informal Design Guidelines for Relational Schemas–Functional Dependencies–Normal forms :First Normal Form ,Second Normal Form ,Third Normal Form–General Definitions of Second and Third Normal Forms–BCNF.Indexing Structures for files:-Types of Single-Level Ordered Indexes: Primary Indexes, Clustering Indexes, and Secondary Indexes.

Module V:Transaction Processing and Database Security (15hrs)

Transaction Processing: Introduction to Transaction Processing -Transaction and System Concepts–Desirable properties of Transactions. Database Security and Authorization: Types of Security –Control measures –Database Security and DBA–Access Control, User Accounts, and Database Audits–Access Control based on Granting and Revoking Privileges.

SEMESTER II

CORE COURSE

CA2B04B18 - OBJECT ORIENTED PROGRAMMING USING C++

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Write programs using C++ and learn its execution environment

CO2: Apply programs to implement various computational tasks which requires loops and conditional statements

CO3: Apply programs to implement the concept of Object Oriented Programming

CO4: Design object oriented programs to implement daily life problems and their solutions

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	1	1	2
CO2	2	3	2	1	2
CO3	1	3	2	1	2
CO4	2	3	3	1	3

Syllabus Content:

Module I: Principles of Object Oriented Programming, Beginning with C++ (12 hrs)

Procedure Oriented Programming-Object Oriented Programming-Basic concepts of object-oriented programming- Benefits of OOP- Applications of OOP-A simple C++program-Structure of C++ program- C++ data types- Symbolic constants- Reference by variables-Operators in C++- Operator precedence- Control structures- Function in C++ - The main function, Function prototyping- Call by reference- Return by reference- Inline function-Default arguments- Function overloading.

Module II: Classes and Objects (15 hrs)

Specifying a class- Defining member functions- Nesting of member functions -Private member functions - Arrays within a class - Memory allocation for objects-Static data members -Static member functions - Arrays of objects - objects as function arguments -Friendly functions-Returning Objects.

Module III: Constructors and Destructors, Overloading (15 hrs)

Constructors- Default constructor-Parameterized constructor-Copy constructor- Multiple constructors- Constructors with default arguments- Dynamic constructor-Destructors-Operator overloading- Unary and Binary operator overloading- Overloading using friends-Rules for overloading- Type conversion.

Module IV: Inheritance (15 hrs)

Inheritance- Defining derived classes-Visibility modes-Single, Multilevel, Multiple, Hierarchical And Hybrid inheritance- Virtual base classes- Abstract classes- Constructors in derived classes- Nesting of classes.

Module V: Pointers, Virtual Functions and Polymorphism, Working with Files (15 hrs)

Pointers- Pointers to objects- this pointer-Pointers to derived classes- Virtual functions-Pure virtual functions- File Stream classes, Opening and closing a file- File opening modes-File pointers and their manipulations- Sequential input and output operations.

SEMESTER II

CORE COURSE

CA2BP02B18 - SOFTWARE LAB -II

Credits: 2

Total Lecture Hours: 48

Course Outcomes:

CO1: Apply the basic concept of database system and applications

CO2: Create database implementations using SQL

CO3: Apply programs to implement the concepts of Object Oriented Programming

CO4: Design object oriented programs to implement daily life problems and their solutions

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	2	2	2
CO2	1	3	2	2	2
CO3	1	3	2	1	2
CO4	2	3	3	1	3

Syllabus Content:

I. **SQL Commands** **(2 hrs. per week)**

1. Data definition commands - CREATE, ALTER, DROP, Adding Constraints Primary key, foreign key, unique key, check, not null.
2. Basic SQL queries INSERT, SELECT, DELETE, UPDATE, Using multiple tables, ordering of rows using ORDER BY option, Set operations using UNION, EXCEPT, INTERSECT, Substring Comparison using LIKE operator, BETWEEN operator.
3. Complex Queries Nested Queries, EXISTS and UNIQUE/DISTINCT functions, NULL values, Renaming of attributes and Joining of tables, Aggregate functions and grouping.
4. Managing views, Simple stored procedures.
5. Data Control commands - Access Control and Privilege commands.

II. **Object Oriented Programming using C++** **(3 hrs. per week)**

1. Programs based on default arguments, function overloading.
2. Programs based on array of objects, friend functions, passing objects as arguments to function.
3. Programs based on operator overloading (binary, unary) using member functions and friend functions.
4. Programs based on constructors, different types of constructors.
5. Programs based on inheritance, different types of inheritance.

SEMESTER II

CORE COURSE

MT2B02B18 - NUMBER THEORY, CRYPTOGRAPHY, LAPLACE TRANFORMS & CONIC SECTIONS

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Explain the fundamental concepts of congruences and carryout different mathematical operations modulo an integer.

CO2: Discuss the basics of cryptography and compare the different encryption and decryption techniques.

CO3: Classify the different conic sections and to describe them in Cartesian and polar coordinates.

CO4: Compute the Laplace transform and inverse Laplace transform of a function and find the solution of differential equations.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	3	1	1
CO2	3	1	2	1	1
CO3	2	1	2	2	1
CO4	3	1	2	1	1

Syllabus Content:

Module 1 - Number theory

Basic properties of congruence , Linear congruences and Chinese remainder theorem (statement and problems only), Fermat's little theorem and pseudoprimes, Wilson's theorem, The sum and number of divisors, Euler's phi-function

Module 2- Cryptography

Introduction to Cryptography , From Caesar Cipher to Public key Cryptography, the Knapsack Cryptosystem

Module 3-Laplace transform

Laplace transform, Linearity of Laplace transform, First shifting theorem, Existence of Laplace transform, Transforms of derivatives, Solution of ordinary differential equation & initial value problem, Laplace transform of the integral of a function, Convolution and Integral equations.

Module 4-Conic sections

Conic Sections & quadratic equations, Classifying Conic Sections by eccentricity, quadratic equations & rotations, Conics & parametric equations; Cycloid, Polar coordinates, Graphing in Polar coordinates, Areas & lengths in Polar coordinates, Conic Sections in Polar coordinates

SEMESTER II

CORE COURSE

ST2B02B18 - PROBABILITY AND RANDOM VARIABLES

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Analyze the degree of relationship between variables using the concept of correlation

CO2: Articulate the concept of least square to estimate the unknown parameters in regression model

CO3: Implement the concept of probability and Bayes theorem to understand the uncertainty in a given problem

CO4: Illustrate the use of probability density function(pdf) of continuous and discrete random variables

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	3	1	2
CO2	3	1	3	1	2
CO3	3	1	2	2	2
CO4	3	1	2	1	1

Syllabus Content:

Module I : **(16 hours)**

Introduction to bivariate data**.** Correlation-Different types of Correlation. Concepts of Simple, Multiple and Partial Correlations. Simple Linear Correlation – Methods of finding simple linear Correlation – Scatter Diagram, Covariance Method, Rank Correlation (equal ranks).

Module II : **(16 hours)**

Curve Fitting – Method of Least squares- Fitting of Straight Lines, Second Degree Equation, Exponential Curve, Power Curve. Simple Linear Regression – Regression Equations – Fitting and identification, properties.

Module III : **(20 hours)**

Probability Concepts – Random Experiment, Sample Space, Events, Probability Measure, Approaches to Probability – Classical, Statistical and Axiomatic, Addition Theorem (upto 3 evens) Conditional Probability, Independence of events, Multiplication theorem (upto 3 events), Total Probability Law, Baye‟s Theorem and its applications

Module IV: **(20 hours)**

Random Variables – Discrete and Continuous, Probability Distributions – Probability Mass Function; Probability Density Function and Cumulative (distribution) function and their properties, change of variables (Univariate only), Bivariate random variables – Definition – Discrete and Continuous, Joint Probability Density Functions, Marginal and Conditional Distributions, Independence of Random Variables.

SEMESTER III

Course Code	Course Title	Credits	Course Type
CA3B05B18	DATA STRUCTURES USING C++	3	Core Course
CA3B06B18	OPERATING SYSTEMS	4	Core Course
CA3B07B18	SYSTEM ANALYSIS AND SOFTWARE ENGINEERING	3	Core Course
CA3BP03B18	SOFTWARE LAB III	2	Core Course
MT3B03B18	CALCULUS	4	Core Course
ST3B03B18	PROBABILITY DISTRIBUTIONS	4	Core Course

SEMESTER III

CORE COURSE

CA3B05B18 – DATA STRUCTURES USING C++

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Choose appropriate data structures to represent data items in real world problems.

CO2: Analyze the time and space complexities of algorithms.

CO3: Design programs using a variety of data structures such as stacks, queues, binary trees, search trees, heaps, graphs, and B-trees.

CO4: Analyze and implement various kinds of searching and sorting techniques.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	3	2	1	2
CO2	1	2	3	1	2
CO3	2	2	2	1	3
CO4	2	2	3	1	2

Syllabus Content:

Module I:(12 Hrs)

Concept of Structured data - Data structure definition, Different types and classification of data structures, Arrays – Memory allocation and implementation of arrays in memory, array operations, Applications - sparse matrix representation and operations, polynomials representation and addition, Concept of search and sort – linear search, binary search, selection sort, insertion sort, quick sort.

Module II:(15 Hrs)

Stacks – Concepts, organization and operations on stacks using arrays (static), examples, Applications - Conversion of infix to postfix and infix to prefix, postfix evaluation, subprogram calls and execution, Multiple stacks representation. Queues - Concepts, organization and operations on queues, examples. Circular queue – limitations of linear queue, organization and operations on circular queue. Double ended queue, Priority queue.

Module III (15 hrs)

Linked list: Concept of dynamic data structures, linked list, types of linked list, linked list using pointers, insertion and deletion examples, circular linked list, doubly linked lists, Applicationslinked stacks and queues, memory management basic concepts, garbage collection.

Module IV (15 hrs)

Trees - Concept of recursion, trees, tree terminology, binary trees, representation of binary trees, strictly binary trees, complete binary tree, extended binary trees, creation and operations on binary tree, binary search trees, Creation of binary search tree, tree traversing methods – examples, binary tree representation of expressions.

Module V (15 hrs)

File - Definition, Operations on file (sequential), File organizations - sequential, Indexed sequential, random files, linked organization, inverted files, cellular partitioning, hashing – hash tables, hashing functions, collisions, collision resolving methods, Algorithms.

SEMESTER III

CORE COURSE

CA3B06B18 – OPERATING SYSTEMS

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Describe the evolution, types, importance, structure and functions of Operating Systems in computing devices

CO2: Illustrate the concepts of process management and process scheduling mechanisms in Operating Systems.

CO3: Explain Inter process synchronization and determine the methods for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems

CO4: Explain the memory management strategies in Operating Systems

CO5: Describe secondary storage management and disk scheduling

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	2	2	1	2
CO2	1	2	2	1	2
CO3	2	2	2	1	2
CO4	2	2	2	1	2
CO5	2	2	2	1	2

Syllabus Content:

Module I:(12 Hrs)

Introduction: OS Definition, Functions, Evolution of OS,OS Structure Operating System Operations,Operating System Services, User Operating System Interface, System Calls, Types of System Calls.

Module II:(15 hrs)

Process: Basic Concepts, Process Scheduling, Operations on Processes, Inter process communication, Process Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling.

Module III:(15 hrs)

Process Coordination: Synchronization - The Critical Section problem, Semaphores, Classic Problems of Synchronization, Monitors. Deadlocks: System Model, Deadlock Characterization, Methods of handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Module IV: (15 hrs)

Memory Management: Memory Management Strategies - Swapping, Contiguous memory allocation,Paging, Segmentation. Virtual Memory Management- Demand paging, Page Replacement.

Module V: (15 hrs)

Storage Management: File System: - File Concept, Access Methods, Directory structure. Implementing File Systems:-File System Structure, Allocation Methods, Free Space Management, Disk Scheduling.

SEMESTER III

CORE COURSE

CA3B07B18 – SYSTEM ANALYSIS AND SOFTWARE ENGINEERING

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Adapt the basic software engineering methods and practices in their appropriate applications.

CO2: Distinguish the various software process models such as waterfall model, evolutionary models, etc.

CO3: Compose the requirements document by understanding the software requirements and identify the software architectural styles to the suitable applications.

CO4: Devise, design and maintain software.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	2	2	3	1	3
CO2	2	2	3	1	2
CO3	2	2	2	1	3
CO4	2	2	2	1	3

Syllabus Content:

Module I **(12 hrs)**

Information systems concepts, Business information systems; Describing the business organization – organization chart , organization function list ; information system levels - operational, lower, middle, top management; the system development life cycle concepts;

hardware and software end products. Life cycle activities- life cycle flow chart, task, management review, baseline specifications, role of system analyst.

Module II **(15 hrs)**

Introduction to Software Engineering - Definition, Program Vs Software, and Software process, Software Characteristics, Brief introduction about product and process, Software process and product matrices. Software life cycle models - Definition, Waterfall model, Increment process models, Evolutionary process models, Selection of a life cycle model.

Module III **(15 hrs)**

Software Requirement Analysis and Specification Requirements Engineering type of requirements, Feasibility Studies, Requirement Elicitation, Various steps for requirement analysis, Requirement documentation, Requirement validation, an example to illustrate the various stages in Requirement analysis. Project planning-Size estimation, cost estimation, the constructive cost model (COCOMO).

Module IV **(15 hrs)**

Software Design - Definition, Various types, Objectives and importance of Design phase, Modularity, Strategy of design, Function oriented design, IEEE recommended practice for software design descriptions. Steps to Analyze and Design Objected Oriented System. Software Reliability Definition, McCall software quality model, Capability Maturity Model.

Module V **(15 hrs)**

Software Testing What is testing?, Test, Test case and Test Suit, Verification and Validation, Alpha, beta and acceptance testing, functional testing, techniques to design test cases, boundary value analysis, Equivalence class testing, decision table based testing, cause effect graphing technique, Structural testing path testing, Graph matrices, Data flow testing; Levels of testing Unit testing, integration testing, system testing, validation testing, a brief introduction about debugging and various testing tools.

SEMESTER III

CORE COURSE

CA3BP03B18 – SOFTWARE LAB III

Credits: 2

Total Lecture Hours: 72

Course Outcomes:

CO1: Identify the appropriate data structures and algorithms for solving real world problems.

CO2: Illustrate various kinds of searching and sorting techniques.

CO3: Compare data structures such as stacks, queues, Search trees, and hash tables to solve various computing problems.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	2	1	2
CO2	2	2	3	1	2
CO3	2	2	2	1	2

Syllabus Content:

Module I **(14 hrs)**

Array – Insertion , Deletion, Polynomial addition using arrays Sort – Selection, Insertion, Quick Search – Linear search, Binary search Sparse matrix – Sparse form representation, transpose and addition using the sparse form

Module II **(14 hrs)**

Stack - Implementation using arrays (linear stack), Infix to postfix conversion, Postfix evaluation Queue – Implementation using arrays (linear queue), Implementation of circular queue.

Module III **(13 hrs)**

Singly linked list – Implementation using dynamic memory allocation techniques, arrange the list based on the ascending or descending order of the information field, concatenate two linked lists, interchange any two nodes in a list, Implementation of circular list, Implementation of linked stacks and queues.Doubly linked list – Implementation of doubly linked list, Implementation of circular doubly linked list.

Module IV **(13 hrs)**

Creation of binary search trees, Insertion and deletion of nodes, Tree traversals.

SEMESTER III

CORE COURSE

MT3B03B18 – CALCULUS

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Compute the higher order derivatives of single and multivariable functions.

CO2: Determine the series expansions of functions using Taylor's and Maclaurin's series .

CO3: Estimate the extreme values of a continuous function of several variables with constrained and unconstrained domains.

CO4: Apply Integral calculus to compute the length of the plane curves and area between curves .

CO5: Employ the concept of multiple integrals in mensuration of solids.

CO6: Evaluate multiple integrals by transforming into various coordinate systems.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	3	1	2
CO2	3	1	2	1	2
CO3	3	2	3	1	2
CO4	3	1	2	1	2
CO5	3	1	2	1	2
CO6	3	1	3	1	2

Syllabus Content:

Module I Differential Calculus (30 hrs)

Successive Differentiation. Expansion of functions using Maclaurin‟s theorem and Taylor‟s theorem. Concavity and points of inflexion.

Module II Partial Differentiation (20 hrs)

Partial derivatives, The chain rule., Extreme values and saddle points, Lagrange multipliers, Partial derivatives with constrained variables. (Text 1 Section 14.3 , 14.4, 14.7, 14.8, 14.9)

Module III Integral Calculus (20 hrs)

Substitution and area between curves, volumes by slicing and rotation about an axis. Volumes by cylindrical shells, Lengths of Plane Curves, Areas of surfaces of Revolution and the theorems of Pappus.

Module IV Multiple Integrals (20 hrs)

Double integrals, Areas, Double integrals in polar form, Triple integrals in rectangular coordinates, Triple integrals in cylindrical and spherical coordinates,substitutions in multiple integrals.

SEMESTER III

CORE COURSE

ST3B03B18 – PROBABILITY DISTRIBUTIONS

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Describe the characteristics of a random variable.

CO2: Explain the various properties of some discrete random variables.

CO3: Establish the applications of continuous distributions

CO4: Illustrate the uses of Tchebychev's Inequality, Laws of Large numbers, and Central limit theorem.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	2	1	2	2	2
CO2	2	1	2	2	3
CO3	2	1	3	2	3
CO4	2	1	3	2	3

Syllabus Content:

Module I **(25 hours)**

Mathematical Expectation – Expectation of a Random Variable, Moments in terms of Expectations, Moment Generating Functions (m.g.f.) and its properties. Characteristic Functions and its Simple Properties, Conditional Expectation.

Module II **(25 hours)**

Discrete Probability Distributions – Uniform: Geometric; Bernoulli; Binomial; Hyper geometric; Poisson; Fitting of Distributions (Binomial and Poisson). Properties – Mean, Variance, m.g.f., Additive property; recurrence relation for moments (binomial and Poisson) Memorylessness property of Geometric distribution.

Module III **(25 hours)**

Continuous distributions – Uniform; Exponential; Gamma; Beta (type I and II); Normal; Standard Normal – definitions, Mean, Variance, m.g.f., Additive property, Memorylessness property of exponential distribution Fitting of Normal, Use of Standard Normal Tables for Computation of Various Probabilities.

Module IV **(15 hours)**

Tchebycheff"s Inequality, Weak Law of Large Numbers, Bernoulli"s Law of Large Numbers, Central Limit Theorem (Lindberg-Levy form) with proof.

SEMESTER IV

Course Code	Course Title	Credits	Course Type
CA4B08B18	LINUX ADMINISTRATION	3	Core Course
CA4B09B18	WEB PROGRAMMING USING PHP	3	Core Course
CA4BP04B18	SOFTWARE LAB IV	3	Core Course
MT4B04B18	VECTOR CALCULUS, THEORY OF EQUATIONS & MATRICES	4	Core Course
ST4B04B18	STATISTICAL INFERENCE	4	Core Course
ST4B05B18	SAMPLE SURVEY AND DESIGN OF EXPERIMENTS	4	Core Course

SEMESTER IV

CORE COURSE

CA4B08B18 - LINUX ADMINISTRATION

Credits: 3

Total Lecture Hours: 54

Course Outcomes:

CO1: Explain concepts and components of Linux.

CO2: Interpret common Linux commands and utilities for general file system operations.

CO3: Construct shell scripts for common shell environments.

CO4: Implement system administration tasks to manage files, software, network, users, services.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	2	1	1	1
CO2	1	3	2	2	1
CO3	2	2	3	2	2
CO4	1	3	2	2	2

Syllabus Content:

Module I: Overview of Linux (12 hours)

Overview of Linux: What is Linux, Linux‟s root in Unix, Common Linux Features, advantage of Linux, Overview of Unix and Linux architectures, Linux files system, hardware requirements for Linux, Linux standard directories. Commands for files and directories cd, ls, cp,rm, mkdir, rmdir, pwd, file, more, less, Creating and viewing files using cat,file comparisons.

Module II: Essential Linux commands (16 hours)

Essential Linux commands:Processes inLinux, process fundamentals, connectingprocesses with pipes, redirectinginput/output, Background processing,managingmultiple processes,process

scheduling– (at, batch), nohup command, kill, ps, who, find, sort, touch, file, file processing commands-wc, cut, paste etc Mathematical commands-expr, factor etc. Creating and editing files with vi editor.

Module III: Shell programming (14 hours)

Shell programming-Basics of shell programming, various types of shell available in Linux, comparisons between various shells, shell programming in bash. Conditional and looping statements, case statement, parameter passing and arguments, Shell variables, system shell variables, shellkeywords, Creating Shell programs forautomating system tasks

Module IV: System administration (15 hours)

System administration-Common administrative tasks, identifying administrative files configuration and log files, Role of system administrator, Managinguseraccounts-adding &deletingusers, changing permissions and ownerships, Creatingand managing groups, modifying group attributes, Temporary disabling of users accounts, creating and mounting file system, checking and monitoring system performance-file security & Permissions, becoming super user using su. Getting system information with uname, host name, disk partitions & sizes, users, kernel, installing and removing packages with rpm command

Module V: Simple filter commands (15hours)

Simple filter commands: pr, head, tail, cut, sort, uniq, tr- Filter using regular expression grep, egrep, sed Understanding various Servers: DHCP, DNS, Squid, Apache, Telnet, FTP, Samba.

SEMESTER IV

CORE COURSE

CA4B09B18 : WEB PROGRAMMING USING PHP

Credits: 3

Total Lecture Hours: 54

Course Outcomes:

CO1: Describe the fundamentals of Web

CO2: Describe the importance of css in web development and identify the function of Javascript as a dynamic webpage creating tool.

CO3: Develop a web page and relate how PHP and HTML combine to produce the web page

CO4: Construct Dynamic web site using server side PHP Programming and Database connectivity.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	1
CO2	3	2	1	2	2
CO3	2	3	2	3	2
CO4	1	3	2	3	3

Syllabus Content:

Module I: Introduction **(12 hours)**

Introduction to web, WWW architecture, Fundamentals of HTML, text formatting tags, marquee, inserting images, links, lists, creating tables, frames, working with form elements.

Module II: CSS introduction **(15 hours)**

CSS introduction, <link>and<style>elements, CSS properties, Controlling Fonts, Text formatting, Text-pseudo classes, Selectors, Links, Backgrounds, lists

Introduction to Java Script, Java Script variables, operators, decision control statements, looping, functions, arrays, events, popup boxes-alert, prompt, conform box, built-in objects, writing JavaScript, form validation

Module III: Introduction to PHP **(15 hours)**

Introduction to PHP, server sides scripting, role of web server software, php comments, variables, echo and print, PHP operators, data types, branching statements, loops, arrays

Module IV: PHP functions **(15 hours)**

PHP functions, PHP form, Passing information between pages, $_GET,$_POST, $_REQUEST. String actions, include and require, session and cookie management, error handling in PHP, Object Oriented Programming using PHP

Module V: Introduction to My SQL **(15 hours)**

Introduction to My SQL, data types, SQL commands-CREATE, UPDATE, INSERT, DELETE, SELECT, PHP functions for MySQL connectivity and operationmysql_connect,sql_select_db,mysql_query,mysql_fetch_row,mysql_fetch_array,mysql_result, ysql_list_fields, mysql_num_fields, insertion, updation and deletion of data using PHP, displaying data from MySQL in web page.

SEMESTER IV

CORE COURSE

CA4BP04B18: SOFTWARE LAB IV

Credits: 3

Total Lecture Hours: 48

Course Outcomes:

CO1: Identify the basic commands of linux operating system and write shell scripts.

CO2: Construct file systems and directories and operate them

CO3: Generalize the principles behind using MySQL as a backend DBMS with PHP

CO4: Construct a responsive web page with proper validation

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	1	1	1
CO2	2	3	2	3	3
CO3	2	3	1	3	2
CO4	1	2	2	2	3

Syllabus Content:

I. **Linux Commands** **(2 hrs. per week)**

1 Getting started–Commands

2 The Linux Architecture and command usage– Commands, General-purposeutilities

3 The Filesystem–Commands

4 Process related commands

5 Handling ordinary files, Basic file attributes

6 Thevi editor

7 Simple Filters, Filters using regular expressions-use of grep command

8 Introduction to shellconcept and writingshellscript

9 Introduction to shell concept and writing shell script, Essential Shell Programming

II. **Web Programming using PHP** **(3 hrs. per week)**

1. Web Programming using PHP
    1) Creatingprograms based on HTML
    2) CreatingJavascript based programs
    3) Creating simple programs based on PHP
    4) Programs usingPHP functions
    5) Programs based on MYSQL

SEMESTER IV

CORE COURSE

MT4B04B18-VECTOR CALCULUS, THEORY OF EQUATIONS & MATRICES

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1: Determine the equations of lines and planes in space and apply vector differentiation in the study of motion.

CO2: Compute line integrals and surface integrals and apply them to determine the various characteristics of a vector field.

CO3: Analyze an algebraic equation and evaluate its roots using different methods.

CO4: Illustrate the properties of matrices and compute the solution of linear equations using matrix algebra.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	2	1	2
CO2	3	2	2	1	2
CO3	3	1	3	1	1
CO4	3	1	2	1	1

Syllabus Content:

Module 1 - (A quick review) **(20 hours)**

(A quick review) Lines and planes in space.,Vector functions Arc length and Unit tangent vector, Curvatureand Unit normal vector, torsion and Unit Binormal vector, Directional derivatives and gradient vectors , tangent planes and normal lines (ONLY).

Module 2 - Integration in Vector Fields **(30 hours)**

Line integrals, Vector fields and line integrals: Work, Circulation and Flux, Path Independence, Conservative Fields and Potential Functions (Proofs of theorems excluded), Green's theorem in the plane (Statement and problems only), Surfaces and Area: Parameterisations of surfaces, Implicit surfaces, Surface integrals, Stokes' theorem (Statement and simple Problems only), Divergence theorem only (Statement and Problems only) Gauss‟ law onwards are excluded.

Module 3 - Theory of Equations **(20 hours)**

Statement of fundamental Theorem of algebra. Deduction that every polynomial of degree n has n and only n roots. Relation between roots and coefficients. Transformation of equations. Reciprocal equations.

Module 4- Matrices **(20 hours)**

Rank of a Matrix, Non-Singular and Singular matrices, Elementary Transformations, Inverse of an elementary Transformations, Equivalent matrices, Row Canonical form, Normal form, Elementary matrices only. Systems of Linear equations: System of non-homogeneous, solution using matrices, Cramer‟s rule, system of homogeneous equations, Characteristic equation of a matrix; Characteristic roots and characteristic vectors. Cayley-Hamilton theorem (statement only) and simple applications (Text 3, Chapters – 5, 10, 19, 23).

SEMESTER IV

CORE COURSE

ST4C01B18 / ST4B04B18 - Statistical Inference

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1: Explain the concepts of statistic and sampling distribution

CO2: Illustrate the methods of estimating parameters of a population

CO3: Describe the procedure of testing of hypotheses

CO4: Explain Standard error and testing procedure for parameters of a normal population using large and small samples

CO5: Evaluate various statistical techniques for modeling and exploring practical situation

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	2	1	2
CO2	3	3	2	3	2
CO3	3	1	2	2	2
CO4	3	3	3	3	2
CO5	3	1	3	2	2

Syllabus Content:

Module I : **(20 hours)**

Sampling Distributions – definition, Statistic, Parameter, Standard Error, Sampling Distributions of Mean and Variance, χ^2, t and F (without derivation), properties, Inter relationships.

Module II : **(30 hours)**

Concepts of Estimation, Types of Estimation – Point Estimation; Interval Estimation, Properties

of Estimation – Unbiasedness, Efficiency; Consistency; Sufficiency. Methods of Estimation – MLE, Methods of Moments, Method of Minimum Variance, Cramer Rao Inequality (without proof), Interval Estimation for Mean, Variance and Proportion.

Module III : (20 hours)

Testing of hypothesis- Statistical hypothesis, Simple and composite hypothesis Null and Alternate hypothesis, Type I and Type II errors, Critical Region, Size of the test, P value, Power, Neyman Pearson approach

Module IV: (20 hours)

Large Sample tests – Z test, Chi-Square test-goodness of fit, test of independence. Small sample tests –Normal tests, t - test, Chi-square test, F- test.

SEMESTER IV

CORE COURSE

ST4B05B18 - SAMPLE SURVEY AND DESIGN OF EXPERIMENTS

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1: Explain the concepts of Census and sample survey and estimate the unbiased estimates of parameters and their variances for SRSWR and SRSWOR.

CO2: Describe the concepts of Stratified random sampling and Systematic sampling and estimate the unbiased estimates of the parameters and their variances in Stratified sampling for SRSWR and SRSWOR.

CO3: Explain the concepts of Experimentation, Linear estimation and ANOVA.

CO4: Illustrate the layout and analysis of CRD, RBD, LSD and missing plot techniques.

CO5: Organize sample surveys using sampling techniques

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	2	2	1
CO2	3	1	2	2	1
CO3	3	2	3	2	1
CO4	3	2	3	2	1
CO5	3	1	3	2	2

Syllabus Content:

Module I : **(20 hours)**

Basic concepts: Census and Sampling, Principal steps in a sample survey- Simple random sampling: Simple random sampling with and without replacement, unbiased estimates of the population mean and population total-their variances and estimates of the variances

Module II : **(30 hours)**

Stratified random sampling: Estimation of the population mean and population total-their variances and estimates of the variances, proportional allocation and Neyman allocation of sample sizes, cost function – optimum allocation, comparison with simple random sampling, Systematic Sampling: Linear and Circular Systematic Sampling (basic concepts only)

Module III : **(20 hours)**

Principles of experimentation, linear estimation, estimability of parametric functions BLUE, Gauss Markov theorem(without proof), ANOVA of one way & two way classified data

Module IV: **(20 hours)**

Lay out and analysis of basic designs CRD, RBD, LSD missing plot techniques

SEMESTER V

Course Code	Course Title	Credits	Course Type
CA5B10B18	JAVA PROGRAMMIING USING LINUX	4	Core Course
CA5BP05B1 8	SOFTWARE LAB V	3	Core Course
MT5B06B18	REAL ANALYSIS I	3	Core Course
MT5B07B18	DIFFERENTIAL EQUATIONS	4	Core Course
ST5B06B18	ENVIRONMENTAL STUDIES, HUMAN RIGHTS AND NUMERICAL METHODS	4	Core Course
CA5D01aB18	COMPUTER FUNDAMENTALS,INTERNET & MS OFFICE	3	Open Course (offered to other programmes)
CA5D01bB18	INFORMATICS AND CYBER ETHICS	3	Open Course (offered to other programmes)

SEMESTER V

CORE COURSE

CA5B10B18 - JAVA PROGRAMMING USING LINUX

Credits : 4

Total Lecture Hours : 72

Course Outcomes:

CO1 : Discuss the basic concepts of object oriented principles

CO2 : Apply conditional and looping constructs in Java code.

CO3 : Explain the concepts of packages and multithreading.

CO4 : Illustrate multithreaded and Networking applications.

CO5 : Design GUI applications and Applets using AWT.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	2	2	1	2
CO2	2	2	2	1	2
CO3	1	2	3	2	2
CO4	1	3	2	1	3
CO5	2	2	2	2	2

Syllabus Content:

MODULE I (12hrs.)

Concepts of Object oriented programming, Benefits of OOP, Features of java. Java environment, java tokens, Constant, variables, datatypes, operators Control Statements- branching statements, looping statements, jump statements, labeled loops.

MODULE II (15hrs.)

Defining a Class, Fields declaration, Method declaration, Creating object, Accessing class members, method overloading, Constructors, constructor overloading, super keyword, static Members, Inheritance, overriding methods, dynamic method dispatch, final (variables, methods and classes), abstract methods and classes, interfaces, visibility control.

MODULE III (15 hrs.)

Arrays- One dimensional arrays, declaration, creation, initialization of arrays, two dimensional arrays, String class. Packages:-java API packages overview(lang, util, io, awt, swing,applet),user defined packages-creating packages, using packages Exception Handling Techniques-try-catch-throw-throws-finally -Multithreading-creation of multithreaded program-Thread class-Runnable interface, Thread lifecycle.

MODULE IV (15hrs.)

EventHandling-Delegation EventModel-EventClasses-Sources of Events-Event Listeners-Event classes-Swing-architecture, components of swing-JLabel, JButton, JCheckBox, JRadioButton, JList, JComboBox, JTextField, JText Area, JPanel, JFrame, Layout Managers(FlowLayout, Grid Layout, CardLayout,BorderLayout,BoxLayout,NullLayout).

MODULE V (15hrs.)

Applet Fundamentals-applettag, applet lifecycle, passing parameters to applets. Working with graphics-Line, Rectangle, Oval, Arc, colorsetting. JDBC architecture-JDBCconnection, JDBC statement object, JDBC drivers.

SEMESTER V

CORE COURSE

CA5BP05B18: SOFTWARE LAB V

Credits : 4

Total Lecture Hours : 72

Course Outcomes:

CO1 : Build Applet, JDBC connection and swing based Programs

CO2 : Apply the concepts of Method Overloading, Method Overriding and inheritance.

CO3 : Execute abstract class, interfaces and packages.

CO4 : Illustrate Exception Handling

CO5 : Design GUI applications and Applets using AWT.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	2	3	1	2
CO2	1	1	2	2	2
CO3	1	1	2	2	2
CO4	1	3	2	1	3
CO5	1	2	2	3	1

Syllabus Content:

Part I. Applet, JDBC connection and swing based Programs

Part II (using class and read inputs from keyboard) Java Programs: Method Overloading-Method Overriding-inheritance- abstract class interfacespackages-Exception Handling-Multithreading.

SEMESTER V

CORE COURSE

MT5B06B18 - REAL ANALYSIS I

Credits : 4

Total Lecture Hours : 72

Course Outcomes:

CO1: Discuss the fundamental properties of the real numbers that support the formal development of Real analysis.

CO2: Describe basic topological concepts and characterizations of real number system such as the notion of open and closed sets.

CO3: Analyze real sequences, their convergence, some basic and significant theorems involving sequences and their applications.

CO4: Explain elementary metric space theory including continuity, connectedness, compactness and completeness.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	1	1
CO2	2	1	2	1	2
CO3	2	1	3	1	2
CO4	3	2	2	1	2

Syllabus Content:

Module 1 (15 hrs)

Intervals, Bounded and unbounded sets, supremum, infimum. Order completeness in R. Archimedian property of real numbers. Dedekinds form of completeness property.

Module II (25hrs)

Neighbourhood of a point. Interior point of a set. Open set. Limit point of a set. Bolzano weierstrass theorem for sets. Closed sets, closure of a set. Dense sets. Countable and uncountable sets. Divergence theorem only (Statement and Problems only) Gauss' law onwards are excluded.

Module III (30 hrs)

Real sequences. The range, bounds of a sequence. Convergence of sequences. Some theorems, limit points of a sequence. Bolzano weierstrass theorem for sequences. Limit interior and superior. Convergent sequences. Cauchy's general principle of convergence. Cauchy's sequences. Statements of theorem without proof in algebra of sequences. Some important theorems and examples related to them. Monotonic sequences, subsequences.

Module IV (20 hrs)

Metric Spaces Definitions & examples, Open & Closed Sets, Convergence & Completeness,Continuity & Uniform Continuity.

SEMESTER V

CORE COURSE

MT5B07B18 - DIFFERENTIAL EQUATIONS

Credits : 4

Total Lecture Hours : 72

Course Outcomes:

CO1: Classify different types of differential equations.

CO2: Construct differential equations by eliminating constants or functions.

CO3: Compute the general and particular solutions of first order and higher order differential equations and find the orthogonal or oblique trajectories.

CO4: Apply power series method to find the solutions of ordinary differential equations.

CO5 : Solve partial differential equations using the method of grouping and the multiplier method.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	2	1	2
CO2	3	2	2	1	2
CO3	3	2	2	1	2
CO4	3	2	2	1	2
CO5	3	2	2	1	2

Syllabus Content:

Module I :Ordinary differential equations (20hrs)

Exact differential equations and integrating factors (proof of theorem 2.1 excluded), separable equations and equations reducible to this form, linear equations and Bernoulli equations, special integrating factors and transformations. Orthogonal and oblique trajectories.

Module II (30hrs)

Basic theory of linear differential equations. The homogeneous linear equation with constant

coefficients. The method of undetermined coefficients, Variation of parameters, The Cauchy – Euler equation.

Module III (25 hrs)

Power series solution about an ordinary point, solutions about singular points, the method of Frobenius, Bessel‟s equation and Bessel Functions, Differential operators and an operator method.

Module IV: Partial Differential equations (15 hrs)

Surfaces and Curves in three dimensions, solution of equation of the form dx/P = dy/Q = dz/R , Origin of first order and second order partial differential equations, Linear equations of the first order, Lagrange‟s method.

SEMESTER V

CORE COURSE

ST5B06B18 - ENVIRONMENTAL STUDIES, HUMAN RIGHTS AND NUMERICAL METHODS

Credits : 4

Total Lecture Hours : 72

Course Outcomes:

CO1: Explain the multidisciplinary nature, important theories and concepts of environmental science, ecosystems, natural resources and conservation

CO2: Identify various types of natural resources and develop skills and commitment to act independently and collectively to sustain and enrich the environment

CO3: Discuss the major environmental problems, its causes, the social and economic consequences and potential solutions

CO4: Identify issues and problems relating to the human rights

CO5:Derive numerical methods for evaluating the roots and solutions for algebraic, transcendental and simultaneous linear equations

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	2	2
CO2	1	1	1	3	2
CO3	1	1	1	2	2
CO4	1	1	1	2	2
CO5	1	1	1	3	2

Syllabus Content:

Module I: (20 Hours)

Unit 1 : Multidisciplinary nature of environmental studies Definition, scope and importance Need for public awareness. Unit 2 : Natural Resources : Renewable and non-renewable resources : Natural resources and associated problems. a) Forest resources : Use and over-exploitation,

deforestation, case studies.Timber extraction, mining, dams and their effects on forest 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, case studies. d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification • Role of individual in conservation of natural resources. • Equitable use of resources for sustainable life styles. Unit 3: Ecosystems • 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 given ecosystem:- Forest ecosystem

Module II: (25 Hours)

Unit 1: Biodiversity and its conservation • Introduction • Biogeograhical classification of India • Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. • India as a mega-diversity nation • Hot-sports of biodiversity • Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts • Endangered and endemic species of India Unit 2: Environmental Pollution Definition Causes, effects and control measures of: - • Air pollution • Water pollution • Soil pollution • .Marine pollution • Noise pollution • Thermal pollution • Nuclear hazards Pollution case studies Disaster management: floods, earthquake, cyclone and landslides.

Unit 3: Social Issues and the Environment • Urban problems related to energy • Water conservation, rain water harvesting, watershed management • Resettlement and rehabilitation of people: its problems and concerns, Case studies • Environmental ethics: Issues and possible solutions • Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies • 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.

Module III (25 Hours)

Unit 1- Human Rights– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights). Unit-2 Human Rights and United Nations – contributions, main human rights related organsUNESCO,UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights. Human Rights in India – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities Unit-3 Environment and Human Rights - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment Conservation of natural resources and human rights: Reports, Case studies and policy formulation. Conservation issues of western ghats- mention Gadgil committee report, Kasthurirangan report. Over exploitation of ground water resources, marine fisheries, sandmining etc.

Module IV (20 Hours)

Solution to algebraic and transcendental equations:- Bisection Method, Iteration method, Regula - falsi method, Newton-Raphson method. Solution to Simultaneous linear equations:- Gauss elimination method, Gauss-Jordan methods, Jacobi‟s method, Gauss-Seidel method Internal: Field study • Visit to a local area to document environmental grassland/ hill /mountain • Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc • Study of simple ecosystem-pond, river, hill slopes, etc (Field work Equal to 5 lecture hours).

SEMESTER V

OPEN COURSE

CA5D01aB18: COMPUTER FUNDAMENTALS,INTERNET & MS OFFICE

Credits : 3

Total Lecture Hours : 72

Course Outcomes:

CO1: Describe the fundamentals and classifications of computers

CO2: Explain the terms associated with Internet and working of Internet

CO3: Outline the salient features of word processing and documentation with special reference to MS Word

CO4: Discuss the features and applications of Spreadsheet with reference to MS Excel and MS Powerpoint

Syllabus Content:

MODULE I: (10 hrs.)

Computer Fundamentals: History, Generations, Classifications, Operating Systems, Types of Networks.

MODULE II (12 hrs.)

The Internet, TCP/IP, IP Addressing, Client Server Communication, Intranet, WWW, Web Browser and Web Server, Hyperlinks, URLs, Electronic Email.

MODULE III (12 hrs.)

Word Processing: Introduction, Microsoft Word, Basic Menus, Formatting the text & paragraph, Working with Index

MODULE IV (10 hrs.)

Spread Sheet: Introduction, Microsoft Excel, Basic Menus, Formulas, Basic functions, Charts and Graphs.

MODULE V (10 hrs.)

Microsoft Power Point: Introduction, Basic Menus, Template, Slide Basics, Charts, Adding Multimedia & Animation.

SEMESTER V

CA5D01bB18: INFORMATICS AND CYBER ETHICS

Credits: 3

Total Lecture Hours: 54

Course Outcomes:

CO1: Describe the Fundamentals and Classifications of Network Communication

CO2: Explain the basic working of Internet and its main services.

CO3:Explain the aspects of Cyber Crime and ethics and discuss the secure use of computers

CO4: Discuss the causes, symptoms and prevention of cyber addiction.

Syllabus Content:

MODULE I : (10 hrs.)

The Internet, TCP/IP, IP Addressing, Client Server Communication, Intranet, WWW, Web Browser and Web Server, Hyperlinks, URLs, Electronic mail.

MODULE II : (10 hrs.)

Internet as a knowledge repository, academic search techniques, creating cyber presence. Academic websites, open access initiatives, open access publishing models, Introduction to use of IT in teaching and learning-Educational software, Academic services–INFLIBNET, NPTEL, NICNET, BRNET.

MODULE III : (12 hrs.)

Introduction to purchase of technology, License, Guarantee, Warranty, Basic concepts of IPR, copyrights and patents, plagiarism. IT & development, the free software movement

MODULE IV : (12 hrs.)

Cyberspace, information overload, cyber ethics, cyber addictions, cybercrimes– categories – person, property, Government–types-stalking, harassment,threats, security & privacy issues.

MODULE V: (10 hrs.)

Cyber Addiction, Information Overload, Health Issues, e-Waste and Green computing impact of IT on language & culture-localization issues-Unicode-IT and regional languages e-Governance in India, IT for National Integration, Role of IT.

SEMESTER VI

Course Code	Course Title	Credits	Course Type
CA6B11B18	COMPUTER NETWORK	4	Core Course
CA6B12aB18	DATA MINING	4	Choice Based Core Course
CA6B12bB18	CLOUD COMPUTING	4	
CA6B12cB18	SOFT COMPUTING TECHNIQUES	4	
CA6B12dB18	DIGITAL IMAGE PROCESSING	4	
MT6B09B18	REAL ANALYSIS II	4	Core Course
ST6B07B18	OPTIMIZATION TECHNIQUES	4	Core Course
CA6BPRB18	SOFTWARE DEVELOPMENT LAB (MAIN PROJECT)	3	Core Course

SEMESTER VI

CA6B11B18 – COMPUTER NETWORK

Credits : 4

Total Lecture Hours : 90

Course Outcomes

CO1: Define basic concepts of Data communication and Computer Networks.

CO2: Identify different Network Models, their functions and transmission medias.

CO3: Classify various topologies, networking types and protocols.

CO4: Apply the encoding schemes, error correction and detection methods, switching techniques as per given network.

CO5: Compare different network devices, addressing schemes, security threats and crypting method

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	3	3
CO2	2	1	2	3	3
CO3	2	2	2	3	3
CO4	1	2	3	3	3
CO5	2	1	2	3	3

Syllabus Content:

MODULE I **(18 hrs)**

Introduction to Networks, Data and signals-analog and digital, periodic analog signals,digital signals, bit rate, baud rate, bandwidth. Transmission impairments- attenuation, distortion and noise. Data communication protocols and standards, Network models - OSI model-layers and their functions. TCP/IP protocol suite.

MODULE II **(18 hrs)**

Bandwidth utilization Multiplexing: FDM, TDM, spread spectrum. Transmission Media- guided media and unguided media. Switching: message, Circuit and packet switched networks, datagram networks, virtual- circuit networks.

MODULE III **(18 hrs)**

Data link layer: Error Detection and Correction, Framing, flow and error control, Protocols - Noiseless channels (Simplest, Stop and Wait) and Noisy channels (Stop and Wait and Piggy Backing).Multiple Access Protocols. Random Access-ALOHA, CSMA. Wired LANs-IEEE standards, wirelessLANs-Bluetooth, Cellular Telephony.

MODULE IV (18 hrs)

Network layer and Transport layer: Repeaters, Bridges, Gateways and routers. Logical addressing – IPV4 and IPV6 addressing, Internet protocol - IPv4 and IPv6. Connectionless and Connection Oriented Services: UDP and TCP. Congestion Control, Quality of Service.

MODULE V **(18 hrs)**

Application layer: HTTP, FTP, SMTP, DNS. Network security: Common Threats- Firewalls (advantages and disadvantages), Cryptography.

SEMESTER VI

ELECTIVE

CA6B12aB18: DATA MINING

Credits : 4

Total Lecture Hours : 90

Course Outcomes:

CO1: Illustrate the key process of Data mining and Warehousing

CO2: Discover appropriate techniques to convert raw data into suitable format for practical data mining tasks

CO3: Analyze and compare various classification algorithms and apply in appropriate domain

CO4: Evaluate the performance of various classification methods using performance metrics

CO5: Devise various tools of Data Mining and their techniques to solve the real time problems

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	2	3	2	1	2
CO2	3	3	2	3	1
CO3	1	3	3	2	1
CO4	3	3	3	2	1
CO5	1	3	3	2	3

Syllabus Content:

MODULE I:

Introduction Data Mining, Data Ware House, Transactional Databases, Data Mining Functionalities Characterization and Discrimination, Mining frequent patterns, Association and correlation, Classification and Prediction, Cluster Analysis, Classification of Data Mining Systems, Data Mining Task Primitive, Integration of Data Mining systems, Major issues in Data Mining, Data integration and transformation, Data reduction, Data discretization.

MODULE II

Data Warehouse and OLAP technology Data Warehouse, Multidimensional data Model, Data warehouse architecture, Data Warehouse implementation, OLAP, Data Warehouse and data mining.

MODULE III

Association Rules and Classification Concepts Efficient and Scalable Frequent item set Mining methods, Mining various kind of association rules, from association mining to Co-relation analysis, Classification and prediction, Issues, Classification by Decision tree induction, Bayesian Classification, Rule-based classification, Support Vector Machines, Learning from your neighbors, Prediction.

MODULE IV

Cluster Analysis Definition, Types of data in cluster analysis, A categorization major Clustering methods- Partitioning methods, K-means and k-medoids, from k-medoids to CLARANS, Hierarchical methods, Density based methods.

MODULE V

Mining Complex Data Spatial Data Mining, Multimedia Data Mining, Text Mining and Mining WWW

SEMESTER VI

ELECTIVE

CA6B12bB18: CLOUD COMPUTING

Credits : 4

Total Lecture Hours : 90

Course Outcomes:

CO1: Associate the theoretical background for computing and storage clouds working environments.

CO2: Deduce the methodologies and technologies for the development of applications that will be deployed and offered through cloud computing environments.

CO3: Summarise Virtualization management and virtualization technologies in cloud computing.

CO4: Establish the Implementation and management of cloud security and the various risk models in security.

CO5: Summarize Market based management and third-party cloud services.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	1	2
CO2	3	3	2	1	1
CO3	3	2	2	1	2
CO4	2	3	2	1	2
CO5	1	3	3	2	2

Syllabus Content:

MODULE I:

Introduction: Historical development, Vision of Cloud Computing, Characteristics of cloud computing as per NIST , Cloud computing reference model ,Cloud computing environments, Cloud services requirements, Cloud and dynamic infrastructure, CloudAdoption and rudiments

ApplicationsSatellite Image Processing ,Social networking.

MODULE II:

Cloud Computing Architecture: Cloud Reference Model, Types of Clouds, CloudInteroperability & Standards, Scalability and Fault Tolerance,Cloud Solutions:CloudEcosystem, Cloud Business Process Management, Cloud Service Management.

MODULE III:

Cloud Management & Virtualization Technology: Virtualization: Fundamental concepts of compute, storage, networking, desktopand application virtualization. Virtualization benefits, server virtualization, Block and filelevel storage virtualization.

MODULE IV:

Cloud Security: Security risks in cloud, security attacks in virtualization, security solutions in virtualization, securing the cloud, security boundary, CSA cloud reference model with security mechanisms, encryption, establishing identity and presence.

MODULE IV

Market Based Management of Clouds, Federated Clouds/Inter Cloud: Characterization & Definition, Cloud Federation Stack, and Third Party Cloud Services.

SEMESTER VI

ELECTIVE

CA6B12Ab18: SOFT COMPUTING TECHNIQUES

Credits : 4

Total Lecture Hours : 90

Course Outcomes:

CO1: Explain soft computing techniques and their applications

CO2: Analyze various neural network architectures.

CO3: Interpret Fuzzy systems and its operations.

CO4: Illustrate the genetic algorithm concepts and their applications.

CO5: Identify a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution. (Apply)

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	2	2	1	2
CO2	2	1	2	1	2
CO3	3	2	2	1	2
CO4	2	3	2	1	3
CO5	1	2	2	1	2

Syllabus Content:

MODULE I: (18 hrs)

Soft Computing, Difference between soft computing and hard computing. Neural Networks: Basic concepts of Neural Networks, Human Brain, Artificial Neuron model, Activation functions, Neural network architecture, Single layer and multilayer feed forward networks, Recurrent networks, Neural network characteristics, Learning methods, Rosenblatt‟s perceptron, Perceptron and linearly separable tasks, XOR problem, Neural network applications.

MODULE II (18 hrs)

Back Propagation Networks: Architecture- perceptron model, solution, single layer artificial neural network, multilayer perception model, back propagation learning- input layer computation, hidden layer computation, output layer computation, calculation of error, Training of neural network, effect of learning rate coefficient, Back propagation algorithm.

MODULE III (18 hrs)

Fuzzy Set Theory: Fuzzy versus crisp, Crisp sets, Operations on crisp sets, Properties of crisp sets, Partition and covering, Fuzzy sets, Membership functions, Basic fuzzy set operations, Properties of fuzzy sets, Crisp relations, Operations on crisp relations, Fuzzy relations, Fuzzy cartesian product, Operations on fuzzy relations.

MODULE IV **(18 hrs)**

Fuzzy Systems: Crisp logic, Laws of propositional logic, Inference in propositional logic, Predicate logic, Interpretations of predicate logic formula, Inference in predicate logic, Fuzzy logic, Fuzzy propositions, Fuzzy connectives, Fuzzy quantifiers, Fuzzy inference, Fuzzy rule based system, Defuzzification methods, Applications.

MODULE V **(18 hrs)**

Genetic Algorithm: History, Basic concepts, Biological background, Creation of offsprings, Encoding, Fitness function, Reproduction, Genetic Modeling: Crossover, Inversion and deletion, Mutation,Bit-wise operators used in genetic algorithm, Generational cycle, Convergence of a genetic algorithm, Issues and benefits of GA, Application domains.

SEMESTER VI

ELECTIVE

CA6B12bB18: DIGITAL IMAGE PROCESSING

Credits : 4

Total Lecture Hours : 90

Course Outcomes:

CO1: Review the fundamental concepts of a digital image processing system.

CO2: Analyze images in the frequency domain using various transforms

CO3: Evaluate the techniques for image enhancement and image restoration.

CO4: Categorize various compression techniques.

CO5 : Interpret image segmentation and representation techniques.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	1	1	2	1
CO2	2	1	2	1	1
CO3	3	2	3	1	2
CO4	2	3	3	1	3
CO5	1	2	3	1	2

Syllabus Content:

MODULE I (18 hrs.)

Digital Image Fundamentals Image, Digital Image, Digital image processing-definitions, Examples of fields that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of Image processing system.

MODULE II (18 hrs.)

Elements of visual perception Elements of visual perception- Image Formation, Brightness

adaptation and Discrimination, Image sampling and quantization- basic concepts, spatial and Intensity resolution, Basic relationship among Pixels.

MODULE III (18 hrs.)

Image Enhancement in Spatial and Frequency Domain Intensity Transformation and spatial Filtering Basics, Intensity transformation functionsImage Negatives, Log Transformations, Power Law Transformations, Histogram Processing, Spatial filtering- correlation and convolution; Fourier transform and frequency domain.

MODULE IV (18 hrs)

Morphological Image Processing Introduction, basis of set theory, Dilation, Erosion, Structuring elements, Opening and Closing, Hit or miss transformation.

MODULE V (18 hrs.)

Image Segmentation Point, Line, Edge detection-detection of isolated points, Basic edge detection-Gradient operators; Pixel based approach-Basics of intensity thresholding, Basic global thresholding; Region based segmentation- region growing, region splitting and merging.

SEMESTER VI

CORE COURSE

MT5B09B18 - REAL ANALYSIS II

Credits : 4

Total Lecture Hours : 72

Course Outcomes:

CO1: Determine the nature of convergence of an infinite series of positive real numbers using different tests.

CO2: Explain the convergence and basic properties of alternating series of real numbers.

CO3: Analyze the properties of real valued continued functions.

CO4: Explain the characteristics of Riemann integral of real bounded functions on intervals.

CO5: Examine the Uniform convergence of sequence and series of real valued functions.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	2	1	1
CO2	3	1	2	1	1
CO3	3	1	2	1	1
CO4	3	1	2	1	1
CO5	3	1	2	1	1

Syllabus Content:

Module 1 (20 hrs)

Infinite Series (20 hrs) A necessary condition for convergence. Cauchy`s general principle of convergence for a series. Positive term series. A necessary condition for convergence of positive term series. Geometric series. The comparison series $\sum 1\ hP$ comparison test for positive term

series without proof. Cauchy`s root test D"ALEMBERTÈS RATIO test. Raabe"s test. Gauss`s test. Series with arbitrary terms. Alternating series. Absolute convergence

Module II (25hrs)

Continuous function (a quick review). Continuity at a point, continuity in an interval. Discontinuous functions. Theorems on continuity. Functions continuous on closed intervals. Uniform continuity.

Module III (30 hrs)

Definitions and existence of the integral. Inequalities of integrals. Refinement of partitions of integrability. Integrability of the sum of integrable functions. The integrals as the limit of a sum. Some applications. Some integrable functions. Integration and differentiation. The fundamental theorem of calculus.

Module IV (15 hrs)

Point wise convergence. Uniform convergence on an interval. Cauchy`s criterion for uniform convergence. A test for uniform convergence of sequences. Test for uniform convergence of series. Weierstrass`s M-test, Abel`s test. Statement of Dirichelet`s test without proof.

SEMESTER VI

CORE COURSE

ST6B07B18: OPTIMIZATION TECHNIQUES

Credits : 4

Total Lecture Hours : 90

Course Outcomes:

CO1: Define Operations Research and cite the history of OR

CO2: Articulate the theoretical workings of the graphical, simplex and analytical methods for making effective decisions on variables to optimize the objective function.

CO3: Illustrate the methods of Transportation Problems and Assignment Problems

CO4: Apply the knowledge of basic PERT and CPM and simplify the network using reduction techniques

CO5: Identify appropriate methods for application of optimization to solve Linear programming for real world applications

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	2	2	1
CO2	3	3	2	2	2
CO3	3	3	2	2	2
CO4	2	3	2	2	2
CO5	2	3	2	2	2

Syllabus Content:

Module I (15 Hours)

Operations Research: Origin and Development of OR, Objectives of OR, Modeling and types of models in OR.

Module II (30 Hours)

Linear Programming: Mathematical formulation of LPP, Graphical and Simplex methods of

solving LPP – Duality in Linear Programming

MODULE III

Transportation and Assignment Problems: North – West Corner Rule, Row Column and Table Minima Method – Vogel‟s Approximation Method. Assignment Problem, Hungarian Algorithm of Solution.

MODULE IV

Network Analysis: Drawing the Network Diagram – Analysis of Network, Calculation of Critical Path – PERT, Expected Completion Time and its Variance.

SEMESTER VI

CORE COURSE

CA6BPRB18 : SOFTWARE DEVELOPMENT LAB (MAIN PROJECT)

Credits : 3

Total Lecture Hours : 75

Course Outcomes:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Sketch problem identification, formulation and solution.

CO3: Apply software application packages as an engineering tool, if required

CO4: Manage Communication effectively with customers, peers, technicians and engineers

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	2	2	2
CO2	3	3	3	1	3
CO3	2	3	2	1	2
CO4	3	3	1	3	2