Syllabus of BCA First Semester

The course will consists of Six Theory Papers of 80 marks each for which there will be University examinations. Other than the internal evaluation for each Theory Paper which will be of 20 marks and will be evaluated on the basis of classroom performance and internal examination.

BCA – 101: Computer Fundamentals and Programming

Number Systems: Representation of characters integers and functions in Computers, various representation of numbers, Error detecting codes,

Input-Output Units: Principles of Computer input / output units, various input and output units. Serial, parallel, USB ports.

Memory: Computer memory, principles, various types of computer memory, primary and secondary memory.

Processor: Computer processor – Summary, description, machine language programs.

Computer Architecture: Interconnection of units, processor to memory, I/O to processor Communications, Interrupt structure, Multiprogramming and multitasking, Processor features, RISC & CISC, Virtual memory.

Computer Languages: Programming concepts, assembly language, high level language, coupling high level languages, some high level languages.

Operating System : Why do we Need an Operating System?, Batch Operating System, Multiprogramming Operating System, Time Sharing Operating System, Personal Computer Operating System, Microkernel Based Operating System, On-Line and real Time System.

Computer Generations and Classifications: First Generation of Computers, the Second Generation, The Third Generation, The Fourth Generation, The Fifth Generation, Moore's Law, Classification of Computers, Distributed Computer System, Parallel Computers.

Computer and Communications : Types of Communications with and among Computers, Need for Computer Communication Networks, Internet and the World Wide Web, Characteristics of Communication Channels, Allocation of Channel, Physical Communication Media, Establishing Channels for Communication, Computer Network Topologies, Communication Protocols, Local Area Network, ATM Networks, Interconnecting Networks.

Bibliography and References:

1. V. Rajaraman, *Fundamentals of Computers,* PHI.

BCA – 102: Mathematics – I

Algebra, Trigonometry, and Elementary Functions : Problems on Integers, Criteria for Divisibility ; Real Numbers, Transformation of Algebraic Expression; Mathematical Induction, Elements of Combinatorics, Binomial Theorem; Equations and Inequalities of the First and the Second Degree; Equations of Higher Degrees, Rational Inequalities; Irrational Equations and Inequalities; Systems of Equations and Inequalities; The Domain of Definition and the Range of a Function; Exponential and Logarithmic Equations and Inequalities; Transformations of Trigonometric Expressions. Inverse Trigonometric Function; Solution of Trigonometric Equations, Inequalities, and Systems of Equations; Progressions; Solution of Problems on Derivation of Equations; Complex Numbers.

Fundamentals of Mathematical Analysis: Sequences and Their Limits, An Infinitely Decreasing Geometric Progression, Limits of Functions; The Derivative. Investigating the Behaviour of Functions with the Aid of the Derivative; Graphs of Functions; the Antiderivative. The Integral. The Area of Curvilinear Trapezoid.

Geometry and Vector Algebra : Vector Algebra; Plane Geometry, Problems on Proof; Plane Geometry, Construction Problems; Plane Geometry, Calculation Problems; Solid Geometry, Problems on Proof; Solid Geometry, Calculation Problems.

Binary Arithmetic: Binary addition, Binary Subtraction, Signed Numbers, Two's Complement Representation of Numbers, Addition/Subtraction of Numbers in 2's Complement Notation, Binary Multiplication, Binary Division, Floating Point Representation of Numbers, Arithmetic Operations with Normalized Floating Point Numbers.

Logic Circuit: Switching Circuits, AND/OR/NOT Operations, Parallel and Serial Adapters, I.C, L.S.I and VLSI, Borlean function, duality principles, truth table.

Bibliography and References:

1. V. Govorov, Dybov, Miroshin & Smirnova, *Problems in Mathematics,* CBS Publishers.

BCA – 103: Mathematics – II

Number, Variable, Function : Real numbers, Real numbers as points on a number scale; The absolute value of a real number; Variables and constants; The range of a variable; Ordered variables, Increasing

and decreasing variables, Bounded variables; Function; Ways of representing functions; Basic elementary functions, Elementary functions; Algebraic functions; Polar coordinate system.

Limit, Continuity of a Function: The limit of a variable, An infinitely large variable; The limit of a function; A function that approaches infinity, Bounded functions; Infinitesimals and their basic properties; Basic theorems on limits; The limit of the function Sin x as $x \rightarrow 0$; The x number e; Natural logarithms; Continuity of functions; Certain Properties of continuous functions; Comparing infinitesimals.

Derivative And Differential : Velocity of motion; The definition of a derivative; Geometric meaning of the derivative; Differentiability of functions; The derivative of the function y=xn, n a positive integer; Derivatives of the function y= sin x, y= cosx ; Derivatives of: a constant, the product of a constant by a function, a sum, a product, and a quotient of functions; The derivative of a logarithmic function; The derivative of a composite function; Derivative of the functions y= tan x, y = cot x, ln x ; An implicit function and its differentiation; Derivatives of: a power function for an arbitrary real exponent, a general exponential function, and a composite exponential function; An inverse function and its differentiation; Inverse trigonometric function and their differentiation; Basic differentiation formulas; Parametric representation of a function; The equations of some curves in parametric form; The derivative of a function represented parametrically; Hyperbolic functions; The differential; The geometric meaning of the differential; Derivatives of different orders; Differentials of different orders; Derivatives (of various orders) of implicit functions and of functions represented parametrically; The mechanical meaning of the second derivative ; The equations of a tangent and of a normal. The lengths of a subtangent and a subnormal; The geometric meaning of the derivative of the radius vector with respect to the polar angle.

Some Theorems On Differentiable Functions : A theorem on the roots of a derivative (Rolle's theorem); The mean-value theorem (Lagrange's theorem); The generalized meanvalue theorem (Cauchy's theorem); The limit of a ration of two infinitesimals (evaluating indeterminate forms of the type 0/0); The limit of a ratio of two infinitely large qualities (evaluating indeterminate forms of the type ∞/∞); Taylor's formula; Expansion of the function ex , sin x , and cos x in a Taylor series.

Investigating The Behaviour Of Functions : Statement of the problem, Increase and decrease of a function, maxima and minima of functions, Testing a differentiable function for maximum and minimum with a first derivative, Testing a function for maximum and minimum with a second derivative, Maximum and minimum of a function on an interval, Applying the theory of maxima and minima of functions to the solution of problems, Testing a function for maximum and minimum by means of Taylor's formula, Convexity and concavity of a curve.

Points of inflection, Asymptotes, General plan for investigating functions and constructing graphs, Investigating curves represented parametrically.

Complex Numbers, Polynomials: Complex numbers, Basic definitions, Basic operations on complex numbers, Powers and roots of complex numbers, Exponential function with complex exponent and its properties, Euler's formula. The exponential form of a complex number, Factoring a polynomial, The multiple roots of a polynomial, Factoring a polynomial in the case of complex roots, Interpolation. Lagrange's interpolation formula, Newton's interpolation formula, Numerical differentiation, On the best approximation of functions by polynomials, Chebyshev's theory.

Functions Of Several Variables : Definition of a function of several variables, Geometric representation of a function of two variables, Partial and total increment of a function, Continuity of a

function of several variables, Partial derivatives of a function of several variables, A geometric interpretation of the partial derivatives of a function of two variables, Total increment and total differential, Approximation by total differentials, Use of a differential to estimate errors in calculations, The derivative of a composite function. The total derivative. The total differential of a composite function, The derivative of a function defined implicitly, Partial derivatives of higher orders, Level surfaces, Directional derivative, Gradient, Taylor's formula for a function of two variables, Maximum and minimum of a function of several variables, Maximum and minimum of a function of several variables related by given equations (conditional maxima and minima), Obtaining a function on the basis of experimental data by the method of least squares, Singular points of a curve.

The Definite Integral: Statement of the problem. Lower and upper sums, The definite integral. Proof of the existence of a definite integral, Basic properties of the definite integral, Evaluating a definite integral. The Newton-Leibniz formula, Change of variable in the definite integral,
Integration by parts, Improper integrals, Approximating definite integrals, Chebyshev's formula, Integrals dependent on a parameter. The gamma function, Integration of a complex function of a real variable.

The Indefinite Integral : Antiderivative and the indefinite integral, Table of integrals, Some properties of the indefinite integral, Integration by substitution (change of variable), Integrals of some functions containing a quadratic trinomial, Integration by parts, Rational fractions. Partial rational fractions and their integration, Decomposition of a rational fraction into partial fractions, Integration of rational fractions, Integrals of irrational functions, Integrals of the form $\int R(x, ax2$
$+ bx + c)dx$, Integration of certain classes of trigonometric functions, Integration of certain irrational functions by means of trigonometric substitutions, On functions whose integrals cannot be expressed in terms of elementary functions.

Geometric and Mechanical Applications Of The Definite Integral : Computing areas in rectangular coordinates, The area of a curvilinear sector in polar coordinates, The arc length of a curve, computing the volume of a solid from the areas of parallel sections (volumes by slicing), The volume of a solid of revolution, The surface of a solid of revolution, computing work by the definite integral, Coordinates of the centre of gravity, Computing the moment of inertia of a line, a circle, and a cylinder by means of a definite integral.

Bibliography and References:

1. Piskunov, *Diff. & Integral Calculus,* Vol. I, CBS Publishers & Distributors.

BCA – 104: Microsoft Office XP for Windows

Basic Office Techniques: Basic Office Techniques, Working in Programs.

Microsoft Word: Introducing Word, Entering and Editing Text, Formatting Text, Formatting Pages, Creating Tables, Special Word Techniques, Word and the Web.

Microsoft Excel: Introducing Excel, Entering Data and Formulas, Structuring the Sheet, Formatting the Sheet, Using Excel Charts, Excel Database Techniques, Special Excel Techniques, Excel and the Web.

Microsoft PowerPoint: Introducing PowerPoint, Building a Presentation, Outlining the Presentation, Creating Text Slides, Creating Chart Slides, and Formatting Charts, Creating Org Chart and Tables, Customizing a Presentation, Drawing on Slides, Creating Slide Shows, PowerPoint and the Web.

Microsoft Access: Introducing Access, Creating a Database, Creating a Table, Creating a Form, Working with Records, Using Queries, Creating a Report, Access and the Web.

Microsoft Outlook: Introducing Outlook, Reading Messages, Sending Messages, Managing Your Mailbox, Keeping a Contacts List, Scheduling Tasks and Meetings.

Bibliography and References:

1. Steve Sagman, *Microsoft Office XP for Windows,* Pearson Education.

BCA – 105: Principles of Management

Management Science, theory and practice, Management and Society: Social responsibility and Ethics.

The nature and purpose of planning, objectives, strategies, policies and planning premises decision making,

The nature and purpose of organizing, Basic departmentalization, Line-staff mobility and Decentralization, Effective organizing and organizational culture,

Human resource management and selection, Performance appraisal and career strategy. Manager and organization development.

Managing and the human factor, Motivation, leadership, communication.

The system and process of controlling, Control techniques and information technology, Productivity and operations management, overall and preventive control. International management: Toward a unified, global management theory.

Bibliography and References:

1. Tripalhi & Reddy, *Principles of Management,* Tata McGraw Hill.

BCA – 106 : Programming With ANSI and Turbo C

Introduction to C: Introduction, About ANSI C Standard, Overview of Compilers and Interpreters, Structure of a C Program, Programming Rules, Executing the Program.

The C Declarations : Introduction, The C Character Set, Delimiters, The C keywords, Identifiers, Constants, Variables, Rules for Defining Variables, data Types, Declaring Variables, Initializing Variables, Type Conversion, Constant and Volatile Variables.

Operators and Expressions: Introduction, Priority of Operators and their Clubbing, Comma and Conditional Operator, Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators.

Input and Output in C: Introduction, Formatted Functions, Unformatted Functions, Commonly used Library Functions.

Decision Statements: Introduction, The If Statement, The If …else Statement, Nested If…else Statement, The break Statement, The continue Statement, The goto Statement, The switch Statement, Nested switch( ) … case Statement, The switch( ) …case and Nested Ifs.

Loop Control Statements: Introduction, The for Loop, Nested for Loops, The while Loop, The do…while Loop, The do…while Statement with while Loop.

Arrays: Introduction, Array Initialization, Definition of Array, Characteristics of Array, OneDimensional Array, Predefined Streams, two-Dimensional Array, Three or Multidimensional Arrays. The sscanf( ) and sprintf( ) Functions.

Working with Strings & Standard Functions: Introduction, Declaration and Initialization of String, Display of Strings with Different Formats. String Standard Functions. Applications of Strings.

Pointers: Introduction, Features of Pointers, Pointer Declaration, Arithmetic Operation with Pointers, Pointers and Arrays, Pointer and two-Dimensional Array, Arrays of Pointers, Pointers to Pointers, Pointers and Strings, Void Pointers.

Functions : Introduction, Definition of Function, Declaration of Function and Function Properties, The return Statement, Types of Functions, call by values and reference, Function Returning More Values, Function as an Argument, Function with Operators, Function and Decision Statements, Function and Loop Statements, Function with Arrays and Pointers, Recursion, Pointer to Function.

Storage Class: Introduction, Automatic Variables, External Variables, Static Variables, Register Variables.

Preprocessor Directives: Introduction, The #define Directives, Undefining a Macro, Token Pasting a Stringizing Operators, The #include Directives, Conditional Compilation, The #ifndef Directive, The #error Directive, The #line Directive, Inline Directive, The #pragma Saveregs, The #pragma Directives, The Predefined Macros In ANSI and Turbo C, Standard I/O predefined Statements in stdio.h, The Predefined Macros in ctype.h

Structure and Union: Introduction, Features of Structures, Declaration and Initialization of Structures, Structure within Structure, Array of Structures, Pointer to Structures, Structure and Functions, Typedef, Bit Fields, Enumerated Data Type, Union, Calling BIOS and DOS Services, Union of Structures.

Files : Introduction, Streams and File Types, Steps for File Operations, File I/O, Structures Read and Write, Other File Functions, Searching Errors in Reading/Writing Files, Low level Disk I/O, Command Line Arguments, Application of Command line Arguments, Environment Variables, I/O Redirection. Additional in C: Dynamic Memory Allocation, Memory Models, Linked Lists, Graphics.

Bibliography and References:

1. Ashok N. Kamthane, *Programming with ANSI and Turbo C,* Pearson Education.