Swami Ramanand Teerth Marathwada University, Nanded

B.Sc. Bioinformatics

Choice Based Credit System (CBCS) Pattern Syllabus

(W.e.f. June - 2016)

B. Sc. Bioinformatics First Year (First Semester)

Code No.	Paper Title	Periods/ Week	Total periods	Credits
CCBI-1A	English & Science communication Skills	03	45	2
CCBI-2A	Basics of Biological Sciences	03	45	3
CCBI-3A	Microbiology	03	45	3
CCBI-4A	Introduction to Bioinformatics	03	45	3
CCBI-5A	Basics of Biocomputing	03	45	3
CCBIP-1A	Lab Course 1 (Practical based on CCBI-2A & 3A)	03+03	20	4
CCBIP-2A	Lab Course 2 (Practical based on CCBI-4A & 5A)	03+03	20	4
Total Credits				**22**

Bioinformatics B.Sc.First Year (Second Semester)

Code No.	Paper Title	Periods/ Week	Total periods	Credits
CCBI-1B	English (Science Communication)	03	45	2
CCBI-2B	Basics of Biochemistry	03	45	3
CCBI-3B	Basics of Cell Biology	03	45	3
CCBI-4B	Basics of Genetics	03	45	3
CCBI-5B	Bioprogramming using C Language	03	45	3
CCBIP-1B	Lab Course-1 (Practical based on CCBI 2B & 3B)	03+03	20	4
CCBI-2B	Lab Course-2 (Practical based on CCBI 4B & 5B)	03+03	20	4
Total Credits				**22**

Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure

Faculty of Science

B.Sc Second Year

Third Semester Bioinformatics Syllabus

Effective from June 2016

Core Course /Code No.	**Course title**	**Instruction Hrs/Week**	**Total Period**	**Credits**
CCBI-1C	English (Science Communication)	03	45	2
CCBI-2C	Molecular Biology	03	45	3
CCBI-3C	Biostatistics & Mathematics	03	45	3
CCBI-4C	*Biodiversity and Phylogenetics	03	45	3
CCBI-5C	Programming in Perl	03	45	3
CCBIP-1C	Practical's based on CCBI-2C & 3C	03+03	20	4
CCBIP-2C	Practical's based on CCBI-4C & 5C	03+03	20	4
SEC-I	**Skill enhanced Course-1	03	10	2
Total Credits				24

B.Sc Second Year Fourth Semester Bioinformatics Syllabus

Core Course /Code No.	Course title	Instruction Hrs/Week	Total Period	Credits
CCBI-1D	English (Science Communication)	03	45	2
CCBI-2D	Basics of Immunology	03	45	3
CCBI-3D	Biochemical Techniques	03	45	3
CCBI-4D	Biological Database management	03	45	3
CCBI-5D	Object oriented Programming	03	45	3
CCBIP-1D	Practical's based on CCBI-2D & 3D	03+03	20	4
CCBIP-2D	Practical's based on CCBI-4D & 5D	03+03	20	4
SEC II	**Skill enhanced Course-2	03+03	10	2
Total Credits				24

Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure

Faculty of Science

B.Sc Third Year

Fifth Semester Bioinformatics Syllabus

Effective from June 2016

Core Course /Code No.	**Course title**	**Periods/ Week**	**Total Period**	**Credits**
DSEBI-1E	Environmental Studies	03	45	***
DSEBI-2E	Genetic Engineering	03	45	3
DSEBI-3E	* Metabolomics	03	45	3
DSEBI-4E	Chemo Informatics	03	45	3
DSEBI-5E	Programming in JAVA	03	45	3
DSEBIP-1E	Practical's based on DSEBI-2E & 3E	03+03	20	4
DSEBIP-2E	Practical's based on DSEBI-4E & 5E	03+03	20	4
DSEBIP-3E	Industrial / Research Institutional Training Course (Min. 1 Week)	-----	----	2
SEC-III	**Skill enhanced Course-3	03	10	2
Total Credits				24

B.Sc Third Year
Sixth Semester Bioinformatics Syllabus

Core Course /Code No.	Course title	Instruction Hrs/Week	Total Period	Credits
DSEBI -1F	Concept of Genomics	03	45	3
DSEBI -2F	Concept of Proteomics	03	45	3
DSEBI -3F	* Advanced Techniques in Bioinformatics	03	45	3
DSEBI -4F	Visual Basic and PHP	03	45	3
DSEBIP -1F	Practical's based on CCBI-1F & 2F	03+03	20	4
DSEBIP-2F	Practical's based on CCBI-3F & 4F	03+03	20	4
DSEBIP-3F	Dissertation /Project Work Industrial Visit	02	10	2
SEC-IV	**Skill enhanced Course-4	03	10	2
Total credits of TY				24
Total credits of B.Sc. I, II and III year				44+ 48+ 48= 140.

***Elective**
** Skill enhanced Course
****Grade**

Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure (New Scheme)

Semester Pattern effective from June 2016

B.Sc First Year (Semester I)

Bioinformatics

CCBI-1A

English & Science Communication)

Maximum Marks: 50 **Hours: 45** **Credits-2**

Unit-I Grammar

Word Classes (Open & Closed), The Sentence & its kinds, Phrase, Clause, Simple, Complex, Compound Sentences. Transformation of sentences, Tenses and Voice. Punctuation & Capitalization, Common Errors.

Unit-II Vocabulary

Word Formation, Synonyms and Antonyms, One Word Substitution, Homophones & Homonyms.

Unit-III Communication Skills

Definition, Types of Communication, Process of Communication, Barriers to Communication, Non Verbal Communication, Principles of Effective Communication.

Unit-IV Writing Skills

Letter Formats, Memo Format, News Paper Advertisements, Curriculum Vitae, Personal Interview.

Unit-V Phonetics

sounds of English, Consonants, Vowels and Diphthongs. Transcription of Words.

Reference Books:

1. Technical Communication- Raman & Sharma- Oxford
2. Technical Communication: A Reader centered approach, Anderson Thomson
3. English Grammar & Composition- Pal & Suri- S. Chand
4. Course in Technical English- Somaya Publication
5. A Practical English Grammar – A.J. Thomson A.V.Martinet
6. Written Communication in English – Sarah Freeman Orient Longman Pvt.Ltd.
7. English for Practical Purpose-Patil, Valke- Mac Milan
8. Developing Communication Skills by Krishna Mohan & Meera Banerjee
9. Personality Development by Dr. T. Bharathi, Neelkamal Publications.

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Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure (New Scheme)

Semester Pattern effective from June 2016

B.Sc First Year (Semester I)

Bioinformatics

CCBI-2A

Basics of Biological Sciences

Maximum Marks: 50 **Hours: 45** **Credits-3**

Unit-I: Evolution of life:

Prebiological chemical evolution, Diversity of living world, Whittaker's Five Kingdom System, Classification up to genus & species level, Brief account of Prokaryotic & eukaryotic cell.

Unit-II: Introduction to Plant World

Lower plants Algae-oodogonium,Bryophytes-Funaria, Pteridophyte-Equisetum, Gymnosperms-Pinus

Unit-III:**Higher plants**. Monocot-Maize, dicot-Sunflower,
Morphological Differences in Monocots & Dicots,
Flower- parts and their functions, Inflorescence- Types (Racemose & Cymose),
Embryo structure & Seed- Structure.

Unit-IV: Brief Introduction to Animal world

Gamatogenesis, reproductive cycles, fertilization, Placentation in mammals, gestation, Partuition & lactation in mammals.

Reference Books:

1) Botany for Degree Students- Vasitha- S. Chand Publication
2) College Botany- B.P. Pandey- S.Chand
3) Botany by –A.C. Dutta- Oxford
4) A textbook of botany Volume I & II- Niranjan Shrotriya & Archna Shrotriya
5) Botany for degree students Algae, bryophytes, pteridophytes, Gymnosperm, angiosperms-B.R. Vashishta.
6) A textbook of Botany Volume I & II- S.N. Pandy, P.S. Trivedi &

Practical:

1) Morphological study of monocots & dicots.
2) Study of flower, inflorescences
3) Study of eukaryotic and prokaryotic cells
4) Observation of permanent slides of anther.
5) Observation of permanent slides of ovule
6) Observation of permanent slides of , embryo sac
7) Observation of permanent slides of embryo
8) Observation of permanent slides of endosperm.

Swami Ramanand Teerth Marathwada University, Nanded
Choice Base Credit System (CBCS) Course Structure (New Scheme)
B.Sc First Year (Semester I)
Semester Pattern effective from June 2016
Bioinformatics
CCBI-3A

Microbiology

Maximum Marks: 50 **Hours: 45** **Credits-3**

Unit-I: Bacteria
Structure of bacterial cell, Bacterial types, Nutrition, Reproduction & growth curve Transformation, Transduction and conjugation,

Unit-II: Fungi
General characteristics of fungi, Ultrastructure of typical fungal cell, hyphae structure, Nutrition (Saprophyte, parasitic, Symbiotic), Reproduction, Meiotic & Mitotic spores, dormancy population and colonization, effect of environment on growth, prevention of fungal growth. Types study-Yeast, Agaricus.

Unit-III: Virus Biology of viruses, Bacteriophages, Replication of Virus, genome, General properties of virus: Morphology, Classification and Nomenclature of virus, Virus cell interactions.

Unit-IV: Lichens Types or forms, external and internal structure, economical importance.

Reference Books:
1. General Microbiology- Powar and Daginawala- Himalay Publication
2 A textbook of Microbiology- R.C. Dubey and D.K. Maheshwari
3. An Introduction to Mycology- K.R.Aneja- New Age
4. An Introduction to Fungi- H.C. Dubey- Vikas
5. Fungi for Degree Students- Vashist- S.Chand
6. Microbiology- Pelczar- Tata McGraw Hill
7. An Introduction to Viruses- Biswas- Vikas
8. Viruses and Plant Diseases- Mishra- DPH

Practical:
1) General Rules and Safety in Microbiology Laboratory.
2) Study of basic requirements in Microbiology Laboratory
   i) Autoclave ii) Hot air oven iii) Incubator
3) Isolation of microorganisms from soil, water and air.
4) Simple staining & Gram staining
5) External and internal structure of Yeast and Agaricus.
6) Types of lichens

Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure (New Scheme)

B.Sc First Year (Semester I)

Semester Pattern effective from June 2016

Bioinformatics

CCBI-4A

Introduction to Bioinformatics

Maximum Marks: 50 **Hours: 45** **Credits-3**

Unit -I: Introduction to Bioinformatics : Various definitions of bioinformatics, history of bioinformatics, applications of bioinformatics, scope of bioinformatics, bioinformatics in business. Introduction to central dogma of molecular biology.

Unit -II: Internet and Bioinformatics : General purpose search engine: Google, Biological search engine: Entrez, SRS. What is Database? Types of Databases Biological databases: Primary databases – GenBank, DDBJ, EMBL. Protein sequence databases – Swissprot, Uniprot, TrEMBL, PIR-PSD, PRINTS. Structural databases – PDB, NDB, PubChem, ChemBank, CCSD. Bibliographic databases:- Pubmed, PMC, PloS. citeXplore.

Unit -III: Biological data mining and Human Genome Project : Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, applications of data mining. The Human Genome Project, Bioinformatics and Human diseases.

Unit -IV: Problem Solving in Bioinformatics : Genomic analysis for DNA sequence, genomic analysis for protein sequence, strategy and options for similarity searches, structure prediction, illustration some problems and solution

Unit -V: Introduction to advance fields of Bioinformatics : Genomics, Proteomics, Transcriptomics,Metabolomics,Metagenomics,Nutricogenomics,Proteinengineering,Comparative Genomics, Pharmacogenomics, Pharmacogenetics, Rational Drug Designing, CADD.

Reference Books:-

1. Bioinformatics Concepts Skills and Application-S.C. Rastogi- PHI
2. Essentials of Bioinformatics-Jin Xion- Cambridge
3. Introduction to Bioinformatics- Attwood & Parry Smith- Pearson
4. Bioinformatics-CSV Murthy-Himalaya
5. Introduction to Bioinformatics- Arthur M. Lesk, - Oxford University
6. Bioinformatics Computing- Bergeron- PHI
7. Discovering Genomics Proteomics and Bioinformatics- Campbell, Heyer- Pearson
8. Data mining: Introductory and advanced-Margeret H. Dunham- IE publisher

Practicals:-

1. Use of different browsers, search engines for desired data retrieval
2. Study of major bioinformatics companies in India and overseas
3. Study of products produced by major bioinformatics firms using biological data analysis in Health (Diagnosis, Vaccines, Therapeutics) Agriculture, Environment etc
4. Explore the sitemap of NCBI. Study the resources available on NCBI.
5. Study format of Genbank entry data retrieval from Genbank
6. Retrieve the Genbank entry with Specific accession number
7. Retrieve and save only the coding sequence of the entry AF375082 in FASTA format.
8. Retrieving Protein sequences from protein database
9. Visit and report on bioinformatics research institute/ company

Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure (New Scheme)

B.Sc First Year (Semester I)

Semester Pattern effective from June 2016

Bioinformatics

CCBI-5A

Basics of Biocomputing

Maximum Marks: 50 **Hours: 45** **Credits-3**

Unit I: Computer system Characteristics and Capability

Basic structure, Block diagram of computer, ALU, Memory, CPU, I/O devices, development of computers, classification of computers (microcomputers, minicomputers, mainframe, supercomputer, PC, server, workstation) Programming language concept (Low level and high level languages)

Unit II: Input/ Output Devices and computer Memory

Keyboard entry, direct entry: Card readers, scanning devices (Barcode, OMR MICR), Voice input devices, pointing devices (light pen, mouse, touch screen, digitizer, scanner), printers: Dot matrix, inkjet, laser, plotter, CRT, LCD, CD-Writer, ZIP drive

Types of memory: RAM, ROM, PROM, EPROM, EEPROM etc., Base memory, Extended memory, expanded memory, virtual memory, cache memory, storage devices: tape, FDD, HDD, CD, DVD, Flash drive.

Unit III : Introduction to Operating System DOS/ Windows

Fundamentals of DOS, file and directory, booting procedure of DOS, DOS commands (internal and external), configuration of DOS (config.sys), Batch file concept (autoexec.bat)

Features of MS-Windows, GUI, Multitasking etc, Main modules of Windows OS: program manager, control panel, Networks, Elements of Windows: Desktop, applications, icons, Switching between applications: running MS-DOS applications, Windows help, Windows Accessories: Notepad, paintbrush, study of important files of windows (DLL, INI)

Unit IV: Introduction to Linux operating system

Introduction to Linux – Features of Linux; Hardware Requirements

Installation, Important Linux Commands.

Unit V: Introduction to MS Office

MS office: MS Word- Word processing, editing, saving, inserting tables, MS Excel- Spreadsheet, Tables & Charts, Formulas, MS Power Point: Creating presentation, Introduction to MS-Access

Reference Books:-

1. Fundamentals of Computer by V. Rajaraman- PHI
2. Computer Fundamentals- P.K. Sinha- BPB Publication
3. MS DOS- Russel- BPB
4. DOS- Satish Jain- BPB
5. Windows 2000 Complete Reference- BPB
6. Linux complete Reference- Richard Peterson- Tata McGraw Hill
7. Ms Office 2000- Leary- Tata McGraw Hill
8. Microsoft Office 2000 Complete (BPB)

Practicals:-

1. Study of various I/O devices
2. Various internal and external DOS commands
3. Study of memory types of computer
4. Practical based on MS-Word, MS- Excel, MS- PowerPoint
5. Study of Linux Operating System

Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure (New Scheme)

Semester Pattern effective from June 2016

B.Sc First Year (Semester II)

Bioinformatics

CCBI-2B

Basics of Biochemistry

Maximum Marks: 50 **Hours: 45** **Credits-3**

Unit I: Introduction

Concept of Atom, Molecule, Biological molecules, molecular interaction as a basis of biological functions, Chiral interactions, Concept of Acid & Base, pH, pK, Buffers.

Unit II: Carbohydrates & Lipids

Definition, classification, structure, simple and complex carbohydrates, polysaccharides: structure and linkages in di and polysaccharides, glycoprotein, glycolipids, biological role of carbohydrates

Lipids: structure of fatty acid, classification of lipids, properties & Role of lipids, lipoprotein

Unit III: Amino Acids

Classification, Structure and properties of amino acids, peptides, peptide bond, types of peptides, biologically important peptides.

Unit IV: Protein and Enzymes

Classification of Proteins, Protein family, Structural level of protein, primary, secondary, tertiary and quaternary structure with examples

Introduction, classification and nomenclature of enzymes, types of enzymes, Biological role of Enzymes

Unit V: Nucleic Acids

Nucleoside, Nucleotides, Structures of nucleic acids; DNA & RNA. Forms of DNA, Types of RNA. Properties and biological Role of Nucleic Acids.

Reference Books:

1. Lehniger Biochemistry- Kalyani Publication
2. Biochemistry- Powar & Chatawal- Himalaya
3. Biochemistry- Rastogi- Tata Mcgraw Hill
4. Biochemistry- U. Satyanarayana & Chakrapani- New Age
5. Biochemistry- J.L Jain- S.Chand
6. Fundamentals of Biochemistry- A.C. Deb- Central publication
7. General Biochemistry- J.H. Weil- New Age

Practicals :-

1. General and Safety Rules of Laboratory
2. Study and care of glassware, instruments, planning and recording of experiment
3. Introduction to measurements, balance, burette, pipette, Standard flasks etc
4. Preparation of Standard solutions – Molar, Molal, Normal, Percent.
5. Identification of Bio molecules by Spot test.
6. Study of Lambert Beer's Law
7. Estimation of Carbohydrate by DNS Reagent.
8. Estimation of Protein by Biuret method.
9. Study of principle and working of pH meter and Standard Buffers.
10. Study and preparation of Distilled water.

Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure (New Scheme)

Semester Pattern effective from June 2016

B.Sc First Year (Semester II)

Bioinformatics

CCBI- 3B

Basics of Cell Biology

Maximum Marks: 50 **Hours: 45** **Credits-3**

Unit I: Introduction

Diversity of cell size and shape, cell theory, Origin of Life, Stanley Miller Experiment, Principles and applications of different types of microscopes (Light and Electron), Introduction to Prokaryotic and Eukaryotic Cell

Unit II: Cell Structure and Organization

Biological membrane, Structure organization, Membrane proteins, lipids. Structure and functions of Cell wall, Nucleus (Nuclear membrane, Nucloplasm, Nucleolus, Choromosomes) Endoplasmic Reticulum, Golgi Apparatus, Lysosomes, Microbodies: Glyoxisome, Peroxisomes, Mitochondria, Chloroplast, Ribosomes, Cytoskeleton: Microtubules, Microfilament, intermediate filaments, Cilia, Flagella, and Melanosome etc

Unit III: Membrane Transport

Transport across cell membrane, Simple diffusion, Passive transport, Active Transport. Na / K ion Channel, Ca ion channel, Vesicular transport.

Events of electron transport chain, ATP Synthesis photosynthesis and photorespiration,

Unit IV: Cell Division, Cell Cycle and Cell Signaling

Cell cycle, General events at Mitosis and Meiosis, Cell-cell interactions**,**

G protein coupled receptor, Brief introduction of concept of Cancer and Stem cells

Text and Reference:

1. Cell biology -C. B.Powar; - Himalaya Pub
2. Cell Biology –V.K. Agarwal- S. Chand
3. General Microbiology- Powar & Daginawala- Himalaya
4. Cell Biology, Genetics, Molecular Biology, Evolution & Ecology- Verma, Agarwal- S. Chand
5. Cell and Molecular Biology - Gerald Karp- John Willey
6. Cytology- Verma Agrawal- S. Chand
7. The World of The Cell-Becker- Person
8. Molecular cell Biology - Darnell, Lodish, Baltimore- WH Freeman
9. Cell Biology- David Sadava- Panima
10. Molecular Biology of The Cell- Albert Bruce- Garland Science

Practicals:

1. Microscopic observation & study of different types of Cells
2. Study of Osmosis (RBC's/ Chicken Egg/ Potato)
3. Sub cellular fractionation and isolation of organelles (Mitochondria, Chloroplast)
4. Study of Mitosis
5. Study of Meiosis
6. Study of Polytene Chromosome

Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure (New Scheme)

Semester Pattern effective from June 2016

B.Sc First Year (Semester II)

Bioinformatics

CCBI-4B

Basics of Genetics

Maximum Marks: 50 **Hours: 45** **Credits-3**

UNIT-I: Classical Genetics

Mendelian laws of Inheritance, Test cross & back cross , interaction of genes for monohybrid & dihybrid, Multiple alleles, Linkage& crossing over, its types & significance , lethality, scope & significance of genetics.

UNIT-II: Human Genetics

Sex Linkage, sex limited inheritance, sex linked diseases (any two),Anomalies in sex chromosomes, Anomalies of autosomes: Hereditary defects- Kleinefelter Turner , Cri-du-Chat & Down syndromes.

UNIT-III: Basic Microbial genetics

Conjugation, Transformation Transduction & their use in genetic mapping. Gene Concept. Classical & modern gene concepts.

Structure of Chromosome, types of chromosomes. Euchromatin & heterochromatin. Polytene & Lampbrush chromosome.

UNIT-IV: Mutation

Mutations-spontaneous & induced; chemical &: Physical mutagens; induced mutation in plants, animals & microbes for economic benefit of man. Gamma garden, parthenocarpy, Structural & numerical aberrations involving chromosomes; evolution in plants (two or three examples) mutation.

UNIT-V: Population Genetics

Gene pool, Gene frequency & genotypic frequency. Population genetics Hardly-Weinberg equilibrium, gene & genotypic frequencies.

Cytological inheritance. Cytoplasmic Male Sterility.

Text & References:

1. Concepts of genetics -William S. Klug & Michael R, Cummings, Person Education.
2. Genetics, -Strickberger, Prentice Hall College Division.
3. Microbial Genetics- Friefelder- Narosa Publication
4. Principles of Genetics- E.J. Gardner, John W.H. Sons Inc.
5. Genetics, R. Good enough International Thomson Publishing.
6. Genetics- Arora-Himalaya Publication
7. Principles of Genetics, D.P. Suntan & M.J. Simmons, John Wiley & Sons Inc.
8. Molecular Biology of Gene - J.D. Watson, Weiner & Hopkins, Addison-Wesly
9. Genetics, P.K. Gupta, Rastogi Publication.
10. Genetics- Verma & Agrawal- S. Chand

Practicals:

1. Two examples each on Dihybrid & Monohybrid cross.
2. One example each on interaction of genes.
3. Two examples on Hardy Weinberg law.
4. Study of Karyotype.
5. Study of Human blood group.
6. Observe sex linked characters in tabulation from surroundings human population
7. Study of polytene chromosome.
8. Study of Human Traits

Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure (New Scheme)

Semester Pattern effective from June 2016

B.Sc First Year (Semester II)

Bioinformatics

CCBI-5B

Bioprogramming using C Language

Maximum Marks: 50 **Hours: 45** **Credits-3**

Unit I: Introduction to C

The character set, constants, variables and keywords, types of constants, types of C variables, C keywords, C Instructions: - Type declaration instruction, arithmetic instruction, and integer and float conversion, types conversions in assignment, hierarchy of operations, storage classes and their scope rules.

Unit II: Control Structure in C

Decision control statement: if statement, use of logical operation, decisions using switch, Looping statement: for, while, do while, the break, continue, go to statement.

Arrays What are arrays, arrays initializations, bounds checking, passing array elements to a function, initializing a 2-dimensional array.

Unit III: Functions

What is function, Arguments and local variables, returning function results, default return type and the type void passing values between function, declaration of function type, recursion, function with variables arguments.

Character String

What are strings, standard library string functions: strlen ( ), strcpy ( ), strcat ( ), strcmp( )

Unit IV: Structures and Unions

Declaring structures, initializing structures, structure variables, accessing structure elements, arrays of structures, functions and structures, structures within structures, introduction to union. difference between structure and union.

Pointers: Introduction to Pointers, Operations on Pointers, Pointers and Functions, Pointers and Arrays.

Unit V: Input /Output in C

Console I/O functions: - printf(), scanf(), getch(), getchar(), putchar(), gets(), puts().

Disk I/O functions :- High level file I/O or standard functions fopen(), fclose(), fgets(), fputs(), fread(), fwrite(), fseek(), feof(), fflush(), Use of command line arguments.

Reference Books:-

1. Let us C - Yeshwant kanetkar – BPB Publication
2. Programming in ANSI C - E. Balagurusamy -TATA Macgraw hill
3. Turbo C/C++ - The complete reference - H. Schildt

Practicals:-

1. Basic operations
2. Decision and loop control structure
3. Arrays
4. Functions
5. Character strings
6. Pointers
7. Structure and unions
8. Input/ Output functions
9. Command line argument
10. File handling