# Swami Ramanand Teerth Marathwada University, Nanded

**B.Sc. (Computer Science) revised draft syllabus**  
*(With effects from 2011-12)*

## B.Sc. (Computer Science) First Year

### First Semester:

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Subject</th>
<th>Lectures/ Week</th>
<th>Max. Marks</th>
<th>Term Work</th>
<th>Total Marks</th>
<th>Exam Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.Sc.(CS).S1.1</td>
<td>Communication Skills-I</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S1.2</td>
<td>Fundamentals of I.T.</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S1.3</td>
<td>Introduction to Programming in C</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S1.4</td>
<td>DBMS</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S1.5</td>
<td>Web Page Designing</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S1.PR1</td>
<td>Fundamentals of I.T. (Dos &amp; Windows)</td>
<td>3</td>
<td>50</td>
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<td>50</td>
<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S1.PR2</td>
<td>C Programming</td>
<td>3</td>
<td>50</td>
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<td>50</td>
<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S1.PR3</td>
<td>DBMS</td>
<td>3</td>
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<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S1.PR4</td>
<td>Web Page Designing</td>
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<td><strong>Total</strong></td>
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### Second Semester

<table>
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<tr>
<th>Paper Code</th>
<th>Subject</th>
<th>Lectures/ Week</th>
<th>Max. Marks</th>
<th>Term Work</th>
<th>Total Marks</th>
<th>Exam Duration</th>
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<tbody>
<tr>
<td>B.Sc.(CS).S2.1</td>
<td>Communication Skills-II</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S2.2</td>
<td>Fundamentals of Statistics &amp; Discrete Mathematics.</td>
<td>4</td>
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<td>20</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S2.3</td>
<td>Data Structure using C</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S2.4</td>
<td>Hardware Interaction using C</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S2.5</td>
<td>Computer Networks</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S2.PR1</td>
<td>Statistics &amp; Discrete Mathematics.</td>
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<td>50</td>
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<td>50</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S2.PR2</td>
<td>Data Structure using C</td>
<td>3</td>
<td>50</td>
<td></td>
<td>50</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S2.PR3</td>
<td>Hardware Interaction using C</td>
<td>3</td>
<td>50</td>
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<td>50</td>
<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S2.PR4</td>
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<td>03 Hrs</td>
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<tr>
<td><strong>Total</strong></td>
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1st and 2nd Semester **1400**
# B.Sc. (Computer Science) Second Year

## Third Semester:

<table>
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<tr>
<th>Paper Code</th>
<th>Subject</th>
<th>Lectures/ Week</th>
<th>Max. Marks (A)</th>
<th>Term Work (B)</th>
<th>Total Marks (A+B)</th>
<th>Exam Duration</th>
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<tbody>
<tr>
<td>B.Sc.(CS).S3.1</td>
<td>System Programming &amp; Operating System –I</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S3.2</td>
<td>Software Engineering</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S3.3</td>
<td>Visual Basic.Net</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S3.4</td>
<td>Object Oriented Concepts using C++</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S3.5</td>
<td>Computer Graphics</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
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<td>B.Sc.(CS).S3.PR1</td>
<td>Software Engineering (Mini Project)</td>
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<tr>
<td>B.Sc.(CS).S3.PR2</td>
<td>Visual Basic.Net</td>
<td>3</td>
<td>50</td>
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<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S3.PR3</td>
<td>C++</td>
<td>3</td>
<td>50</td>
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<tr>
<td>B.Sc.(CS).S3.PR4</td>
<td>Computer Graphics</td>
<td>3</td>
<td>50</td>
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<td>03 Hrs</td>
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<td><strong>Total</strong></td>
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## Fourth Semester

<table>
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<tr>
<th>Paper Code</th>
<th>Subject</th>
<th>Lectures/ Week</th>
<th>Max. Marks (A)</th>
<th>Term Work (B)</th>
<th>Total Marks (A+B)</th>
<th>Exam Duration</th>
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<tbody>
<tr>
<td>B.Sc.(CS).S4.1</td>
<td>System Programming &amp; Operating System – II</td>
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<td>B.Sc.(CS).S4.2</td>
<td>C#.Net</td>
<td>4</td>
<td>80</td>
<td>20</td>
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<td>B.Sc.(CS).S4.3</td>
<td>Computer System Security</td>
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<tr>
<td>B.Sc.(CS).S4.4</td>
<td>Web Development using PHP &amp; MYSQL</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
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<td>B.Sc.(CS).S4.5</td>
<td>Multimedia</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S4.PR1</td>
<td>C#.Net</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S4.PR2</td>
<td>System Programming &amp; Operating System –II</td>
<td>3</td>
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<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S4.PR3</td>
<td>Web Development using PHP &amp; MYSQL</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S4.PR4</td>
<td>Multimedia using Flash</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>03 Hrs</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
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### 3rd and 4th Semester

1400
### B.Sc. (Computer Science) Third Year

#### Fifth Semester:

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Subject</th>
<th>Lectures/ Week</th>
<th>Max. Marks (A)</th>
<th>Term Work (B)</th>
<th>Total Marks (A+B)</th>
<th>Exam Duration</th>
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<tbody>
<tr>
<td>B.Sc.(CS).S5.1</td>
<td>Cyber Security</td>
<td>4</td>
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<tr>
<td>B.Sc.(CS).S5.2</td>
<td>Cloud Computing</td>
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<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S5.3</td>
<td>Programming in Java-I</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S5.4</td>
<td>Oracle 10G SQL &amp; PL/SQL</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
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<td>B.Sc.(CS).S5</td>
<td>Digital Image Processing</td>
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<td>80</td>
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<td>03 Hrs</td>
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<tr>
<td>B.Sc.(CS).S5.PR1</td>
<td>Programming in Java –I</td>
<td>3</td>
<td>50</td>
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<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S5.PR2</td>
<td>Oracle 10G SQL &amp; PLSQL</td>
<td>3</td>
<td>50</td>
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<td>03 Hrs</td>
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<td>B.Sc.(CS).S5.PR3</td>
<td>Digital Image Processing</td>
<td>3</td>
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<td>B.Sc.(CS).S5.PR4</td>
<td>Seminar</td>
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<td>03 Hrs</td>
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#### Sixth Semester

<table>
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<tr>
<th>Paper Code</th>
<th>Subject</th>
<th>Lectures/ Week</th>
<th>Max. Marks (A)</th>
<th>Term Work (B)</th>
<th>Total Marks (A+B)</th>
<th>Exam Duration</th>
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<tbody>
<tr>
<td>B.Sc.(CS).S6.1</td>
<td>Programming in Java-II</td>
<td>4</td>
<td>80</td>
<td>20</td>
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<td>03 Hrs</td>
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<td>B.Sc.(CS).S6.2</td>
<td>Oracle 10G DBA</td>
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<tr>
<td>B.Sc.(CS).S6.3</td>
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<tr>
<td></td>
<td>1. Data Mining</td>
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<tr>
<td></td>
<td>2. Research Methodology</td>
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<tr>
<td></td>
<td>3. Bioinformatics</td>
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<td>4. Linux Administration</td>
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<td>Project Work &amp; Seminar</td>
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<td>80</td>
<td>20</td>
<td>100</td>
<td>03 Hrs</td>
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<td>B.Sc.(CS).S6.PR1</td>
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<td>3</td>
<td>50</td>
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<td>50</td>
<td>03 Hrs</td>
</tr>
<tr>
<td>B.Sc.(CS).S6.PR2</td>
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<td>3</td>
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<td>50</td>
<td>03 Hrs</td>
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<td>50</td>
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<td>03 Hrs</td>
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<td>(Industry Visit &amp; Report writing)</td>
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<td>2. Research Methodology</td>
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<td>3. Bioinformatics</td>
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<td>4. Linux Administration</td>
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<td></td>
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<td><strong>700</strong></td>
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**5th and 6th Semester**

|                  |                                  |                |                |               | **1400**        |               |
B.Sc.(CS).S1.1 COMMUNICATION SKILLS-I
(80 Marks) (Total 50 Lectures)

Unit I: Language and communication
Definition of Language, nature of language
Characteristics of Human Language
Varieties of English Language: British, American, Indian, Australian etc.
English for specific and special purposes.
Communication:
Importance of communication;
Animal and human communication;
Methods of communication (Verbal & Non-Verbal);
Barriers of communication.

Unit II: Oral Communication
Basic skills of communication
Listening (with Understanding)
Extended natural speech in business situations
Both face to face and on the telephone.
b) Understanding standard American, British and Indian accents.
Speaking with correct Pronunciation)
English Consonants
b) English Vowels
Speaking with right accent

Unit III: Presentation Skills
1) Planning and preparing to speak
2) Strategies for making powerful openings in presentations.
3) Body Language
4) Voice Modulations

Unit IV: a) Meetings
b) Group discussions
c) Seminars
d) Conference
e) Interviews

Suggested Reading:
1) DEVELOPING COMMUNICATION SKILLS Krishna Mohan and Meera Bajaj
2) THE STERILING BOOK OF COMMON ERRORS IN ENGLISH Gratian Vass
3) SPOKEN ENGLISH FOR YOU. R.Radha Krishna Pillai and K Rajeevan
4) INDIAN AND BRITISH ENGLISH- A HAND BOOK OF USAGE AND PRONUNCIATION. Paroo Nihlani, Ray Tongue and Priya Hosali
5) A COURSE IN PHONETICS AND SPOKEN ENGLISH Sethi and Dhamija.
6) ENGLISH PRONUNCING DICTIONARY. Daniel Jones.
7) MACMILLAN’S FOUNDATION ENGLISH. R. K. Dwivedi and A. Kumar
1. Computer System Characteristics And Capability:
Basic structure, ALU, memory, CPU, I/O devices.
Development of computers.
Classification of computers:
(Micro, mini frame, super computer, pc, server, workstations)

2. Data Representation With in Computer:
BIT, BYTE, WORD
ASCII, EBCDIC, BCD Code
Introduction to Number system: Binary, Octal, Decimal and Hexadecimal.
Conversation from one number system to another number system.
Introduction to Basic Gates.

3. Input Devices:
Keyboard
Direct Entry: Card readers, scanning devices (BAR CODE, OMR, MICR),
Voice input devices, Light pen, Mouse, Touch Screen, Digitizer, Scanner.

4. Output Devices:
Printers: Impact and Non-impact printers.
CRT, LCD, CD-WRITTER, ZIP DRIVE, DVD
Introduction to Web Camera, modem

5. Memory:
RAM, ROM, PROM, EPROM, EEPROM
Base memory, extended memory, expanded memory, Cache memory
Storage devices Tape, FDD, HDD, CDROM, Pen Drive.

6. Algorithm & Flowcharts:
Definition and properties
Principles of flowcharting
Flowcharting symbols
Converting algorithms to flowcharts.

7. Introduction To Programming Environment
History of languages, high-level, Low level, Assembly languages etc.
Compilers, Interpreters, Assemblers, Linkers, Loaders.

8. Microcomputers
What is Microprocessor, Introduction to Family of microprocessor, Ideal microcomputer, An Actual microcomputer, Memory system for microcomputer, Minimum microcomputer configuration.

9. Voice and Data communication
Types of communications, Physical communication, Public Switched Telephone Network, Cellular communication system.
10. Disk Operating System:
   What is DOS, History.
   Files and Directory
   Study of all internal & External commands.
   Types of files.
   Configuration of DOS (config. sys)
   Batch file concept & study of Autoexec.bat file.
   Booting Procedure of DOS

11. Introduction to Windows Operating System:
   What are Windows O.S., History, files and Folders?
   Architecture of windows O.S., Study of windows directories.
   Basics of windows: Desktop, My computer, Recycle bin, my network places,
   Quick launch tool bar.

Reference Books:
1. FUNDAMENTALS OF COMPUTERS BY V. RAJARAMAN.
2. COMPUTERS AND COMMONSENSE BY R. HUNT AND SHELL Y.
5. MS-Dos 6.22- Russell A Stultz (BPB Publication)
1 Programming languages
1.1 Machine language
1.2 Assembly language
1.3 High level languages
1.4 Compilers and Interpreters

2 Problem Solving using Computers
2.1 Algorithms
2.2 Flowcharts

3 Introduction to C
3.1 History
3.2 Structure of a C program
3.3 Functions as building blocks
3.4 Application Areas
3.5 C Program development life cycle

4 C Tokens
4.1 Keywords
4.2 Identifiers
4.3 Variables
4.4 Constants – character, integer, float, string, escape sequences
4.5 Data types – built-in and user defined
4.6 Operators and Expressions, Operator types (arithmetic, relational, logical, assignment, bitwise, conditional, other operators), precedence and associativity rules.

5 Input and Output
5.1 Character input and output
5.2 String input and output
5.3 Formatted input and output

6 Control Structures
6.1 Decision making structures, If, if-else, switch
6.2 Loop Control structures, While, do-while, for
6.3 Nested structures
6.4 break and continue

7 Functions in C
7.1 What is a function
7.2 Advantages of Functions
7.3 Standard library functions
7.4 User defined functions, Declaration, definition, function call, parameter passing, return keyword,
7.5 Scope of variables, storage classes
7.6 Recursion
8 Arrays
8.1 Array declaration, initialization
8.2 Types – one, two and multidimensional
8.3 Passing arrays to functions

9 Pointers
9.1 Pointer declaration, initialization
9.2 Dereferring pointers
9.3 Pointer arithmetic
9.4 Pointer to pointer
9.5 Arrays and pointers
9.6 Functions and pointers – passing pointers to functions, function returning pointers, pointer to function
9.7 Dynamic memory allocation

10 Strings
10.1 Declaration and initialization
10.2 Standard library functions
10.3 Strings and pointers
10.4 Array of strings.

11 Structures and Unions
11.1 Creating structures
11.2 Accessing structure members (dot Operator)
11.3 Array of structures
11.4 Passing structures to functions
11.5 Nested structures
11.6 Pointers and structures
11.7 Unions
11.8 Difference between structures and unions

12 C Preprocessor
12.1 Format of Preprocessor directive
12.2 File Inclusion directive
12.3 Macro substitution, nested macro, argumented macro
12.4 Conditional compilation

13 Command Line Arguments
13.1. Accessing command line arguments

14 File Handling
14.1 Streams
14.2 Types of Files
14.3 Operations on files
14.4 Random access to files

References
2. The C Programming language – Kernighan and Ritchie
3. Complete C Reference – Herbert Schildt
B.Sc.(CS).S1.4 Data Base Management System

1 File Organization
Introduction
Physical / logical files
Special characters in files, fields & record organization (fixed , variable length) types of file organization ( heap, sorted, indexed, hashed), choosing a file organization

2 Indexed File Organization
Overview of indexes, types of indexes ( dense, sparse, clustered, primary, secondary, tree ( multilevel indexes, B+ tree)

3 Introduction of DBMS
Overview, File system Vs DBMS, Describing & storing data ( Data models (relational, hierarchical, network)), Levels of abstraction , data independence, Queries in DBMS ( SQL : DDL,DML,DCL,TCL), Structure of DBMS, People who deal in DBMS, Advantages of DBMS

4 Conceptual Design (E-R model)
. Overview of DB design, ER data model ( entities, attributes, entity sets, relations, relationship sets), Additional constraints ( key constraints, participation constraints, weak entities, aggregation / generalization, conceptual design using ER ( entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER), Conceptual design for small to large enterprises, Case studies .

5 Relational data model
Relations (concepts, definition), Conversion of ER to Relational model , integrity constraints ( key, referential integrity, general constraints)

6 Relational algebra
Preliminaries, Relational algebra ( selection, projection, set operations, renaming, joins, division)

7 SQL
DDL (create, drop, alter), forms of a basic SQL query (egs, expressions, strings in SQL), union / intersection / except, nested queries ( introduction, correlated queries, set comparison operators), Aggregate operators ( group by, having), aggregate functions, Null values ( comparison using NULL, logical connections ( AND,OR,NOT) impact on SQL commands, outer joins, disallowing NULL), examples on SQL (case studies )

8 Functional dependency
Introduction to schema refinement ( problems caused by redundancy, use of ecomposition , problems related to decomposition, functional dependencies, egs motivating schema refinement ( constraints on an entity set, constraints on relation set, identifying attributes of entities, identifying entity sets)), reasoning about functional dependency ( F+ , attribute closure), Normalization forms ( 1NF, 2NF, 3NF, BCNF), decomposition ( lossless join, dependency preserving property), normalization ( decomposition into BCNF, decomposition into 3NF), other kinds of decomposition (multivalued dependency)

References
1. Database systems , By KORTH
2. Database systems By Nawathe
3. Postgresql , O’Reilly publications
4. Database systems , by Raghuramakrishnan
1. Introduction to Web Publishing:
Web browser, WWW, Web design process, Implementation, Maintenance Phases of Web site, Web Publishing

2. HTML Documents:
Overview, rules & guidelines, structure of HTML documents, document types.

3. The Markup Tags:
HTML, HEAD, TITLE, BODY, Paragraphs, Lists, Formatted & Unformatted text, Extended quotations, Address, Horizontal rules, Hyper link, Font (Size, Color), Table, Image (Add, Alignments), Cell Space / Cell padding, Frame Set, Options, Form.

4. Linking:
URL, Mailto anchors.

5. Link Image:
Image size attributes, aligning images, alternate text for images, Background graphics, and Background color, External Images, Sounds & Animations, Image map, Server side image map, Client side image map, Inline image.

6. Tables:
Table tags, General Table format, Row Span, Cols span.

7. Frame:
Overview of frame, Simple frame example, Frame targeting, Floating frame, Frame Problems.

8. Form:
Action attribute, Method attribute, Name attribute, Enc type attribute, Complete form Syntax Example.

9. DHTML:
Dynamic HTML, Document object model, Rollover Buttons, Moving objects with DHTML, Ramification of DHTML.

10. VB Script:
- Adding script to document, Input box, working with global & local variables, numbers, date & time, operators, arrays, uppercase & lowercase letters. - Functions, Control statements, if-then-else, Nested ifs, Select Case, Looping Statements for-Next, Do-while, Do-Until.

11. Java Script Basics:
Introduction, Basics, Data Types & variables, Expressions & Operators.

Reference Book:
1. HTML COMPLETE BPB PUBLICATION.
2. JAVA SCRIPT 1.1: BY – DANESH & TATTERS :SAMSNET PUBLICATIONS.
3. VB SCRIPT BY BPB PUBLICATIONS.
Lab Assignments:

B.Sc.(CS).S1.PR1 – Fundamentals of I.T. (50 Marks)

1. Introduction to DOS (Booting Process, Using basic commands like date, time, dir, copy con, type, ren etc.)
2. Creating a directory structure in Dos (Using commands md, cd, rd, copy) and batch file.
3. Introduction to Windows (File operations using windows explorer, Internet explorer, desktop related operations etc.)
5. Installation and handling plug and play devices with windows

B.Sc.(CS).S1.PR2 – C Programming (50 Marks)

1. Assignment to demonstrate use of data types, simple operators (expressions)
2. Assignment to demonstrate decision making statements (if and if-else, nested structures)
3. Assignment to demonstrate decision making statements (switch case)
4. Assignment to demonstrate use of simple loops
5. Assignment to demonstrate use of nested loops
6. Assignment to demonstrate menu driven programs.
7. Assignment to demonstrate writing C programs to use of user defined functions
8. Assignment to demonstrate recursive functions.
9. Assignment to demonstrate use of arrays (1-d arrays) and functions
10. Assignment to demonstrate use of multidimensional array (2-d arrays) and functions
11. Assignment to demonstrate use of pointers
12. Assignment to demonstrate concept of strings (string & pointers)
13. Assignment to demonstrate array of strings.
14. Assignment to demonstrate use of bitwise operators.
15. Assignment to demonstrate structures (using array and functions)
16. Assignment to demonstrate structures and unions
17. Assignment to demonstrate command line arguments and preprocessor directives.
18. Assignment to demonstrate file handling (text files)
19. Assignment to demonstrate file handling (binary files and random access to files)

B.Sc.(CS).S1.PR3- DBMS (50 Marks)

1. Assignment to create simple tables, with only the primary key constraint (as a table level constraint & as a field level constraint) (include all data types)
2. Assignment to create more than one table, with referential integrity constraint, PK constraint.
3. Assignment to create one or more tables with following constraints, in addition to the first two constraints (PK & FK)
   a. Check constraint
   b. Unique constraint
   c. Not null constraint
4. Assignment to drop a table from the database, to alter the schema of a table in the Database.
5. Assignment to insert / update / delete records using tables created in previous Assignments. (use simple forms of insert / update / delete statements)
6. Assignment to query the tables using simple form of select statement
   \[ \text{Select } \langle \text{field-list} \rangle \text{ from table }
   [\text{where } \langle \text{condition} \rangle \text{ order by } \langle \text{field list} \rangle ] \]
   \[ \text{Select } \langle \text{field-list} \rangle, \text{ aggregate functions } > \text{ from table [where}
   \langle \text{condition} \rangle \text{ group by } <> \text{ having } <> \text{ order by } <> ] \]

7. Assignment to query table, using set operations (union, intersect)

8. Assignments to query tables using nested queries

9. Assignment related to small case studies (Each case study will involve creating tables with specified constraints, inserting records to it & writing queries for extracting records from these tables)

B.Sc.(CS).S1.PR4- Web Page Designing (50 Marks)

At least 15 practical based on following points
1. Create a simple web page
2. Create a web page contains link of other page & other area
3. Create a web page which contains table, frames & image
4. Create a web page contains animated image & text.
5. Use of VB Script in Web pages
6. Demonstrating Java Script in Web Pages etc.
Unit I: **Reading**
- a) Reading and understanding business letters, Reports and memos.
- b) Reading and understanding scientific texts.
- c) Reading a dictionary, thesaurus, and encyclopedia.
- d) Reading passages and poems.

Unit II: **Writing**
- a) Letters- Formal and Informal
- b) Note taking and note making
- c) Reports
- d) Curriculum Vitae
- e) Making advertisements for newspapers
- f) Rearranging the jumbled sentences.

Unit III: **Use of Grammar and usage reference sources.**
- a) Morphology: Word formation processes
- b) Word classes: Noun, adjective, verb, adverb.
- c) Phrase, Clause and Sentence
- d) Punctuation and Capitalization.
- e) Common errors in the use of English.
- d) Types of sentences: simple, complex, compound.

Unit IV: **Speaking with Effective Language**
- a) One word substitution
- b) Synonyms
- c) Antonyms
- d) Idioms and Phrases.

**Suggested Reading:**

1) **PRACTICAL ENGLISH GRAMMAR**
Thomson and Martinet
2) **LIVING ENGLISH STRUCTURE**
W. S. Allen
3) **UNIVERSITY ENGLISH GRAMMAR**
Quirk et al
4) **MODERN ENGLISH GRAMMAR (AN INTRODUCTION)**
L. S. Deshpande & P.H. Dharamsi
5) **ENGLISH FOR PRACTICAL PURPOSES**
Z.N. Patil, B.S. Walke, A. Thorat, Z. Merchant
6) **BUSINESS COMMUNICATION**
Urmila Rai & S.M. Rai
7) Modern English Grammer Pal and Suri.
B.Sc. (CS).S2.2  
FUNDAMENTALS OF STATISTICS & DISCRETE MATHEMATICS

- **Unit–I**  
  **Introduction**  
  Definition of Statistics, Scope and importance of Statistics & Mathematics  
  Primary and Secondary data, Types of data: qualitative, quantitative,  
  Graphical presentation: Histogram, frequency polygon, frequency Curves  
  Diagrammatic presentation: Bar diagrams, Pie diagram,  
  Classification of data: Discrete and continuous frequency

- **Unit-II**  
  **Measures of Central Tendency**  
  Concept of central tendency. For group and ungroup data  
  Arithmetic mean (A.M.) Merits and demerits of A.M.  
  Computation of A.M. for grouped and ungrouped data.  
  Mode: Computation of mode, Merits and demerits of mode.  
  Median: Computation for grouped and ungrouped data.  
  Merits & demerits of median. Numerical problems

- **Unit-III**  
  **Measures of Dispersion**  
  Concept of Dispersion and measures of Dispersion,  
  Range (definitions and problems)  
  Quartile Deviation (definitions and problems)  
  Mean Deviation (definitions and problems)  
  Standard Deviation (definitions and problems)  
  Variance, Numerical problems

- **Unit-IV**  
  **Theory of Probability**  

- **Unit-V**  
  **Set Theory**  
  Introduction  
  Set Notation and Description  
  Subsets, Venn diagram, Set Operations

- **Unit-VI**  
  **Relations & Functions**  
  Introduction, Cartesian product,  
  Relations, types of relations, 1. Equivalence, 2. Partial ordering relations.  
  Function; Domain, Range  
  Types of Function: One-One, On-To, In-To, One to One
• Unit-VII

**Graphs**
- Introduction
- Definition & Elementary Results
- Types of Graph
- Isomorphism

• Unit-VIII

• **Connected Graph**
  - Introduction
  - Definition of Connected, Disconnected Graph
  - Edge Sequence, Path, Circuit
  - Vertex and Edge Connectivity
  - Eulerian graph, Hamiltonian graph.

• **Reference Books:**
  1. Fundamentals of Statistics by S.C. Gupta
  5. Elements of Discrete Mathematics
     By C.L. Liu
  6. Discrete Mathematics
     By Seymour Lipschutz & Marc Lipson
  7. Application to Computer Science & Engineering
     By Narsing Deo
Objective:
- To learn the systematic way of solving problems
- To understand the different methods of organizing large amount of data
- To efficiently implement the different data structures
- To efficiently implement solutions for specific problems

Prerequisites: Knowledge of C Programming Language

1. Introduction to data structures [2]
   1.1 Concept
   1.2 Data type, Data object, ADT
   1.3 Need of Data Structure
   1.4 Types of Data Structure

2. Algorithm analysis [2]
   2.1 Algorithm – definition, characteristics
   2.2 Space complexity, time complexity
   2.3 Asymptotic notation (Big O, Omega _)

3. Linear data structures
   3.1 Introduction to Arrays - array representation [6]
   3.2 sorting algorithms with efficiency
      - bubble sort, Insertion sort, Merge sort, Quick Sort

4. Linked List [6]
   4.1 Introduction to List
   4.2 Implementation of List – static & dynamic representation,
   4.3 Types of Linked List
   4.4 Operations on List
   4.5 Applications of Linked List – polynomial manipulation
   4.6 Generalized linked list – concept & representation

5. Stacks [6]
   5.1 Introduction
   5.2 Representation-static & dynamic
   5.3 Operations
   5.4 Application - infix to postfix & prefix, postfix evaluation,
   5.5 Recursion using implicit stack
   5.6 Concept of Multiple stacks

6. Queues [8]
   6.1 Introduction
   6.2 Representation -static & dynamic
   6.3 Operations
   6.4 Circular queue, DeQue, priority queues
   6.5 Concept of Multiple Queues

7. Trees [12]
   7.1 Concept & Terminologies
   7.2 Binary tree, binary search tree
   7.3 Representation – static & dynamic
   7.4 Operations on BST – create. Insert, delete, traversals (preorder, inorder, postorder), counting leaf,
      non-leaf & total nodes
   7.5 Application - Heap sort
      Height balance tree- AVL trees- Rotations
8. Graph [6]
8.1 Concept & terminologies
8.2 Graph Representation
8.3 Traversals – BFS & DFS
8.4 Applications – AOV network – topological sort
AOE network – critical path
Shortest path with implementation

References:
1. Fundamentals of Data Structures ---- By Horowitz Sahani (Galgotia)
2. Data Structures using C --- By ISRD Group (Tata McGraw Hill)
3. Introduction to Data Structures using C----By Ashok Kamthane
4. Data Structures using C --- Bandopadhyay & Dey (Pearson)
B.Sc.(CS).S2.4 Hardware Interaction using C

1. Internal Architecture of 8086. 6Hrs.
   Overview, CPU Architecture, Pin Diagram, Internal Operation, Addressing Modes.

2. Pointers 7Hrs.
   Pointer to Pointer, Pointer & Functions, Pointer & Array, Array of Pointer, Dynamic Memory Allocation,
   Using near, far & Huge pointers, Command Line Arguments.

3. Structure & Union 7Hrs.
   Introduction of structure, Declaration & initialization, Arrays of Structures, Structure within structure,
   Introduction to Union.

4. File Management in 'C' 6Hrs.
   Introduction, Opening and Closing a file, I/O operations on file, Error Handling during I/O operation

5. Bit Operations 7Hrs.
   One's Compliment operator, Right shift Operator, Left Shift Operator, Bit wise operator- AND, OR, XOR.

6. Interaction with Hardware through 'C' 6Hrs.
   Interrupt & Interrupt Vector table, ROMBIOS Philosophy, Invoking ROMBIOS function, int 86 () function,
   Interrupts to access ROMBIOS Services 5h, 10h, 14h etc.

7. VDU Basic 12Hrs.
   Components of VDU, Monitors & Display Adaptors, Video Display Modes, Text or Graphics, colors in
   text mode, colors in graphics mode, colors in SVGA, Video page, writing to video memory in text mode,
   Video interrupt services, set video mode (0h), set cursor size (1h), set cursor position (2h), read cursor
   position (3h), display blinking characters (9h), write pixel (0ch), read pixels (0dh).

8. Keyboard And Mouse basic 6Hrs.
   Operation of keyboard, Shift and toggle keys, keyboard interrupt (16h) - get keyboard next character (0h)
   , Report whether character is ready (1h), get shift status (2h).

9. Mouse programming 8Hrs.
   Mouse interrupt (33h), reset mouse (0h), show mouse pointer (1h), Hide mouse pointer (2h), set mouse
   position and button status (3h).

10. Printer basics 6Hrs.
    Introduction to ports, detecting installed ports, send one bite to printer (0h), Get printer status (2h).

Reference Books.
1. Microprocessor System, the 8086/8088 family Architecture, programming & design By Chengliu A Gibson.
2. Let us C by Yeshwant Kanetkar 3rd Edition
3. Pointers In C By Yeshwant Kanetkar 3rd Edition
1 Introduction to Computer Networks (Lectures: 7)

Computer Networks, goals and applications
Network Hardware broadcast and point-to-point, topologies – star, bus, mesh, ring etc.
Network Types LAN, MAN, WAN, Wireless Networks, Home Networks, Internetworks,
Protocols and Standards – Definition of Protocol, Defacto and
dejure standard Peer-to-peer and Server-based LAN
Network Software Protocol Hierarchies - layers, protocols, peers, interfaces network architecture, protocol
stack design issues of the layers – addressing, error control, flow control, multiplexing and demultiplexing,
routing
Connection-oriented and connectionless service
Service Primitives – listen, connect, receive, send, disconnect and Berkley Socket
The relationships of services to protocol

2 Network Models (Lectures: 5)

OSI Reference Model
Functionality of each layer
TCP/IP Reference Model
Introduction to IP, TCP, and UDP
TCP/IP Protocol Suite
Comparison of OSI and TCP/IP model
Addressing Physical, Logical and Port addresses

3 The Physical Layer (Lectures: 10)

Basic Concepts Signals, Types – Analog and Digital Signals, Bit rate, bit length, baseband transmission
Transmission Impairments – attenuation, distortion and noise
Data Rate Limits – Nyquist’s bit rate formula for noiseless channel and Shannon’s law
Performance of the Network Bandwidth, Throughput, Latency(Delay), Bandwidth – Delay
Product, Jitter
Line Coding Characteristics, Line Coding Schemes – Unipolar, NRZ, RZ, Manchester and Differential
Manchester
Transmission Modes-Parallel Transmission
Serial Transmission – Asynchronous and Synchronous
Multiplexing FDM and TDM
Switching Circuit Switching, Message Switching and Packet Switching
ISDN Services, Evolution, Architecture

4 The Data Link Layer (Lectures: 12)

Design Issues Services to Network Layer, Flow
Control, Error Control Framing Character Count, Byte Stuffing, Bit Stuffing and Physical Layer Coding
Violations
Error Control Hamming Code and CRC
Elementary Data
Link Layer Protocols
Utopia, A Simplex Stop-And-Wait, A
Simplex protocol for noisy channel
Sliding Window Protocols
Piggybacking–
Need, Advantages/Disadvantages, 1-bit sliding window protocols, Pipelining –
Go-Back N and Selective Repeat
Data Link Layer Protocols
HDLC – frame format, all frame types
PPP – Use, Frame Format, Use of PPP in the Internet

5 The Medium Access Sublayer (Lectures:7)
Random Access Protocols
ALOHA – pure and slotted
CSMA – 1-persistent, p-persistent and non-persistent CSMA/CD CSMA/CA
Controlled Access Reservation, Polling and Token Passing
Channelization FDMA, TDMA and CDMA- Analogy, Idea, Chips, Data
Representation, Encoding and Decoding, Signal Level, Sequence Generation

6 Wired LANS (Lectures:7)
IEEE Standards Data Link Layer, Physical Layer 1
Standard Ethernet MAC Sublayer – Frame Format, Frame Length, Addressing, Access Method
Physical Layer – Encoding and Decoding, 10Base5, 10Base2, 10Base-T, 10Base-F,
Changes In The Standard – Bridged Ethernet, Switched Ethernet, Full Duplex Ethernet
Fast Ethernet – Goals, MAC Sublayer, Topology, Implementation
Gigabit Ethernet – goals, MAC Sublayer, Topology, Implementation
Ten-Gigabit Ethernet – goals, MAC Sublayer, Physical Layer

Reference Books:
1) Computer Networks by Andrew Tanenbaum, Pearson Education.
2) Data Communication and Networking by Behrouz Forouzan, TATA McGraw Hill.
Lab Assignments:

B.Sc.(CS).S2.PR1 – Stat & DM (50 Marks)

At least 15 assignments should cover based on syllabi
* Practical on Statistics using Excel / Assignments
* Assignments on Mathematics

B.Sc.(CS).S2.PR2- Data Structure using C (50 Marks)

2. Static/Dynamic stack implementation, infix to postfix, infix to prefix and evaluation of postfix.
3. Static and Dynamic Queue Implementation.
5. Polynomial addition (Using Linked list).
6. Binary Tree Traversal: Create, add, delete, display nodes.
7. Graph: in degree, out degree, DFS, BFS.
8. Shortest path Dijkstra algorithm.
9. Adjacency matrix to adjacency list conversion.

B.Sc.(CS).S2.PR3- Hardware Interaction using C (50 Marks)

At least 15 assignments should cover for file, mouse, keyboard, video, memory, printer etc. interfaces related programs in C.

B.Sc.(CS).S2.PR4 – Computer Networks (50 Marks)

At least 15 assignments should cover to demonstrate above syllabi.