

# CURRICULUM

FOR

DIPLOMA PROGRAMME

IN

## Information Technology

### 2<sup>nd</sup> Year (i.e. 3<sup>rd</sup> & 4<sup>th</sup> Semester)

FOR THE STATE OF HIMACHAL PRADESH



(Implemented w.e.f. Session 2013-14)

Prepared by:-

**Composite Curriculum Development Centre**

Directorate of Technical Education,

Vocational & Industrial Training, Sundernagar(H.P.)

July, 2013

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## PREFACE

India, in last two decades, has made significant progress in all major spheres of activity. Since 1947, the Technical Education System has grown into fairly large sized system, offering opportunities for education and training in wide variety of trades / disciplines at different levels. Needless to say that well trained technical manpower is the backbone of any growing economy in the era of fast industrialization. It has been the endeavor of the Technical Education Department to take decisive steps to enhance the capacities of technical institutions with major emphasis on quality and excellence in technical education .Our country is the only country in the world which has 50% population below the age of 25 years whereas America has 30% and China 40%.Working Age Population (WAP) is increasing in India whereas it is decreasing in other parts in the world. Challenge before us is to train this WAP for the world of work .Updated curriculum is one of the most powerful tools to improve the quality of training.

Curriculum Document is a comprehensive plan or a blue print for developing various curriculum materials and implementing given educational programme to achieve desired and formally pre-stated educational objectives. Moreover it (the document) is the output of exhaustive process of curriculum planning and design, undertaken by the implementers under the expert guidance of curriculum designer.

While working out the detailed contents and study and evaluation scheme, the following important elements have been kept in mind:

Major employment opportunities of the diploma holders.

Modified competency profile of the diploma holders with a view to meet the changing needs due to technological advancement and requirements of various employment sectors.

Vertical and horizontal mobility of diploma pass outs for their professional growth.

Pragmatic approach in implementing all the curricula of diploma programmes in engineering and technology in the state of H.P.

The document is an outcome of the feedback received from field organizations/ industry of different categories viz. small, medium and large scale which offer wage employment for the diploma pass outs. In every stage of planning and designing of this curriculum, suggestions and advice of experts representing industry, institutions of higher learning, research organizations etc. were sought and incorporated as per the requirement of curriculum . The document contains the study and evaluation scheme and detailed subject/course contents to enable the H.P. Polytechnics to implement revised curriculum and to achieve the desired objectives.

Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which Communication Lab has been introduced during the first year itself.

We hope that this revision will prove useful in producing competent diploma holders in the state of Himachal Pradesh. The success of this curriculum depends upon its effective implementation and it is expected that the managers of polytechnic education system in Himachal Pradesh will make efforts to create better facilities, develop linkages with the world of work and foster conducive and requisite learning environment.

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## 2<sup>nd</sup> YEAR OF THREE YEAR DIPLOMA PROGRAMME IN INFORMATION TECHNOLOGY

### 1. SALIENT FEATURES

- 1) Name of the Programme : Three year Diploma Programme Information Technology
- 2) Duration of the Programme : Three years (06 Semesters)
- 3) Entry Qualification : As prescribed by H.P. Takniki Shiksha Board
- 4) Intake : As approved by H.P. Takniki Shiksha Board
- 5) Pattern of the Programme : Semester Pattern
- 6) Curriculum for : 2<sup>nd</sup> year of Three year Diploma Programme(Technical Stream)

### 7) **Student Centred Activities:**

A provision of 2-4 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. These activities will comprise of co-curricular & other activities such as expert lectures, games, seminars, declamation contests, educational field visits, NCC, NSS and cultural activities & hobby classes like photography, painting, singing etc.

### 8) **Industrial Training:-**

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of a minimum of 4 weeks duration to be organised during the semester break starting after second year i.e. after IV Semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An internal assessment of 50 and external assessment of 50 marks have been provided in the study and evaluation scheme of V Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behaviour, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry.

Teachers and students are requested to see the footnote below the study and evaluation scheme of IV Semester for further details.

## 2. GUIDELINES

### 2.1 GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

**Distribution of 25 marks for SCA will be as follows:**

- i. 5 Marks shall be given for general behaviour
- ii. 5 Marks for attendance shall be based on the following distribution:
  1. Less than 75% Nil
  2. 75-79.9% 3 Marks
  3. 80-84.9% 4 Marks
  4. Above 85% 5 Marks
- iii. 15 Marks shall be given for the Sports/NCC/Cultural and Co-curricular activities/other activities after due consideration to the following points:
  1. For participation in sports/NCC/Cultural/Co-curricular activities at National or above level, shall be rewarded with minimum of 10 marks
  2. For participation in sports/NCC/Cultural/Co-curricular activities at Inter-polytechnic level, shall be rewarded with minimum of 08 marks
  3. For participation in two or more of the listed activities, 5 extra marks should be rewarded

**Note:** *Head of Department shall ensure that these marks are conveyed to the H.P. Takniki Shiksha Board, Dharamsala at the end of semester along with sessional record.*

### 2.2 GUIDELINES FOR SESSIONAL ASSESSMENT

- The distribution of marks for Internal Assessment in theory subjects and drawing shall be made as per the following guidelines:
  - i. 60% of internal assessment shall be based on the performance in the tests. At least three tests shall be conducted during the semester out of which at least one should be house test. 30% weightage shall be given to house test and 30% to class test(One best out of two).
  - ii. 20% marks shall be given to home assignments, class assignments, seminars etc.
  - iii. 20% marks shall be given for attendance/punctuality in the subject concerned.
- The distribution of marks for Internal/External Assessment in practical subjects shall be made as per the following guidelines:
  - i. 60% marks shall be awarded for performance in practical.
  - ii. 20% marks shall be given for Report/Practical book and punctuality in equal proportion.
  - iii. 20% marks shall be for Viva-voce conducted during the practicals.
- The distribution of mark for internal assessment in drawing subjects shall be as per following guidelines:-
  - i. 60% marks for sheets ii. 40% for test.

## STUDY AND EVALUATION SCHEME

### Third Semester

S. No.	Subject	Load Hrs/Week		Marks Distribution								
				Internal Assessment			External Assessment					TOTAL
		Th	Pr	Th	Pr	Total	Th	Hrs.	Pr	Hrs	Total	
3.1	*Digital Electronics	4	2	30	20	50	100	3	50	3	150	200
3.2	Internet and Web Technologies	4	4	30	20	50	100	3	50	3	150	200
3.3	*Data Communication and Networks	3	2	30	20	50	100	3	50	3	150	200
3.4	*Programming through 'C' Language	4	4	30	20	50	100	3	50	3	150	200
3.5	*Operating Systems	4	4	30	20	50	100	3	50	3	150	200
Student Centred Activities		-	3	-	25	25	-	-	-	-	3	25
Total		19	19	150	125	275	500	-	250	-	750	1025
* The subject is common with diploma in Computer Engineering.												

## Fourth Semester

S.No.	Subject	Load Hrs/Week		Marks Distribution								
				Internal Assessment			External Assessment					TOTAL
		Th	Pr	Th	Pr	Total	Th	Hrs.	Pr	Hrs.	Total	
4.1	Computer Architecture and Organization	4	2	30	20	50	100	3	50	3	150	200
4.2	* Programming in VB.Net	4	4	30	20	50	100	3	50	3	150	200
4.3	* Computer Networks	4	2	30	20	50	100	3	50	3	150	200
4.4	* Data Structures Using 'C'	4	4	30	20	50	100	3	50	3	150	200
4.5	* Relational Database Management System	4	4	30	20	50	100	3	50	3	150	200
Student Centred Activities		-	2	-	25	25	-	-	-	-	-	25
Total		20	18	150	125	275	500	-	250	-	750	1025
* The subject is common with diploma in Computer Engineering.												

## 3.1 DIGITAL ELECTRONICS

L T P  
4 - 2

### Rationale:-

*To study different logic families. To introduce different logic gates, their Boolean algebra and combinational logic design using those gates. To learn how to design sequential logic using flip flop. After this course the student will be able to design simple logic circuits, assemble logic circuits, test the logic circuits, observe outputs of logic circuits and troubleshoot digital circuits*

### Pre-Requisite -

1. Basic Electronics Engineering

### DETAILED CONTENTS

- 1. Introduction To Digital Techniques** **10 hrs**  
Digital circuit., Digital signal, Use of digital circuit and digital signal, Advantages and Disadvantages of Digital circuits, Number System - Introduction to Binary, Octal, Decimal, Hexadecimal number system. Conversion of number systems, 1's complement and 2's complement, Binary arithmetic (addition, subtraction). BCD code, BCD arithmetic (addition, subtraction).  
Introduction to A/D and D/A Converters.
- 2. Logic Gates And Boolean Algebra** **09 hrs**  
Logical symbol, logical expression and truth table of AND, OR, NOT, NAND, NOR, EX- OR and EX-NOR gates, Universal gates – NAND and NOR gate, Logical circuits of basic gates using universal gates, Basic laws of Boolean algebra, Duality theorem, De Morgan's theorems.
- 3. Combinational Logic Design / Circuits** **16 hrs**  
Simplification of Boolean expression using Boolean algebra. Construction of logical circuits forms Boolean expressions. Boolean expressions using Sum of products and product of sums forms. K-map representation of logical functions. Minimization of logical expressions using K-map ( 2, 3, 4 variables). Standardization of SOP & POS equations. Concept of Adders / Subtractors. Truth table, K-map, Simplified logical expression and logical circuit using basic gates and universal gates of:
  - (a) Half adder and full adder.
  - (b) Half subtractor and full subtractor.Block diagram, Truth table, Logical expression and logic diagram of Multiplexers (4:1 and 8:1), Multiplexer IC. Block diagram and Truth table of Demultiplexer (1:4; 1:8; 1:16), Demultiplexer IC. Block diagram, Truth table, working principle of Encoders & Decoders
- 4. Flip Flops And Sequential Logic Design** **24 hrs**  
One-bit memory cell, clock signal, Symbol and Logic diagram using NAND gates, working and truth table of R S flip- flop. Symbol and Logic diagram using NAND gates, working, truth table and timing diagram of Clocked R S flip flop. Triggering: edge triggering and level triggering, Symbol and Logic diagram using NAND gates, working, truth table and timing diagram of J-K flip flop. Block diagram and truth table of Master slave J-K flip flop. Symbol, working and truth table of D- flip flop and T-flip flop. Applications of flip flops, Concept, Modulus, Working, truth table, timing diagram of a counter. Asynchronous counter (3 bit, 4



bit); Design of mod N-counter: working, truth table and timing diagram, 3-bit Synchronous counter: working, truth table and timing diagram, Block diagram, Working, Truth Table and waveforms of Shift register: SISO, SIPO, PISO, PIPO (4-bit) and Universal Shift register (4-bit). Applications of Counters and Registers.

**5. Memories**

**05 hrs**

Classification of memories RAM, ROM, PROM, EPROM, E2PROM. Circuit diagram and working of Static and dynamic RAM

**Practical:**

Skills to be developed:

Intellectual Skills:

1. Interpret the results
2. Verify the tables

**List of Practical:**

- 1) Study of Digital IC datasheets and noting down the characteristics for TTL & CMOS logic families.
- 2) Verification of truth table of logic gates.
- 3) Verification of DeMorgan's theorem.
- 4) Construction of Half adder and Full adder.
- 5) Implementation of Combinational Circuit using Multiplexer.
- 6) Construction of 7-segment decoder driver.
- 7) Verification of truth table of Flip flops.
- 8) Universal Shift Register
- 9) Decade counter using IC 7490.
- 10) Design of 3-bit Synchronous counter.

**Text Books:**

Name of Authors	Titles of the Book Edition	Name of the Publisher
<i>R.P. Jain</i>	<i>Modern Digital Electronics</i>	<i>Tata McGraw Hill</i>
<i>Malvino Leach</i>	<i>Digital Principles</i>	<i>Tata McGraw Hill</i>
<i>Tokheim</i>	<i>Digital Electronics</i>	<i>Tata McGraw Hill</i>

**Reference books :**

Name of Authors	Titles of the Book Edition	Name of the Publisher
<i>S.P. Bali</i>	<i>2000 solved problems in Electronics Sigma series</i>	<i>Tata McGraw Hill Digital</i>

**SUGGESTED DISTRIBUTION OF MARKS**

Topic No	Time Alloted	Marks Alloted
1	10	15
2	9	15
3	16	25
4	24	35
5	5	10

## 3.2 Internet and Web Technologies

L T P  
4 - 4

### Rationale

*Information is of little use if it is not communicated to a right person at a right time. At first sight it appears to be a ridiculous idea that there can be a medium for communication where everyone is connected. But, Internet came into being and took the world by storm. Internet is the global data communication super highway with ever-increasing penetration. Internet has redefined the way in which we used to communicate. Every day, Internet is expanding and finding new application areas. It is a need of the hour that everyone should learn to live in this new form of society. This subject gives a basic walk-through the evolution, technology, and primitive application areas of the Internet.*

### Detailed Contents

#### 1. Introduction (08 Hours)

Computer Network, LAN, WAN, MAN, Intranet, Internet, Brief history of Internet, Network Protocols

#### 2. TCP/IP (08 Hours)

TCP/IP Protocol stack, IP address – Host Address, Network Address and Subnet Mask, CIDR Notation, Ports, Well-known Ports, Domain Name System (DNS)

#### 3. Internet Connectivity Options (06 Hours)

Broadband, Dial-up, WiMax, Leased Line, Mobile 3G, ISDN

#### 4. Services on Internet (10 Hours)

File Transfer Protocol, Remote Login: TELNET and SSH, Electronic Mail: POP and IMAP, WWW, Multimedia Delivery

#### 5. World Wide Web (06 Hours)

Web Server, Web Browsers (Netscape Navigator, Mozilla Firefox, Internet Explorer, Opera), URL, URI, Hyperlink, HTTP

#### 6. Web Sites Classification (06 Hours)

Static Websites, Dynamic Websites, Web Portals, Search Engines, Social Networking Sites, Web Mail, Online Shopping, RSS Feeds, Blogs, Familiarity with Netiquette

#### 7. Hyper Text Markup Language (14 Hours)

Structure of an HTML Document, HTML Tags: <html>, <head>, <title>, <body>, <table>, <thead>, <th>, <tr>, <td>, <center>, <hr>, <ol>, <ul>, <li>, <div>, <span>, <img>, <a>, <h1>..<h6>, <link>, <p>, HTML Comments

#### 8. Cascading Style Sheets (CSS) (06 Hours)

Inline Styles, Embedded and External Style Sheets, CSS Block Model, Selectors, Setting Position, Color, Alignment, Padding, Margins, Cascading Rules

## Practical List

Students must prepare a neat and clean practical copy covering at least the practical work mentioned below:

- 1) Using FTP Client on Windows/ Linux: open, get, put, quit, dir
- 2) Using TELNET Client on Windows/ Linux
- 3) Creating an email account (gmail/ hotmail/ yahoo/ rediff etc.)
- 4) Using email: compose new mail, attach files, send to multiple recipients, forward
- 5) Using Search Engines (GOOGLE, BING)
- 6) Create 5-10 web pages covering all the tags mentioned in Section-7 and linking them together
- 7) Using CSS for positioning, setting background/ text colors of HTML elements, setting background images, setting padding, borders, margins

## Books/ References

1. W3C.org Website
2. "Internet and Web Technologies," By Raj Kamal, Tata McGraw-Hill Education
3. "Internet & World Wide Web How to Program," Paul J. Deitel, Harvey M. Deitel, Abbey Deitel: Prentice Hall

Required Machinery, Equipment, Software, Material, and Other Resources:

1. Desktop Computers running on Windows/ Linux OS. No more than two students should be allowed to share one computer at a time. A dual-boot machine with both Windows and Linux OS should be preferred.
2. Internet Connectivity must be available on each computer preferably through Local Area Network.
3. A Server Computer running on Windows Server/ Linux for conducting the experiments requiring client/ server setup.

## SUGGESTED DISTRIBUTION OF MARKS

<b>Topic #</b>	<b>Time Allotted</b>	<b>Marks Allotted</b>
<b>1</b>	<b>08</b>	<b>15</b>
<b>2</b>	<b>08</b>	<b>10</b>
<b>3</b>	<b>06</b>	<b>10</b>
<b>4</b>	<b>10</b>	<b>15</b>
<b>5</b>	<b>06</b>	<b>10</b>
<b>6</b>	<b>06</b>	<b>10</b>
<b>7</b>	<b>14</b>	<b>20</b>
<b>8</b>	<b>06</b>	<b>10</b>

## 3.3 DATA COMMUNICATION AND NETWORKS

L	T	P
3	-	2

### Rationale

*Effective communication is vital for healthy society. Information is of little use if it is not communicated to a right person at right time. Convergence of computing and communication technologies has changed the way we used to communicate. Internet is one of the testimonies of the success of this convergence. This course is designed to enable students to develop the basic understanding of data communication. The students will get conversant with the basic terminology, concepts, principles, protocols and practices related to data communication.*

### Detailed Contents

#### 1. Communication Basics (06 Hours)

Data Communication, Communication Model – Components, Data Representation, Data Flow – Simplex, Half-Duplex and Full-Duplex, Communication Modes – Serial and Parallel Transmission, Synchronous and Asynchronous Transmission, Network Topologies, Protocols and Standards, Introduction to ISO/OSI Model for Computer Networks

#### 2. Data Transmission (10 Hours)

Analog and Digital Data, Analog and Digital Signals, Periodic Analog Signals – Period, Frequency, Phase and Wavelength, Composite Signals, Digital Signals – Bit Rate, Bit Length, Digital Transmission – Baseband and Broadband, Transmission impairments, Data Rate Limits – Nyquist and Shannon Capacities, Performance Metrics – Bandwidth, Throughput, Latency and Jitter, Transmission Media (Principles, Characteristics, Performance and Applications) – Guided (Twisted Pair, Coaxial cable, Optical Fiber) and Unguided (Radio wave, Microwave, Infrared wave, Light wave)

#### 3. Communication Signaling (08 Hours)

Modulation, Need for modulation, Analog to Analog Modulation (AM, FM, PM), Digital to Analog (ASK, FSK, PSK), Analog to Digital (PCM), Digital to Digital (Line coding, Block coding)

#### 4. Error Detection and Correction Techniques (08 Hours)

Error, Types of Errors, Error Rate, Error Detection and Correction Techniques – Block Coding (Parity Check, Hamming Codes), Cyclic Codes (CRC), Checksum

#### 5. Data Link Control (08 Hours)

Framing, Flow Control, Stop and wait protocols, Sliding window protocol

#### 6. Bandwidth Management (08 Hours)

Multiplexing and Spreading, Type of Multiplexing (TDM, FDM, WDM), Spread Spectrum – FHSS, DSSS, Switching Techniques – Circuit Switching and Packet Switching

## Practical List

- 1) To study Amplitude/ Frequency modulation and demodulation (AM, FM)
- 2) To study Amplitude/ Frequency/ Phase Shift Keying (ASK, FSK, PSK)
- 3) To study Pulse Code Modulation (PCM)
- 4) To get familiar with different network cables (UTP, Thin Ethernet, Thick Ethernet, OFC)
- 5) To get familiar with different network connectors (RJ-45, RJ-11, BNC)
- 6) To prepare UTP patch cord (using standard 568A and 568B)
- 7) To study multiplexed signals

## Books/ References

1. "Data and Computer Communication," By William Stallings, PHI
2. "Computer Communication and Networking," By John Freer
3. "Data Communications and Networking," By B.A. Forouzan, Tata McGraw Hill

## SUGGESTED DISTRIBUTION OF MARKS

<b>Topic #</b>	<b>Time Allotted</b>	<b>Marks Allotted</b>
<b>1</b>	<b>06</b>	<b>14</b>
<b>2</b>	<b>10</b>	<b>22</b>
<b>3</b>	<b>08</b>	<b>16</b>
<b>4</b>	<b>08</b>	<b>16</b>
<b>5</b>	<b>08</b>	<b>16</b>
<b>6</b>	<b>08</b>	<b>16</b>



## 7. Functions

8 hrs.

Definition, Prototype of a function: Formal parameter list, Return Type, Function call, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments.

## 8. Structures and Unions

6 hrs.

Structure variables, initialization, structure assignment, arrays of structures, unions.

## 9. Pointers

8hrs.

Address and dereferencing operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, dynamic memory allocation( malloc , calloc , free).

### Practical List

Students must prepare a neat and clean practical copy covering at least the programming exercises mentioned below:

Writing, Compiling and Executing a Simple Program:

1. To print a message like "Hello World" on computer screen

#### **Using variables and arithmetic operators:**

2. To perform addition, subtraction, multiplication and division operations on two integers

#### **Using unformatted I/O**

3. To use unformatted character I/O functions (getchar() and putchar())
4. To use unformatted string I/O functions (gets() and puts())

#### **Using Formatted I/O**

5. To use scanf() function to read integers (%d, %i, %o, %u, %x), characters (%c), floating point numbers (%f, %g, %e), strings (%s, scanf)
6. To use printf() function to format and print output (%d, %i, %o, %u, %x, %e, %E, %f, %g, %c, %p, %C, %s, %n)
7. To change width, precision and alignment of the output of printf()

#### **Using Bit-wise operators**

8. To perform and, or, not, exor, left-shift and right-shift operations on integers

#### **Using Conditional Branching**

9. To compute the real roots of a quadratic equation (using if statement to check for the imaginary roots)
10. To check whether a given integer is even or odd (if ... else statement)
11. To write month name corresponding to a month number (switch ... case)

### **Using Iterative Statements**

12. To check whether a given integer is prime
13. To reverse the digits of a given positive integer
14. To generate the multiplication table of a given integer
15. To generate the first n terms of a given AP series
16. To generate first n terms of Fibonacci series
17. To compute factorial of a given integer

### **Using Arrays**

18. To compute sum of elements of a one dimensional integer array
19. To find the largest element in a one dimensional array
20. To search a given element in a one dimensional array
21. To perform matrix addition and matrix multiplication using 2-D arrays

### **Using Strings**

22. To convert the alphabetic characters of a string to uppercase
23. To find the length of a string
24. To use Standard Library String Functions (strcat(), strrev(), strcmp(), strcmp())

### **Using Structures and Unions**

25. To read and print multiple data items (roll\_no, name, branch, semester etc.) pertaining to an individual student
26. Demonstrating the use of union

### **Using Pointers**

27. Demonstrating the use of address and dereferencing operators
28. Performing pointer arithmetic to manipulate an array

### **Using Functions**

29. Writing a function to find sum of two integers
30. Writing a function to swap value of two integers (Call by reference)
31. Writing a function to compute factorial of a given integer (Recursion)



## Books/ References

1. *"The C Programming Language," B.W. Kernighan & D M Ritchie, Pearson Education*
2. *"Programming with C," Byron S Gottfried Second edition, Tata McGraw Hill*
3. *"Let us C," Yashwant Kanetkar, BPB Publications*
4. *"Programming with ANSI-C," E. Balagurusamy, Tata McGraw Hill*
5. *B.W. Kernighan & D M Ritchie, "The C Programming Language, Pearson Education*
6. *Byron S Gottfried "Programming with C" Second edition, Tata McGrawhill,*
7. *Kanetkar Y, "Let us C", BPB Publications, E. Balagurusamy, "Programming with ANSI-C", Tata McGraw Hill.*

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	6	10
2	8	10
3	6	10
4	8	15
5	6	10
6	8	10
7	8	10
8	6	10
9	8	15

## 3.5 Operating System

L	T	P
4	-	4

### Rationale

*An Operating System (OS) turns an otherwise heap of computer hardware to a useful and usable unit. An OS manages all the hardware resources, provides a framework for user applications to run, and has a user interface that makes it convenient for users to interact with the computer system. Today there are a number of operating systems for different-different platforms and usages. Yet, there is a considerable commonality amongst all. This course focuses on these common aspects of various OS. This course will make the students familiar with the concepts, terminology, functions and internal working of an OS.*

### Detailed Contents

- 1. Introduction (4 Hours)**  
Operating System (OS): Objectives, Functions, Evolution, Classification, Booting (Cold and Warm)
- 2. Operating System Structures (6 Hours)**  
OS Services, User Interface (Command-Line Interface, Graphical User Interface), System Calls, Kernel, OS structure (monolithic, layered and microkernel)
- 3. Process Management (10 Hours)**  
Process, Process States, Process Control Block (PCB), Operations on Processes, Inter-process Communication, Process Synchronization – Critical Section Problem, Solutions to Critical Section Problem – Peterson’s Solution, Hardware Solution, Semaphores and Monitors, Deadlocks – Essential Conditions, Prevention and Avoidance – Bankers Algorithm, Threads – User-level and Kernel-level threads, Multithreading Models – Many to One, One to One, Many to Many
- 4. CPU Scheduling (10 Hours)**  
Scheduling – Objectives, performance criteria, CPU and I/O burst cycle, Preemptive Vs. Non preemptive scheduling, CPU Scheduler(Long-term, Short-term), Scheduling Algorithms: First-come-first-served (FCFS), Shortest job first (SJF), Shortest Remaining Time First (SRTF), Round Robin (RR), Priority Scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue
- 5. Memory Management (10 Hours)**  
Contiguous Memory Allocation – MFT, MVT, Buddy System, Fragmentation (Internal, External), Compaction, Memory Hole Allocation Strategies (First-fit, Best-fit, Worst-fit), Non-contiguous Memory Allocation – Paging – Logical and Physical Address Spaces, Page, Frame, Shared Pages, Page Table Structure – Hierarchical, Hashed and Inverted, Segmentation – User View of main memory, Segments.

**6. Virtual Memory (4 Hours)**

Swapping, Demand Paging, Page Replacement Policies – FIFO, Optimal, LRU, LFU and MFU, Thrashing

**7. Storage Management (8 Hours)**

File – Concept, Attributes, Operations, Types, Structure, Access Methods – Sequential and Direct, Allocation Methods – Contiguous, Linked, Indexed, Directory Structure – Single level, Two level and Tree Structure, Free Space management techniques –Bitmap and Linked List, Disk Scheduling

**8. I/O Subsystem (6 Hours)**

I/O instructions based and Memory-mapped I/O systems, Polling, Interrupts, DMA, Buffering, Caching, Spooling

**9. Case Studies (6 Hours)**

Features comparison of Windows Family, UNIX, Linux and Android Operating Systems

**Practical List**

- 1) Installation and configuration of Windows 7/ Windows 8
- 2) Installation and configuration of Linux (Ubuntu/ Redhat)
- 3) Getting familiar with various components of Windows Desktop
- 4) Using general Windows commands – CLS, DIR, MD, CD, RD, DEL, MOVE, COPY, REN, ATTRIB, ECHO, EXIT, TYPE
- 5) Using general Linux commands – man, apropos, clear, ls, mkdir, cd, rmdir, pwd, rm, touch, mv, tr, wc, sort, grep, wall, write, who, chmod, useradd, usermod, userdel, groupadd, groupmod, groupdel, chown, chgrp, kill, ssh, ftp, telnet
- 6) Using Android and IOS devices (preferably on Tablets)

**Books/ References**

1. Operating Systems: Design and Implementation, Andrew S. Tanenbaum, PHI
2. Operating System Concepts Abrahm Silberschaz, Peter Galvin, Addison Wesley
3. Operating System, William Stallings, PHI

**SUGGESTED DISTRIBUTION OF MARKS**

Topic #	Time Allotted	Marks Allotted
1	04	10
2	06	10
3	10	15
4	10	15
5	10	15

Topic #	Time Allotted	Marks Allotted
6	04	05
7	08	10
8	06	10
9	06	10

# 4.1 Computer Architecture and Organization

L	T	P
4	-	2

## Rationale

*The hardware of a computer system determines its capabilities. Software put hardware into work in a particular order to accomplish some useful task. A computer system is the basic requirement in most of the ICT applications. Hence, it is worthwhile to include a subject that gives a comprehensive insight into a computer system with a special focus on hardware part. This course covers the basics of computer system architecture and organization of its various components.*

## Detailed Contents

- 1. Introduction (6 Hours)**  
Evolution of Digital Computers, Computer Generations, Functional units of a computer, The Von-Neumann Model, Interconnection of components, Performance of a computer, Flynn's Taxonomy.
- 2. Data Representation (9 Hours)**  
Integer Representation: Signed Magnitude, Complement Systems, Floating-Point Representation, Floating-Point Arithmetic, IEEE-754 Floating-Point Standard, Character Codes: Binary-Coded Decimal, EBCDIC, ASCII, Unicode
- 3. Basic Computer Organization (6 Hours)**  
CPU, Bus, Clocks, Input/Output Subsystem, Memory Hierarchy, Interrupts, Register Transfer Notation, Fetch-Decode-Execute Cycle
- 4. Instruction Sets (6 Hours)**  
Machine instructions, Operands, Addressing modes, Instruction formats, Instruction sets, Instruction set architectures - CISC and RISC architectures
- 5. Central Processing Unit (10 Hours)**  
Organization of a processor - Registers, ALU and Control unit, Data path in a CPU, Instruction cycle, Control unit - Operations, Hardwired Vs. Microprogrammed control unit.
- 6. Main Memory (06 Hours)**  
Types of Memory: RAM, ROM, Memory Hierarchy, Locality of Reference, Cache Memory, Replacement Policies, Hit Ratio, Virtual Memory, Paging
- 7. Input/ Output and Storage System (12 Hours)**  
Programmed I/O, Interrupt controlled I/O, and DMA controlled I/O, I/O interfaces - Serial port, Parallel port, PCI bus, SCSI bus, USB bus, Firewall and Infiniband, Magnetic Disk Technology: Hard Disk Drives, Floppy Disks, Optical Disks: CD-ROM, DVD, Blue Ray Disk, Magnetic Tapes, RAID

**8. Peripheral Devices (06 Hours)**

Keyboard, Mouse, Printer: Dot-Matrix, Inkjet, LASER, VDU: CRT

**9. Introduction to Pipelining and Superscalar Processors (03 Hours)**

**Practical List**

Students must prepare a neat and clean practical copy covering at least the practical work mentioned below:

- 1) Programs for integer arithmetic using Microprocessor Kits
- 2) Assembly Language Programs on a Computer System using an Assembler

**Books/ References**

1. "Computer Organization and Architecture," By D.A.Godse A.P.Godse: Technical Publications.
2. "Computer Organization and Architecture," By William Stallings: Pearson Education.
3. "Computer Fundamentals: Architecture and Organisation," By B. Ram: New Age International.

**Required Machinery, Equipment, Software, Material, and Other Resources:**

1. Desktop Computers (x86) running on Windows/ Linux OS. No more than two students should be allowed to share one computer at a time.
2. Intel 8085 microprocessor simulator like GNUSim8085
3. 8085 Microprocessor Kits.
4. Assembler (MASM/ TASM/ NASM) for x86 architecture.

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic #</b>	<b>Time Allotted</b>	<b>Marks Allotted</b>
<b>1</b>	<b>06</b>	<b>10</b>
<b>2</b>	<b>09</b>	<b>15</b>
<b>3</b>	<b>06</b>	<b>10</b>
<b>4</b>	<b>06</b>	<b>10</b>
<b>5</b>	<b>10</b>	<b>15</b>
<b>6</b>	<b>06</b>	<b>10</b>
<b>7</b>	<b>12</b>	<b>15</b>
<b>8</b>	<b>06</b>	<b>10</b>
<b>9</b>	<b>03</b>	<b>5</b>



## Practical's

1. Introduction & Installation of VB.NET
2. VB.NET IDE Environment
3. Building Windows Application
4. Displaying Dialog Boxes & Message Boxes
5. Creating Menus
6. Creating Your own Custom Controls
7. Accessing Data Bases Using Microsoft Access
8. Data Accessing Using ADO & OLEDB
9. Data Binding
10. Creating Windows Application Using Date , Timer, Text Boxes, Buttons, Check Boxes, Radio Buttons ,List Boxes, Combo Boxes, Picture Boxes, Check List Boxes, Scrollbars

## Suggested Text Books and References

1. *Visual Basic .NET Black Book*, Steven Holzner, Dreamtech Press
2. *Visual Basic .NET The Complete Reference* Jeffrey R. Shapiro, TM
3. *Beginning VB.NET*, Richard Blair, Jonathan Crossland, Mathew Reynolds, Thearon Willis

## Digital References

- 1 <http://www.w3school.com>
- 2 <http://www.microsoft.com>
- 3 <http://www.technologia.com>
- 4 <http://www.makesofteducation.com>
- 5 [www.iranicdl.ir/files/Vb.NET-Syllabus.pdf](http://www.iranicdl.ir/files/Vb.NET-Syllabus.pdf)
- 6 [http://home.pec.edu/pg\\_syllabus/mca.pdf](http://home.pec.edu/pg_syllabus/mca.pdf)

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	4	6
2	4	8
3	8	12
4	5	10
5	7	10
6	12	18
7	12	18
8	12	18

## 4.3 Computer Networks

L T P  
4 - 4

### RATIONALE

*The Course provides the student with the basic of Computer Network. Awareness of various protocols and routing algorithms. Knowledge of various devices used in networking. Network Security & Its issues.*

### DETAILED CONTENTS

- 1. Networks Basics (12 Hrs)**  
What is Network, Uses of Computer Networks, Networking Models (Client Server, peer to peer, Distributed processing), Network Topologies, Types of network (PAN, LAN, MAN, WAN), Network Terminologies (Broadcast, Multicast, Unicast, Layer, Protocols, Interface), Design issues for Layer, Network Services, Services primitives, Wireless Networks – WiFi, WiMax, Features of Wireless Networks.
- 2. Reference Models (08Hrs)**  
OSI Reference Model, Functions of layers in OSI Reference Model, TCP/IP reference Model, TCP/IP Network Model.
- 3. Internetworking Basics (10 Hrs)**  
Internet, Intranet, Communication over internet, IP Addressing, Classes of IP Addressing, sub-netting, super-netting, IPv4 header format, CDIR, NAT, Mobile IP, IPv6, Need for IPv6, IPv6 header format.
- 4. Network Channel Allocation (10 Hrs)**  
Static Channel allocation in LANs and MANs, Dynamic Channel allocation in LANs and MANs, Multiple Access protocols (ALOHA - Pure ALOHA & Slotted ALOHA, CSMA, CSMA/CD, Collision Free protocols), Ethernet Cabling, Fast Ethernet, Gigabit Ethernet.
- 5. Routing. (08 Hrs)**  
Adaptive & Non adaptive routing, Optimality principle, shortest path routing, flooding,
- 6. Network Connectivity (08 Hrs)**  
Network Connectivity Devices, NIC, Repeater, Hub, Switch, Router, Bridge, Gateway, VOIP, Wireless NIC, Access Point, Modem, Print Server, Bluetooth.



## 7. Network Security

(08 Hrs)

Security Issues, Cryptography, Encryption Model, Encryption Methods, IPSec, Firewall, VPN, WEP.

### Practical Work

1. Practicing of UTP cable for networking.
2. Preparing straight and cross over cable and their testing.
3. Recognizing the physical topology of a network.
4. Identify the IP address of a workstation and the class of the address and configure the IP address on a workstation.
5. Establishing a LAN and its testing.
6. Installation and configuring wireless NIC and access point.
7. Establishing and testing of WiFi and Adhoc Network.
8. Setting up security component for wire and wireless networks.

### RECOMMENDED BOOKS

1. *Computer Network by Andrew S. Tanenbaum (PHI)*
2. *Computer Communication and Networking by John Freer*
3. *Data Communications and Networking by Foronzan, Tata McGraw Hill, NewDelhi.*

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	12	20
2	08	12
3	10	16
4	10	16
5	08	12
6	08	12
7	08	12
<b>Total</b>	<b>64</b>	<b>100</b>

## 4.4 DATA STRUCTURES USING 'C'

L T P

4 - 4

### RATIONALE

*Data structures are the techniques of designing the basic algorithms for real-life projects. Understanding of data structures is essential and this facilitates the understanding of the language. The practice and assimilation of data structure techniques is essential for programming. The knowledge of 'C' language and data structures will be reinforced by practical exercises during the course of study. The course will help students to develop the capability of selecting a particular data structure.*

### DETAILED CONTENTS

- 1. Introduction (08 hrs)**  
Algorithms, Flowcharts, Data Types, Data Structures – Linear and Non-Linear Data Structures, Pointers, Dynamic Memory Allocation (malloc(), calloc() and free())
- 2. Arrays (10 hrs)**  
Representation in Memory, Operations on Arrays – Searching, Insertion, Deletion and Sorting, Two-Dimensional Arrays – Representation in Memory (Row-Major and Column-Major Order)
- 3. Linked Lists (12 hrs)**  
Introduction to linked list and double linked list, Representation of linked lists in Memory, Traversing a linked list, Searching linked list, Insertion and deletion into linked list, Application of linked lists, Doubly linked lists, Traversing a doubly linked lists, Insertion and deletion into doubly linked lists
- 4. Stacks, Queues and Recursion (12 hrs)**  
Introduction to stacks, Representation of stacks, Implementation of stacks (using arrays, using linklist), different operations on stacks, Introduction to queues, deferent operations on queues, circular queue, , Implementation of queues (with algorithm), Circular Queues, De-queues, Recursion
- 5. Trees (08 hrs)**  
Concept of Trees, Concept of representation of Binary Tree, Binary Search Trees, Traversing Binary Trees (Pre order, Post order and In order), Searching, inserting and deleting binary search trees
- 6. Sorting and Searching (14 hrs)**  
Introduction, Search algorithm (Linear and Binary), Concept of sorting, Sorting algorithms (Bubble Sort, Quick Sort, Selection Sort) and their comparisons.

## Practical List

Students must prepare a neat and clean practical copy covering at least the practical work with algorithms, flowcharts, C implementation and output for exercises mentioned below:

- 1) Inserting and deleting elements in an array
- 2) To implement a linked list and demonstrate insertion, deletion and traversing operations on it
- 3) To implement a doubly linked list and demonstrate insertion, deletion and traversing operations on it
- 4) To implement a stack and demonstrate push, pop and peek operations on it
- 5) To display the reverse of a string using a stack (push all characters until '\0', pop and display elements until stack is empty)
- 6) To implement a queue and demonstrate various operations on it
- 7) To implement a circular-queue and demonstrate various operations on it
- 8) To implement a dequeue and demonstrate various operations on it
- 9) To implement a tree and perform In-order, Pre-Order and Post-order traversals
- 10) To implement a binary search tree and perform insertion, deletion and search operations on it
- 11) To search an element in an array using linear search
- 12) To search an element in a sorted array using binary search
- 13) To sort elements of a given array in ascending order using selection sort technique
- 14) To sort elements of a given array in ascending order using bubble sort technique
- 15) To sort elements of a given array in ascending order using quick sort technique
- 16) To sort elements of a given array in ascending order using merge sort technique

### INSTRUCTIONAL STRATEGY

This subject clears all fundamentals of programming techniques. Teachers should stress on explaining all the techniques and algorithm in detail in theory sessions. The students should be asked to convert their ideas about a problem into algorithms in theory class and then write programs for the algorithms. Finally all the programmes should be run on computers. This will help the students to have clear concepts of programming.

## RECOMMENDED BOOKS

- 1) *Data Structures and Algorithm Using C* by RS Salaria, Khanna Book Publishing Co. (P) Ltd. New Delhi
- 2) *Expert data structures with C* by R.B. Patel – Khanna Publishers, New Delhi.
- 3) *Data structures – Schaum’s Outline Series – McGraw Hill*
- 4) *Data structures – O.G. Kakde and U.A. Deshpande*
- 5) *Data Structures by Kruse*
- 6) *Data Structures by Sanjiv Sofat, Khanna Publishers, New Delhi*
- 7) *Data Structures by Horwitz and Sartaj Sahni*
- 8) *Data Structures by Tanenbaum, Prentice Hall of India, New Delhi*
- 9) *Pascal and Data Structure by Dale and Lily*
- 10) *Data Structure by Schaum’s Series, McGraw Hills Publications*
- 11) *Data Structure using Pascal by Tenenbaum, Prentice Hall of India*
- 12) *Data Structure using C by Robert Kruse, Prentice Hall of India*
- 13) *Data Structure through C by Yashwant Kanekar, BPB Publications*
- 14) *Data Structure through C in depth by SK Srivastava, Deepali Srivastava, BPB Publications*
- 15) *Introduction to Data Structure and Algorithm with C++ by Glenn W. Rowe, Prentice Hall of India*
- 16) *Data Structure through “C” Language by Sameeran Chattopadhyay, Matangini Chottopadhyay, BPB Publications*

## SUGGESTED DISTRIBUTION OF MARKS

Topic #	Time Allotted	Marks Allotted
1	08	8
2	10	12
3	12	20
4	12	20
5	10	15
6	12	25
Total	64	100

## 4.5 Relational Database Management System

L P  
3 4

### RATIONALE:

*Database and database systems have become an essential component of everyday life in modern society. This course will acquaint the students with the knowledge of fundamental concepts of DBMS and its application in different areas, storage, manipulation and retrieval of data using query languages.*

### DETAILED CONTENTS

#### THEORY

1. **Introduction (03 hrs)**  
Database Systems, Database and its purpose, Characteristics of the database approach, Advantages and disadvantages of database systems, Classification of DBMS Users, Actors on the scene, Database Administrators, Database Designers, System Analysts.
2. **Database System Concepts and Architecture (05 hrs)**  
Schemes and Subschemes, Instances, keys, Redundancy, DBMS Architecture, The External level, The conceptual level, The internal level, Mappings.  
Data Independence, Logical data Independence, Physical data Independence.  
Database Languages and Interfaces, DBMS Language, DBMS Interfaces.
3. **Data Modelling using E.R. Model (Entity Relationship Model) (04 hrs)**  
Data Models Classification : Object and Record based model, semantic data models. Entities and Attributes. Entity types and Entity sets. Key attribute and domain of attributes. Association and Relationship among entities
4. **Relational Model (06 hrs)**  
Relational Model Concepts: Domain, Attributes, Tuples and Relations.  
Relational constraints and relational database schemes, Domain constraints, Key constraints and constraints on Null, Relational databases and relational database schemes, Entity integrity, referential integrity and foreign key.
5. **Dependencies and Normalization (08 hrs)**  
Functional Dependencies, Trivial and Non-trivial dependencies Closure of a set of dependencies and attributes  
Normalization  
Non-loss decomposition, First, Second and Third normal forms, Boyce/Codd normal form.
6. **Structure Query Language(SQL) and PL/SQL (12 hrs)**  
Data Definition Language(DDL), Data Manipulation Language(DML), Create, Drop, Alter, Insertion commands, Select command with WHERE clause using conditional and Boolean operator, group by Clause Like operator, Grouping Data joins, sub queries union, Intersect, Minus Clause.

Sorting and updating the Data. PL/SQL Introduction, PL/SQL block structure variables, SQL statements in PL/SQL, PL/SQL Control Structures.

- 7. Query Processing and Transaction Processing (10 hrs.)**  
General strategies for query processing, Equivalence expressions, Selection & join operation. Concept of transaction, States of transactions, Concurrent Executions, Serializability Recoverability, Transaction Definition in SQL. Lock based protocols : share & exclusive models, Protocols. Deadlock handling, Deadlock prevention, detection & recovery.

### Practicals

- 1) Creating & Executing DDL in SQL.
- 2) Creating & Executing Integrity constraints in SQL.
- 3) Creating & Executing DML in SQL.
- 4) Executing relational, logical and mathematical set operators using SQL.
- 5) Executing group functions
- 6) Executing string operators & string functions.
- 7) Executing Date & Time functions.
- 8) Executing Data Conversion functions.
- 9) Executing DCL in SQL.
- 10) Executing Sequences and synonyms in SQL.
- 11) Execute 50 SQL queries (operators, functions, clauses, join concepts)
- 12) Program for declaring and using variables and constant using PL/SQL.
- 13) Program using if then else in PL/SQL
- 14) Program using for loop & while loop in PL/SQL.
- 15) Program using nested loop in PI/SQL.

### INSTRUCTIONAL STRATEGIES

*Explanation of concepts using real time examples, diagrams etc is required. For practical sessions books along with CDs or learning materials with specified activities are recommended to be used. Various exercises and small applications should be given along with theoretical explanation of concepts.*

### RECOMMENDED BOOKS

- 1) *An introduction to database systems by Date C.J. Adison Wesley*
- 2) *An Introduction to database systems by Bipin C. Desai, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi 110 002*
- 3) *Database Management system by Korth*
- 4) *Fundamentals of Database Management Systems by Dr Renu Vig and Ekta Walia, - an ISTE, Publication, New Delhi*
- 5) *Database Management Systems by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., New Delhi*
- 6) *Fundamentals of Database Systems by Elmasri/Navathe/Adison Wesley*
- 7) *SQL Unleashed by Hans Ladanyi Techmedia Publications, New Delhi*
- 8) *Oracle 8, The complete reference by Koch and Loney, Tata McGraw Hill Publications New Delhi*

### Digital References

- 1 [http://www.niit.edu.pk/~kamran/lectures/rdbms\\_oracle/SQL/lecture\\_1.pdf](http://www.niit.edu.pk/~kamran/lectures/rdbms_oracle/SQL/lecture_1.pdf)
- 2 [http://en.wikipedia.org/wiki/Relational\\_database\\_management\\_system](http://en.wikipedia.org/wiki/Relational_database_management_system)

### SUGGESTED DISTRIBUTION OF MARKS

<b>Sr No</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	Introduction	03	05
2	Database System Concepts and Architecture	05	10
3	Data Modeling using E.R. Model (Entity Relationship Model)	04	10
4	Relational Model:	06	15
5	Dependencies and Normalisation	08	20
6	Structure Query Language(SQL) and PL/SQL	12	20
7	Query Processing and Transaction Processing	10	20
<b>Total</b>		<b>48</b>	<b>100</b>