

CURRICULUM
for
DIPLOMA PROGRAMME
in
COMPUTER ENGINEERING
2nd Year (3rd & 4th Semester)
FOR THE STATE OF HIMACHAL PRADESH



Prepared by:-

**National Institute of Technical Teachers Training & Research
Sector-26, Chandigarh-160019, India.**

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General Guidelines for Curriculum Implementation

1. Weightage for the internal assessment in respect of theory subjects will be as follow:
 - House Test: 40 %
 - Class Test: 20%
 - Home Assignment: 20%
 - Attendance: 20%
 2. There will be two class tests in every semester and the average of the two tests will be taken into account.
 3. The syllabus for the class tests will be as under:
 - Class Test-I: 30 % of syllabus
 - Class Test-II: next 30 % of syllabus
 4. Class Test-I should be conducted in first week of March/September.
 5. Class Test-II should be conducted in the second week of April/October.
 6. The 30%, 60% and 80% contents of the syllabus will be based on the number of hours allocated for the topics in the detailed curriculum of each subject.
 7. The question paper for both the class tests will be of 30 marks each and of one-hour duration.
 8. Improvement test can be conducted after every class test on the basis of some genuine reason to be judged by the Head of concerned Department.
 9. There will be one house test in the First week of May/November and syllabus converge will be 80%.
 10. The house test will be of total 60 marks and the duration of House Test should be two hours.
 11. There will be minimum two home assignments per subject per semester.
 12. Weightage for the internal assessment in respect of Practical subjects should be: Practical Performance: 60% and Viva Voce : 40%
 13. Weightage for Internal Assessment in respect of Drawing subjects will be as under:
 - i. House Test and Class Test = 40%
 - ii a) Class performance/Drawing Sheets=40%
 - ii b) Attendance/punctuality = 10%
 - ii c) Viva = 10%
- For iia), iib), iic) marks should be given in each drawing sheet by concerned teacher during evaluation.
14. It is suggested that students may be taken for industrial visits for industrial exposure in second year and third year.
 15. **Student Centered Activities:** A provision has been made for organizing Student Centered Activities for overall personality development of students. SCA will comprise co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, cultural activities and participation in programs like technical and cultural events etc.

Distribution of marks for SCA will be as follows:

- i. 20% marks shall be given for general behaviour
- ii. 20% marks for attendance shall be based on the following distribution:

Attendance	Marks
Less than 65%	Nil
More than 65%	Proportionate

- iii. 60% 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 40% marks
 2. For participation in sports/NCC/Cultural/Co-curricular activities at Inter-polytechnic level, shall be rewarded with minimum of 30% marks
 3. For participation in two or more of the listed activities, 20% extra marks should be rewarded

Note: These marks are to be sent to the H.P. Takniki Shiksha Board, Dharamsala at the end of semester along with internal assessment.

STUDY AND EVALUATION SCHEME
THIRD SEMESTER COMPUTER ENGINEERING

Sr. No.	Name of the Subject	Th	Pr	Internal Assessment			External Assessment					Total Marks
				Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
3.1	Digital Systems and Applications	4	2	30	20	50	100	3	50	3	150	200
3.2	*Internet Technologies	3	4	30	20	50	100	3	50	3	150	200
3.3	*Operating Systems	4	4	30	20	50	100	3	50	3	150	200
3.4	Advanced Programming in C Language	4	6	30	20	50	100	3	50	3	150	200
3.5	*Data Communication & Computer Networks	4	2	30	20	50	100	3	50	3	150	200
	#Student Centered Activities	-	3	-	25	25	-	-	-	-	-	25
		19	21	150	125	275	500	-	250	-	750	1025

*Common with Diploma in Information Technology

STUDY AND EVALUATION SCHEME
FOURTH SEMESTER COMPUTER ENGINEERING

Sr. No.	Name of the Subject	Th	Pr	Internal Assessment			External Assessment					Total Marks
				Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
4.1	*Web Programming	4	4	30	20	50	100	3	50	3	150	200
4.2	*Relational Database Management System	4	4	30	20	50	100	3	50	3	150	200
4.3	Data Structures using C	4	6	30	20	50	100	3	50	3	150	200
4.4	Computer Organization and Architecture	4	2	30	20	50	100	3	50	3	150	200
4.5	*Software Engineering	4	-	50	-	50	100	3	-	-	100	150
	#Student Centred Activities	-	4	-	25	25	-	-	-	-	-	25
		20	20	170	105	275	500	-	200	-	700	975

* Common with Diploma in Information Technology

Industrial Training - After examination of 4th Semester, the students shall go for training in a relevant industry/field organisation for a minimum period of 4 weeks and shall prepare a diary. The students shall also prepare a report at the end of training and shall present it in a seminar, which will be evaluated during 5th semester.

Rationale

Digital systems are designed to collect, store, process, and communicate information in digital format. The modern digital computers are typical examples of the power of digital systems. The wide application areas of digital systems include Information and Communication Technology (ICT), electronic gadgets, smart appliances, industrial processes control etc. Modern computer systems and communication technology is largely based on binary logic, hence it is important for the students of computer engineering to appreciate the inherent power of digital systems. After studying this course, the students will be able to realize the inherent power of digital systems.

DETAILED CONTENTS

Unit-1: Introduction to Digital Systems 04 Hrs 08 Marks

Analog Systems: Analog Signal and Graphical Representation of Analog Signals, Analog Systems, Examples of Analog Systems, Disadvantage of Analog Systems. Digital Systems: Digital Signal and Graphical Representation of Digital Signals, Digital Systems, Examples of the Digital System, Advantage and Limitation of Digital Systems. Comparison of Analog and Digital Systems. Introduction to Analog to Digital Convertor and Digital to Analog Convertor.

Unit-2 : Digital Number System and their Conversion 12 Hrs 12 Marks

Binary Number System: Characteristics, Binary to Decimal Conversion, Decimal to Binary Conversion. Signed Binary Numbers: Sign Magnitude Representation, One's Complement Representation and Two's Complement Representation. Introduction to Octal Number System: Characteristics, Octal to Decimal Conversion, Decimal to Octal Conversion, Octal to Binary Conversion, Binary to Octal Conversion. Hexadecimal Number System: Characteristics, Hexadecimal to Decimal Conversion, Decimal to Hexadecimal Conversion, Hexadecimal to Binary Conversion, Binary to Hexadecimal Conversion.

Unit-3 : Binary Arithmetic 06 Hrs 14 Marks

Binary Arithmetic: Binary Addition, Binary Subtraction, Binary Multiplication, Binary Division, Addition and Subtraction using Two's Complement Representation. Octal Arithmetic: Octal Addition and Octal Subtraction. Hexadecimal Arithmetic: Hexadecimal Addition and Hexadecimal Subtraction.

Unit-4 : Boolean Algebra and Logic Gates 06 Hrs 14 Marks

Boolean Algebra: Axioms of Boolean Algebra, Boolean Laws: Commutative law, Associative law, Distributive law, AND law, OR law and INVERSION law. DeMorgan's Theorems. Logic Gates: AND Operation, OR Operation, NOT Operation, NAND Operation, NOR Operation, Ex-OR Operation, Universality of NAND and NOR Gates.

Unit-5 Simplification of Boolean Functions 06 Hrs 14 Marks

Boolean Function: Definition, Truth Table Formation, Standard and Karnaugh-map Representation for Boolean Functions. Simplification of a Boolean Function: Simplification of a Boolean Function using Karnaugh-map (Up to three Variables), Minimization of Boolean Function specified in Minterm, Maxterm and Truth Table.

Unit-6 : Combinational Circuits.....**10 Hrs****18 Marks**

Half Adder Circuit: Definition, Block diagram, Truth Table and Circuit Diagram. Full Adder Circuit: Definition, Block diagram, Truth Table and Circuit Diagram. Half Subtractor Circuit: Definition, Block diagram, Truth Table and Circuit Diagram. Full Subtractor Circuit: Definition, Block diagram, Truth Table and Circuit Diagram. Multiplexers Circuit: Definition, Block diagram, Truth Table, 2 : 1 Multiplexer, 4 : 1 Multiplexer and 16 : 1 Multiplexer. Demultiplexers Circuit: Definition, Block diagram, Truth Table, 2 : 1 Demultiplexer, 4 : 1 Demultiplexer and 16 : 1 Demultiplexer. Encoder Circuit: Definition, Block diagram, Truth Table and Circuit Diagram, Priority Encoder. Decoder Circuit: Definition, Block diagram, Truth Table and Circuit Diagram, 2 to 4 Line Decoder.

Unit-7 : Flip Flops.....**06 Hrs****10 Marks**

S-R Flip Flop: Definition, Block Diagram, Circuit Diagram, Truth Table and Operation. Master Slave JK Flip Flop: Definition, Block Diagram, Circuit Diagram, Truth Table and Operation. Delay (D) Flip Flop: Definition, Block Diagram, Circuit Diagram, Truth Table and Operation. Toggle (T) Flip Flop: Definition, Block Diagram, Circuit Diagram, Truth Table and Operation.

Unit-8 : Semiconductor Memory Devices**06 Hrs****10 Marks**

Random Access memory (RAM): Characteristics and Types (SRAM and DRAM), Read Only memory (ROM): Characteristics and Types (PROM, EPROM and EEPROM). Flash Memory: Characteristics and Types (Server-Flash Memory, All-Flash Array, Traditional Flash Storage and Hybrid Array).

List of Practicals

- (1) To study AND, OR, NOT logic gates and verify their truth tables.
- (2) To study NAND, NOR, Ex-OR logic gates and verify their truth tables.
- (3) To realize basic gates (AND, OR, NOT) using NAND gates only.
- (4) To realize basic gates (AND, OR, NOT) using NOR gates only.
- (5) To realize DeMorgan's theorem.
- (6) To design and implement Half adder circuit.
- (7) To design and implement Full adder circuit.
- (8) To design 7-segment decoder driver.
- (9) To Verify the truth table of S-R and JK flip flops.
- (10) To design and implement multiplexer and de-multiplexer.
- (11) To design and implement encoder and decoder.

Text Books

- (i) Modern Digital Electronics by R.P. Jain, Tata McGraw Hill Publication
- (ii) Digital Principles by Malvino Leach, Tata McGraw Hill Publication
- (iii) Digital Electronics by Tokheim, Tata McGraw Hill Publication

Reference Books

- (i) 2000 Solved Problems in Digital Electronics by S.P. Bali, Tata McGraw Hill Sigma Series

Rationale

The advent of Internet has revolutionize the way of modern communication and dissemination of information. The ever increasing outreach, speed and reliability of affordable Internet is opening doors for many future technologies like ubiquitous computing and cloud computing. World-wide-web (www) is the most common and popular service provided by the Internet. HTML, CSS and JavaScript are the core languages that power the www. This course is aimed at providing students with the insight of Internet and related technologies. After pursuing this course, the students will be fully acquainted with the Internet terminology, basic concepts and its most important application viz. world-wide-web.

DETAILED CONTENTS**Unit-1 : Internet and Web Basics** **04 Hrs** **10 Marks**

Internet and its applications, World Wide Web and its evolution, WWW vs Internet, web server, web page, web site (static and dynamic), HTTP protocol, URL, Web Browsers, Search Engine, Proxy Server.

Unit-2 : Working with HTMLS **8 Hrs** **20 Marks**

HTML coding conventions, HTML5 structural elements: <html>, <head>, <body>; head elements : <title>, <meta>, <link>; body elements: <h1>..<h6>, <table>, <hr>, <p>, <div>, ,
, , , comments, , <iframe>, <form>; semantic elements: <article>, <aside>, <details>, <figcaption>, <figure>, <footer>, <header>, <main>, <mark>, <nav>, <section>, <summary>, <time>; HTML attributes: accesskey, class, data-*, id, style, tabindex, title

Unit-3 : HTML Lists and Tables **04 Hrs** **10 Marks**

Ordered Lists, Unordered Lists, Definition Lists, Nested Lists, Table elements: <table>, <thead>, <tbody>, <tfoot>, <tr>, <th>, <td>; using rowspan and colspan attributes.

Unit-4 : HTML Forms **04 Hrs** **10 Marks**

Form elements: <input>, <select>, <option>, <optgroup>, <textarea>, <button>, <datalist>, <fieldset>, <label>, <legend>, <submit>, action attribute.

Unit-S : Cascaded Style Sheet (CSS) **8 Hrs** **20 Marks**

CSS types: inline, internal and external; CSS rule, Selectors, CSS box model, CSS attributes: border, margin, padding, height, width, color, text-align, border-collapse, border-spacing, background-color, background-image, background-repeat, background-attachment, background-position, text-decoration, text-transform, letter-spacing, word-spacing, font-family, font-style, font-size, font-variant, position, display, float, list styles, table styles, pseudo classes.

Unit-6 : JavaScript **9 Hrs** **20 Marks**

JavaScript overview, <script> element, variable, lifetime and scope of variables, operators, control statements: if...else, switch...case; iteration: for, while, do...while; linking external JavaScript file

with an HTML document, manipulating HTML DOM tree with JavaScript, arrays, object-oriented programming in JavaScript, built-in javascript functions, user-defined functions.

Unit-7 : jQuery

05 Hrs

10 Marks

Need of jQuery, Adding jQuery to a Webpage – using CDN or Local Copy; jQuery Selectors, jQuery Effects – hide(), show(), toggle(), fadeIn(), fadeOut(), fadeTo(), fadeToggle(), animate(); jQuery Events – blur(), click(), focus(), ready(), load(), on(), off().

List of Practicals

- (1) To send an email to other class mates and check the received emails.
- (2) To transfer files from one computer to the other using FTP.
- (3) Creating a web page using basic HTML elements.
- (4) Inserting images, imagemaps, lists and hyperlinks in web pages.
- (5) Creating tables demonstrating all the table related tags.
- (6) Creating forms containing all form controls.
- (7) Using inline, internal and external CSS.
- (8) Setting margin, border and padding of elements using CSS.
- (9) Setting text and font CSS properties using CSS.
- (10) Setting background color and images using CSS.
- (11) Layouting webpages using <div> elements and positioning/ resizing them using CSS.
- (12) Demonstrating pseudo CSS classes.
- (13) Calculating sum of two numbers using JavaScript.
- (14) Write JavaScript function to check whether the given number is prime.
- (15) Access HTML elements from within the JavaScript code.
- (16) Sort an array of elements using inbuilt sort array function.
- (17) Create objects in JavaScript code. (18) To add jQuery library to a web page. (19) To demonstrate different jQuery effects. (20) To demonstrate different jQuery events.

Text Books

- (i) HTML & CSS: The Complete Reference by Thomas A. Powell, Tata McGraw Hill Publication
- (ii) JavaScript: The Definitive Guide by David Flanagan, O'Reilly Media Inc.

Reference Books

- (i) HTML 5 Black Book by Kogent Learning Solutions Inc.
- (ii) Web Design with HTML, CSS, JavaScript and jQuery Set By John Duckett, Wiley Publication
- (iii) Web Programming with HTML5, CSS and JavaScript by John Dean, Jones and Bartlett Publishers

Web Resources

- (i) <http://www.w3schools.com>
- (ii) <http://www.tutorialspoint.com>

Rationale

An Operating System (OS) turns an otherwise a 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 Oses. This course will make the students familiar with the concepts, terminology, functions and internal working of a typical OS.

DETAILED CONTENTS

- Unit-1 : Introduction to operating system** **04 Hrs** **10 Marks**
- Definition of Operating System. Evolution of operating systems - simple batch systems, multi-programmed batch systems, timesharing systems. Functions of an operating system. Single user and multiuser operating systems. Open-source and closed-source operating systems.
- Unit-2 : Process Overview** **08 Hrs** **14 Marks**
- Definition of process, process states, process life cycle, Process Control Block (PCB), Process Scheduling - Scheduling queues, Schedulers (short term, medium term and long term). Dispatcher. Context Switch.
- Unit-3 : CPU Scheduling** **12 Hrs** **22 Marks**
- CPU Scheduler, preemptive and non-preemptive scheduling. Scheduling criteria - CPU utilization, Throughput, Turnaround time, Waiting time, Response time. Scheduling Algorithms- First-Come-First-Serve, Shortest-Job-First, Priority Scheduling, Round-Robin.
- Unit-4 : Introduction to Deadlocks** **08 Hrs** **14 Marks**
- Normal mode of operation - Request-Use-Release sequence, Definition of deadlock, Deadlock Characterization, Necessary and sufficient conditions - Mutual exclusion, Hold and wait, No preemption and Circular wait. Introduction to methods for handling deadlocks (without algorithms).
- Unit-5 : Memory Management Techniques** **12 Hrs** **20 Marks**
- Fixed partitioning, dynamic partitioning, memory fragmentation, simple paging, simple segmentation, virtual memory with paging, virtual memory with segmentation, page fault, thrashing. Page replacement policies - FIFO, Optimal, LRU.
- Unit-6 : Storage Management** **12 Hrs** **20 Marks**
- File concept - file attributes, file operations, file types. Access Methods - sequential access, direct access. Directory Structure - directory overview, single-level directory, two-level directory, tree-structured directories. Disk Storage Access ways - Host-Attached Storage, Network-Attached Storage, and Storage Area Network. Disk scheduling - FCFS, SSTF, SCAN, C-SCAN.

List of Practicals

- (1) To install and configure MS Windows 7/8/10 on a computer
- (2) To get familiar with general Windows commands - ECHO, CLS, DIR, TREE, MD, CD, TYPE, RD, DEL, MOVE, COPY, REN, ATTRIB, COLOR, DATE, TIME, ERASE, FIND, FC, MORE, CMD, PATH, SYSTEMINFO, SHUTDOWN, TASKLIST, TASKKILL, VER, VOL, CHKDSK
- (3) To use wildcard characters for copying, moving, renaming, and deleting files and directories in a given hierarchical directory structure under Windows's command prompt.
- (4) To get familiar with windows control panel components.
- (5) To use Windows backup and restore features.
- (6) To get familiar with commonly used Windows PowerShell cmdlets like Get-ChildItem, Get-Content, Get-Command, Get-Help, Clear-Host, Copy-Item, Move-Item, Remove-Item, Rename-Item, Get-Location, Set-Location, Write-Output, Get-Process, Stop-Process.
- (7) To write scripts in Windows PowerShell to automate tasks.

Text Books

- (i) Operating System Concepts by Abraham Silberschatz, Peter B. Galvin, and Gerg Gagne, Wiley India Pvt. Ltd.

Reference Books

- (i) Operating Systems - Internals and Design Principles by William Stallings, Pearson Edn.

Rationale

'C' programming language has maintained its status as the most popular programming language in academic world over last many years. Most of the modern programming languages are either based on or influenced by the 'C' language. Hence, learning 'C' as the first programming language helps students to learn other languages easily. The objective of this course is to make the student understand the concepts of programming language and problem solving. After completing this course the student is expected to analyze the basic real life computational problems and write program in 'C' language to solve them.

DETAILED CONTENTS

Unit-1 : Introduction to Programming	02 Hrs	05 Marks
Algorithm, Flowchart, Evolution of Programming Languages, Structured Programming, Compiling, Linking, Testing and Debugging a program. Syntax Error, Semantic Error.		
Unit-2 : Introductions to 'C' Language	04 Hrs	12 Marks
Character set, identifier, keywords, variables, data types, constants and literals. Structure of a 'C' program, unformatted I/O functions – getchar(), putchar(), gets(), puts(); formatted I/O functions – printf(), scanf().		
Unit-3 : Operators	04 Hrs	10 Marks
Arithmetic operators, relational operators, logical operators, bit-wise operators, assignment operators, conditional operators, special operators. Associativity and order of precedence of operators.		
Unit-4 : Flow Control Statements	08 Hrs	14 Marks
Branching statements: Conditional – if, if...else, nested if, if...else if ladder, switch...case; Unconditional – goto, break, continue, return, Loops – while, do...while, for; Nested loops, Infinite loops.		
Unit-5 : Storage Classes	04 Hrs	07 Marks
Scope and lifetime of variables, local and global variables, storage classes – auto, extern, static, register.		
Unit-6 : Arrays	08 Hrs	15 Marks
Definition of array, memory representation of arrays, one-dimensional arrays: declaration and initialization; two-dimensional arrays: declaration and initialization, strings, standard string functions – strlen(), strcmp(), strcpy(), strcat().		
Unit-7 : Functions	08 Hrs	12 Marks
Definition, function prototype, formal parameters, function call, call by reference, call by value, recursive Functions, arrays as function arguments.		
Unit-8 : Structures and Unions	06 Hrs	08 Marks

Definition of structure and union, difference between structure and union, declaring structures/ unions, initializing a structure, structure assignment, arrays of structures.

Unit-9 : Pointers

08 Hrs

10 Marks

Definition of pointer, address and dereferencing operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic.

Unit-10 : File Handling

04 Hrs

07 Marks

Definition of file, file opening modes, create a new file, open an existing file, read/ write in a file, moving file pointer within an opened file, close an opened file. File handling functions - fopen(), fclose(), getc(), putc(), fprintf(), fscanf(), fgets(), fputs(), feof(), fseek(), rewind().

List of Practicals

- (1) To get familiar with the structure of a 'C' program and print "Hello World!" on computer screen.
- (2) To perform addition, subtraction, multiplication and division operations on two integers.
- (3) To use unformatted I/O functions (getchar() and putchar(), gets() and puts()).
- (4) To use scanf() function to read integers (%d, %i, %o, %u, %x), characters (%c), floating point numbers (%f, %g, %e), strings (%s, scanfset).
- (5) To use printf() function to format and print output (%d, %i, %o, %u, %x, %e, %E, %f, %g, %c, %p, %c, %s, %n)
- (6) To change width, precision and alignment of the output of printf().
- (7) To perform and, or, not, xor, left-shift and right-shift operations on integers.
- (8) To check whether a given integer is even or odd (if ... else statement).
- (9) To write month name corresponding to a month number (switch ... case).
- (10) To check whether a given integer is prime using while loop.
- (11) To reverse the digits of a given positive integer using while loop.
- (12) To generate the multiplication table of a given integer using for loop.
- (13) To generate first n terms of Fibonacci series using do-while loop.
- (14) To compute factorial of a given integer using for loop.
- (15) To compute sum of elements of a one dimensional integer array.
- (16) To find the largest element in a one dimensional array.
- (17) To perform matrix addition and matrix multiplication using 2-D arrays.
- (18) To convert the alphabetic characters of a string to uppercase.
- (19) To find the length of a string.
- (20) To use Standard Library String Functions (strcat(), strrev(), strcpy(), strcmp())
- (21) Writing a function to find sum of two integers.
- (22) Writing a function to swap value of two integers (call by reference).
- (23) Writing a function to compute factorial of a given integer (using recursion).
- (24) To read and print multiple data items (roll_no, name, branch, semester etc.) pertaining to an individual student.
- (25) Demonstrating the use of union
- (26) Demonstrating the use of address and dereferencing operators
- (27) Performing pointer arithmetic to manipulate an array
- (28) To read the contents from a file and display it on screen
- (29) To read names and addresses of persons and write them into a file.

(30) Write a program to read the contents of two different files and write it into the third file.

Text Books

- (i) The C Programming Language by B.W. Kernighan & D M Ritchie, Pearson Education
- (ii) Programming with C, Byron S Gottfried, Second edition, Tata McGraw Hill Publication

Reference Books

- (i) Let us C by Yashwant Kanetkar, BPB Publications
- (ii) Programming with ANSIC by E. Balagurusamy, Tata McGraw Hill Publication

Rationale

Right information at right time to the right person is the key to success for any modern business. Timely dissemination of information is crucial for effective decision-making process in every enterprise. Computer networks are the result of the need to merge computers and communication together. With the advent of computer networks, the unnecessary distinction between tools to process and store information and tools to collect and transport information is disappearing. Today, a computer not connected to some network is considered as a limiting factor. In modern cloud-based service delivery era, the once tagline of the Sun Microsystems "The network is the computer" is turning out to be truer than ever. This course is aimed to provide the students with the basic concepts of computer network. On completing this course the students will be able to appreciate the importance of computer networks and have the basic idea about the working of computer networks.

DETAILED CONTENTS

- Unit-1 : Fundamentals of Data Communications** **06 Hrs** **10 Marks**
- Definition of data communication, fundamental characteristics of data communication – delivery, accuracy, timeliness, jitter. Components of data communication – message, sender, receiver, transmission medium, and protocol. Data representation – text, numbers, images, audio, video. Data flow – simplex, half-duplex, full duplex.
- Unit-2 : Introduction to Computer Networks** **08 Hrs** **15 Marks**
- Definition & objectives of computer network, networking models – client-server, peer-to-peer; types of network – PAN, LAN, MAN, WAN; network topologies – mesh, star, bus, ring.
- Unit-3 : ISO-OSI Model** **15 Hrs** **30 Marks**
- Seven layers of OSI model; functions of physical, data link, network, transport, session, presentation, and application layers.
- Unit-4 : Transmission Media** **06 Hrs** **10 Marks**
- Guided and unguided transmission media; twisted pair cable – UTP Vs STP, RJ45 connector, categories of UTP, applications; coaxial cable – coaxial cable standards, connector, and applications; optical fiber cable – construction and principle, propagation modes, connectors, applications, advantages, disadvantages; wireless transmission – radio waves, microwaves, infrared; ISM band.
- Unit-5 : Network Devices** **06 Hrs** **10 Marks**
- Network Interface Card, repeater, hub, switch, bridge, router, gateway, modem, firewall.
- Unit-6 : TCP/IP Model** **15 Hrs** **25 Marks**
- Layers of TCP/IP – network layer: classes of IP addressing, CIDR and subnet mask notation of IP addresses, subnetting, supernetting, IPv4 header, need of IPv6. Transport layer: TCP, UDP, concept of ports, well known ports. Application layer: SMTP, TELNET, FTP, DHCP.

List of Practicals

- (1) To get familiar with the institute network topology and draw the network diagram consisting of switches, hubs, routers, firewalls etc. present in the network.
- (2) To create straight-through and crossover UTP cables using EIA 568A/568B standard.
- (3) To configure the IP address of a computer and identify the class of the IP address.
- (4) To learn and observe usages of different networking commands IPCONFIG, PING, TRACERT, GETMAC, PATHPING, and NETSTAT.
- (5) To create and test a network of two computers with and without hub/switch (Windows-Windows, Linux-Linux, Windows-Linux).
- (6) To share a folder between two computers.
- (7) To setup a TELNET Server and connect to it using TELNET command.
- (8) To setup FTP server and practice uploading/downloading files.
- (9) To setup DHCP server.

Text Books

- (i) Computer Network by Andrew S. Tanenbaum, PHI
- (ii) Data Communications and Networking by Forouzan, Tata McGraw Hill

Reference Books

- (i) Computer Communication and Networking by John Freer, CRC Press
- (ii) Data and Computer Communication by William Stallings, Pearson Publication
- (iii) CompTIA Network+ Study Guide: Exam N10-006 by Todd Lammle, John Wiley

Rationale

Dynamic websites are powered by some server-side scripting language and a database. PHP has emerged as the most popular server-side scripting language due to its simplicity. MySQL is a popular open-source DBMS known for its wide acceptance. PHP and MySQL together form the most popular combination for dynamic website backend. This course is designed to cover the most essential aspects of dynamic websites using PHP and MySQL. After completing this course, the students will be fully conversant with the web programming terminology and will be able to develop simple websites running on LAMP stack.

DETAILED CONTENTS

- Unit-1 : Dynamic Websites Basics** **08 Hrs** **10 Marks**
- Review of HTML5, CSS and JavaScript; HTTP, HTTP Request, HTTP Response, URL, Working of Web Servers and Web Browsers, Static Websites, Dynamic Websites, Web Applications, Form Data Submission Methods – GET and POST, HTTP Sessions, HTTP Cookies.
- Unit-2 : Introduction to PHP** **10 Hrs** **15 Marks**
- Origin of PHP, Advantages of PHP, Working of PHP, Embedding PHP Code in Webpages, LAMP Stack, Install and Configure PHP Environment, PHP Script, PHP Syntax, Statements, Comments, Variables, Naming Variables, Variable Scope, Constants, echo and print Statements, PHP Data Types, String Literals – Single and Double Quoted Strings, Operators, PHP Control Statements, PHP Arrays.
- Unit-3 : PHP Functions** **08 Hrs** **15 Marks**
- PHP Standard Library Functions: String Functions – htmlspecialchars(), ltrim(), rtrim(), trim(), strtoupper(), strtolower(), explode(), implode(), strlen(), strcmp(), strpos(); Math Functions – sqrt(), ceil(), floor(), log10(), pow(), sin(), cos(), tan(); User-defined Functions.
- Unit-4 : PHP Form Processing** **06 Hrs** **15 Marks**
- HTML Form Element, action and method Attributes, submit and clear Buttons, Form Elements, name and id attributes, Hidden Input, Client-side Form Validation, PHP Superglobals – \$GLOBALS, \$_SERVER, \$_REQUEST, \$_POST, \$_GET, \$_FILES, \$_ENV, \$_COOKIE, \$_SESSION; Server-side Validation, Handling Uploaded Files.
- Unit-5 : PHP Advanced Features** **08 Hrs** **15 Marks**
- Handling Date and Time; Dealing with Multiple PHP files : include, require, include_once and require_once; HTTP Sessions and Cookies, Error and Exception Handling in PHP, PHP Mail, using HTTP Headers with header() Function, Cross-Site Scripting (XSS) Attack and its Prevention.
- Unit-6 : Using MySQL Database in PHP** **10 Hrs** **20 Marks**
- Basic Database Concepts – Database, Table, Column Types, Constraints, Views, Creating Database Users and Granting Privileges; Connecting PHP to MySQL, Executing Simple SQL Statements – INSERT, UPDATE, DELETE and SELECT, Retrieving and Processing Query Results, mysqli_real_escape_string() function, Handling MySQL errors, Handling SQL Injection.
- Unit-7 : Using XML and AJAX with PHP** **06 Hrs** **10 Marks**
- Role of XML, XML Syntax, XML Tags, XML Elements, XML Attributes, Manipulating XML in PHP; Role of AJAX, Handling AJAX Requests in PHP.

List of Practicals

- (1) To install and configure LAMP/ XAMP server on Windows or Linux machine.
- (2) To embed PHP script in a web page that displays a simple message in the browser.
- (3) To use variables in PHP script and perform arithmetic calculations on them.
- (4) To use if...elseif...else statement to determine the division of a student depending upon the percentage of obtained marks.
- (5) To generate the multiplication table of a given number using for statement.
- (6) To create an HTML form and demonstrate action attribute and submit button.
- (7) To demonstrate the GET and POST form data submission methods.
- (8) To demonstrate the difference between validating form data in JavaScript and PHP script.
- (9) To handle uploaded files in PHP.
- (10) To demonstrate the difference between single quoted and double quoted strings in PHP.
- (11) To create multiple PHP web pages and demonstrate the use of include and require.
- (12) To demonstrate error handling feature of PHP using set_error_handler() and trigger_error().
- (13) To demonstrate exception handling feature of PHP (try...catch, throw).
- (14) To demonstrate the use of header () function.
- (15) To demonstrate the working of AJAX by dynamically loading a page with PHP response.
- (16) To demonstrate date/time manipulation in PHP.
- (17) To create a HTML form-based interface to INSERT, UPDATE, DELETE and SELECT data from MySQL database.
- (18) To create a login/registration form that uses PHP Sessions and Cookies.
- (19) To demonstrate the SQL injection attack and its remedy.

Text Books

- (i) PHP & MySQL by Joel Murach and Ray Harris, Mike Murach & Asso. Inc.
- (ii) PHP and MySQL Web Development by Luke Welling and Laura Thomson, Addison-Wesley

Reference Books

- (i) Learning PHP, MySQL & JavaScript by Robin Nixon, O'Reilly Media.
- (ii) PHP and MySQL for Dynamic Web Sites by Larry Ullman, Peachpit Press

Weh Resources

- (i) <http://www.w3schools.com>
- (ii) <http://www.php.net>

Rationale

A Database Management Systems (DBMS) not only efficiently maintains the voluminous data, but also provides convenient and consistent interface between the data it maintains and the end-user applications. Majority of user applications are mostly driven by some database. Modern dynamic web sites are also powered by a database at the backend. Information and Communication Technology (ICT) is continuously improving the speed and accuracy in the collection, storage, processing and transmitting of data. Hence, database approach is all set to power the future data-intensive applications. This course is designed with the purpose of enabling the learners with the basic terminology and concepts of modern DBMS. After completing this course, the students will be able to design, implement and use a basic database in MySQL.

DETAILED CONTENTS

- Unit-1 : Introduction to Database Systems** **04 Hrs** **10 Marks**
- Database Systems, Database and its Purpose, Comparison of Database Approach with File-based and Traditional Record Keeping Approaches, Advantages and Disadvantages of Database Approach, Classification of Database Users, Role of DBA.
- Unit-2 : Database System Concepts and Architecture** **06 Hrs** **15 Marks**
- Data Models, Schemas, and Instances; ANSI/SPARC Architecture of a Database System, External Level, Conceptual Level, Internal Level, Mappings; Data Independence, Logical Data Independence, Physical Data Independence.
- Unit-3 : Relational Model** **06 Hrs** **15 Marks**
- Relational Database Model, Relations, Attributes, Tuples, Domains; Key – Primary Key, Candidate Keys, Alternate Keys, Superkey, Secondary Key, Foreign Keys; Database Constraints.
- Unit-4 : Entity Relationship Model** **04 Hrs** **10 Marks**
- Entity, Entity Sets, Strong and Weak Entities, Attributes, and Keys; Association, Relationship, Roles, and Structural Constraints, ER Diagrams.
- Unit-5 : Structure Query Language (SQL) using MySQL** **20 Hrs** **25 Marks**
- Object Naming Conventions, Keywords, Database, Table, View, Index, Alias; Data Types – Numeric, Date and Time, String Types; Data Definition Language(DDL): CREATE, DROP, ALTER, RENAME, Data Manipulation Language(DML): INSERT, UPDATE , DELETE, SELECT, SELECT Clauses: FROM, WHERE, ORDER BY, GROUP BY, HAVING, Operators: Arithmetic, Logical, Relational, String; Joins: Inner, Left, Right and Outer Joins; Subqueries, Set Operations: Union, Intersect, Minus, Data Control Language(DCL): GRANT, REVOKE; Transaction Control Language(TCL): COMMIT, ROLLBACK, SAVEPOINT.
- Unit-6 : Dependencies and Normalization** **06 Hrs** **10 Marks**
- Prime and Non-Prime Attributes, Functional Dependencies, Trivial and Non-trivial Dependencies, Non-Loss Decomposition, Normalization, First, Second and Third Normal Forms, Boyce/Codd Normal Form.

Unit-7 : Functions in SQL

10 Hrs

15 Marks

Numeric: ABS, ROUND, FLOOR, CEIL, SQRT, POWER, TRUNCATE, LOG; Date and Time Functions : NOW, DATE, TIME, CURDATE, CURTIME, DAY, MONTH, YEAR, DATEDIFF, DATE_SUB, DATE_ADD, DATE_FORMAT; String Functions : CONCAT, LENGTH, UPPER, LOWER, LEFT, RIGHT, LTRIM, RTRIM; Aggregate Functions: MAX, MIN, SUM, AVG, COUNT; Data Conversion Functions: CAST, STR_TO_DATE; User Defined Procedures and Functions (Introduction only).

List of Practicals

- (1) To install and configure MySQL database management system.
- (2) To create tables having columns with different data types, widths and precisions.
- (3) To alter tables to add new columns, delete existing columns and change column names, data types and widths.
- (4) To apply integrity constraints to the tables.
- (5) To insert data of different data types in tables (INSERT statement).
- (6) To view the data stored in different tables (SELECT statement).
- (7) To demonstrate join operation on tables using left, right and inner join.
- (8) To demonstrate different row functions as mentioned in Unit-7.
- (9) To demonstrate group functions SUM, MAX, MIN, COUNT.
- (10) To use WHERE, HAVING, ORDER BY and GROUP BY clauses with SELECT.
- (11) To demonstrate different string functions as mentioned in Unit-7.
- (12) To execute date & time functions as mentioned in Unit-7.
- (13) To convert data from one data type to other.
- (14) To write a MySQL stored procedure that accepts parameter(s).
- (15) To write a MySQL function that returns whether the passed parameter is even or odd.

Text Books

- (i) An Introduction to Database Systems by C.J. Date, Addison Wesley
- (ii) MySQL: The Complete Reference by Vikram Vaswani, Tata McGraw Hill

Reference Books

- (i) An Introduction to database systems by Bipin C. Desai, Galgotia Publications
- (ii) Database System Concepts by A. Silberschatz, H.F. Korth and S. Sudarshan Tata McGraw Hill
- (iii) Fundamentals of Database Systems by R. Elmasri and S.B. Navathe, Pearson Education
- (iv) MySQL 8 Cookbook by Karthik Appigatla, Packt Publishing

Rationale

CPU of a computer is always busy in manipulating one or the other data items in computer memory. Hence, it is very crucial to store data in memory such that it can be processed efficiently. Data structures is all about efficient organization of data in computer memory with the objective of convenient and heuristic processing. Developing efficient software also encompasses the activity of identification of appropriate data structures for representing data. This course will help students to develop the capability of analyzing and selecting appropriate data structures for a given situation.

DETAILED CONTENTS

Unit-1 : Introduction

05 Hrs**10 Marks**

Data Types, Data Structures - Linear and Non-Linear Data Structures, Pointers, Dynamic Memory Allocation (malloc(), calloc() and free())

Unit-2 : Arrays and Structures

09 Hrs**15 Marks**

One-Dimensional Arrays - Representation in Memory, Declaration, Initialization, Operations on Arrays - Traversing, Searching, Insertion, Deletion and Sorting, Two-Dimensional Arrays - Representation in Memory (Row-Major and Column-Major Order), Declaration, Initialization, Structures - Declaration, Typedef Declarations, Initialization of Structures, Accessing the Members of a Structure, Nested Structures, Arrays of Structures, Passing Structures as Function Parameters, Self-referential Structures.

Unit-3 : Stacks and Queues

10 Hrs**20 Marks**

Stack, Representation of stacks, Implementation of stacks (using arrays), Operations on Stacks - Push, Pop, Peek; Applications of Stacks; Queues, Operations on Queues, Applications of Queues, Circular Queues, Double-Ended Queues.

Unit-4 : Linked Lists

12 Hrs**20 Marks**

Linked List, Representation of Linked Lists in Memory, Linked Lists versus Arrays, Operations on Linked List - Insertion, Deletion, Traversing, Searching; Application of Linked Lists; Doubly Linked Lists, Operations on Doubly Linked Lists - Insertion, Deletion, Traversing, Circular Linked Lists.

Unit-5 : Trees

10 Hrs**15 Marks**

Basic Concept of Trees - Node, Root, Parent, Children, Sibling, Leaves; Binary Tree, Traversing Binary Trees (Pre order, Post order and in order), Applications of Trees.

Unit-6 : Sorting and Searching

10 Hrs**20 Marks**

Search algorithm (Linear and Binary), Sorting, Sorting Algorithms (Bubble Sort, Selection Sort, Merge Sort) and their comparisons.

List of Practicals

- (1) To insert and delete elements at specified location in an array.
- (2) To implement a stack and demonstrate push, pop and peek operations on it.
- (3) To implement a queue and demonstrate various operations on it.

- (4) To implement a circular-queue and demonstrate various operations on it.
- (5) To implement a linked list and demonstrate insertion, deletion and traversing operations on it.
- (6) To implement a doubly linked list and demonstrate insertion, deletion and traversing operations.
- (7) To implement a tree and perform in-order, pre-order and post-order traversals.
- (8) To implement a binary search tree and perform insertion, deletion and search operations on it.
- (9) To search an element in an array using linear search.
- (10) To search an element in a sorted array using binary search.
- (11) To sort elements of a given array in ascending order using selection sort method.
- (12) To sort elements of a given array in ascending order using bubble sort method.
- (13) To sort elements of a given array in ascending order using quick sort method.
- (14) To sort elements of a given array in descending order using insertion sort technique
- (15) To sort elements of a given array in descending order using merge sort technique

Text Books

- (i) Data Structures by Seymour Lipschutz, Schaum's Outline Series, McGraw Hill.
- (ii) Data Structures & Algorithms using C by RS Salaria, Khanna Publishers
- (iii) Data Structures by Tanenbaum, Prentice Hall of India, New Delhi

Reference Books

- (i) Data Structures using C by Tanenbaum, Prentice Hall of India
- (ii) Data Structure using C by Robert Kruse, Prentice Hall of India
- (iii) Data Structures through C by G.S Baluja, Dhanpat Rai and Sons

DETAILED CONTENTS

Unit-1 : Introduction	06 Hrs	10 Marks
Brief history of computers, Block Diagram of Digital Computers, Computer Organization, Computer Design and Computer Architecture, Von Neumann Architecture.		
Unit-2 : Computer Arithmetic	10 Hrs	20 Marks
Addition and Subtraction with Signed-Magnitude Data - Hardware Implementation and Algorithm. Addition and Subtraction with 2's Complements Data - Hardware for 2's complement addition and subtraction, algorithm for adding and subtracting numbers in 2's complement representation. Multiplication Algorithms - Hardware Implementation for Signed-Magnitude Data, Booth Multiplication Algorithm.		
Unit-3 : Central Processing Unit	10 Hrs	15 Marks
Components of CPU, General Register Organization, Stack Organization - Register and Memory Stack, Reverse Polish Notation and Evaluation of Arithmetic Expressions; Instruction formats - Three Address Instructions, Two Address Instructions, One Address Instructions, Zero Address Instructions; Brief Introduction to RISC and CISC; Microprogrammed Vs Hardwired Control Units.		
Unit-4 : Memory Organization	08 Hrs	15 Marks
Memory Device Characteristics, Memory Hierarchy, Main Memory (RAM & ROM), Introduction to Associative Memory, Cache Memory - Locality of Reference, Hit Ratio, Writing into Cache - Write Through, Write Back;		
Unit-5 : Input-Output Organization	08 Hrs	15 Marks
Peripheral Devices. Input-Output Interface - I/O Versus Memory Bus, Isolated versus Memory-Mapped I/O; Modes of Transfer - Programmed I/O, Interrupt-Initiated I/O and DMA.		
Unit-6 : 8085 Microprocessor	08 Hrs	15 Marks
Features, Block Diagram, Registers, Address Bus, Data Bus, Interrupts, Addressing Modes, Instruction Set (Introduction only), Memory and I/O Interfacing.		
Unit-7 : Overview of Advanced Microprocessor Technologies	06 Hrs	10 Marks
Parallel Processing, Pipelining, Vector Processing, Hyper Threading		

List of Practicals

Students must execute at least the following list of assembly language programs preferably on 8085 microprocessor trainer board or on simulators like GNUSim8085 on a PC.

- (1) To add two 8-bit numbers resulting in 8 bits sum.
- (2) To add two 8-bit numbers resulting in 16 bits sum.
- (3) To subtract two 8-bit numbers.
- (4) To multiply two 8-bit numbers
- (5) To find largest among two numbers.

- (6) To find the largest number in a data array.
- (7) To find smallest among two numbers.
- (8) To find the smallest number in a data array.
- (9) To sort a list of numbers.

Text Books

- (i) Computer System Architecture by M. Morris Mano, Pearson Education.
- (ii) Microprocessors Architecture, Programming and Applications with 8085 by R. Gaonkar, Penram International Publishing.

Reference Books

- (i) Computer Architecture & Organization by J.P. Hayes, McGraw Hills.
- (ii) Fundamentals of Microprocessors and Microcontroller by B. Ram, Dhanpat Rai Publications.

Rationale

Software engineering is a detailed study of engineering to the design, development and maintenance of software. Software engineering was introduced to address the issues of low-quality software projects. Problems arise when a software generally exceeds timelines, budgets, and reduced levels of quality. It ensures that the application is built consistently, correctly, on time and on budget and within requirements. The demand of software engineering also emerged to cater to the immense rate of change in user requirements and environment on which application is supposed to be working. After undergoing this course, the students will have a thorough understanding of the software processes and will be able to handle a small-scale software development project.

DETAILED CONTENTS

Unit-1 : Introduction to Software Engineering **06 Hrs** **10 Marks**

Software Overview: Definition, Characteristics, Software Evolution; Software Paradigms: Software Development Paradigm, Software Design Paradigm and Programming Paradigm. Software Engineering: Definition, Need of Software Engineering, Emergence of Software Engineering and Notable Changes in Software Development Practices.

Unit-2 : Software Development Life Cycle and Models **10 Hrs** **20 Marks**

Software Development Life Cycle Activities: Communication, Requirement Gathering, Feasibility Study, System Analysis, Software Design, Coding, Testing, Integration, Implementation and Operation and Maintenance; Software Development Life Cycle Models: Classical Waterfall Model, Prototype Model, Rapid Application Model, Spiral Model, Comparison of Different Life Cycle Models, Selection Criteria of an Appropriate Life Cycle Model for a Project.

Unit-3 : Software Cost Estimation **08 Hrs** **12 Marks**

Metrics used for Project Size Estimation, Project Estimation Techniques, Empirical and COCOMO Estimation Techniques.

Unit-4 : Software Requirement Analysis and Specification **10 Hrs** **20 Marks**

Software Requirements: Goal of the Requirements Analysis and Specification Phase, Types of Requirements - Functional Requirements, Non-Functional Requirements and User Interface Requirements; Requirement Elicitation Process: Requirements Elicitation, Organizing Requirements, Negotiation, Discussion and Documentation; Requirement Elicitation Techniques: Interviews, Surveys, Questionnaires, Brainstorming, Requirements Analysis, Software Requirements Specification (SRS) Document, User of SRS Document, Characteristics of a Good SRS Document.

Unit-5 : Software Design **08 Hrs** **14 Marks**

Software Design Overview: Goals and Outcome of Software Design Phase, Characteristics of a Good Software Design, Cohesion and Coupling; Software Design Levels: Architectural Design, High-level Design and Detailed Design; Software Analysis and Design Tools (Introduction Only): Data Flow Diagram, Structure Charts. Software Design Strategies:

Structured Design, Function Oriented Design, Software Design Approaches: Top Down Design, Bottom Up Design.

Unit-6 :Software Coding-----

06 Hrs

10 Marks

Software Coding Overview: Goal of Software Coding Phase, Coding Standards and Guidelines. Code Reviews: Code Walkthrough, Code Inspection and Clean Room Testing. Software Documentation: Internal Software Documentation and External Software Documentation

Unit-7 : Software Testing-----

08 Hrs

14 Marks

Software Testing Overview: Goal of Software Testing Phase, Software Verification versus Software Validation and Testing Activities, Software Testing Approach: Black Box Testing Approach and White Box Testing Approach. Software Testing Techniques: Unit Testing Technique, Integration Testing Technique and System Testing Technique.

Text Books

- (i) Fundamental of Software Engineering by Rajib Mall, PHI
- (ii) Software Engineering: A Practitioner's Approach, Roger S. Pressman, McGraw Hill.

Reference Books

- (i) Software Engineering by Pankaj Jalote, Narosa Publication.
- (ii) Software Engineering, Schaum's Outline Series, Tata McGraw Hill Publication