

CURRICULUM
FOR
DIPLOMA PROGRAMME
IN
Computer Engineering

FOR THE STATE OF HIMACHAL PRADESH



N-2022

Prepared by:-

Composite Curriculum Development Centre
Directorate of Technical Education,
Vocational & Industrial Training, Sundernagar (H.P.)

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THREE YEAR DIPLOMA IN: COMPUTER ENGINEERING

SALIENT FEATURES

Programme	Diploma in (COMPUTER ENGINEERING)
Duration	Three years (Six Semesters)
Entry Qualification	As prescribed by H.P. Takniki Shiksha Board /AICTE
Intake	As approved by H.P. Takniki Shiksha Board
Pattern	Semester System

PROGRAM OUTCOMES:

PO 1	Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
PO 2	Problem Analysis: Identify and analyze well-defined engineering problems using codified standard methods.
PO 3	Design Development of Solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
PO 4	Engineering Tools, Experimentation and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
PO 5	Engineering Practices for Society, sustainability and environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.
PO 6	Project Management: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
PO 7	Life-Long Learning: Ability to analyse individual needs and engage in updating in the context of technological changes.

PROGRAM SPECIFIC OUTCOMES

PEO 1	To apply knowledge of computer engineering to solve engineering and societal problems.
PEO 2	To serve national/regional industries and agencies by pursuing successful career as Software Professionals, IT Consultants and System Administrators.
PEO 3	To maintain and improve technical competence through lifelong learning including entering and succeeding in a degree program in a field such as engineering or science.

COURSE CODE AND DEFINITION

Course Code	Definition
L	Lecture
P	Practical
DCS	Doubt Clearing Session
T	Tutorial
CO	Computer
PC	Program Core
PE	Program Elective
AU	Audit Courses
PR	Project
OE	Open Elective
SI	Summer Internship
HS	Humanities & Social Sciences
BS	Basic Science Course
SE	Seminar

COURSE LEVEL CODING SCHEME

- First two letters of the course code specify the program (e.g.CO: Computer).
- Next two letters represents the type of the course (PC: Program Core, PE: Program Elective, OE: Open Elective etc).
- Next one digit represents the course year (1 :1st Year, 2 : 2nd Year and 3 : 3rd Year).
- Next two digits represents the course number (odd numbered courses are to be offered in the odd semester and even numbered courses are to be offered in the even semester of respective years)

Foreword

Curriculum serves as the foundation on which educational edifice is built upon. Curriculum needs constant updation after ongoing scrutiny, to stay relevant and on par with the developments in the concerned field of Technical knowledge. Polytechnics in Himachal Pradesh are affiliated to Himachal Pradesh Takniki Shiksha Board Dharamshala. Directorate of Technical Education Vocational and Industrial Training Sundernagar is involved in revision of Curriculum from time to time. This N-2022 Curriculum, pertaining to Diploma in Computer Engineering is outcome of such an effort by the Composite Curriculum Development Cell (CCDC) of the Directorate of Technical Education. Curriculum N-2022 is proposed to be outcome based curriculum in line with the AICTE Model Curriculum. The task of curriculum revision is time-consuming and needs to be undertaken with extreme diligence. The Curriculum is designed to have a credit system including courses in emerging areas and with a focus on fundamentals, discipline level courses and electives both from disciplines and cross disciplines. Student Induction program of the AICTE is introduced to make the students comfortable with the new environment, develop awareness of the people around them and the society at large. Internship is included, to ensure that students are on par with changes in Industry. Built-in flexibility in terms of program elective and open elective courses, Course on Entrepreneurship and startups, extracurricular and co curricular activities are other areas included. Thus the Curriculum revision is envisaged to be, contemporary, socially relevant and Industry ready. Following faculty members of the Department of Technical Education contributed in the development of the N-2022 Curriculum pertaining to the Diploma in Computer Engineering.

Sh. Puneet Mahajan, Principal, Govt. Millennium Polytechnic Chamba, Coordinator.

Sh. Chander Shekhar, HoD, Computer Engineering, Sh. Rajesh Sharma HOD, Computer Engineering, Sh. Pankaj Thakur, Sr. Lecturer Computer Engineering, Sh. Suneel Kumar, Sr. Lecturer Computer Engg., Sh Rajesh Kumar Jarial, Sr. Lecturer Com. Engg, Smt. Sonali Malhotra, Sr. Lecturer Comp. Engg. Sh. Vijay Pathania, Sr. Lecture IT, Sh. Rajeev Kumar, Lect Comp Engg., Sh. Ashish Kalia, Lecturer Comp. Engg. Sh. Pankaj Gautam, Lect. Information Technology, Smt. Pratibha Thakur, Lecturer Information Technology, Smt. Kumari Neena, Lect. Computer Engg., and Smt. Komal Choudhary, Lect. Computer Engg.

HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

Sr. No.	Subjects	Distribution in Hours per Week in Various Semesters			
		I	II	III	IV
1	Computer Programming Using C			8	
2	Operating Systems			8	
3	Data Communication & Computer Networks			6	
4	Computer System Architecture			5	
5	Web Technologies			7	
6	Student Centred Activities			2	
7	Database Management Systems				8
8	Data Structures & Algorithms				8
9	Program Elective -I				4
10	Program Elective – II				7
11	Minor Project				4
12	Essence of Indian Knowledge and Tradition				2
13	Student Centred Activities				2
	TOTAL			36	35

STUDY AND EVALUATION SCHEME
Third Semester Computer Engineering

Sr. No.	Category	Code No.	Course Title	Hours/Week			Total Hrs/Week	Credits	Evaluation Scheme						
				L	P	DCS			Internal		External			Total	
									Th	Pr	Th	Hrs	P		Hrs
1	PC	ITPC201	Computer Programming using C*	3	--	1	4	3	40		60	3			100
2	PC	ITPC209	Operating Systems *	3	--	1	4	3	40		60	3			100
3	PC	IoTPC201	Data Communication & Computer Networks **	3	--	1	4	3	40		60	3			100
4	PC	COPC207	Computer System Architecture	2	--	1	3	2	40		60	3			100
5	PC	IoTPC205	Web Technologies **	2	--	1	3	2	40		60	3			100
6	PC	ITPC211	Computer Programming using C (Lab) *	--	4	--	4	2		40			60	3	100
7	PC	ITPC217	Operating System (Lab) *	--	4	--	4	2		40			60	3	100
8	PC	IoTPC207	Data Communication & Computer Networks (Lab) **	--	2	--	2	1		40			60	3	100
9	PC	COPC217	Computer System Architecture (Lab)	--	2	--	2	1		40			60	3	100
10	PC	IoTPC211	Web Technologies (Lab) **	--	4	--	4	2		40			60	3	100
11	-	-	Student Centred Activities	--	2	--	2	0		25			0		25
Total				13	18	5	36	21	200	225	300		300		1025

Note:

*Course is common with Computer Engineering, Information Technology, and Computer Engineering & IoT

** Course is common with Computer Engineering and Computer Engineering & IoT

***The students shall undergo Internship-I at the end of 3rd semester (During semester break after board examinations of duration 04 weeks) which will be evaluated and reflected in study and evaluation scheme of 4th semester.

STUDY AND EVALUATION SCHEME
Fourth Semester Computer Engineering

Sr.No.	Category	Code No.	Course Title	Hours/Week			Total Hrs/Week	Credits	Evaluation Scheme						
				L	P	DCS			Internal		External				Total
									Th	Pr	Th	Hrs	Pr	Hrs	
1	PC	ITPC204	Database Management Systems *	3	--	1	4	3	40	--	60	3	--	--	100
2	PC	COPC204	Data Structure & Algorithms	3	--	1	4	3	40	--	60	3	--	--	100
3	PE	COPE202	Program Elective-I COPE202-I: Fundamentals of Artificial Intelligence COPE202-II: Advanced Computer Networks ITPE202-I: Information Security *	3	--	1	4	3	40	--	60	3	--	--	100
4	PE	COPE204	Program Elective-II COPE204-I: Digital Marketing COPE204-II: Wireless Communication COPE204-III: Mobile Computing	2	--	1	3	2	40	--	60	3	--	--	100
5	PC	ITPC208	Database Management Systems Lab *	--	4	--	4	2	--	40	--	--	60	3	100
6	PC	COPC208	Data Structure & Algorithms Lab	--	4	--	4	2	--	40	--	--	60	3	100
7	PE	COPE206	Program Elective-II Lab COPE206-I: Digital Marketing Lab COPE206-II: Wireless Communication Lab COPE206-III: Mobile Computing Lab	--	4	--	4	2	--	40	--	--	60	3	100
8	PR	PR202	Minor Project	--	4	--	4	2	--	40	--	--	60	3	100
9	AU	AU202	Essence of Indian Knowledge and Tradition	2	--	--	2	0	40	--	60	3	--	--	100
10	-	-	Student Centred Activities	--	2	--	2	0	--	25	--	--	--	--	25
11	SI	SI-I	Summer Internship – I *(after 3 rd Semester)	--	--	--	--	2	--	40	--	--	60	3	100
Total				13	18	4	35	21	200	225	300	--	300	--	1025

Note: *Course is common with Computer Engineering, Information Technology, and Computer Engineering & IoT

**The students shall undergo Internship-II at the end of 4th semester (During semester break after board examinations of duration 06 weeks) which will be evaluated and reflected in study and evaluation scheme of 5th semester.

DETAILED CONTENTS

THIRD SEMESTER

Course Code	:	ITPC201
Course Title	:	Computer Programming using 'C' (Common to IT, CO and CO&IOT)
Number of Credits (Teaching Load)	:	3 (L : 3, DCS : 1, P : 0)
Prerequisites	:	-
Course Category	:	PC (Program Core)

Course Learning Objectives

Programming is one of the core skills that a diploma holder student must possess. This course is designed to enable students to design structured solutions to basic computational problems. The practical component of this course is designed to provide adequate hands-on practice to the students in implementing the designed solutions as programs in C language.

Course Outcomes

- CO-1. Understand the basic terminology of computer programming.
- CO-2. Write algorithms and draw flowcharts for simple computational problems.
- CO-3. Write, edit, compile, debug, run simple programs in 'C'.
- CO-4. Make use of flow control structures in programs.
- CO-5. Organize complex programs around a set of functions.

Course Content

Unit 1: Introduction to Programming 6 Marks

Program Design Tools - Algorithm, Flowchart, Pseudocode; Evolution of Programming Languages, Programming Terminology - Program, Compiler, Interpreter, Linker, Source Code, Libraries, Syntax and Semantic Errors, Bugs.

Unit 2: Introduction to C Language 9 Marks

Brief History of C Language, Features of C Language, Character Set, Identifier, Keywords, Literals, Variables, Constants, Structure of a 'C' Program, Comments, Preprocessor Directives, Data Types, Type Casting, Storage Classes

Unit 3: Input/ Output 9 Marks

Standard Input, Standard Output, Standard Error, I/O Redirection, Unformatted I/O Functions - getchar(), putchar(), gets(), puts(); Formatted I/O Functions - printf(), scanf(), Format Specifier

Unit 4: Operators 9 Marks

Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Assignment Operators, Conditional Operator, Special Operators, Expressions, Associativity and Order of Precedence of Operators

Unit 5: Flow Control Statements ----- **12 Marks**

Selection Statements: if, if...else, Nested if, if...else if Ladder, switch...case; Loops - while, do...while, for; Jump Statements - goto, break, continue, return; Nested Loops, Infinite Loops

Unit 6: Arrays, Structures, Unions and Pointers ----- **9 Marks**

Array, Memory Representation, One-Dimensional Arrays and Two-Dimensional Arrays: Declaration and Initialization; Enumeration, Strings, String Constants, Escape Sequences, Standard String Functions - strlen(), strcmp(), strcpy(), strcat(); Structures, Unions, Pointer - Declaration, Initialization, Assignment; Dynamic Memory Allocation: malloc(), calloc(), free()

Unit 7: Functions ----- **6 Marks**

Definition of Function, Function Prototype, Formal and Actual Parameters, Function Call, Call by Value and Call by Reference, Arrays as Function Arguments, Recursion

Reference Books

1. Problem Solving and Programming in C, R.S. Salaria, Khanna Publications
2. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
3. The C Programming Language, Brian Kernighan and Dennis Ritchie, Pearson
4. How to Solve it by Computer, R. G. Dromey, Pearson
5. Outline of Programming with C, Byron Gottfried, Schaum, McGraw-Hill

SUGGESTED DISTRIBUTION OF MARKS		
Unit No.	Time Allotted (Hrs)	Marks Allotted
Unit 1: Introduction to Programming	8 Hrs	6
Unit 2: Introduction to C Language	10 Hrs	9
Unit 3: Input/ Output	8 Hrs	9
Unit 4: Operators	10 Hrs	9
Unit 5: Flow Control Statements	12 Hrs	12
Unit 6: Arrays, Structures, Unions and Pointers	10 Hrs	9
Unit 7: Functions	6 Hrs	6
TOTAL	64 Hrs	60

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Course Code	: ITPC211
Course Title	: Computer Programming using ‘C’ Lab (Common to IT, CO and CO&IOT)
Number of Credits (Teaching Load)	: 2 (L : 0, T : 0, P : 4)
Prerequisites	: -
Course Category	: PC (Program Core)

Course Outcomes

After the completion of this course students will be able to implement the concepts learned in the theory of “Computer Programming using ‘C’”.

List of Laboratory Experiments

S.No.	Experiment Objective
1.	To set up and get familiar with the programming environment (Editor, Compiler, Linker)
2.	To declare, initialize and use variables of various data types in ‘C’.
3.	To demonstrate printf() and scanf() functions with different format specifiers.
4.	To demonstrate various arithmetic operators and arithmetic expressions.
5.	To demonstrate various bitwise operators.
6.	To use if...else statement to check whether a given year is a leap year.
7.	To use switch...case statement to print the numbers entered by the user (1-10) in words.
8.	To use while statement to reverse the digits of a given number.
9.	To use for statement to print the multiplication table of a given number.
10.	To implement a menu driven arithmetic calculator using do while loop.
11.	To read the marks of 10 students in an array and calculate their average.
12.	To read two matrices and compute their sum using 2-Dimensional arrays.
13.	To reverse the characters of a given string.
14.	To demonstrate strlen(), strcat(), strcmp() functions.
15.	To swap values of two variables using a function.
16.	To compute the factorial of a given number using recursion.
17.	To read the data of a student in a structure and print it.
18.	To count the number of vowels in a given string using a pointer.

Course Code	:	ITPC209
Course Title	:	Operating Systems (Common to IT, CO and CO&IOT)
Number of Credits (Teaching Load)	:	3 (L : 3, DCS : 1, P : 0)
Prerequisites	:	-
Course Category	:	PC (Program Core)

Course Learning Objectives

Every computing device ranging from powerful supercomputers to handheld mobile devices to tightly constrained wireless sensor nodes are controlled and managed by appropriate operating systems. Without an appropriate operating system, any computing hardware is nothing more than a pile of electronic devices. The objective of this course is to make students understand the basic functionalities provided by an operating system.

Course Outcomes:

After the completion of the course learners will be able to:

- CO-1. Understand the terminology related to the domain of operating systems.
- CO-2. Explain the role and functions of an operating system.
- CO-3. Understand the architecture of modern operating systems.
- CO-4. Understand basic techniques used by an OS to manage computing resources.

COURSECONTENTS

Unit 1 : Overview of Operating Systems ----- 12 Marks

Objectives and Functions of Operating Systems, Operating Systems Evolution - Batch Processing Systems, Multiprogramming Systems, Multiprocessing Systems, Time Sharing Systems, Personal Computer Operating Systems, Handheld Computer Systems, Real Time Systems, Distributed Systems; Operating System Architecture - Monolithic vs Microkernel

Unit 2 : Processes and Threads ----- 12 Marks

Process, Process States, Process Life Cycle, Process Control Block (PCB), Threads, Multithreading, Inter-process Communication, Process Synchronization, Race Condition, Critical Section Problem and its Solutions, Deadlocks - Characterization, Necessary Conditions, Deadlock Avoidance, Prevention and Recovery

Unit 3 : CPU Scheduling ----- **12 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, Shortest Remaining Time First, Priority Scheduling, Round-Robin; Multiprocessor Scheduling

Unit 4 : Memory Management ----- **12 Marks**

Memory Hierarchy, Address Space, Address Translation, Memory Protection, Swapping, Contiguous Memory Allocation, Fixed Partition and Variable Partition Schemes, Memory Allocation Strategies, Fragmentation, Compaction, Non-Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory, Demand Paging, Thrashing, Page Replacement Policies

Unit 5 : Storage Management ----- **6 Marks**

Storage Devices - Magnetic Tapes, Magnetic Disks, Optical Disks, Flash Storage; Sequential and Direct Access, Disk Scheduling - SCAN, CSCAN

Unit 6 : Linux Operating System ----- **6 Marks**

Features of Linux OS, GNU Project, Linux Architecture - Kernel, System Calls Interface, System Libraries, Shell

Reference Books

1. Modern Operating Systems by Andrew S. Tanenbaum
2. Operating System Internal and Design Principles by William Stallings
3. Operating System Concepts by Abraham Silberschatz, Wiley India Pvt. Ltd.
4. Linux with Operating System Concepts By Richard Fox, Chapman and Hall

SUGGESTED DISTRIBUTION OF MARKS		
Unit No.	Time Allotted (Hrs)	Marks Allotted
Unit 1 : Overview of Operating Systems	12 Hrs	12
Unit 2 : Processes and Threads	12 Hrs	12
Unit 3 : CPU Scheduling	12 Hrs	12
Unit 4 : Memory Management	12 Hrs	12
Unit 5 : Storage Management	8 Hrs	6
Unit 6 : Linux Operating System	8 Hrs	6
TOTAL	64 Hrs	60

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Course Code	:	ITPC217
Course Title	:	Operating Systems Lab (Common to IT, CO and CO&IOT)
Number of Credits (Teaching Load)	:	2 (L : 0, T : 0, P : 4)
Prerequisites	:	-
Course Category	:	PC (Program Core)

Course Outcomes

After completing this course the students will be able to practically demonstrate the following experiments related to operating systems.

List of Laboratory Experiments

S.No.	Experiment Objective
1.	To install and configure MS Windows 10/11 on a computer system.
2.	To install and configure Linux on a computer system.
3.	To get familiar with the Windows 10/11 graphical user interface.
4.	To get familiar with Windows 10/11 directory structure and role of each directory.
5.	To get familiar with Linux directory structure and role of each directory.
6.	To get conversant with various operations on files and folders in Windows 10/11.
7.	To connect a computer to the LAN/ WiFi network and Internet in Windows 10/11 and demonstrate file transfer and remote login.
8.	To carry out basic file operations using command prompt/ terminal in Windows 10/11.
9.	To get familiar with various components of the Control Panel in Windows 10/11.
10.	To get conversant with various shortcut keys in Windows 10/11 to carry out various tasks.
11.	To view and terminate running processes in Windows 10/11.
12.	To simulate FCFS and SJF scheduling algorithms in any programming language.

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Course Code	:	IoTPC201
Course Title	:	Data Communication & Computer Networks (Common to CO and CO&IOT)
Number of Credits (Teaching Load)	:	3 (L : 3, DCS : 1, P : 0)
Prerequisites	:	-
Course Category	:	PC (Program Core)

Course Learning Objectives

Computer networks have transformed the way we communicate, socialize, learn, work, entertain and trade. Computer networks are found everywhere from homes to schools to highways to offices. This course is designed to enable the students to understand the underlying technologies in modern computer networks.

Course Outcomes

After completing this course the students will be able to:

- CO-1. Understand the terminology used in the domain of computer networks.
- CO-2. Explain the underlying principles of computer networks.
- CO-3. Identify and use common networking devices and cables.
- CO-4. Understand the working of TCP/IP as a case study.

Course Content

Unit 1 : Overview of Data Communication ----- 12 Marks

Data Communication, Data Communication Characteristics - Delivery, Accuracy, Timeliness, Jitter; Components of Communication System, Data Flow - Simplex, Half-Duplex, Full-Duplex; Analog and Digital Signals, Peer-to-Peer and Client-Server Networks, Characteristics of Analog Signals - Frequency, Amplitude, Wavelength; Composite Signal, Phase, Bandwidth; Low Pass and Band Pass Channels, Baseband and Broadband Transmission, Data Rate Limit

Unit 2 : Computer Networks ----- 12 Marks

Objectives of Computer Networks, Applications, Network Protocols, Packet Switching, Circuit Switching, Network Topologies, Types of Computer Networks - PAN, LAN, MAN, WAN, Internetworks, Internet - History, Internet Infrastructure, DNS, Internet Routing Hierarchy

Unit 3 : ISO OSI Reference Model**12 Marks**

Advantages of Layered Network Architecture, ISO OSI Reference Model, Principles of OSI Reference Model, Functions of OSI Layers, Overview of Basic Protocols at Physical, Data Link, Network and Transport Layers

Unit 4 : Transmission Media and Networking Devices**12 Marks**

Wired Media – Coaxial, UTP, STP, Optical Fibre Cables; Wireless Media – Infrared, Radio Waves, Microwaves; Terrestrial and Satellite Wireless Communication; Transmission Impairments, Networking Devices - Repeater, Hub, Bridge, Switch, Router, Gateway, Modem

Unit 5 : TCP/IP Protocol Suite**12 Marks**

Layers in TCP/IP Protocol Suite, TCP/IP Protocol Data Units, IPv4 and IPv6 addresses, IPv4 CIDR Notation, Netmasks and Subnets, IPv4 Address Classes and Reserved Ranges, TCP and UDP, Ports, Well-known Ports, Telnet, FTP, SNMP, DHCP and DNS, Overview of Routing - Flooding, Distance Vector, Link State

Reference Books

1. Computer Networks, Andrew S. Tanenbaum, PHI
2. TCP/IP Illustrated, Volume-1, W. Richard Stevens, Addison Wesley
3. Data and Computer Communications, William Stallings, PHI
4. An Engineering Approach to Computer Networking, S. Keshav, Addison Wesley/Pearson
5. An Integrated Approach to Computer Networks, Bhavneet Sidhu, Khanna Publishing House
6. Data Communication and Computer Networks by Behrouz Forouzan.

SUGGESTED DISTRIBUTION OF MARKS		
Unit No.	Time Allotted (Hrs)	Marks Allotted
Unit 1 : Overview of Data Communication	14 Hrs	12
Unit 2 : Computer Networks	14 Hrs	12
Unit 3 : ISO OSI Reference Model	14 Hrs	12
Unit 4 : Transmission Media and Networking Devices	12 Hrs	12
Unit 5 : TCP/IP Protocol Suite	10 Hrs	12
TOTAL	64 Hrs	60

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Course Code	:	IoTPC207
Course Title	:	Data Communication & Computer Networks Lab (Common to CO and CO&IOT)
Number of Credits (Teaching Load)	:	1 (L : 0, T : 0, P : 2)
Prerequisites	:	-
Course Category	:	PC (Program Core)

Course Outcomes

After completing this course the students will be able to practically demonstrate the following experiments related to data communication and computer networks.

List of Laboratory Experiments

S. No.	Experiment Objective
1.	To get familiar with various types of Networking Cables, Connectors and Tools and create UTP CAT5 patch cords using a crimping tool.
2.	To get familiar with various types of Networking Devices NIC, Hub, Switch, Router, WiFi Access Point and find out their technical specifications.
3.	To install and configure Network Interface Card and determine its MAC address.
4.	To find out and draw the Network Layout with its topology for the LAN of your Institution.
5.	To study and practice different networking commands - IPCONFIG, PING, TRACERT, GETMAC, HOSTNAME, ROUTE, PATHPING, NETSTAT, NSLOOKUP, ARP
6.	To configure the networking of a PC/ Laptop and explore different configuration options and their impact – IP address, Subnet mask, Gateway, DNS.
7.	To establish and test a physical network of two computers with hub/ switch.
8.	To set up a FTP Server and transfer a file to the server from another computer on the network.
9.	To create a WiFi hotspot using a wireless access point and configure the options of DHCP and security.

Course Code	:	COPC207
Course Title	:	Computer System Architecture
Number of Credits (Teaching Load)	:	2 (L : 2, DCS : 1, P : 0)
Prerequisites	:	-
Course Category	:	PC (Program Core)

Course Learning Objectives

After completing this course students will be able to understand digital logic concepts, working of microprocessor functioning of memories and Input Output systems.

Course Outcomes:

After the completion of the course learners will be able to:

CO 1	Understand the basic building blocks of computer system.
CO 2	Design combinational and sequential circuits.
CO 3	Understand the basic architecture and programming of a microprocessor (8085).
CO 4	Demonstrate an understanding of the design of the functional units of a digital computer system.
CO 5	Explain memory hierarchy of a computer system.

COURSE CONTENTS**Unit 1: Introduction** ----- .5 Marks

Functional units of Digital Computer, Computer Organization, Computer Design, Computer Architecture, Von-Neumann and Harvard architecture, Bus Interconnection, Evolution of Microprocessors, Concept of Microcomputer, Microcontroller and Embedded Systems.

Unit 2: Overview of Digital Electronics ----- .10 Marks

Number systems: Decimal, Binary, Octal and Hexadecimal. Conversion from one number system to other number System, Signed Binary Numbers: Sign Magnitude Representation, One's Compliment Representation and Two's Compliment Representation. Binary Arithmetic: Addition, Subtraction, Binary Arithmetic using one's and Two's Compliment. Fixed and Floating

Point Numbers, Computer Codes: BCD, EBCDIC, ASCII. Multiplication Algorithms - Hardware Implementation for Signed-Magnitude Data, Booth Multiplication Algorithm.

Unit 3: Digital Logic ----- .15 Marks

Logic Gates: Symbols and Truth Table, Boolean Algebra, Logic Diagram, De Morgan's Theorem, Combinational Circuits: Block Diagram, Half Adder, Full Adder, Flip Flop: SR, D Flip Flop and J K Flip Flop, Example of a sequential circuit, Decoder & Encoder: 3 to 8, Multiplexer & De Multiplexer: 4 to 1 line.

Unit 4: Basic Architecture of Microprocessor 8085 ----- .10 Marks

Basic features of 8085 Microprocessor, Block Diagram of 8085 Microprocessor, Functions of various blocks, Concept of Buses, Bus Multiplexing and De-multiplexing, Status Flags, Addressing Modes and Interrupts.

Unit 5: Central Processing Unit: ----- .10 Marks

Major Components of CPU, General Register Organization, Control Word, 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 Processors, Concept of Parallel Processing and Pipelining.

Unit 6: Memory Organization ----- .10 Mark

Components of memory hierarchy: main memory, auxiliary memory and cache memory, Introduction to Associative Memory, Cache Memory - Locality of Reference, Hit Ratio, Writing into Cache - Write Through, Write Back, Input-Output Interface –Purpose, I/O Versus Memory Bus, Isolated versus Memory-Mapped I/O.

Reference Books:

1. Computer System Architecture, by M. Morris Mano.
2. Computer Organization and Architecture, William Stallings, Pearson
3. Structured Computer Organization, Andrew S. Tanenbaum. Pearson.

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SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	Time Allotted(Hrs)	Marks Allotted(%)
1	4	5
2	10	10
3	10	15
4	8	10
5	8	10
6	8	10
Total	48	60

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Course Code	:	COPC217
Course Title	:	Computer System Architecture (Lab)
Number of Credits (Teaching Load)	:	1 (T : 0, DCS : 0, P : 2)
Prerequisites	:	-
Course Category	:	PC (Program Core)

Course Learning Objectives

The course is aimed to provide practical exposure to the students on concepts taught in theory class of Computer System Architecture.

Course Outcomes:

After the completion of this course students will be able to implement the concepts learned in the theory.

List of Laboratory Experiments

S. No.	Experiment Objective
1.	To study AND, OR, NOT logic gates and verify their truth tables (using breadboard).
2	To study NAND, NOR, Ex-OR logic gates and verify their truth tables (using breadboard).
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 & Full adder circuit.
7.	To design 7-segment decoder driver.
8	To Verify the truth table of S-R and JK flip flops.
9	To design and implement encoder and decoder.
10	Addition and subtraction of two 8 bit numbers.
11	To add two 8-bit numbers resulting in 16 bits sum.
12	To find largest among two numbers.
13	To sort a list of numbers.

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NOTE: Students must execute practicals 11 to 15 using assembly language programs preferably

on 8085 microprocessor trainer board or on simulators like GNUSim8085 on a PC.

Course Code	:	IoTPC205
Course Title	:	Web Technologies (Common to CO and CO&IOT)
Number of Credits (Teaching Load)	:	2 (L : 2, DCS : 1, P : 0)
Prerequisites	:	-
Course Category	:	PC (Program Core)

Course Learning Objectives

The Internet is the enabling technology for many services like email, world-wide-web, cloud computing, e-commerce, IoT etc. The objective of this course is to expose the students to the Internet enabled technologies with special emphasis on the world-wide-web.

Course Outcomes

After completing this course the students will be able to :

- CO-1. Understand the Internet and WWW terminology.
- CO-2. Utilize the Internet services like email, www and FTP.
- CO-3. Connect a computer to the Internet and troubleshoot common network issues.
- CO-4. Develop basic static websites using HTML, CSS and Javascript.

Course Content

Unit 1 : Internet and World Wide Web 9 Marks

Brief History of the Internet, Structure of the Internet, Internet Services and Applications, Different Ways to Connect to the Internet, Common Internet Connection Issues and their Solutions, World Wide Web, HTTP, Familiarization with the Key Terms - Network Protocol, Web Server, Web Browser, Website, Web Application, Hypertext, Hyperlink, Search Engine, Proxy Server, URL, DNS

Unit 2 : HTML 5 9 Marks

HTML, HTML Coding Conventions, HTML Tag, Structure of HTML Element, Global Attributes - id, class, style, title, tabindex; Structure of a Web Page - <html>, <head>, <body>, <!DOCTYPE>, <title> and <meta> Elements; HTML Comments, Document Object Model (DOM)

Unit 3 : HTML Basic Elements 12 Marks

Headings - <h1> ... <h6>; Paragraphs - <p>, Special Text Elements - <pre>, <code>, <q>, <var>; Lists : Ordered Lists (), Unordered Lists (); Attributes of List Elements: type, start; Nested Lists, Line Break (
) and Horizontal Rule (<hr>); Text Formatting Elements - , , , <i>, <mark>, <u>, <sub>, <sup>; Tables - <table>, <thead>, <tbody>, <tfoot>, <tr>, <th>, <td>, <colgroup>, <col>; Table Attributes - cellpadding, cellspacing, border, rowspan, colspan;

Images - ; Image Attributes - src, alt; Hyperlink - <a>; Hyperlink Attributes - href, target;

Unit 4 : HTML Layout Elements 9 Marks

Block and Inline Elements, Creating Sections - <div>, ; Identifying Elements - id, class and name attributes; Frames - <iframe>; HTML5 Semantic Elements - <main>, <header>, <footer>, <article>, <section>, <nav>, <aside>, <details>, <summary>, <time>, <figure>

Unit 5 : Cascading Style Sheets 12 Marks

CSS Types - Inline, Internal, External; <style> and <link> elements; CSS Rule, Selector and Declaration; CSS Length Units; CSS Box Model; Setting Margins, Borders and Padding of Elements; CSS Colors - Color Names, RGB and HEX Formats; Setting Colors of Text, Background and Border; Styling Text - font-family, font-size, font-style, font-weight, font-transform, font-decoration, text-align; CSS Layout - position and float; Flexbox and Grid layouts; Styling Tables and Lists; Basic Animation using CSS, CSS Pseudo Elements and Pseudo Classes

Unit 6 : Javascript 9 Marks

Role of Javascript in a Web Page, Embedding Javascript Code in Web Page, Javascript Variables - Naming, Scope and Lifetime, Hoisting; Javascript Operators, Control Statements; Javascript Arrays; Linking External Javascript File; Accessing and Manipulating HTML DOM Elements with Javascript; JavaScript, Builtin Javascript Functions, User-defined Functions

Reference Books and Web Resources

1. Web Technologies - A Computer Science Perspective, Jeffrey C.Jackson,
2. Web programming - Building Internet Application, Chris Bales
3. HTML & CSS: Design and Build Websites, John Duckett, Wiley Publishing
4. <https://www.w3schools.com> - HTML, CSS and Javascript Tutorials
5. Mozilla MDN Network Tutorials on HTML, CSS and Javascript
6. Modern JavaScript Tutorials at <https://javascript.info>

SUGGESTED DISTRIBUTION OF MARKS		
Unit No.	Time Allotted (Hrs)	Marks Allotted
Unit 1 : Internet and World Wide Web	8 Hrs	9
Unit 2 : HTML 5	8 Hrs	9
Unit 3 : HTML Basic Elements	10 Hrs	12
Unit 4 : HTML Layout Element	6 Hrs	9
Unit 5 : Cascading Style Sheets	8 Hrs	12
Unit 6 : Javascript	8 Hrs	9
TOTAL	48 Hrs	60

Course Code	:	IoT211
Course Title	:	Web Technologies Lab (Common to CO and CO&IOT)
Number of Credits (Teaching Load)	:	2 (L : 0, T : 0, P : 4)
Prerequisites	:	-
Course Category	:	PC (Program Core)

Course Outcomes

After completing this course the students will be able to practically demonstrate the following experiments related to Internet technologies and website development.

List of Laboratory Experiments

S.No.	Experiment Objective
1.	To send, receive, reply and forward emails with attachments.
2.	To connect the computer system to the Internet using at least two methods.
3.	To install and configure Visual Studio Code for static website development.
4.	To create a web page consisting of text elements <h1> - <h6>, <p>, <pre>, <code>, <q>, <var> and set their background colors using inline CSS.
5.	To create a web page consisting of ordered and unordered lists and set their fonts and other text properties using internal CSS.
6.	To create a web page using HTML and CSS consisting of different <div> elements arranged in a grid structure with each <div> containing a different image. The experiment must also demonstrate the CSS box model.
7.	To create a web page containing hyperlinks to the web pages created in the first five experiments. The experiment must demonstrate different values of the target attribute.
8.	To create a web page using semantic elements <main>, <header>, <footer>, <article>, <section>, <nav>, <aside>, <details>, <summary> with each element properly positioned as per standard web page layout.
9.	To create a web page to demonstrate basic CSS animation.
10.	To create a web page to find out the sum of two numbers using Javascript.
11.	To create a web page consisting of a label, a text field, a command button and write Javascript code to find out whether the number entered in the text field is a prime number.

12.	To dynamically add HTML elements to a web page using Javascript.
13.	To change the CSS properties of a text element using Javascript.
14.	To demonstrate frequently used Javascriptbuiltin functions (at least 10).

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FOURTH SEMESTER

Course Code	:	ITPC204
Course Title	:	Database Management Systems (Common to IT, CO and CO&IOT)
Number of Credits (Teaching Load)	:	3 (L : 3, DCS : 1, P : 0)
Prerequisites	:	-
Course Category	:	PC (Program Core)

Course Learning Objectives

A Database Management Systems (DBMS) not only efficiently maintains the voluminous data, but also provides a convenient and consistent interface between the data it maintains and the end-user applications. Modern dynamic web sites are powered by a database at their 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 to get acquainted 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.

Course Outcomes

- CO-1. Understand the basic terminology associated with database management.
- CO-2. Design an optimal database for a given basic application.
- CO-3. Apply normalization techniques while designing databases.
- CO-4. Use SQL commands to carry out various database operations.

Course Content

Unit 1 : Introduction to Database Systems ----- 9 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 ----- 9 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 and E-R Models ----- **12 Marks**

Relational Database Model, Relations, Attributes, Tuples, Domains; Prime and Non-prime Attributes, Key – Primary Key, Candidate Keys, Alternate Keys, Superkey, Secondary Key, Foreign Keys; Database Constraints, Entity Relationship Model - Entity, Entity Sets, Strong and Weak Entities, Attributes, and Keys; Association, Relationship, Roles, Structural Constraints, ER Diagrams

Unit 4 : Database Dependencies and Normalization ----- **6 Marks**

Functional Dependencies, Trivial and Non-trivial Dependencies, Non-Loss Decomposition, Normalization, First, Second and Third Normal Forms, Boyce-Codd Normal Form

Unit 5 : Overview of MySQL ----- **12 Marks**

MySQL, Features of MySQL, Database Objects - Database, Table, View, Index, Alias; MySQL Object Naming, Keywords, User-defined Variables, Data Types - Numeric, Date and Time, String Types; Operators: Arithmetic, Logical, Relational, String; MySQL System Schema, MySQL Database Users and Roles, Database Privileges, Access Control and Account Management, MySQL Server and MySQL Client

Unit 6 : Structure Query Language using MySQL ----- **12 Marks**

SQL, DDL Statements : CREATE, DROP, ALTER, RENAME; DML Statements: INSERT, UPDATE , DELETE, SELECT; SELECT Clauses - FROM, WHERE, ORDER BY, GROUP BY, HAVING; Join Operations - Inner, Left, Right and Outer Joins; Subqueries, Set Operations - Union, Intersect, Minus; GRANT and REVOKE Privileges; Transaction Statements - COMMIT, ROLLBACK, SAVEPOINT; Prepared Statements, SQL Functions - ABS, ROUND, FLOOR, CEIL, SQRT, POWER, TRUNCATE, LOG, NOW, DATE, TIME, CURDATE, CURTIME, DAY, MONTH, YEAR, DATEDIFF, DATE_SUB, DATE_ADD, DATE_FORMAT, CONCAT, LENGTH, UPPER, LOWER, LEFT, RIGHT, LTRIM, RTRIM, MAX, MIN, SUM, AVG, COUNT, CAST, STR_TO_DATE

Reference Books and Web Resources

1. Fundamentals of Database Systems by ElmasriRamez&NavatheShamkant, Pearson Education
2. An Introduction to Database Systems by C.J. Date, Pearson Education
3. Database System Concepts by Abraham Silberschatz& Henry F. Korth, McGraw Hill Education
4. Murach's MySQL by Joel Murach, Mike Murach& Associates Inc.

5. MySQL online documentation at <https://dev.mysql.com/doc/>
6. MySQL tutorials at <https://www.w3schools.com/mysql>

SUGGESTED DISTRIBUTION OF MARKS		
Unit No.	Time Allotted (Hrs)	Marks Allotted
Unit 1 : Introduction to Database Systems	8 Hrs	9
Unit 2 : Database System Concepts and Architecture	12 Hrs	9
Unit 3 : Relational and E-R Models	10 Hrs	12
Unit 4 : Database Dependencies and Normalization	10 Hrs	6
Unit 5 : Overview of MySQL	12 Hrs	12
Unit 6 : Structure Query Language using MySQL	12 Hrs	12
TOTAL	64 Hrs	60

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Course Code	:	ITPC208
Course Title	:	Database Management Systems Lab (Common to IT, CO and CO&IOT)
Number of Credits (Teaching Load)	:	2 (L : 0, T : 0, P : 4)
Prerequisites	:	-
Course Category	:	PC (Program Core)

Course Outcomes

After completing this course the students will be able to practically demonstrate the following experiments related to database management.

List of Laboratory Experiments

S.No.	Experiment Objective
1.	To install and configure MySQL database server on Windows or Linux machines.
2.	To create database tables having columns with different data types, widths and precisions.
3.	To alter existing database tables to add new columns, delete existing columns and change column names, data types and widths.
4.	To apply integrity constraints - PRIMARY KEY, NOT NULL, UNIQUE, CHECK, FOREIGN KEY, to the database tables.
5.	To insert data in a table having columns of different data types (INSERT statement).
6.	To view the data stored in different tables using the SELECT statement. Apply WHERE, HAVING, ORDER BY and GROUP BY clauses with SELECT.
7.	To demonstrate join operation on tables using left, right and inner join.
8.	To demonstrate at least 10 SQL row functions in queries.
9.	To demonstrate SUM, MAX, MIN, COUNT aggregate functions and also demonstrate the use of HAVING and GROUP BY clauses in SELECT statement.
10.	Case Study : Student Database – The case study project must identify various entities related to the students in a typical academic institution, draw E-R diagrams, Apply Database Normalization, Create Tables, Apply Database Constraints, Insert data, Delete Data and Query the Database etc.

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Course Code	:	COPC204
Course Title	:	Data Structures & Algorithms
Number of Credits	:	3 (L:3,DCS:1,P:0)
Prerequisites	:	-
Course Category	:	PC

Course Learning Objectives

The performance of a computer program largely depends upon the way in which the data is stored in memory and processed by the program instructions. 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 analysing and selecting appropriate data structures for a given situation.

Course Outcomes:

After the completion of the course learners will be able to:

CO 1	Understand the basic terms associated with data structures and algorithms.
CO 2	Select appropriate data structures to efficiently store and process data.
CO 3	Write efficient algorithms for given problems.
CO 4	Analyze the performance of various general algorithms.

COURSE CONTENTS

Unit 1: Introduction:

8 Marks

Algorithms-Definition, Characteristics, Efficiency, Notations - Asymptotic, Big-Oh, Omega, Theta notation; Data Types, Data Structures - Characteristics, Types - Linear, Non-linear, General Operations, Efficiency;

Unit 2: Arrays, Structures and Pointers

14 Marks

Arrays, One-Dimensional and Multi-Dimensional Arrays, One-Dimensional Arrays-Memory Representation, Traversal, Insertion and Deletion, Sorting and Searching; Two-Dimensional Arrays-Memory Representation, Implement Matrices using Two-Dimensional Arrays, Matrix Operations-Addition, Subtraction, Multiplication, Transpose; Structure-Accessing structure members using (.) and (->) operators, self-referencing structures, Pointers-Dynamic Memory Allocation using malloc(), calloc(), free() and realloc(), Manipulate Arrays using Pointers.

Unit 3: : Sorting and Searching

14 Marks

Searching Techniques - Linear Search, Binary Search; Sorting Techniques – Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort; Efficiencies of Sorting Algorithms.

Unit 4: Linear Data Structures**14 Marks**

Linked Lists - Representation, Advantages, Disadvantages, Implementation, Operations; Doubly Linked List, Stacks, Stack Operations - Push, Pop; Implementation of Stack using Arrays and Linked List; Queues, Queue Operations, Implementation of Queue using Arrays and Linked List.

Unit 5 Non-Linear Data Structures**10 Marks**

Trees, Tree Terminology - Node, Root, Parent, Children, Sibling, Edge, Leaves; Binary Tree, Binary Tree Representation, Binary Tree Traversal, Binary Search Tree, Graphs, Graph Terminology, Directed Graphs, Weighted Graphs, Graph Implementation using Adjacency Matrix and Adjacency List.

Reference Books:

1. Data Structures, R.S. Salaria, Khanna Book Publishing, New Delhi
2. Data Structures Using C, Reema Thareja, Oxford University Press India.
3. Classic Data Structures, Samanta Debasis, Prentice Hall of India.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
5. Data Structures: A Pseudo code approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
6. Data Structures and Algorithms: Concepts, Techniques and Applications, G. A. V. Pai, McGraw-Hill Education, In

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	Time Allotted (Hrs)	Marks Allotted
1	12	8
2	16	14
3	12	14
4	12	14
5	12	10
Total	64	60

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Course Code	:	COPC208
Course Title	:	Data Structure and Algorithm Lab
Number of Credits	:	2 (L: 0,DCS:0,P:4)
Prerequisites	:	-
Course Category	:	PC

Course Learning Objectives

This Lab course is intended to practice whatever is taught in theory class of 'Data Structures and Algorithms' and is an extension of previous course on 'Computer Programming'. Students should work on problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listed below. This Lab course requires a good coordination between theory course in Data Structures and Algorithms.

Course Outcomes:

After the completion of this course students will be able to implement the concepts learned in the theory.

Course Contents:

Sr. No.	Topics for Practice
1	To insert and delete elements at specified location in an array.
2	To search an element in an array using linear search.
3	To search an element in a sorted array using binary search.
4	To sort elements of a given array in ascending order using selection sort method.
5	To sort elements of a given array in ascending order using bubble sort method.
6	To sort elements of a given array in ascending order using quick sort method.
7	To sort elements of a given array in descending order using insertion sort technique
8	To sort elements of a given array in descending order using merge sort technique.
9	To implement a stack and demonstrate push, pop and peek operations on it
10	To implement a queue and demonstrate various operations on it.
11	To implement a circular-queue and demonstrate various operations on it.
12	To implement a linked list and demonstrate insertion, deletion and traversing operations on it.
13	To implement a doubly linked list and demonstrate insertion, deletion and traversing operations.
14	To implement a tree and perform in-order, pre-order and post-order traversals.
15	To implement a binary search tree and perform insertion, deletion and search operations on it.

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Course Code	:	COPE202-I
Course Title	:	Program Elective-I (Fundamentals of Artificial Intelligence)
Number of Credits	:	3 (L: 3, DCS: 1, P:0)
Prerequisites	:	-
Course Category	:	PE

Course Learning Objectives

The primary objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence. After pursuing this course, the students will gain a historical perspective of AI and its foundations, and become familiar with basic principles of AI to problem-solving, inference, perception, knowledge representation, and learning.

Course Outcomes:

After the completion of the course learners will be able to:

CO 1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
CO 2	Solve basic AI based problems.
CO 3	Define the concept of Artificial Intelligence.
CO 4	Apply AI techniques to real-world problems to develop intelligent systems.
CO 5	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

COURSE CONTENTS

UNIT1 : Introduction to Artificial Intelligence ----- 12 Marks

Definition of Intelligence, Components of Intelligence - Learning, Reasoning, Problem Solving, Perception, and Using Language; Artificial Intelligence (AI), AI Definition, Human Intelligence Vs. Artificial Intelligence, Goals of AI, Foundational Disciplines in AI - Philosophy, Mathematics, Psychology, Computer Engineering, Linguistics, Biological Science and Others; Evolution of AI, Symbolic AI, AI Winters, Risks and Benefits of AI, Major Subfields of AI (Introduction Only) - Machine Learning, Neural Networks, Machine Vision, Robotics, Expert Systems, Natural Language Processing.

UNIT2 : Intelligent Agents and Environments -----12 Marks

Four Views of AI - Acting Humanly (Turing Test), Thinking Humanly, Acting Rationally and Thinking Rationally; AI Agents - Simple Reflex Agent, Model-based Reflex Agent, Goal-based

Agent, Utility-based Agent, Learning Agent; Agent Environment - Task Environment, Task Environments Properties

UNIT3 : State Space Search ----- 12 Marks

Properties of Search Algorithms - Completeness, Optimality, Time Complexity, Space Complexity; Uninformed Search - Depth-first Search, Breadth-first Search, Iterative Deepening Depth-first Search, Uniform-cost Search; Informed Search - Best First Search, Beam Search, A* Search

UNIT4: Logic and Inferences ----- 12 Marks

Knowledge-Based Agents, Propositional Logic, First Order Logic, Fuzzy Logic, Soundness and Completeness, Modus Ponens, Modus Tollens, Forward and Backward Chaining, Reasoning, Temporal and Spatial Reasoning. Probabilistic Reasoning, Inference and Resolution for Problem Solving, Expert Systems

UNIT5: Machine Learning-----12 Marks

PAC Learning Model, Forms of Learning – Supervised, Unsupervised, Reinforcement Learning; Linear Regression and Classification, Inductive Learning, Decision Trees, Neural Network - Biological Neurons, Perceptron, Artificial Neural Network, Feedforward Multi-Layer Perceptron, Training the Artificial Neural Network

Reference Books:

1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India)
2. Stefan Edelkamp and Stefan Schroedl. Heuristic Search, Morgan Kaufmann.
3. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, A K Peters/CRC Press
4. Elaine Rich and Kevin Knight. Artificial Intelligence, Tata McGraw Hill.
5. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, Prentice Hall
6. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	Time Allotted (Hrs)	Marks Allotted
1	12	12
2	12	12
3	14	12
4	13	12
5	13	12
Total	64	60

Course Code	:	COPE202-II
Course Title	:	Programme Elective – I (Advanced Computer Networks)
Number of Credits	:	3 (L: 3, DCS: 1, P:0)
Prerequisites	:	-
Course Category	:	PE

Course Learning Objectives

Introduce Advance Networking Concepts, Theories and Tools

Course Outcomes:

After the completion of the course learners will be able to:

CO 1	Understand subnetting and routing protocols.
CO 2	Explain various switching techniques and understand wireless networks.
CO 3	Understand network redundancy and various network security issues.
CO 4	Simulate and study a network.

COURSE CONTENTS

UNIT 1:

15 Marks

Review of Networking Basics; Advance Topics in IPv4 – Subnetting, Multicasting, Multicast Routing Protocols (IGMP, PIM, DVMRP); Advance Topics in TCP – flow management, congestion avoidance, protocol spoofing; Ipv6

UNIT 2:

15 Marks

Telecom Networks, Switching Techniques; Introduction to Frame Relay, ATM, MPLS; VSAT Communication – Star and Mesh architectures, bandwidth reservation; Wireless Networks – WiFi, WiMax, Cellular Phone Technologies – GSM, CDMA, 3G, 4G

UNIT 3:

10 Marks

Network Redundancy, Load Balancers, Caching, Storage Networks; QoS; Network Monitoring – SNMP, RMON;

UNIT 4:**10 Marks**

Introduction to Network Security – VLAN, VPN, Firewall, IPS, Proxy Servers

UNIT 5:**10 Marks**

Network Simulation, Network design case studies and exercises, IP Addressing schema, Protocol Analysers (Wireshark, etc)

Reference Books:

1. RFCs and Standards Documents (www.ietf.org and other standard body websites)
2. Communication Networking – An Analytical Approach, Anurag-Manjunath-Joy
3. TCP/IP Illustrated (Vol.1,2), Stevens
4. Data Networks, Bertsekas-Gallager
5. An Engineering Approach to Computer Networking, S. Keshav

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	Time Allotted (Hrs)	Marks Allotted
1	14	15
2	14	15
3	12	10
4	12	10
5	12	10
Total	64	60

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Course Code	: ITPE202-I
Course Title	: Information Security (Common to IT, CO and CO&IOT)
Number of Credits (Teaching Load)	: 3 (L : 3, DCS : 1, P : 0)
Prerequisites	: -
Course Category	: PE (Program Elective)

Course Learning Objectives

Information security is crucial than ever before to all organizations to protect their information and IT resources. Securing IT assets is becoming more and more challenging due to a paradigm shift towards cloud computing and the need for ubiquitous access to IT resources. This course is meant to sensitize the students about the importance of information security and various techniques for safeguarding the vital information resources.

Course Outcomes

- CO-1. Understand the fundamental terminology related to information security.
- CO-2. Develop understanding of various security threats to information systems.
- CO-3. Apply the information security principles/ tools to prevent common attacks.
- CO-4. Understand various information security laws, acts and standards.

Course Content

Unit 1 : Introduction 6 Marks

Information Security, Cybersecurity, Need for Cybersecurity, Aspects of Information Security (PAIN), Malware - Worm, Virus, Trojan Horse, Bots & Botnets, Ransomware, Spyware, Keylogger, Spamming and Phishing; Security Features of Operating Systems - Authentication, Logs, Audit Features, File System Protection, User Privileges, RAID Options, Anti-Virus Software, OS Security Patches

Unit 2 : Basics of Cryptography 9 Marks

Cryptography, Symmetric and Asymmetric Ciphers, Substitution Cipher, Caesar Cipher, Transposition Technique, Steganography, Stream and Block Ciphers (Introduction Only), Public Key Cryptography

Unit 3 : Cybersecurity Framework 9 Marks

NIST Definition of Computer Security, CIA Triad, NIST Framework for Cybersecurity,

Cybersecurity Framework Components, Framework Core - Functions, Categories, and Subcategories; Framework Implementation Tier

Unit 4 : Information Security Architecture ----- 12 Marks

OSI Security Architecture, Definitions of Security Attack, Security Mechanism, Security Service, Threat and Attack; Active and Passive Attacks, Security Services - Authentication, Access Control, Data Confidentiality, Data Integrity and Non-repudiation; Security Mechanisms - Encipherment, Digital Signature, Access Control, Data Integrity, Authentication Exchange, Traffic Padding, Routing Control and Notarization

Unit 5 : Network and Internet Security ----- 12 Marks

Network Classification : Trusted, Semi-trusted, Untrusted & Unknown Networks; Network Attacks Classification : Interruption, Interception, Modification & Fabrication; Network Attacks : Password Stealing, Packet Sniffers, IP Spoofing, Denial-of-Service (DoS), Man-in-Middle, Session Hijacking; Security Weaknesses in Networks, Network Access Control, IEEE 802.1x, VLAN, Firewall, Extensible Authentication Protocol, Network Security Protocols - TLS, SSL, HTTPS, IPSec and SSH, Ingres Filtering, VPN, Firewalls, Internet Security Threats : Privacy Breach, DNS Spoofing, Email Spam, Cross-site Scripting (XSS); Web Browser Security Settings : Cookies, Website Certificates, Browsing History, Plugins, Parental Control, Form Autofill, CAPTCHA; Strong Passwords

Unit 6 : Cyber Laws ----- 9 Marks

Cyber Crime, Cyber Crime against Person, Property and Government, Major Provisions under Indian IT Act-2000 (Sections 65, 66, 67, 69); Intellectual Property Rights, Patent Law, Copyright Law, Digital Signatures

Reference Books & Online Resources

1. Information Security and Cyber Laws, Sarika Gupta, Khanna Publishing House
2. Acts, Laws and Standards (IT Act, ISO27001 Standard, IPR and Copyright Laws)
3. Cyber Security By Nina Godbole, Wiley
4. Information Security: The Complete Reference By Mark Rhodes, McGraw-Hill
5. Cryptography and Network Security : Principles and Practice by William Stallings, Pearson Education

SUGGESTED DISTRIBUTION OF MARKS		
Unit No.	Time Allotted (Hrs)	Marks Allotted
Unit 1 : Introduction	10 Hrs	9
Unit 2 : Basics of Cryptography	10 Hrs	9
Unit 3 : Cybersecurity Framework	10 Hrs	9
Unit 4 : Information Security Architecture	12 Hrs	12
Unit 5 : Network and Internet Security	14 Hrs	12
Unit 6 : Cyber Laws	08 Hrs	9
TOTAL	64 Hrs	60

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Course Code	:	COPE204-I
Course Title	:	Programme Elective-II (Digital Marketing)
Number of Credits	:	2 (L: 2, DCS: 1, P: 0)
Prerequisites	:	-
Course Category	:	PE

Course Learning Objectives

The aim of the Digital Marketing Course is to provide students with the knowledge about business advantages of the digital marketing and its importance for marketing success; to develop a digital marketing plan; to define a target group; to get introduced to various digital channels, their advantages and ways of integration; how to integrate different digital media and create marketing content; how to optimize a Web site and SEO optimization; how to create Google AdWords campaigns; social media planning; to get basic knowledge of Google Analytics for measuring effects of digital marketing and getting insight of future trends that will affect the future development of the digital marketing. The application of the gained knowledge, skills and competences will help future managers in forming digital marketing plan in order to manage a digital marketing performance efficiently.

COURSE CONTENTS

Course Outcomes:

After the completion of the course learners will be able to:

CO 1	Analyze the confluence of marketing, operations and human resources in real time delivery.
CO 2	Write Blog Posts.
CO 3	Recognize ethical and privacy issues with the social media.
CO 4	Investigate and evaluate issues in adapting to globalized market.

Unit 1 Principles of Digital Marketing

9 Marks

Defining Digital Marketing , Setting Digital Marketing Objectives, Set of activities of digital marketing: Search Engine Optimization, SEO, Search Engine Marketing – Google AdWords, Social Media Marketing: Facebook, LinkedIn, YouTube, Display Advertising – Contextual, Behavioral,

Targeted, Content Marketing & Blogging, Lead Generation : Marketing Offer – Attractive / Relevant Offer, Landing Page – Offer’s details with form, Conversion Page – Thank you page, Email Marketing, Video Marketing, Responsive Design, Google Analytics

Unit 2. Search Engine Optimization

15 Marks

What is SEO?, Why SEO?, How Search Engine works?, Essential SEO guidelines for website owner, designer, blogger and content writer : Keyword Research - Creating Content Hierarchy, Brainstorming – Think and discuss them, Google Suggest, Related Searches, Google Keyword Planner, Keyword Tools, Google Trends – Finding Search Trends, Most Search Terms, How to translate keywords?, Organizing the keywords, Writing Headlines (Page Titles) with examples, Writing Summary (META Descriptions) with examples, SEO for Images, Structuring the Content-SEO-friendly Domain Name, SEO-friendly URL Structure, Plan your Site’s Hierarchy, Internal Linking – Site Navigation, How Google reads our pages?, Localized SEO, Website Speed Testing, HTML Improvements using Google Search Console, Links from YouTube Videos, Users’ Engagement , Links to Related Stories , Enable Social Sharing , Embedding videos , Enabling site search feature

Unit 3. Google AdWords

9 Marks

Setting up Google AdWords Campaigns – that avails high ranking at low cost, Content Structuring, Understanding Quality Score, Finding and selecting the right Keywords, Keywords Matching Options, Campaign Setup procedure, Ads and Ad Groups, Organizing Ad Groups, Creating Effective Ads, Optimizing Landing Pages, Bid Management, Negative Keywords, Analytics – Measure and fine-tune, Remarketing Campaigns – How to configure, Setup and Monitor them?, YouTube Video Ad Campaigns

Unit 4. Google Analytics

12 Marks

Getting Started with Google Analytics, Understanding Dashboard – Audience | Advertising | Traffic Source | Content | Conversions, Taking decisions based on Analytics Reporting, Defining Business Goals and Objectives, Tracking Social Media Traffic, Tracking SEO Traffic, Integrating your Google AdWords campaigns into Google Analytics, Measuring Tools and Methods, Measuring your Site’s ROI, Introduction to Goal Conversion – Tracking the Conversions, Configuring UTMs (Custom URLs), Google Tag Manager – a brief overview.

Unit 5. Social Media Marketing

Social Media Marketing Strategy : Setting up Goals- Finding out where your targeted people connect, Popular Social Media Networks, KnowEm – Check Social Media Username Availability, Knowing your Audience - Google Alerts – Monitoring your brands, competitions, and industry trends using, TweetDeck – a monitoring tool similar to Google Alerts for Twitter, Hashtags – Best Practices & Tools, Facebook / Instagram / LinkedIn- Setting up a Facebook Business Page, Facebook Graph Search – SEO for Facebook, Facebook Fans vs Talking about this, Promoting your Page, Boost Post, Facebook/Instagram Advertising using Facebook Ads Manager, Remarketing/Retargeting using Facebook Custom Audiences, LinkedIn Advertising: Text Ads | Sponsored Content, Measuring Success- Fans, Likes, Comments & Share, Track performance using Google Analytics, UTMs – URL Builder, Bounce Rate, Time Spent on Site and Conversions!, Tracking Offline Conversions, Tracking your emails, Viral Videos Examples, Instagram, Facebook and Pinterest – Best Practices, Tips and Tools

RECOMMENDED BOOKS

1. Digital Marketing by Vandana Ahuja, published by Oxford Publication
2. Fundamentals of Digital Marketing by Puneet Bhatia, published by Pearson.
3. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	Time Allotted (Hrs)	Marks Allotted
1	8	9
2	12	15
3	8	9
4	10	12
5	10	15
Total	48	60

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Course Code	:	COPE206-I
Course Title	:	Programme Elective-II (Digital Marketing Lab)
Number of Credits	:	2 (L: 0,T:0,P: 4)
Prerequisites	:	-
Course Category	:	PE

Course Learning Objectives

This lab course is intended to practice whatever is taught in theory class of Digital Marketing.

Course Outcomes:

After the completion of this course students will be able to implement the concepts learned in the theory.

Course Contents:

S. No.	Experiment Objective
1.	Create SEO Friendly Web Pages.
2.	To Submit Website in various search Engines
3	To develop a Facebook Customised Page Tab
4	Create and Write a blog on some free blogging website.
5	To write an Email newsletter.
6	To Make a video and YouTube Channel
7	Build a Network of Partner Websites to Get Influence on the SERP and Jump up to 30+ Positions
8	To create infographics
9	To create Google Adword Account and make use of Keyword Planner
10	To create and Use Google Analytics Account
11	To Create “refer-a-friend” or “bookmark this page” links on your site
12	To create Google Map on Places for Business.
13	Understanding various SEO Tools like woorank, seositecheckup, seoquake, similarweb, siteliner, etc.

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Course Code	:	COPE204-II
Course Title	:	Programme Elective – II (Wireless Communication)
Number of Credits	:	2 (L: 2, DCS: 1, P:0)
Prerequisites	:	-
Course Category	:	PE

Course Learning Objectives:

This course provides a comprehensive overview and advanced knowledge of modern wireless communication systems. Building on the prior knowledge on digital communications, students develop further understanding on the challenges and opportunities brought by the wireless medium.

Course Outcomes:

After the completion of the course learners will be able to:

CO 1	Explain various wireless communication technologies.
CO 2	Understand electromagnetic spectrum and transmission impairments.
CO 3	Explain various propagation modes for wireless communication.
CO 4	Understand the architecture of cellular communication.
CO 5	Understand Bluetooth standard for wireless communication.

Course Content:

Unit 1: Introduction to Wireless Communication ----- 10 Marks

Wireless communication and its applications, advantages and disadvantages of wireless communication, Types of Services: broadcast, paging, cellular telephony, trunking radio, cordless telephony, WLAN, PAN, adhoc & sensor networks, fixed wireless access; challenges in wireless communication.

Unit 2: Electromagnetic Spectrum ----- 10 Marks

Electromagnetic spectrum, licensed/unlicensed spectrum bands, ISM band, terrestrial and satellite microwave communication, broadcast radio, infrared and light wave communication, wireless transmission impairments – attenuation, distortion, noise, interference, path loss, shadowing and fading.

Unit 3: Fundamentals of Wireless Communication -----15 Marks

Concept of bandwidth, analog and digital signals, data rate, signal strength, SNR, RSSI, electromagnetic wave propagation: ground waves, sky waves and line-of-sight propagation; radio waves, microwaves, infrared; Overview of Propagation Mechanisms: reflection, diffraction and scattering; outdoor and indoor propagation.

Unit 4: Cellular Architecture -----15 Marks

Cellular Communication: cellular concept, cellular system architecture, cells, clusters, frequency reuse, cell splitting, handoff, Digital Cellular System: TDMA, ETDM, PCS, CDMA, Global System for Mobile Communication (GSM), GSM network: switching system, BSS, operation and support system, Generations of cellular networks and their features (1G – 5G).

Unit 5: Wireless LAN Technology and Bluetooth ----- 10 Marks

Wireless LAN (WLAN), IEEE-802.11, WLAN applications, WLAN types, WLAN problems – hidden station and exposed station problems; Bluetooth technology, Direct Sequence Spectrum Scheme, Frequency Hopping Spread Spectrum, Personal Area Networks.

Reference Books

1. Wireless Communication: Principles and Practice by Theodor S. Rappaport, Pearson Education.
2. Wireless Communication and Networking- William Stallings, PHI.
3. Mobile Computing: Technology, Applications and Service Creation by Asokek Talukdar and Roop R. Yavagal, TMA.

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	Time Allotted (Hrs)	Marks Allotted
1	10	10
2	8	10
3	12	15
4	12	15
5	6	10
Total	48	60

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Course Code	:	COPE206-II
Course Title	:	Programme Elective -II (Wireless Communication Lab)
Number of Credits	:	2 (L:0; T:0; P:4)
Prerequisites	:	-
Course Category	:	PE (Program Elective)

Course Learning Objectives

To help the students understand the concepts behind wireless communication systems through hands-on experiments and to make them more confident both in system design and analysis.

Course Outcomes:

After the completion of this course students will be able to implement the concepts learned in the theory.

Course Contents:

S. No.	Experiment Objective
1.	To identify various wireless networking devices and to recognise physical topology in the lab.
2.	To create WLAN of at least five wireless devices using any simulation tool (e.g. packettracer).
3.	To setup a WLAN using access point.
4.	Data sharing using Bluetooth.
5.	To transfer data between two wireless devices (e.g.PC-PC, PC-Smart phone)
6.	To install, configure and use a Printer with WiFi.

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Course Code	:	COPE204-III
Course Title	:	Programme Elective-II (Mobile Computing)
Number of Credits	:	2 (L: 2, DCS: 1, P:0)
Prerequisites	:	-
Course Category	:	PE

Course Learning Objectives:

To introduce the basic concepts and principles in mobile computing. This includes major techniques involved, networks & systems issues for the design and implementation of mobile computing systems and applications. To explore both theoretical and practical issues of mobile computing. To provide an opportunity for students to understand the key components and technologies involved and to gain hands-on experiences in building mobile applications.

Course Outcomes:

After the completion of the course learners will be able to:

CO 1	Understand the evolution of wireless data networks.
CO 2	Explain architecture for mobile computing.
CO 3	Understand emerging technologies in mobile computing.
CO 4	Understand the Android Operating System & develop android based application.

Unit-1 Overview of Mobile Computing 10 Marks

Mobility of bits and bytes, the convergence leading to ICT, Wireless the beginning, evolution of wireless networks, evolution of wireless data, evolution of wireless LAN, PAN, Mobile computing, Mobile computing functions, Devices, wireline, wireless, Ad hoc networks, bearers, middleware and gateways, application and services, security in mobile computing.

Unit-2 Mobile Computing Architecture.....15 Marks

Architecture for mobile computing, three tier architecture, design considerations for mobile computing, client context manager, introduction to CC/PP, policy manager, semantic web, security manager, GPS, Mobile computing through Internet.

Unit-3 Emerging Technologies..... 20 Marks

Introduction- Bluetooth, Bluetooth protocols, protocol stack, RFID, applications, Mobile IP, How Mobile IP works, IP packet delivery, Agent Discovery, Registration, Tunnelling and encapsulation, Route optimization, IP Handoff, Introduction to LTE. Java card, mobile computing over SMS, SMS as information bearer, Introduction to GPRS network architecture, applications.

Unit 4: Overview of Android Operating System15 Marks

Design constraints in applications for handheld devices, an overview of Android Operating System, Architecture, creating android virtual devices, creating android applications, android application components, activity life cycle, intents, intent types, linking activities, using intents. Fragments, layouts UI-widgets-button, toggle button, check box, spinner, radio button, web view, edit text, data picker, time picker etc.

Reference Books:

1. Wireless Communication: Principles and Practice by Theodor S. Rappaport, Pearson Education
2. Mobile Computing: Technology, Applications and Service Creation by Asoke k Talukdar and Roopa R. Yavagal, TMA
3. Principles of Mobile Computing by Owe Hansman, LotharMerk, Martin S
4. Computer Networks, 4th Edition (or later), Andrew S. Tanenbaum, PHI

SUGGESTED DISTRIBUTION OF MARKS		
Topic No.	Time Allotted (Hrs)	Marks Allotted
1	10	10
2	12	15
3	16	20
4	10	15
Total	48	60

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Course Code	:	COPE206-III
Course Title	:	Programme Elective -II (Mobile Computing Lab)
Number of Credits	:	2 (L:0, DCS:0,P:4)
Prerequisites	:	-
Course Category	:	PE

Course Learning Objectives

To help the students understand the concepts behind Mobile Communication.

Course Outcomes:

After the completion of this course students will be able to implement the concepts learned in the theory.

Course Contents:

S. No.	Experiment Objective
1.	To identify various mobile computing devices and to study and compare their features.
2.	To transfer data between two wireless devices (e.g. Laptop/PC-Laptop/PC, PC-Smart phone)
3.	Prepare a report on features and services provided by different mobile service providers like Idea, Airtel, Jio etc.
4.	Prepare a report on specifications of different handsets provided by different companies.
5.	To create Android Application to display "Hello World"
6	To create Android Virtual Device
7	To create two activities and link using intents
8	To display notification using toasts
9	To implement various layouts in android application
10	To implement various UI-widgets such as button, radio button, check box etc.
11	Industrial visit to mobile company-GSM (e.g. BSNL Airtel, BPL).

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Course Code	:	AU202
Course Title	:	Essence of Indian Knowledge & Tradition
Number of Credits (Teaching Load)	:	0 (L: 2, DCS:0; P:0)
Prerequisites	:	-
Course Category	:	AU (Audit Course)

Course Learning Objectives

The objective of this course is to expose the students with the concepts of Indian traditional knowledge and to make them appreciate the importance of the roots of indigenous knowledge system.

Course Outcomes

After completing this course the students will be able to:

- CO-1. Identify the concept of Indian Knowledge System (IKS).
- CO-2. Understand the need and importance of protecting traditional knowledge.
- CO-3. Compare the Indian traditional knowledge and modern science.
- CO-4. Understand the use of Yoga in stress management, mental health, mindfulness, healthy eating, weight loss and quality sleep.
- CO-5. Aware of the general knowledge of Himachal Pradesh.

Course Content

Unit 1 Indian Knowledge System (IKS):-----15 Marks

- Introduction and Function of Indian Knowledge System(IKS).
- The Basic Structure of Indian Knowledge System(IKS) (only Introduction)
 1. The 4 Vedas, Namly ऋग्वेद (Rigveda) , यजुर्वेद (Yajurveda), सामवेद (Samaveda) , अथर्ववेद (Atharvaveda) .
 2. The 4 UpVedas, Namely आयुर्वेद (Ayurveda (health-care)), धनुर्वेद (Dhanurveda (archery)), गंधर्ववेद (Gandharva-veda (dance, music etc.)) and स्थापत्यवेद (Sthapatyaveda (architecture)).
 3. The 6 Vedagangs ,namely Shiksha (शिक्षा), Kalpa (कल्प), Vyakarana (व्याकरण), Chhandas (छंदस), Nirukta (निरुक्त), and Jyotisha (ज्योतिष).
 4. Itihasa (इतिहास)(Ramayana रामायण and Mahabharata महाभारत) and Purana पुराण (Vishnupurana विष्णुपुराण, Bhagavata Purana (भागवतपुराण) etc.)

5. Dharmashatraधर्मशास्त्र (Manusmritiमनुस्मृति, Yajnavalkya-smritiयाज्ञवल्क्यस्मृति, etc.).
6. Darshanदर्शन (आस्तिकतथानास्तिक).
7. Nyaya न्याय (Logic तर्कशास्त्रandEpistemologyज्ञानमीमांसा).

Unit 2 : Modern Science -----

12 Marks

- Modern science: Introduction, Characteristics, importance and Example
- Difference between modern Science and Indian knowledge system
- Role of IKS in modern science

Unit 3 : Traditional knowledge -----

9 Marks

- Traditional knowledge: Definition, nature, characteristics, scope and importance
- Indigenous Knowledge (IK): characteristics
- Traditional knowledge vis-a-vis Indigenous knowledge
- Traditional knowledge Vs western knowledge
- The need for protecting traditional knowledge

Unit 4 : Yoga and Holistic Health -----

15 Marks

Care

- Yoga: Meaning and Importance of Yoga
- Yoga and physical health, Yoga and psychological health, Yoga and intellectual health, Yoga and spiritual health, Yoga and social approach.
- Introduction to Ashtanga Yoga, Yogic Kriyas (Shat Karma)
- Pranayama and its types; Active lifestyle and stress management through Yoga
- Physical Fitness, Health and wellness: Meaning and Importance of Wellness,
- Components of Wellness, Health and physical Fitness;
- Traditional sports & Regional Games for promoting wellness:
- Leadership through Physical Activity and Sports; Introduction to First Aid.

Unit 5 : Himachal Pradesh: A Basic Information -----

9 Marks

- History, Culture, Heritage/ Tradition, Customs & Manners,
- Regional Knowledge, Geographical Features, Constitutional History
- Tourism Place & Scope
- Festivals and Fairs

Suggested Text/ Reference Books

1. Cultural Heritage of India-Course Material by V. SivaramakrishnaBharatiya, VidyaBhavan,

Mumbai, 5th Edition, 2014

2. Modern Physics and Vedant by Swami JitatmanandBharatiya, VidyaBhavan
3. The wave of Life by Fritz of Capra
4. Tao of Physics Fritz of Capra
5. Tarkasangraha of Annam Bhatta, International by V N Jha, Chinmay Foundation, Velliarnad, Ernakulam
6. Science of Consciousness Psychotherapy and Yoga Practices by RN Jha, VidyanidhiPrakashan, Delhi, 2016
7. Himachal Pradesh History, Culture & Economy by MianGoverdhan Singh & Prof. Dr. C.L. Gupta.

SUGGESTED DISTRIBUTION OF MARKS (Internal Assessment)		
Project Component	Time Allotted (Hrs)	Marks Allotted
Unit 1 : Indian Knowledge System (IKS)	8	15
Unit 2 : Modern Science	6	12
Unit 3 : Traditional knowledge	5	9
Unit 4 : Yoga and Holistic Health Care	8	15
Unit 5 : Himachal Pradesh: A Basic Information	5	9
Total	32	60

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Course Code	:	PR202
Course Title	:	Minor Project
Number of Credits	:	2 (L: 0,DCS:0,P:4)
Prerequisites	:	-
Course Category	:	PR

Course Learning Objectives

Main objective of this project work is to provide the students with an opportunity to showcase their ability to develop a complete project by applying the principles of Software Engineering and the experience gained during their industrial training/. Project work inculcates skills like problem-solving, creative thinking, time-management, planning, teamwork, leadership, presentation, report-writing, communication etc.

Course Outcomes:

After the completion of the course learners will be able to:

CO 1	Apply the principles of software engineering and the experience gained during their industrial training
CO 2	Design and construct a hardware and software system, component, or process to meet desired needs.
CO 3	Work as professionals, with portfolio ranging from data management, network configuration, designing hardware, database and software design to management and administration of entire systems.
CO 4	Demonstrate skills like problem solving, creative thinking, time management, planning, teamwork, leadership, presentation, report-writing, communication etc.
CO 5	Gain confidence at having conceptualized, designed and implemented a working minor project with their team.

GUIDELINES

The students may be encouraged to choose a project from any of the following identified areas:

- To build a basic desktop application with GUI, database support and report generation.
- To develop websites using HTML, CSS and JavaScript and server-side scripting language like PHP/ASP.NET/JSP.

- To develop web applications using popular frameworks like CodeIgnitor, Laravel, Magento, Django etc.
- Undertake a hardware project using commercially available platforms (Arduino or Raspberry-Pi).

The students should be encouraged to undertake projects to solve some real-world problems like library management, hostel management, student record maintenance, institute management system, employee leave record system, payroll system, timetable preparation etc. The preference should be given to such minor projects which could be continued as major projects during 6th semester. The list of project areas given above are tentative only, the students are free to select any project of their choice based on technologies relevant to their diploma stream.

Note: The teachers must guide/help students to identify their minor project work and chalk out their plan of action well in advance. As a minor project activity each student is supposed to study the project clearly and prepare a detail project report of the observations/ processes/ activities observed by him/ her. The students should be guided by the respective subject teachers. The teachers will conduct performance/ assessment of the students.

SUGGESTED DISTRIBUTION OF MARKS (Internal Assessment)

Sr. No.	Project Component	Marks Allotted (%)
1	Synopsis and Project Title Selection	10 %
2	Initiative in performing tasks during project work	10%
3	Attendance and punctuality	20%
4	Final outcome as per objectives set by student(s)	40%
5	Report writing	20%

SUGGESTED DISTRIBUTION OF MARKS (External Assessment)

Sr. No.	Project Component	Marks Allotted (%)
1	Project Demonstration	40 %
2	Project Presentation	20 %
3	Project Report	20 %
4	Viva	20 %

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Course Code	:	SI-I
Course Title	:	Internship-I
Number of Credits (Teaching Load)	:	2 (L: 0; T:0; P:0)
Prerequisites	:	-
Course Category	:	SI (Internship)

Guidelines

An internship of four weeks after 3rd semester during vacations should be undertaken in an industry/ Govt. or Pvt. Certified Agencies which are in social sector/ Govt. Skill Centres/ Institutes/ Schemes. The assessment of internship will be carried out in 4th semester. The faculty members must visit the internship site during the course of internship to monitor the progress of the students.

Evaluation Criteria

The internal assessment of internship is to be carried out by the Industry/ Organization where the students have undergone the internship. The internal assessment done by the industry/ organization may be rationalized by the Department, if needed. The external assessment is to be done at the Institute. The department shall finalize external assessment within a month of the beginning of the 4th semester. The students have to prepare a daily diary of their internship period and the same has to be submitted at the institute after completion of the internship. The students have also to present the experience gained during internship in a seminar for the purpose of external evaluation.

(a) The assessment criteria (Internal Assessment) by the industry/ organization where the students have undergone the internship is as follows:

- Attendance and general behavior : 20%
- Daily diary maintenance : 20%
- Initiative and participative attitude during internship : 20%
- Performance in the assigned activities by the industrial supervisor : 40%

(b) The assessment criteria (External Assessment) by the institute is as follows:

- Seminar : 50%
- Viva : 50%

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Course Code	:	SI-II
Course Title	:	Internship-II
Number of Credits (Teaching Load)	:	3 (L: 0; T:0; P:0)
Prerequisites	:	-
Course Category	:	SI (Internship)

Guidelines

An internship of Six weeks after 4th semester during vacations should be undertaken by the students in relevant Industry. The objective of this mandatory internship is to expose the students to the real world of work and get experience with the latest tools, best practices, work & culture, etiquettes and ethics followed in modern industries. The assessment of internship will be carried out in 5th semester. The faculty members must visit the internship site during the course of internship to monitor the progress of the students.

Evaluation Criteria

The internal assessment of internship is to be carried out by the Industry/ Organization where the students have undergone the internship. The internal assessment done by the industry/ organization may be rationalized by the Department, if needed. The external assessment is to be done at the Institute. The department shall finalize external assessment within a month of the beginning of the 5th semester. The students have to prepare a daily diary of their internship period and the same has to be submitted at the institute after completion of the internship. The students have also to present the experience gained during internship in a seminar for the purpose of external evaluation.

(a) The assessment criteria (Internal Assessment) by the industry/ organization where the students have undergone the internship is as follows:

- Attendance and general behavior : 20%
- Daily diary maintenance : 20%
- Initiative and participative attitude during internship : 20%
- Performance in the assigned activities by the industrial supervisor : 40%

(b) The assessment criteria (External Assessment) by the institute is as follows:

- Presentation : 60%
- Report : 20%
- Viva : 20%

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