Computer Science & Technology

(CST)

(III to VI Semester)

Semester III

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme corecourse-1	CSPC301	Computer Programming	3	0	0	3	3
2	Programme corecourse-2	CSPC302	Computer System Organization	3	0	0	3	3
3	Programme corecourse-3	CSPC303	Operating Systems	2	0	0	2	2
4	Programme corecourse-4	CSPC304	Scripting Languages (Python /Perl – any one)	2	0	0	2	2
5	Programme corecourse-5	CSPC305	Digital Logic Design & Microprocessor	2	0	0	2	2
6	Programme corecourse-6	CSPC306	Computer Programming Lab	0	0	4	4	2
7	Programme corecourse-7	CSPC307	Scripting Languages Lab	0	0	4	4	2
8	Programme corecourse-8	CSPC308	Operating Systems Lab	0	0	2	2	1
9	Programme corecourse-9	CSPC309	Digital Logic Design & Microprocessor Lab	0	0	2	2	1
10	Summer Internship-I (4 weeks) after IInd Semester)	CSSI310	Summer Internship-I	0	0	0	0	2
			Total				**24**	**20**

Semester IV

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-10	CSPC401	Data Structures & Algorithms	3	0	0	3	3
2	Programme core course-11	CSPC402	Introduction to DBMS	3	0	0	3	3
3	Programme core course-12	CSPC403	Computer Networks	2	0	0	2	2
4	Programme core course-13	CSPC404	Software Engineering	2	0	0	2	2
5	Programme core course-14	CSPC405	Data Structures Lab	0	0	2	2	1
6	Programme core course-15	CSPC406	Introduction to DBMS Lab	0	0	2	2	1
7	Programme elective course-1	CSPE407	1. Mobile Application Development / 2. Object Oriented Programming Methodology / 3. Multimedia Technologies	3	0	0	3	3
8	Mandatory course	HS408	Professional Skill Development	2	1	0	3	3
9	Minor Project	CSPR409	Mini Project	0	0	4	4	2
10	Mandatory Course-1	AU401	Essence of Indian Knowledge and Tradition	2	0	0	2	0
			Total				**26**	**20**

Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-16	CSPC501	Introduction to e-Governance	3	0	0	3	3
2	Programme core course-17	CSPC502	Internet of Things (IoT)	2	0	0	2	2
3	Programme core course-18	CSPC503	Web Technologies	2	0	0	2	2
4	Programme core course-19	CSPC504	Networking Lab	0	0	2	2	1
5	Programme core course-20	CSPC505	Web Technology Lab	0	0	2	2	1
6	Programme elective course-2	CSPE506	Distributed Systems / Cloud Computing / Data Science	3	0	0	3	3
7	Programme elective course-3	CSPE507	Mobile Computing / Software Testing / FOSS	3	0	0	3	3
8	Open elective course-1	**OE508	To be offered by other departments	3	0	0	3	3
9	Summer Internship-II (6 weeks) after IV Semester	CSSI509	Summer Internship-II	0	0	0	0	3
10	Major Project	CSPR510	Project part-I	0	0	2	2	1
			Total				**22**	**22**

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Semester VI

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-21	CSPC601	Wireless and Mobile Network	3	0	0	3	3
2	Programme core course-22	CSPC602	Fundamentals of AI	2	0	0	2	2
3	Programme elective course-4	CSPE603	1. Advance Computer Networks/ 2. Information Security / 3. Network Forensics	3	0	0	3	3
4	Humanities and Social Science course	HSS604	Entrepreneurship and Start-up's	3	1	0	4	4
5	Open elective-2	**OE05	To be offered by other departments	3	1	0	4	4
6	Mandatory Course-2	AU606	Indian Constitution	2	0	0	2	0
7	Major Project	CSPR607	Project part-II	0	0	6	6	3
8	Seminar	CSSE608	Seminar	2	0	0	2	1
			Total				**26**	**20**

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DETAILED SYLLABUS

Semester III

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme corecourse-1	CSPC301	Computer Programming	3	0	0	3	3
2	Programme corecourse-2	CSPC302	Computer System Organization	3	0	0	3	3
3	Programme corecourse-3	CSPC303	Operating Systems	2	0	0	2	2
4	Programme corecourse-4	CSPC304	Scripting Languages (Python /Perl – any one)	2	0	0	2	2
5	Programme corecourse-5	CSPC305	Digital Logic Design & Microprocessor	2	0	0	2	2
6	Programme corecourse-6	CSPC306	Computer Programming Lab	0	0	4	4	2
7	Programme corecourse-7	CSPC307	Scripting Languages Lab	0	0	4	4	2
8	Programme corecourse-8	CSPC308	Operating Systems Lab	0	0	2	2	1
9	Programme corecourse-9	CSPC309	Digital Logic Design & Microprocessor Lab	0	0	2	2	1
10	Summer Internship-I (4 weeks) after IInd Semester)	CSSI310	Summer Internship-I	0	0	0	0	2
			Total				**24**	**20**

Computer Programming

Course Code	CSPC301
Course Title	Computer Programming
Number of Credits	3(L : 3, T : 0, P : 0)
Prerequisites	Interaction with DOS / Windows Operating System
Course Category	Programme Core Course

Course Outcomes: -

After completion of the course student will be able to

1) Learn the common units of programming languages
2) Identify problems to be solved
3) Develop structured solutions to problems
4) Express solution in a machine readable form or a programming language

Detailed Course Contents

Module- 1: Introduction of Programming

Number of class hours: 8

Suggestive Learning Outcomes:

1) Identify problems to be solved
2) Understand Structure of a program
3) Learn various basic units of program and use them.

Detailed content of the unit:

1.1. Introduction to Problem Solving
1.2. Structured Language and an overview of C
1.3. Character set, Tokens, Constants, Variables
1.4. Key words and Identifiers
1.5. Data types used in C & their size.

Module- 2: Operators and I/O

Number of class hours: 4

Suggestive Learning Outcomes:

1) Explain and use various operators
2) Illustrate I/O operation

Detailed content of the unit:

2.1. Arithmetic, Relational, Logical and Bitwise Operators
2.2. Operator precedence

2.3. Input, Output, Formatting and File I/O

Module-3: Control statements

Number of class hours: 7

Suggestive Learning Outcomes:

1) Understand and learn various control statements
2) Recognize and apply control statements where ever required

Detailed content of the unit:

3.1. Decision making and branching statements
3.2. if statement (if, ifelse,else-if ladder, nested if-else)
3.3. Switch case statement.
3.4. Iterative/Loop statement
3.5. while, do-while
3.6. for Loop structure
3.7. Break and continue statement
3.8. Conditional and unconditional Goto statement

Module-4: Functions and Arrays

Number of class hours: 8

Suggestive Learning Outcomes:

1) Learn and identify types of functions and arrays
2) Apply them in solving problems

Detailed content of the unit:

4.1. Functions, Need of functions, Difference between library function and user defined Function.
4.2. Prototype declaration, Defining functions, Passing parameter types, Function call, Return values
4.3. Category of function (No argument No return value, No argument with return value, Argument with return value)
4.4. Advantages of arrays
4.5. Declaration and initialization of one dimensional, two dimensional and character arrays
4.6. Accessing array elements.

Module- 5: Recursion

Number of class hours: 3

Suggestive Learning Outcomes:

1) Illustrate recursive function
2) Use recursive function

Detailed content of the unit:

5.1. Recursion and use of memory stack
5.2. Types of recursion,
5.3. Advantages and disadvantages of recursive function.

References:

1. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
2. Outline of Programming with C, Byron Gottfried, Schaum, McGraw-Hill
3. Let Us C, Yashavant Kanetkar
4. Programming in C, Reema Thareja, OUP India
5. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
6. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
7. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.

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Computer System Organisation

Course Code	CSPC302
Course Title	Computer System organisation
Number of Credits	3(L: 3, T:0, P:0)
Prerequisites	Knowledge of Number System
Course Category	Programme Core Course

Course Outcomes: -

After Completion of the course students will be able to:

1) Have a thorough understanding of functioning of digital computer system as such and its various subcomponents.
2) Understand computing requirement for a specific purpose
3) Analyse performance bottlenecks of the computing device
4) Choose appropriate computing device for a given use case.

Detailed Course Contents

Module- 1: Introduction to Computer System

Number of class hours: 6

Suggestive Learning Outcomes:

4) Identify and explain functionality of various parts of digital computer
5) Illustrate data representation.
6) Explain register and arithmatic microoperation.

Detailed content of the unit:

1.1. Structure of Computers: Computer Functional units, Von-Neumann architecture, Bus Structures.
1.2. Basic Operational Concepts, Data representation (Fixed and Floating point)
1.3. Error detecting codes.
1.4. Register Transfer and Micro Operations: Register transfer, Bus and memory transfers.
1.5. Basics of Arithmetic micro-operations, Logic micro-operations, Shift micro-operations, and Arithmetic logic shift unit.

Module- 2: Micro Programmed Control and Pipeline

Number of class hours: 8

Suggestive Learning Outcomes:

3) Explain working of Control unit.
4) Solve arithmetic problems
5) Understand concept of pipelining

Detailed content of the unit:

2.1. Micro Programmed Control: Control memory, Address sequencing, and design of control unit
2.2. Computer Arithmetic: Addition and Subtraction, Multiplication and Division algorithms, Floating-point arithmetic operation
2.3. Introduction to Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors

Module-3: Microprocessor

Number of class hours: 6

Suggestive Learning Outcomes:

3) Understand and learn various various parts of microprocessor
4) Recognize and apply various instructions .

Detailed content of the unit:

3.1. Introduction to Microproccessor Architecture
3.2. Instruction Set Architecture design principles fromprogrammer's perspective. One example microprocessor (Intel, ARM, etc).

Module-4: Programming the Basic Computer

Number of class hours: 5

Suggestive Learning Outcomes:

1) Write simple assembly level programs
2) Understand and explain procedure and macros
3) Evaluate arithmatic expression

Detailed content of the unit:

4.1. Assembly Language Programming: Simple programs, Assembly language programs involving logical, branch and call instructions
4.2. Sorting, evaluation of arithmetic expressions
4.3. String manipulation, assembler directives
4.4. Procedures and macros.

Module- 5: Memory and I/O Organization

Number of class hours: 5

Suggestive Learning Outcomes:

1) Understand and illustrate memory and I/O interfacing
2) Demonstarte various modes of I/O operation

Detailed content of the unit:

5.1. Memory and Digital Interfacing: addressing and address decoding
5.2. Interfacing RAM, ROM, EPROM, programmable peripheral interface
5.3. Various modes of operation and interfacing to processor, interfacing keyboard, displays etc.

References:

1. Computer System Architecture, M. Moris Mano, Pearson/PHI, India.
2. Microprocessors Interface, Douglas V.Hall, Tata McGraw-Hill.
3. Computer Organization, Carl Hamacher, Zvonks Vranesic, SafeaZaky, McGraw-Hill
4. Advanced Microprocessors and Peripherals- Architecture, Programming and interfacing, A.K.Ray, K.M.Bhurchandi, Tata McGraw-Hill, New Delhi, India.
5. Computer Organization and Design: A Hardwar/Software Interface (MIPS Edition) by Patterson and Hennessy

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Operating System

Course Code	CSPC303
Course Title	Operating System
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	Computer Organization and Digital Design
Course Category	Programme Core Course

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Understand the basics of operating systems like kernel, shell, types and services of operating systems. (K2)
C.O. 2:Understand the concept of program, process and thread and analyse various CPU scheduling Algorithms. (K2,K3)
C.O. 3: Describe and analyse the memory management and its allocation policies. (K3)
C.O. 4: Understand the issues related to file system interface and implementation.(K2,K3)
C.O. 5: Understand disk management and explain disk scheduling algorithms for better utilization of external memory. (K2, K3)
C.O. 6: Configure OS in an efficient and secure manner. (K3)

Course Content:

Module 1 – Introduction

Learning Outcomes:-

Students will be able to-

1. Define an operating system.
2. Discuss history of operating system.
3. Discus about various types of operating systems and operating system services.
4. Define system call with an example.
5. Explain single, multi user operating system structure.

Content:
Overview of Operating System, basic concepts, UNIX/LINUX Architecture, Kernel, services and systems calls, system programs.

Module 2 – Process Management and Memory management

Learning Outcomes:-

Students will be able to-

1. Define process, threads and multithreading.
2. Understand b) process state diagram c) process control block.
3. Describe process creation and termination.
4. Explain various scheduling algorithms – FCFS, SJF, Priority, Round Robin,
5. Explain inter process communication.
6. Explain single partition allocation and multiple partition allocation, paging and segmentation.
7. Describe page replacement algorithms - FIFO, LRU, Optimal.
8. Define concept of thrashing and page fault.

Content:
Process Management: Process concepts, operations on processes, IPC, Process Scheduling, Multithreaded programming.
Memory management: Memory allocation, Swapping, Paging, Segmentation, Virtual Memory, various faults.

Module 3 –File management

Learning Outcomes:-

Students will be able to-

1. Define file management.
2. List and explain various file operations and file access methods.
3. Explain directory structure organization.
4. Describe the concept of file protection.
5. Understand Different types of file systems.

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Content:
Concept of a file, access methods, directory structure, file system mounting, file sharing and protection, file system structure and implementation, directory implementation, free space management, efficiency and performance. Different types of file systems.

Module 4 – I/O System

Learning Outcomes:-

Students will be able to-

1. Explain disk structure.
2. Understand swap space management.
3. Explain various disk scheduling algorithms- FCFS, SST, SCAN,C-SCAN, LOOK.
4. Explain various RAID levels.

Content:
Mass storage structure - overview, disk structure, disk attachment, disk scheduling algorithms, swap space management, RAID types.

Module 5 –OS Security

Learning Outcomes:-

Students will be able to-

1. Understand and identify potential threats to operating system,
2.Explain different Authentication schemes.
2. Explain security features design to guard against threats.

Content:
Authentication, Access Control, Access Rights, System Logs

References/ Suggested Learning Resources:-

1. Operating System Concepts, Silberschatz and Galvin, Wiley India Limited
2. UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education
3. Operating Systems, Internals and Design Principles, Stallings, Pearson Education, India
4. Operating System Concepts, Ekta Walia, Khanna Publishing House
5. Modern Operating Systems, Andrew S. Tanenbaum, Prentice Hall of India
6. Operating systems, Deitel & Deitel, Pearson Education, India
7.Principles of Operating Systems, Naresh Chauhan, Oxford University Press India.

Websites for Reference: http://swayam.gov.in

SCRIPTING LANGUAGE(PYTHON)

Course Code	CSPC304
Course Title	Scripting Language (Python)
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	Knowledge of Programming
Course Category	Programme Core Course

Course Outcomes: -

After the completion of the course Student will be able to

1) Draw flow charts for solving different problems, develop efficient algorithms for solving a problem. (**K3**)
2) Use the various constructs of Python viz. conditional, iteration(**K1**)
3) Write programs making judicious use of Lists, Strings, Tuples, Dictionaries wherever required(**K3)**
4) Manage data using NumPy (**K3**)
5) Handle files and Modules in Python (**K2**)

Course Content:-

Module- 1: Introduction to Programming, Algorithm and Flowcharts

Number of class hours: 04 Hrs

Suggestive Learning Outcomes:

1) Understand the concept and evolution of Programming. **(K1)**
2) Understand the concepts and purposes of algorithm and flowchart. **(K1)**
3) Use algorithm and flowchart to solve problem independent of language. **(K3)**
4) Gain knowledge of different constructs of algorithm and flowchart. **(K2)**

Detailed content of the unit: - The basic Model of computation, Algorithms, Flowcharts, Programming Languages, Compilation, Testing & debugging and documentation, Flow Chart Symbols, Basic algorithms/flowcharts for sequential processing, Decision based processing and Iterative processing.

Module- 2: Introduction to Python

Number of class hours: 05 Hrs

Suggestive Learning Outcomes:

1) Understand features of Python that make it one the most popular languages in the industry. **(K1)**
2) Understand structure of Python problem. **(K2)**
3) Understand the areas where Python is used. **(K2)**

Detailed content of the unit: - Python Introduction, Technical Strength of Python, Introduction to Python Interpreter and program execution, Using Comments, Literals, Constants, Python's Built-in Data types, Numbers (Integers, Floats, Complex Numbers, Real, Sets), Strings (Slicing, Indexing, Concatenation, other operations on Strings), Accepting input from Console, printing statements, Simple 'Python' programs.

Module- 3: Operators, Expressions and Python Statements, Sequence data types

Number of class hours: 8 Hrs

Suggestive Learning Outcomes:

1) Use the basic operators and expressions available in Python in developing program. **(K3)**
2) Understand and use various Python statements like conditional constructs, looping constructs in writing Python program. **(K3)**
3) Work with various built-in Sequence datatypes and their use. **(K3)**
4) Understand the concept of mutable and immutable objects. **(K2)**

Detailed content of the unit: - Assignment statement, expressions, Arithmetic, Relational, Logical, Bitwise operators and their precedence, Conditional statements: if, if-else, if-elseif-else; simple programs, Notion of iterative computation and control flow –range function, While Statement, For loop, break statement, Continue Statement, Pass statement, else, assert.
Sequence Data Types: Lists, tuples and dictionary, (Slicing, Indexing, Concatenation, other operations on Sequence datatype), concept of mutability, Examples to include finding the maximum, minimum, mean; linear search on list/tuple of numbers, and counting the frequency of elements in a list using a dictionary.

Module- 4: Functions, File Processing, Modules

Number of class hours: 8 Hrs

Suggestive Learning Outcomes:

1) Apply the in-built functions available in Python in solving different problems. **(K3)**
2) Work with modular approach using user defined functions. **(K2)**
3) Work with files and reading /writing onto files. **(K3)**
4) Understand the concept of modules and importing, loading and reloading of modules in programs. **(K1)**

Detailed content of the unit: - Functions Top-down approach of problem solving, Modular programming and functions, Function parameters, Local variables, the Return statement, DocStrings, Global statement, Default argument values, Keyword arguments, VarArgs parameters. Library functions, Time functions, Recursion, Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file, File functions,
Command Line arguments, Scope of objects and Names, LEGB Rule, Module Basics, Module Files as Namespaces, Import Model, Reloading Modules.

Module- 5: NumPy Basics

Number of class hours: 05 Hrs

Suggestive Learning Outcomes:

1) Work on NumPy array manipulation to access data and subarrays and to split, reshape, join arrays etc. **(K3)**

Detailed content of the unit: - Introduction to NumPy, ndarray, datatypes, array attributes, array creation routines, Array from Existing Data, Array from Numerical Ranges, Indexing & Slicing.

References: - 1) Python Programming- A modular Approach (with Graphics, database, Mobile and Web Applications by Sheetal Taneja and Naveen Kumar, Pearson.

2) Head First Python by Paul Berry, O'Reilly

3) Dive into Python by Mark Pilgrim, APress

4) Beginning Programming with Python Dummies by John Paul Meuller.

5) Programming and Problem Solving Through Python Language, Prof. Satish Jain, Shashi Singh, BPB Publication.

OR

SCRIPTING LANGUAGE (PERL)

Course Code	CSPC304
Course Title	Scripting Language(Perl)
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	Knowledge of Programming and Linux
Course Category	Programme Core Course

Course Outcomes: -

After the completion of the course Student will be able to

1) The fundamentals to create functional Perl scripts **(K1)**.
2) Know about data structures, flow control mechanisms, regular expressions, and subroutines and modules. **(K2)**
3) Know about the usage of Database Access using Perl. **(K3)**

Course Content:-

Module- 1: An Overview of Perl

Number of class hours: 08 Hrs

Suggestive Learning Outcomes:

1) Understand features and structure of Perl. **(K1)**
2) Understand the areas where Perl is used. **(K1)**
3) Understand the uses of Filehandles, Operators, Control Structures, Regular Expressions. **(K3)**

Detailed content of the unit: - Perl Introduction, Perl Environment, Perl Installation, Natural and Artificial Languages, A Grade Example, Filehandles, Operators, Control Structures, Regular Expressions, List Processing

Module- 2: The Gory Details

Number of class hours: 8 Hrs

Suggestive Learning Outcomes:

1) Use the basic operators and expressions available in Perl in developing program. **(K2)**
2) Understand and use various subroutines, formats in writing Perl program. **(K3)**
3) Work with various built-in datatypes and their use **(K3)**
4) Understand the concept of pattern matching, variables and hashes. **(K2)**

Detailed content of the unit: - Lexical Texture, Built-in Data Types, Terms, Pattern Matching, Operators, Statements and Declarations, Subroutines, Formats, Special Variables, Hashes

Module- 3: References and Nested Data Structures

Number of class hours: 05 Hrs

Suggestive Learning Outcomes:

1) Understand the concept of References, Braces, Brackets, and Quoting, **(K2)**
2) Understand the concept of lists and data structure codes. **(K3)**

Detailed content of the unit: - About Reference, Creating Hard References, Using Hard References, Symbolic References, Braces, Brackets, and Quoting, Manipulating Lists of Lists, Data Structure Code Examples.

Module- 4: Functions, Packages, Modules, and Object Classes

Number of class hours: 05 Hrs

Suggestive Learning Outcomes:

1) Work on Understand the concept of Functions. **(K2)**
2) Understand the concept of Modules. **(K2)**
3) Understand the concept of Object, Instance variables. **(K1)**
4) Understand the concept of Packages. **(K1)**

Detailed content of the unit: - Perl Functions by Category, Perl Functions in Alphabetical Order, Packages, Modules, Objects, Perl's Objects, Brief Refresher on Object-Oriented Programming, Using Tied Variables, About Object Design, Instance Variables, Containment, Implementation, Delegation,

Module- 4: Database Access

Number of class hours: 05 Hrs

Suggestive Learning Outcomes:

1) Understand the concept of Database file. **(K3)**
2) Understand the concept of SQL Command Using DBI and DBD. **(K3)**

Detailed content of the unit: - Making and Using a DBM File, Emptying a DBM File, Converting Between DBM Files, Merging DBM Files, Locking DBM Files, Sorting Large DBM Files, Executing an SQL Command Using DBI and DBD

References: -

1) Programming Perl by Larry Wall, Tom Christiansen, & Randal Schwartz; O'REILLY.
2) Learning Perl by Tom Phoenix, Randal L. Schwartz, O'REILLY.
3) Perl Cookbook by Tom Christiansen, Nathan Torkington, O'REILLY.
4) Perl: The Complete Reference by Martin C Brown, McGraw-Hill

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Digital Logic Design & Microprocessor

Course Code	CSPC305
Course Title	Digital logic design & Microprocessor
Number of Credits	2 (L: 2, T:0, P:0)
Prerequisites	--------
Course Category	Programme Core Course

Course Outcomes: -

After Completion of the course students will be able to:

1) Test the digital systems, logic families and logic gates.
2) Construct combinational logical circuit.

3) Construct sequential logical circuit.
4) Use registers and instructions of 8086.
5) Develop assembly language programs using 8086.

Detailed Course Contents

Module- 1: Number systems, Digital Logic families and Logic Gates

Number of class hours: 4 to 5.

Suggestive Learning Outcomes:

1) Convert the number from the given number system to the specified number system.
2) Perform the given binary arithmetic operation on the given data.
3) Describe the characteristics of the given Digital Logic family.
4) Derive the truth table of the given basic logic gate/derived logic gate.
5) Apply Boolean algebra for designing the given logic circuit.
6) Design the logical circuit for the given application.

Detailed content of the unit:

1. Terms - Bit, Byte, Nibble.
2. Number systems – Decimal, Binary, Octal and Hexadecimal and their conversions from one number system to another (Integer and fractional).
3. Codes – BCD, Gray, ASCII, EBCDIC.
4. Binary arithmetic – Compliments – 1's and 2's, Addition, subtraction, multiplication and division. (up to 8 bit).
5. Applications of digital circuits, Comparison of TTL, CMOS, ECL, Characteristics of digital ICs. (Propagation Delay, Noise Margin, Power dissipation, Fan-in Fan-out, Threshold logic levels).
6. Basic gates (AND, OR, NOT), Derived gates (NAND, NOR, EX-OR, EX-NOR), Universal gates.
7. Basic logic operations using laws of Boolean algebra. DE Morgan's Theorems.

Module- 2: Combinational Logic Circuits

Number of class hours: 5 to 6.

Suggestive Learning Outcomes:

1) Simplify the given logical expression using Sum-of-Product (SOP) and Product-of-Sum (POS) approaches.
2) Minimize the given logical function using Karnaugh's map (K-MAP).
3) Explain the approach of designing the given data for half-adder/half-subtractor using K-MAP.
4) Construct the logical diagrams of multiplexer/demultiplexer to solve the given problem.

Detailed content of the unit:

1. Standard/canonical forms for Boolean functions, Min terms and Max terms.
2. Simplification of logical circuit by way of SOP and POS approaches.
3. Expression simplification using Boolean algebra techniques (i.e. K-MAP of 2,3,4 variable K-MAPs).
4. Construction of Half Adder and Half subtractor using K-MAP.
5. Necessity, principle and types of multiplexers and demultiplexer.

Module- 3:Sequential Logic Circuits

Number of class hours: 5 to 6.

Suggestive Learning Outcomes:

1) Differentiate characteristics of the given logic circuits.
2) Identify the given situations where edge triggering is preferred over level triggering with justification.
3) Explain with sketches the working principle of given type of flip flop.
4) Choose relevant type of flip-flop (SR/JK/D/T) based on given number of inputs and the manner in which they affect the binary state of flip-flops.

Detailed content of the unit:

1. Combinational and sequential logic Circuits. Block diagram of sequential circuit.
2. Flip-flops: One-it memory cell symbol applications of flip-flops, Types of triggering flip-flops, Edge triggered and level triggered.
3. Principle of working of different flip-flop types-SR, JK, D and T Flip-flop.

Module- 4:Microprocessor: 8086 and Model Microprocessors

Number of class hours: 6 to 7.

Suggestive Learning Outcomes:

1) Explain the process of executing the given instructions in 8086 microprocessors.
2) Derive physical address to locate the given data from memory segmentation.
3) Compare architecture of Microprocessor 8086 with the specified processor on the given parameters.
4) Select the CISC/RISC architecture-based processor for the given situation with justification.

Detailed content of the unit:

1. Evolution of Microprocessor and type. 16-bit Microprocessor-8086.

2. Features of 8086, pin diagram and architecture of 8086, Flag register and segment registers of 8086, Minimum mode and maximum mode of operation. Timing diagram. Concept of memory segment and pipelining, physical address generation.
3. Overview of Pentium family and processors.
4. Characteristics of RISC processor.
5. CISC with RISC in terms of Instruction set, Length, addressing modes.

Module- 5:Assembly Language Programming using 8086.

Number of class hours: 6 to 7.

Suggestive Learning Outcomes:

1) Select relevant addressing mode of 8086 to identify instruction for solving the given problem with justification.
2) Choose relevant instruction to perform the given operation from the instruction set of 8086 with justification.
3) Develop assembly language programme to solve the given expression.
4) Develop the assembly language program to solve the given problem using decision making and looping structure.

Detailed content of the unit:

1. Programming model of 8086 assembly language program.
2. Addressing modes of 8086 with examples.
3. Group of instruction set-Data transfer, Arithmetic and Logical, Branch and loop, Flag manipulation, shift and rotate and string instructions, (only format and examples).
4. Assembly Language programs for (8-bit and 16-bit) Addition, Subtraction, Multiplication, Division, Decision making and looping.

References:

Sl.no.	Title of Book	Author(s)	Publication
1	Modern Digital Electronics	R.P.Jain	McGraw Hill Education, New Delhi.
2	Digital Principles and Applications	Donald P. Leach, Albert Paul Malvino, Gautam Saha.	McGraw Hill Education, New Delhi.
3	Advanced Microprocessor and Peripherals 3/E	K. M. Bhurchandi, A.K. Roy	McGraw Hill Education, New Delhi.
4	8086 Programming and advance processor architecture	M.T. Savaliya	Wiley India, New Delhi

Suggested software/Learning Websites:

1. http://www.electrical4u.com/some-common-applications-of-logic-gates/
2. http://www.zeepedia.com
3. http://www.cburch.com/logisim
4. http://www.logiccircuit.org/download.html
5. http://www.learnabout-electronics.org
6. http://www.firmcodes.com/different-risc-sics-architecture/
7. http://www.arm.com
8. http://meseee.ce.rit.edu/551-projects/fall2012/1-1.pdf
9. http://www.intel.com

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Computer Programming Lab

Course Code	CSPC306
Course Title	Computer Programming Lab
Number of Credits	2 (L : 0, T : 0, P : 4)
Prerequisites	Interaction with DOS / Windows Operating System
Course Category	Programme Core Courses

Course Outcomes: -

After completion of the course student will be able to

1) Handle of Computer System properly.
2) Apply different logics to solve given problem.
3) Understand different steps and stages to develop complex program
4) Write program using different implementations for the same problem.
5) Identify different types of errors as syntax, semantic, fatal, linker & logical.
6) Debugging of programs.

Detailed Course Contents

Module No.	List of suggested programs/ experiments	No. of class hour
1	1. Display Hello World 2. Taking input from user 3. Find ASCII value of Character 4. Use of gets() function	4

2	5. Displaying hexadecimal, decimal, octal number format of the entered numbers. 6. Displaying entered number with leading zeros and trailing zeros. 7. Displaying entered number with right and left justification. 8. Displaying with different formatting specifiers. 9. Swapping two numbers 10. To find greatest / smallest of three numbers. 11. To display pass class, second-class, distinction according to the marks entered from the keyboard. 12. To find even or odd numbers. 13. To display spellings of number 1-10 on entry. 14. Implementation and displaying the menu to execute 1. ADD, 2. 15. SUBTRACT 3. MULTIPLICATION, 4. DIVISION using switch case. 16. Handling with unformatted, formatted files in different 17. operational mode.	10
3	18. To display our College name twenty times on screen. 19. To demonstrate Continue and Break statements within loop 20. structure. 21. To add first 'n' natural, even, odd numbers using different loop 22. structures. 23. To find GCD, LCM of two integral numbers. 24. To generate simple number triangle for n rows. 25. To generate Pascal triangle for n rows. 26. To add the series 1 + (1 + 2) + (1 + 2 + 3) + …+ (1 +2 +3 + …+n) 27. To generate all prime numbers within the given range. 28. To find all the Armstrong numbers within 100 to 1000.	10
4	29. Display elements of array 30. Reverse an Array 31. Insert element to array 32. Find largest and smallest element in Array 33. Display teo dimentional array. 34. Addition and subtraction of Matrix 35. To calculate multiplication of 2-dimensional matrix. 36. To find the number of vowels and consonants in a string. 37. Implementation of strlen(), strcpy(), strcat() and strcmp() functions. 38. To check whether a string is palindrome or not. 39. Use of all types of functions	10
5	40. Using recursion write program 41. To calculate sum of two numbers 42. To calculate factorial of any given number. 43. Display Fibonacci series 44. Reverse a string 45. Sum of Digits	6

References:

1. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
2. Outline of Programming with C, Byron Gottfried, Schaum, McGraw-Hill
3. Let Us C, Yashavant Kanetkar
4. Programming in C, Reema Thareja, OUP India
5. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
6. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
7. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.

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SCRIPTING LANGUAGE LAB(PYTHON)

Course Code	CSPC307
Course Title	Scripting Language Lab(Python)
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	Knowledge of Programming
Course Category	Programme Core Course

Course Outcomes: -

After the completion of the course Student will be able to

1) Draw flow charts for solving different problems, develop efficient algorithms for solving a problem. (**K3**)
2) Use the various constructs of Python viz. conditional, iteration(**K3**)
3) Write programs making judicious use of Lists, Strings, Tuples, Dictionaries wherever required(**K3)**
4) Manage data using NumPy (**K3**)

Practical Assignments:

1) Write a program to print all Armstrong numbers in a given range. Note: An Armstrong number is a number whose sum of cubes of digits is equal to the number itself. E.g. 370=33+73+03
2) Write a function to obtain sum n terms of the following series for any positive integer value of X
   X +X3 /3! +X5 /5! ! +X7 /7! + …
3) Write a function to obtain sum n terms of the following series for any positive integer value of X
   1+x/1!+x2/2!+x3/3!+…
4) Write a program to multiply two numbers by repeated addition e.g.
   6*7 = 6+6+6+6+6+6+6
5) Write a program to compute the wages of a daily labourer as per the following rules :-

Hours Worked Rate Applicable Upto first 8 hrs Rs100/-

a) For next 4 hrs Rs30/- per hr extra

b) For next 4 hrs Rs40/- per hr extra

c) For next 4 hrs Rs50/- per hr extra

d) For rest Rs60/- per hr extra

6) Accept the name of the labourer and no. of hours worked. Calculate and display the wages. The program should run for N number of labourers as specified by the user.

7) Write a function that takes a string as parameter and returns a string with every successive repetitive character replaced by? e.g. school may become school.

8) Write a program that takes in a sentence as input and displays the number of words, number of capital letters, no. of small letters and number of special symbols.

9) Write a Python program that takes list of numbers as input from the user and produces a cumulative list where each element in the list at any position n is sum of all elements at positions upto n-1.

10) Write a program which takes list of numbers as input and finds:

a) The largest number in the list

b) The smallest number in the list

c) Product of all the items in the list

11) Write a Python function that takes two lists and returns True if they have at least one common item.

12) Write a Python program to combine two dictionary adding values for common keys.

d1 = {'a': 100, 'b': 200, 'c':300}

d2 = {'a': 300, 'b': 200, 'd':400}

Sample output: Counter ({'a': 400, 'b': 400, 'd': 400, 'c': 300})

13) Write a program that takes sentence as input from the user and computes the frequency of each letter. Use a variable of dictionary type to maintain and show the frequency of each letter.

14) Write a NumPy program to find the most frequent value in an array.

15) Take two NumPy arrays having two dimensions. Concatenate the arrays on axis 1.

16) Write a function that takes two filenames f1 and f2 as input. The function should read the contents of f1 line by line and write them onto f2.

References: -

1) Python Programming- A modular Approach (with Graphics, database, Mobile and Web Applications by Sheetal Taneja and Naveen Kumar, Pearson.

2) Head First Python by Paul Berry, O'Reilly

3) Dive into Python by Mark Pilgrim, APress

4) Beginning Programming with Python Dummies by John Paul Meuller.

5) Programming and Problem Solving Through Python Language, Prof. Satish Jain, Shashi Singh, BPB Publication.

OR

SCRIPTING LANGUAGE LAB(PERL)

Course Code	CSPC307
Course Title	Scripting Language Lab(Perl)
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	Knowledge of Programming and Linux
Course Category	Programme Core Course

Course Outcomes: -

After the completion of the course Student will be able to

1) The basic programming using Perl scripts **(K3)**.
2) Know about data structures, flow control mechanisms, regular expressions, and subroutines and modules. **(K2)**

Practical Assignments:

1) Write a program that computes the circumference of a circle with a radius of 12.5. The circumference is 2π times the radius (and π approximates 3.141592654).
2) Modify the program from the previous exercise to prompt for, and accept, a radius from the person running the program.
3) Write a program to take in two numbers that prints out the result of the two numbers multiplied together.
4) Write a program that reads in a string and a number, and then prints out the string the number of times requested. (Hint: use the 'x' operator)
5) Write a program that reads a list of strings, and prints out the list in reverse order.
6) Write a program that reads in a number and a series of lines, then prints one of the lines from the list, as selected by the number.
7) Write a program that reads in a list of strings, then prints one chosen at random.
8) Write a program that asks for the temperature outside (us oldies work in Farenheit). The program should print **too hot** if the temperature is above 72, and **too cold** otherwise.
9) Write a program that reads in a list of numbers (one per line), until the number 999 is entered, then it prints the sum of all the numbers entered. Be sure not to add the 999. For example, if the numbers 1, 2, 3, 999 are entered, the answer is 6 (1+2+3).
10) Write a program that reads in a list of strings (on separate lines), then prints out the list in reverse order. Do this without using the reverse operator.
11) Write a program that reads a series of words (with one word per line) until End-Of File, and then prints a summary of how many times each word was seen.
12) Write a program that acts like ***cat***, but reverses the order of the lines.
13) Construct regular expressions that match:
    a. at least one 'a', followed by any number of 'b's

b. any number of back-slashes, followed by any number of stars
c. three consecutive copies of whatever is contained within the variable $whatever
d. any five characters, including the newline character
e. the same word written two or more times in a row, where "word" is defined as a non-empty sequence of non-whitespace characters.

14) Write a program that looks through **/home/kiz/test.passwd.file** (on STDIN), printing the login name and real name of each user.
15) Write a program that looks through **/home/kiz/test.passwd.file** (on STDIN), for users with the same first name, and prints out those names.
16) Write a program that accepts a list of words on STDIN and looks for a line containing all five vowels (specifically a,e,i,o,u). Run this this program on */usr/dict/words*. ie, run "*myprog < /usr/dict/words*"

References: -

1) Programming Perl by Larry Wall, Tom Christiansen, & Randal Schwartz; O'REILLY.
2) Learning Perl by Tom Phoenix, Randal L. Schwartz, O'REILLY.
3) Perl Cookbook by Tom Christiansen, Nathan Torkington, O'REILLY.
4) Perl: The Complete Reference by Martin C Brown, McGraw-Hill

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Operating System Lab

Course Code	CSPC308
Course Title	Operating System Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Computer Programming using C
Course Category	Programme Core Course

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Learns Operating systems- LINUX/UNIX.**(K2)**
C.O. 2: Understand various UNIX commands on a standard UNIX/LINUX Operating System.**(K2)**
C.O. 3: Apply the scheduling algorithms for the given problem.**(K3)**
C.O. 4: Implement the process synchronous concept using message queue, shared memory . **(K3)**
C.O. 5: Implement the various methods in memory allocation and page replacement algorithm. **(K3)**

List of Practical's/ Activities ***(To perform minimum 6 practical)***

1. Revision practice of various commands like man, cp, mv, ln, rm, unlink, mkdir, rmdir, etc and many more that were learnt in IT Workshop course and later.
2. Implement two way process communication using pipes.
3. Implement message queue form of IPC
4. Implement shared memory and semaphore form of IPC
5. Simulate the CPU scheduling algorithms - Round Robin, SJF, FCFS, priority
6. Simulate all FIFO Page Replacement Algorithm using C program
7. Simulate all LRU Page Replacement Algorithms using C program
8. Simulate Paging Technique of Memory Management
9. Practice various commands/utilitiessuch as catnl, uniq, tee, pg, comm, cmp, diff, tr, tar, cpio, mount, umount, find, umask, ulimit, sort, grep, egrep,fgrep cut, paste, join, du, df , ps, who, etc and many more.

Reference Books:

1. Operating System Concepts, Silberschatz, Abraham and Galvin, Peter, Wiley India Limited.
2. UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education.
3. Operating System Concepts, Ekta Walia, Khanna Publishing House.

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Digital Logic Design & Microprocessor Lab

Course Code	CSPC309
Course Title	Digital logic design & Microprocessor Lab
Number of Credits	1 (L: 0, T:0, P: 2)
Prerequisites	--------
Course Category	Programme Core Course

Course Outcomes: -

After Completion of the course students will be able to:

1) Test the digital systems, logic families and logic gates.
2) Construct combinational logical circuit.
3) Construct sequential logical circuit.
4) Use registers and instructions of 8086.
5) Develop assembly language programs using 8086.

Detailed course content:

Sl. No.	Suggested Programme/experiments with Practical outcomes	Linked Unit to the theory paper CSPC305
1	Test truth tables of basic logic gates using Transistor-Transistor Logic (TTL), Integrated Circuits (ICs)	1
2	Check truth tables of universal logic gates (NAND and NOR) using TTL and ICs.	1 *
3	Check De-Morgan's theorem using ICs	1
4	Convert given expression to Sum of Product (SPO) from using basic logic gates.	2 *
5	Convert given expression to Product of Sum (POS) from using basic logic gates.	2
6	Implement Combinational Circuit using Multiplexer.	2
7	Construct S-R, J-K, D and T flip-flop and verify their truth tables.	3 *
8	Write and execute an Assembly Language Program (ALP) to ass/subtract two 8 bit and 16 bit numbers with the help of programming tools and any simulator.	5 *
9	Write and execute ALP to find sum of series of 8 bit and 16 bit numbers.	5
10	Develop an ALP to multiply two 8 bit and 16 bit numbers. (Unsigned/signed numbers).	5 *
11	Develop an ALP to divide two 8 bit and 16 bit numbers. (Unsigned/signed numbers).	5
12	Write an ALP to add/subtract two BCD numbers.	5
13	Write an ALP to multiply/divide two BCD numbers.	5
14	Develop an ALP to find smallest and largest number from array of n numbers.	5 *
15	Develop an ALP to find largest number from array of n numbers.	5
16	Write an ALP to perform block transfer from one memory location to another.	5 *

(**Note:** The list of experiments is just suggestive. More such practical outcome can be added to attain the Cos and competency. A judicial mix of minimum 12 or more practical need to be performed, out of which the practical marked as '*' are compulsory.

Suggestive list of equipments/instruments required:

Sl. No.	Equipment Name with board specifications
1	Digital Multimeter, pulse generator/functional generation, DC regulated power supply, Bread boards, connecting wires, Stripper, Soldering Gun, Soldering Metal, Flux, IC Tester, LEDs, Digital ICs, Data sheets of ICs used in Lab.
2	Desktop Computer with minimum 2 GB RAM, 500GB HDD, windows 7

	onwards, any editor to write/edit programs, Turbo/Macro Assembler (TASM/MASM), Turbo Linker (TLINK/LINK), Turbo Debugger (TD/Debug), (DOSBOX utility for higher end operating systems), shared Printer. 8086 Microprocessor programming Kit.
3	8086 freeware/open source-based simulator to demonstrate internal functioning of microprocessor.

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Summer Internship-I

Course Code	CSSI310
Course Title	Summer Internship-I
Number of Credits	2 (L: 0, T: 0, P: 0)
Prerequisites	Nil
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 2nd Semester	3-4 Weeks	Inter/ Intra Institutional Activities **	2	80 Hours

(** Students are required to be involved in Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective Institutions; contribution at incubation/ innovation /entrepreneurship cell of the Institute; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop; Working for consultancy/ research project within the Institutes and Participation in all the activities of Institute's Innovation Council for e.g.: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.)

Benefits to Students:

1. An opportunity to get hired by the Industry/ organization.
2. Practical experience in an organizational setting.
3. Excellent opportunity to see how the theoretical aspects learned in classes are integrated into the practical world. On-floor experience provides much more professional experience which is often worth more than classroom teaching.
4. Helps them decide if the industry and the profession is the best career option to pursue.
5. Opportunity to learn new skills and supplement knowledge.
6. Opportunity to practice communication and teamwork skills.

7. Opportunity to learn strategies like time management, multi-tasking etc. in an industrial setup.
8. Opportunity to meet new people and learn networking skills.
9. Makes a valuable addition to their resume.
10. Enhances their candidacy for higher education.
11. Creating network and social circle and developing relationships with industry people.
12. Provides opportunity to evaluate the organization before committing to a full-time position.

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Explain the real life organizational and industrial environment situations (K2).

C.O.2: Develop organizational dynamics in terms of organizational behaviour, culture and professional ethics (K1).

C.O.3: Understand the importance of Team work (K2).

C.O.4: Explain invaluable knowledge and networking experience (K2).

C.O.5: Develop skill to build a relationship with a prospective employer (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-I is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.

5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	Credit	Schedule	Total Duration	Sub Activity Head	Proposed Document as Evidence	Evaluated by	Performance appraisal/ Maximum points/ activity
Inter/ Intra Institutional Activities	2	Summer Vacation after 2nd Semester	3-4 Weeks	Inter/ Intra Institutional Workshop/ Training	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Working for consultancy/ research project	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Festival (Technical / Business / Others) Events	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Contribution in Incubation/ Innovation/ Entrepreneurship Cell/ Institutional Innovation Council	Certificate	Cell In-charge	Satisfactory/ Good/ Excellent
				Learning at Departmental Lab/Tinkering Lab/ Institutional workshop	Certificate	Cell In-charge	Satisfactory/ Good/ Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

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Semester IV

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-10	CSPC401	Data Structures & Algorithms	3	0	0	3	3
2	Programme core course-11	CSPC402	Introduction to DBMS	3	0	0	3	3
3	Programme core course-12	CSPC403	Computer Networks	2	0	0	2	2
4	Programme core course-13	CSPC404	Software Engineering	2	0	0	2	2
5	Programme core course-14	CSPC405	Data Structures Lab	0	0	2	2	1
6	Programme core course-15	CSPC406	Introduction to DBMS Lab	0	0	2	2	1
7	Programme elective course-1	CSPE407	4. Mobile Application Development / 5. Object Oriented Programming Methodology / 6. Multimedia Technologies	3	0	0	3	3
8	Mandatory course	HS408	Professional Skill Development	2	1	0	3	3
9	Minor Project	CSPR409	Mini Project	0	0	4	4	2
10	Mandatory Course-1	AU401	Essence of Indian Knowledge and Tradition	2	0	0	2	0
			Total				**26**	**20**

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DATA STRUCTURES & ALGORITHMS

Course Code	CSPC401
Course Title	Data Structures & Algorithms
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	-
Course Category	Program core course

Course Outcomes: -Upon completion of the course the students will be able to:

1)Classify Data structures **(K2)**
2) Describe Linear Data Structures **(K2)**
3) Explain Non-Linear Data Structures**(K2)**
4) Explain basic algorithmic concepts and recursion **(K2)**
5) Apply different Sorting and Searching Algorithms**(K3)**

Course Content:-

Module- 1: Introduction to Data Structures

Number of class hours: 3-4 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Define Data Structures
2) Classify Data Structures
3) Describe operations on Data Structures

Detailed content of the unit: - Basic Terminology, Classification of Data Structures, Operations on Data Structures

Module- 2: Linear Data Structures

Number of class hours: 10-12 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain Arrays and operations on Arrays
2) Illustrate Linked List and operations on Linked List
3) Demonstrate Stack, Queue and related applications.

Detailed content of the unit: -
Arrays: Introduction to Arrays, Representation in Memory, Operations on an Array, Two Dimensional Arrays

Linked Lists: Singly Linked List, Representation in Memory, Operations on a Single Linked List, Circular Linked Lists, Doubly Linked Lists.

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on a Stack, Linked List Representation and Operations of Stack, Applications of Stacks-Infix-to-Postfix Transformation, evaluating Postfix Expressions.

Queues: Introduction to Queues, Array Representation of Queues, Operations on a Queue, Linked List Representation and Operations of Queue, Types of Queues-DeQueue, Circular Queue, Applications of Queues-Round Robin Algorithm

Module-3:Non Linear Data Structures

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain Tree
2) Explain operations on Binary Tree
3) Explain Graph and its various representations

Detailed content of the unit: - Trees: Basic Terminologies, Definition and Concepts of Binary Trees, Representations of a Binary Tree using Arrays and Linked Lists, Operations on a Binary Tree-Insertion, Deletion, Traversals, Types of Binary Trees.

Graphs: Graph Terminologies, Representation of Graphs- Set, List, Matrix, Graph Traversals.

Module-4: Introduction to Algorithms

Number of class hours: 3-5 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Define Algorithms and Flowcharts
2) Define Time & Space complexity
3) Explain recursion with examples

Detailed content of the unit: - Algorithms and flow charts, Time & Space complexity (definition only)
Recursion: Basic concepts and examples of recursion e.g. factorial problem, Fibonacci sequence.

Module- 5: Sorting & Searching Algorithms

Number of class hours: 7-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Apply various Sorting Algorithms
2) Apply different Searching Algorithms

Detailed content of the unit: - Sorting Algorithms**:** Algorithms and their analysis (time and space) — Bubble sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap sort and Radix Sort

Searching Algorithms**:** Linear search — Binary search –Concept of Hashing.

References: - 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, SamantaDebasis, 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, India.
7) Introduction to Algorithms, T.H. Cormen, C.E. Leiserson, R. L. Rivest, C. Stein, MIT Press

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INTRODUCTION TO DBMS

Course Code	CSPC402
Course Title	Introduction to DBMS
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	-
Course Category	Programme core course

Course Outcomes: -Upon completion of the course the students will be able to:

1)Describe the requirements and applications of DBMS **(K2)**
2) Utilize ER and EER model**(K3)**
3) Apply relational algebra and calculus**(K3)**
4) Develop SQL programs **(K4)**
5) Utilize Normalization techniques and relational database design algorithms Architecture **(K3)**

Course Content:-

Module- 1: Introduction to DBMS

Number of class hours: 3-4 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Define DBMS
2) List the requirements of DBMS
3) Describe the applications of DBMS

Detailed content of the unit: - Introduction; Database System Concepts and Architecture.

Module- 2: ER model and EER model

Number of class hours: 4-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain data modelling using ER and EER model
2) Utilize ER model
3) Utilize EER model

Detailed content of the unit: - Data Modeling using the Entity-Relationship Model; The Enhanced Entity-Relationship (EER) model.

Module-3:Relational Data model, Relational Algebra and Calculus

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain relational data model and relational database constraints
2) Demonstrate ER/EER to Relational Model mapping
3) Apply relational algebra and relational calculus

Detailed content of the unit: - The Relational Data Model and Relational Database Constraints; ER/EER to Relational Model mapping; Relational Algebra and Relational Calculus.

Module-4: SQL

Number of class hours: 10-12 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Define schema, constraints, queries and views etc.
2) Categorize DDL, DML etc.
3) Develop SQL programs

Detailed content of the unit: SQL-99: Schema definition, Constraints, Queries, and Views; Security; Introduction to SQL programming Techniques.

Module- 5: Normalization

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain functional dependencies
2) Normalize relational database tables

3) Utilize relational database design algorithms and further dependencies

Detailed content of the unit: - Functional dependencies and normalization for relational databases; Relational database design algorithms and further dependencies.

References: - 1) Fundamentals of Database Systems, Elmasri&Navathe, Pearson Education
2) Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata McGraw-Hill.
3) Database System Concepts, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill, New Delhi, India.
4) Introduction to Database Systems, C.J.Date, Pearson Education
5) Introduction to SQL, Rick F.VanderLans, Pearson Education

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COMPUTER NETWORKS

Course Code	CSPC403
Course Title	Computer Networks
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	-
Course Category	Programme core course

Course Outcomes: -Upon completion of the course the students will be able to:
1)Describe the Computer networks and network models **(K2)**
2) Use different transmission media **(K3)**
3) Explain network layer and routing **(K2)**
4) Explain the transport layer and its protocols **(K2)**
5) Utilize different network devices **(K3)**

Course Content:-

Module- 1: Introduction

Number of class hours: 3-4 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Describe the computer networks
2) Describe the OSI reference model
3) Describe the TCP/IP model

Detailed content of the unit: - Introduction to computer networks; Network Models- OSI Reference Model, TCP/IP Model

Module- 2: Transmission Media

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Utilize wired transmission media
2) Explain various wireless transmission media
3) Explain data link layer & different protocols

Detailed content of the unit: - Transmission Media – principles, issues and examples; Wired Media – Coaxial, UTP, STP, Fiber Optic Cables; Wireless Media – HF, VHF, UHF, Microwave, Ku Band; Network topologies; Data Link Layer –design issues, example protocols (Ethernet, WLAN, Bluetooth); Switching Techniques

Module-3:Network Layer

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain network layer and its protocols
2) Explain principles/issues in routing
3) Explain different routing algorithms and protocols

Detailed content of the unit: - Network Layer - design issues, example protocols (IPv4); Routing - principles/issues, algorithms (Distance-vector, Link-state) and protocols (RIP, OSPF)

Module-4: Transport Layer

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe different design issues of transport layer
2) Explain transport layer protocols (TCP)
3) Describe different application layer protocols (SMTP, DNS)

Detailed content of the unit: - Transport Layer - design issues, example protocols (TCP); Application Layer Protocols (SMTP, DNS)

Module- 5: Functioning of Network Devices

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Use different network devices

2) Explain network management system
3) Explain network management system protocols

Detailed content of the unit: - Functioning of Network Devices – NIC, Hub, Switch, Router, WiFi Devices; Network Management System and example protocol (SNMP)).

References: - 1) Computer Networks, 4th Edition (or later), Andrew S. Tanenbaum, PHI
2) TCP/IP Illustrated, Volume-1, W. Richard Stevens, Addision Wesley
3) Data and Computer Communications, William Stallings, PHI
4) An Engineering Approach to Computer Networking, S. Keshav, Addision Wesley/Pearson
5) An Integrated Approach to Computer Networks, Bhavneet Sidhu, Khanna Publishing House

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SOFTWARE ENGINEERING

Course Code	CSPC404
Course Title	Software Engineering
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	-
Course Category	Program Core Course

Course Outcomes: -Upon completion of the course the students will be able to:
1)Describe Software engineering, life cycle and process models **(K2)**
2) Demonstrate software development **(K2)**
3) Utilize different software testing techniques**(K3)**
4) Apply project management tools **(K3)**

Course Content: -

As per the course design, concepts learned as part of this course will/should be used in the Mini Project (PR401). These two courses should go hand in hand to be effective.

Module- 1: - Introduction to Software Engineering

Number of class hours: 3-4 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Describe the basic concepts of software engineering
2) Describe software life cycle

3) Describe process models

Detailed content of the unit: - Introduction to Software Engineering, Lifecycle, Process Models - Traditional v/s Agile processes.

Module- 2: Development Activities

Number of class hours: 6-7 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain requirements gathering and analysis
2) Demonstrate software design concepts
3) Summarize effective coding and debugging techniques.

Detailed content of the unit: - Development Activities - Requirements Gathering and Analysis, Design Concepts, Software architecture and Architectural styles, Basic UI design, Effective Coding and Debugging techniques.

Module-3:Software Testing

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Illustrate software testing
2) Describe different testing techniques
3) Write and execute test cases.

Detailed content of the unit: - Software Testing Basics, Unit, Integration, System and Acceptance Testing, Introduction to various testing techniques (e.g. Stress testing), Writing and executing test cases, Quality Assurance.

Module-4: Project Management

Number of class hours: 4-5 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe project management concepts
2) Explain configuration and release management
3) Utilize version control and its tools

Detailed content of the unit: - Project Management - Project management concepts, Configuration and Release Management, Version Control and its tools (Git), Release Planning, Change Management, Software Maintenance, Project Metrics.

References: - 1) Software Engineering – A Practitioner's Approach, 7th Edition, Roger Pressman.
2) Software engineering, Ian Sommerville, Pearson Education

3) An Integrated Approach to Software Engineering, Pankaj Jalote, Springer Verlag
4) Software Engineering, Nasib Singh Gill, Khanna Book Publishing Co. India.
5) Software Engineering, K. K. Agarval, Yogesh Singh, New Age International Publishers.

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DATA STRUCTURES LAB

Course Code	CSPC405
Course Title	Data Structures Lab
Number of Credits	1 (L:0, T:0, P:2)
Prerequisites	-
Course Category	Program core course

Course Outcomes: -Upon completion of the course the students will be able to:

1)Implement single and two dimensional array **(K3)**
2) Develop programs to implement different search operations **(K3)**
3) Implement sorting algorithms**(K3)**
4) Implement different types of Linked List **(K3)**
5) Utilize array and linked list to implement Stack and Queue**(K3)**
6) Implement binary tree **(K3)**

Course Content:-

Sl No	Topics for practice
1	Write a program to implement array
2	Write a program to add two matrices using two dimensional arrays
3	Write a program using recursive and non-recursive functions to perform search operation in a given list of integers using linear search technique
4	Write a program to implement search operation in a given list of integers using binary search technique
5	Write a program to implement insertion sorting for a given random data
6	Write a program to implement bubble sorting for a given random data
7	Write a program to implement quick sorting for a given random data
8	Write a program to implement selection sorting for a given random data
9	Write a program to implement heap sorting for a given random data
10	Write a program to implement Hashing tables
11	Write a program to implement single linked list
12	Write a program to implement double linked list
13	Write a program to implement circular linked list

14	Write a program to Implement Stack operations using array and linked list
15	Write a program to Implement Queue operations using array and linked list.
16	Write a program to implement Breadth First Search (BFS)
17	Write a program to implement Depth First Search (DFS)
18	Write a program to implement a binary tree of integers
19	Write a program to find the minimum depth of a binary tree

Above programs may be developed using C programming language

References: - 1) Data Structures, R.S. Salaria, Khanna Book Publishing
2) Data Structures Using C, Reema Thareja, Oxford University Press India.
3) Classic Data Structures, SamantaDebasis, 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, India.

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INTRODUCTION TO DBMS LAB

Course Code	CSPC406
Course Title	Introduction to DBMS Lab
Number of Credits	1 (L:0, T:0, P:2)
Prerequisites	-
Course Category	Program core course

Course Outcomes: -Upon completion of the course the students will be able to:

1)Apply DDL commands to create a tableand insert data into it **(K3)**
2) Utilize DML commands to modify database contents**(K3)**
3) Implement Employee database**(K3)**
4) Prepare E-R model, Relational model etc.**(K3)**
5) Apply Normalization techniques**(K3)**

Course Content:-

Sl No	Topics for practice
1	Case Study-1: Employee database – 'Create' employee table, 'Select' and display an employee matching a given condition, 'Delete' duplicate records, delete rows using triggers, insert and update records, find net salary, etc.
2	Case Study-2: Visitor Management database
3	Case Study-3: Students Academic database

4	Case Study-4: Inventory Management System database
5	Case study-5: Bank Operations database
6	Case Study-6: Bus Operator (Roadways) – Do related activities such as prepare E-R Model, Relational Model, do Normalization, Create Tables, Insert data, Delete Data, Query database, create stored procedures, etc

References: - 1) Elmasri&Navathe, Fundamentals of Database Systems, Pearson Education
2)Raghurama Krishnan, Johannes Gehrke, Database Management Systems, Tata McGraw-Hill,New Delhi, India.Computer Engineering Curriculum Structure 344
3) Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw-Hill, New Delhi, India.
4) Introduction to Database Systems, C.J.Date, Pearson Education
5) Introduction to SQL, Rick F.VanderLans, Pearson Education

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MOBILE APPLICATION DEVELOPMENT

Course Code	CSPE407-1
Course Title	Mobile Application Development
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Basic knowledge of Java and XML
Course Category	Programme Elective Course

Course Outcomes: -

After the completion of the course Student will be able to

1) Recognize the concept of application development for mobile devices**(K1)**
2) Install and configure mobile application development tools **(K2).**
3) Create mobile applications and activities**(K3)**
4) Design user Interfaces for the mobile applications**(K3)**
5) Create database for saving, retrieving, and loading data in mobile application development

Course Content:-

Module- 1: Introduction to Mobile Application Development

Number of class hours: 4-5 Hrs

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Recognize mobile computing platforms and mobile computing

2) Recognize mobile development environments
3)Explains the basic concepts of Android phone features

Detailed content of the unit: - Concept of application development for mobile devices, mobile computing platforms and mobile computing, smart devices, mobile development environments, Android phone features and capabilities.

Module- 2: Installation and configuration of Android app development tools

Number of class hours: 5-6 Hrs

Suggestive Learning Outcomes:

1) Install and configure Android app development tools
2) Deploy the app to an emulator and a device.
3) Recognizes the structure of an Android application

Detailed content of the unit: - Android- Background &Architecture, Installation and Configuration of application development tools, Java Software Development Kit (JDK), Android Software Development Kit (SDK), Android Studio, Android Virtual Device and SDK Manager, SDK Manager, The Android Emulator, Dalvik Debug Monitor Service (DDMS), The Android Debug Bridge (ADB).

Module- 3: Creating applications and activities

Number of class hours: 9-10 Hrs

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Use necessary tools for Android application development
2) Explains the relationship between XML and Java for the Android platform.
3)Creates, writes and tests Android applications

Detailed content of the unit: - Creating applications and activities, Introducing the Application Manifest, Using the Manifest Editor, Activity Life Cycle, Android Activity Classes,Understanding Application Priority and Process States, Externalizing Resources, Creating Resources, Creating Simple Values Styles and Themes, Drawables, Layouts, Animations, Menus, Using Resources, Using Resources in Code, Referencing Resources within Resources, Using System Resources

Module- 4: Designing and developing User Interfaces for the Android platform

Number of class hours: 5-6 Hrs

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Create User Interface and Intents

2) Launch Activities and passing information between Activities
3) Create custom SurfaceViews and simple animations

Detailed content of the unit: - Android Applications, Activities and Widgets, ActionBar Activities, Customizing, Styles and Themes, Displaying images, Playing video and audio, UI Fragments and the Fragment Manager, Creating custom SurfaceViews and simple animation, responding to touch events, Supporting different devices, localizations, orientations, API levels, and resolutions., XML resources, Launching Activities and passing information between Activities, Introducing Intents, Using Intents to Launch Activities, Explicitly Starting New Activities, Implicit Intents

Module- 5: Database -- saving, retrieving, and loading

Number of class hours: 5-6 Hrs

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Discuss different ways to store and retrieve data
both in the app and externally.
2) Create database and connect with android application
Database

3)Use SQLite Database in application development

Detailed content of the unit: - Introducing Android Databases, Introducing SQLite Databases, Introducing Content Providers, Introducing SQLite, Cursors and Content Values, Working with SQLite Databases Introducing the SQLiteOpenHelper, Opening and Creating Databases without SQLiteHelperAndroid Database Design Considerations, Querying a Database, Extracting Results from a Cursor, Adding, Updating, and Removing Rows, Inserting New Rows, Updating a Row, Deleting Rows

References: - 1) Android App Development for Dummies, Michael Burton
2)Fundamentals of Android App Development, Sujit Kumar Mishra
3) Android Programming: The Big Nerd Ranch Guide,Kristin Marsicano,Chris Stewart

OBJECT ORIENTED PROGRAMMING METHODOLOGY

urse Code	CSPE407-2
urse Title	Object Oriented Programming Methodology
mber of Credits	3 (L: 3, T: 0, P: 0)
requisites	CSPC301
urse Category	Programme elective course

Course Outcomes: -Upon completion of the course the students will be able to:

1) Describe the different features of Object Oriented Programming**(K2)**
2) Write programs to Implement the concepts of classes and objects**(K3)**
3) Create new classes using the concepts of inheritance**(K3)**
4) Apply knowledge of Polymorphism to solve real life problems**(K3)**
5) Implement exception handling mechanism **(K3)**

Course Content:-

Module- 1: Introduction to Object Oriented Programming

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) List the different features of ObjectOrientedProgramming
2) Recognize different function oriented programming and ObjectOriented Programming
3) Describe the merits and limitations of Object OrientedProgramming.

Detailed content of the unit: - Object Oriented Paradigm Objects and Classes, Features Object oriented Programming, Structured Vs Object Oriented Development, Features of Object Oriented Languages, Applications ofObjectOriented Programming, Merits and Limitations of Object Oriented Programming.Basic Data types, Basic Type modifiers, Derived Data types, Variables, Storage class specifiers, Initializing variables, Operators, Unformatted Console and stream I/O Functions, Formatted Console I/O Functions

Module- 2: Classes and Objects

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Declare and define a class with appropriate data members and member functions
2) Use different access specifiers in class definition
3) Create constructors and destructors in programs

Detailed content of the unit: - Classes ,Class Members and Creating Objects, Member functions, Member Access Specifiers (public, private, protected), Static class member, Inline Functions, Arrays within a Class and Array of Objects, Passing Objects as function arguments and returning object from a function,Constructors, Overloaded Constructors, Null Contradictor, Copy Constructor, Destructors Constraints on Constructors and Destructors

Module- 3: Inheritance

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Define base class and derived class
2) Write programs to implement different types of inheritance
3) Create virtual base class

Detailed content of the unit: - Base and Derived classes, Accessing Base class members and Access Control, Overriding member functions, Multi Level, Multiple, Hierarchical& Hybrid Inheritance, Virtual Base Class.

Module- 4: Polymorphism

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe the concepts of function overloading and operator overloading
2) Write programs to implement virtual function
3) Discuss the concepts of early and late binding

Detailed content of the unit: - Fundamental of Polymorphism, Overloading Functions, Overloading Operators (Unary, binary, string manipulation using operator), Pointer to object and derived class, 'This' pointer, Virtual Functions, Early and Late Binding, Rules of Virtual Functions, Pure Virtual Function, Friend Functions.

Module- 5: File Handling, Exception Handling & Templates

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Discuss the basic file operations
2) Describe the exception handling mechanism
3) Write programs to implement functions template and class templates

Detailed content of the unit: - Basic File Operations, File Handling, Classes for file stream operation, Opening and Closing Files, File modes File, Introduction to Exception Handling, Catching Class Types, Multiple Catch Handlers, Exception Specification, Generic Functions/Function Templates, Template Arguments.

References: -

1. Object Oriented Programming With C++, E Balagurusamy
2. Object oriented programming in C++ , Robert Laffore
3. Introduction To Programming With C++, Diane Zak
4. Object oriented programming with C++ Reema Thareja

MULTIMEDIA TECHNOLOGIES

Course Code	CSPE407-3
Course Title	Multimedia Technologies
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	---
Course Category	Programme core course

Course Outcomes: -Upon completion of the course the students will be able to:

6) Describe the concepts of designing and developing multimedia **(K2)**
7) Use the various data compression techniques **(K3)**
8) Design and develop multimedia solutions **(K3)**
9) Describe the basics of graphics and image data representations **(K2)**
10) Use programming in interactive multimedia development **(K3)**

Course Content:-

Module- 1: Introduction to Multimedia

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

4) List the components of multimedia
5) Recognize different multimedia hardware and software
6) Describe multimedia communication system

Detailed content of the unit: - Multimedia Foundation and Concepts: Multimedia Hardware, Multimedia Software, Multimedia operating systems, Multimedia communication system.

Module- 2: Basic Compression Techniques

Number of class hours: 3-4 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Discuss various video and audio data compression techniques.
2) List different data compression algorithms/standards.
3) Use different video and audio data compression Techniques

Detailed content of the unit: - Video and Audio Data Compression Techniques – Lossy and Lossless. Example algorithms/standards: Huffman, RLE, JPEG, MPEG, MP3, MP4, LZMA, FLAC, ALAC, ITU G.722, H.261, H.265.

Module- 3: Content Development and Distribution

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

4) Use different desktop publishing software
5) Develop multimedia animations
6) Use multimedia distribution techniques

Detailed content of the unit: - Desktop publishing (Coral Draw, Photoshop, Page maker) Multimedia Animation & Special effects (2D/3D animation, Flash).

Module- 4: Introduction to Digital Imaging

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

4) Describe the concepts of representing image in Computer Systems
5) Recognize different types of digital images
6) Use of digital Images in multimedia

Detailed content of the unit: - Basics of Graphic Design and use of Digital technology, Definition of Digital images, Digital imaging in multimedia.

Module- 5: Introduction to Multimedia Programming and Applications

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Use appropriate programming language for developing multimedia
2) Write program to develop interactive multimedia solutions
3) Test multimedia applications and fix bugs arise

Detailed content of the unit: - Basic programming concepts, HTML basics, Java Scripts for interactive website Development, Programming in Macromedia Flash.

References: - 1) An Introduction to Multimedia Authoring, A. Eliens
2) Fundamentals of Multimedia, Prentice Hall/Pearson, Ze-Nian Li & Mark S. Drew.
3) Multimedia and Animation, V.K. Jain, Khanna Publishing House, Edition 2018.
4) Fundamentals of Multimedia, Ramesh Bangia, Khanna Book Publishing Co., N. Delhi (2007)

Professional Skill Development

Course Code	:	HS 408
Course Title	:	Professional Skill Development
Number of Credits	:	3 (L: 2, T: 1, P:0)
Prerequisites	:	NIL
Course Category	:	HU

Course Outcomes:

After successful completion of this course, students would be able to:
CO1: Understand the importance of soft skills and personality in a person's career growth. K2
CO2: Communicate uprightly while looking for a job. K3
CO3: Learn and utilize the key skills while facing job interview. K2 & K3
CO4: Demonstrate effective writing skills for professional excellence. K2
CO5: Explore ways to make oral communications interesting and captivating. K3

Module – 1Soft Skills & Personality Development

Number of Class Hours: 06 **Marks: 08**

Learning Outcomes:

1) Get acquainted with the details of soft skills and the importance of personality. K1
2) Understand the importance of communication skills in developing one's personality. K2
3) Understand the importance of soft skills and personality in a person's career growth. K2

Detailed Content:

1. **Soft skills - Demand of Every Employer:** How soft skills complement hard skills, Soft skills as competitive weapon, Classification of soft skills into personal and interpersonal traits, Soft skills needed for career growth- Time management, Leadership traits, Communication and networking skills, Teamwork and Interpersonal skills, Empathy and Listening skills, Responsibility, Attitude, Ethics, Integrity, Values and Trust.

2. **Personality Development – A must for career Growth:** Grooming one's personality as a signal that others read, mapping different personality types – Perfectionists, Helpers, Achievers, Romantics, Observers, Questioners, Enthusiasts or adventurers, Bosses or asserters, Mediators or peacemakers.

Module – 2 Looking for a Job

Number of Class Hours: 05 **Marks: 08**

Learning Outcomes:

1) Learn to write Job Applications, Cover Letter, Resume, Curriculum Vitae, bio data. K2
2) Develop interpersonal skills/ soft skills through Group Discussion. K3

Detailed Content

1. Job Application : Job Application Letters in response to advertisements, Self-application letters for Jobs
2. Curriculum Vitae/Resume: Formats of Resume and CV for a fresher and for someone with experience, Differences between Resume, CV, Bio-data, and choice of referees.
3. Group Discussion : A test of soft skills

Module – 3 Job Interviews

Number of Class Hours: 05 **Marks: 08**

Learning Outcomes:

1) Understand the importance of Job interviews in the selection procedure. K2
2) Comprehend and Adapt to various types, stages and processes of job interviews. K1&K3
3) Demonstrate appropriate body language in interviews. K3

Detailed Content

1. Job Interviews: Definition, processes of Interviews, Types of Interviews
2. Stages in Job interviews: Before interview stage, On D' Day, After interview stage.
3. Importance of Body language in Interviews: : Facing an interview, Using proper verbal and non- verbal cues, the perfect handshake ,Exhibiting confidence, the business etiquettes to maintain, body language ,and dress code - what to speak, how to speak in an interview and answer interview questions, negative body language, handling an awkward situation in an interview.
4. Probable interview questions and answers.
5. Mock interviews to be conducted by mock interview boards.

Module – 4 Enhancing Writing skills

Number of Class Hours: 12 **Marks: 08**

Learning Outcomes:

1) Write dialogues on given topics / situations. K3
2) Express facts & ideas effectively in written form. K3

3) Learn to write formal and informal letters & emails. K2

Detailed Content

1) **Art of Condensation**: Principles to increase clarity of written communication.
2) **Dialogue Writing:** Meeting and Parting, Introducing and Influencing, Requests, Agreeing and Disagreeing, Inquiries and Information.
3) **Letter Writing:** Placing an order, Letter to Inquiry, Letter of Complaint, Letter seeking permission.
4) **E- mail writing**: writing the perfect e-mail, steps to the perfect e-mail, formal and informal greetings, requests through an e-mail, writing an apology, complaint and seeking help and information in an e-mail, informing about a file attached in an email, writing the formal ending of an e-mail.

Module – 5 Conversations, Panel Discussion and Public Speaking

Number of Class Hours: 12 **Marks: 08**

Learning Outcomes:

1. Speak persuasively on a given topic fluently and clearly. K3
2. Participate in formal and informal conversations. K3
3. Express ideas and views on given topics. K3

Detailed Content

1) **Conversation & Dialogue Practice:**
   a) Introducing oneself
   b) Introduction about family
   c) Discussion about the weather
   d) Seeking Permission to do something
   e) Seeking Information at Railway Station/ Airport
   f) Taking Appointments from superiors and industry personnel
   g) Conversation with the Cashier- College/ bank
   h) Discussing holiday plans
   i) Asking about products in a shopping mall
   j) Talking over the Telephone

2) **Panel Discussion:** Act of a moderator - ways to respond to audience questions.
Suggested topics: Current Affairs

3) **Public Speaking**: Art of Persuasion, Making speeches interesting, Delivering different types of speeches: Ceremonial, Demonstrative, Informative, Persuasive.

List of Software/Learning Websites

1. http://www.free-english-study.com/
2. http://www.english-online.org.uk/course.htm
3. http://www.english-online.org.uk/

4. http://www.talkenglish.com/
5. http://www.learnenglish.de/

Reference Books:

(Name of Authors/ Title of the Book /Edition /Name of the Publisher)

1) Sanjay Kumar &Pushp Lata, Communications Skills, 2nd Edition, Oxford University Press
2) Meenakshi Raman & Sangeeta Sharma Technical Communication: Principles & Practice Oxford University Press
3) M. Raman & S. Sharma Technical Communication Oxford University Press
4) Barun Kumar Mitra, Personality Development and Soft Skills Oxford University Press

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Minor Project

Course Code	CSPR409
Course Title	Minor Project
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Demonstrate a through and systematic understanding of project contents (K2).

C.O. 2: Identify the methodologies and professional way of documentation and communication (K3).

C.O. 3: Illustrate the key stages in development of the project (K2).

C.O. 4: Develop the skill of working in a Team (K3).

C.O. 5: Apply the idea of mini project for developing systematic work plan in major project (K3).

Course Content:-

The minor project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Perform detailed study about various components of a project.
2) Study about methodologies and professional way of documentation and communication related to project work.
3) Develop idea about problem formulation.
4) Knowledge of how to organize, scope, plan, do and act within a project thesis.
5) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
6) Demonstrate the implementation of a minor project work.

Essence of Indian Knowledge and Tradition

Course Code	AU410
Course Title	Essence of Indian Knowledge and Tradition
Number of Credits	0 (L: 2, T: 0, P: 0)
Prerequisites	NA
Course Category	Audit

Course Outcomes: -

After completion of the course the students will be able to-
CO 1: Understand the essence of Indian tradition and the importance of carrying them forward. (**K_2**)
CO 2: Understand the Vedic literature and important ideas discussed in the Vedas. (**K_2**)
CO 3: Describe scientific heritage of ancient India along with comprehending its relevance and application in various modern scientific disciplines. (**K_1**)
CO 4: Relate the theoretical and practical sides of the science of Yoga and Aurveda with modern knowledge systems. (**K_1**)
CO 5: Explain the worth of Indian intellectual heritage, traditional practices and Indian lifestyle from scientific lenses. (**K_4**)

Module- 1

Name of the Module: Introduction to Vedic Literature

Number of class hours:**05**

Content:

- General structure of Vedic Literature,
- Different theories on the age of the Vedas,
- Educational system in the Vedic times

- subject-matter of Ṛgveda-samhitā, *Sāmaveda -Saṁhitā, Yajurveda-Saṁhitā, Atharvaveda-Saṁhitā, Brāhmaṇa*and *Āraṇyaka* literature, Upaveda

Learning outcomes of the Module

1.	Describe the Vedic literature (K1)
2.	Outline the heritage of ancient India specially the scientific knowledge that is embedded in the Vedas will be shown through this module (K2)

Module- 2

Name of the Unit: Fundamental doctrines of the *Upaniṣad*s

Number of class hours:**05**

Content:

- General introduction of Upaniṣadic literature
- Philosophical ideas and ethics in Upaniṣadas

Learning outcomes of the Module

1.	Understand Upaniṣads and its significance as the perennial source Indian philosophy (K2)
2.	Explain the scientific temperament, knowledge and methods of scientific enquiry that is embedded in the Upaniṣadas (K2)

Module- 3

Name of the Unit: *Vedāṅga*s, Purāṇasand Dharmaśāstra Literature

Number of class hours:**05**

Content:

- Introduction to Vedāṅga Literature
- History of Sanskrit Grammar
- An Overview of Purāṇic literature
- History of Dharmaśāstra

Learning outcomes of the Module

1.	Describe various scientific and academic disciplines of ancient India along with scientific knowledge that is rooted in the Puranic literature (K1)
2.	Remember ancient system of Law and Governance in a nutshell especially the principles and philosophy behind the ancient constitutions (K1)

Module- 4

Name of the Module: Introduction to Indian Philosophical Systems, Scientific aspects of Indian knowledge systems

Number of class hours:**05**

Content:

- General introduction to Indian Philosophical systems, i.e. Orthodox and Heterodox
- Glimpse of ancient Indian Science and technology.

Learning outcomes of the Module

1.	Describe the Indian Philosophical systems and their relevance and application in modern scientific enquiry (K1)
2.	Remember the various scientific methods, means and validity of knowledge as discussed in these systems, methods of discussion, debate and systemic learning as structured in ancient Indian knowledge literature (K1)

Module- 5

Name of the Unit: Introduction to Yoga &Āyurveda

Number of class hours:**05**

Content:

- General ideas about Yoga,
- Origin and Development of Pātañjala Yoga,
- Origin and Development of Āyurveda and its relevance

Learning outcomes of the Module

1.	Understand about principles and philosophy of Yogic sciences and Āyurveda. (K2)
2.	Identify various ancient texts, practices of Yoga and Āyurveda along with gaining basic practical and theoretical knowledge which they will be able to relate with modern healthcare systems (K4)

<u>References:</u> -

1) Capra, Fritjof. *The Tao of Phisics*. New York: Harpercollins, 2007.
2) Capra, Fritjof. *The Web of Life*. London: Harpar Collins Publishers, 1996.
3) Dasgupta, Surendranath& De, Sushil Kumar. *A History of Sanskrit Literature.*Delhi: Motilal Banarsidass, 2017.
4) Dasgupta, Surendranath. *A History of Indian Philosophy*. Delhi: Motilal Banarsidass, 1991.
5) Gonda, Jan. *A History of Vedic Literature*. Delhi: Monohar Publishers and Distributors, 2020.

6) Jha, R.N. *Science and Consciousness Psychotherapy and Yoga Practices*. Delhi: VidyanidhiPrakashan, 2016.
7) Kane. P.V. *History of Dharmasastra*, Poona: Bhandarkar Oriental Research Institute, 1930.
8) Max Muller. *Ancient Sanskrit Literature*, London: Spottiswoode and Co., 1859.
9) *Pride of India*,New Delhi: Samskrita Bharati, 2006.
10) Shastri, Gourinath. *A History of Vedic Literature*, Kolkata: Sanskrit PustakBhandar, 2006.
11) Sinha, Jadunath. *Indian Philosophy*. Delhi: Motilal Banarsidass,1938.
12) Wujastiyk, Dominik. *The Roots of Ayurveda*. India: Penguin India, 2000.

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Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-16	CSPC501	Introduction to e-Governance	3	0	0	3	3
2	Programme core course-17	CSPC502	Internet of Things (IoT)	2	0	0	2	2
3	Programme core course-18	CSPC503	Web Technologies	2	0	0	2	2
4	Programme core course-19	CSPC504	Networking Lab	0	0	2	2	1
5	Programme core course-20	CSPC505	Web Technology Lab	0	0	2	2	1
6	Programme elective course-2	CSPE506	Distributed Systems / Cloud Computing / Data Science	3	0	0	3	3
7	Programme elective course-3	CSPE507	Mobile Computing / Software Testing / FOSS	3	0	0	3	3
8	Open elective course-1	**OE508	To be offered by other departments	3	0	0	3	3
9	Summer Internship-II (6 weeks) after IV Semester	CSSI509	Summer Internship-II	0	0	0	0	3
10	Major Project	CSPR510	Project part-I	0	0	2	2	1
			Total				**22**	**22**

Introduction to e-Governance

Course Code	:	CSPC 501
Course Title	:	Introduction to e-Governance
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme core course

Course outcomes:

1. Exposure to introductory ideas and practices of e-Governance initiatives in India
2. Understand and escalate the essence of e-Governance.
3. Articulate the policy and social issues facing agencies in implementing e-government initiatives.
4. Apply business-case and government IT-management concepts to e-government strategies.
5. Develop skills to evaluate government websites and e-services for best practice, principles and standards.

Detailed Course Contents

Module- 1:

Number of Class hours: 6

Learning Outcomes of the module:

1. Understand the basic concepts of ICT for development activities (K3)
2. Design and implement various e-governance projects using technologies and business models(K4)
3. Expose to the e-governance lifecycle(K3)

Detailed content of the module:

3.1 Exposure to emerging trends in ICT for development
3.2 Understanding of design and implementation of e-governance projects
3.3 E-governance lifecycle.

Module- 2:

Number of Class hours: 6

Learning Outcomes of the module:

1. Recognize the elements of government process for transparency (K3)
2. Analyse the e-governance plans of India(K5)
3. Implement the SMART government initiatives (K4)
4. Investigate the main components to develop effective and efficient e-government projects.(K3)

Detailed content of the module:

2.1 Need for Government Process Re-engineering (GPR);

2.2 National e-Governance Plan (NeGP) for India;
2.3 SMART Governments & Thumb Rules

Module 3:

No. of Class hours: 6

Learning Outcomes of the module:

1. Analyze and compare between development models of e-government services. (K3)
2. Distinguish the benefits of implementing e-government services. (K4)
3. Evaluate and compare between the technologies and mechanisms to develop e-government services. (K5)
4. Recognize the challenges that may hinder the development of e-government services. (K3)

Detailed content of the module:

3.1 Architecture and models of e-Governance, including Public Private Partnership (PPP);
3.2 Need for Innovation and Change Management in e-Governance;
3.3 Critical Success Factors; Major issue including corruption, resistance for change
3.4 E-Security and Cyber laws

Module 4

No. of Class hours: 6

Learning Outcomes of the module:

1. Categorize the initiatives of the government to implement e-government services. (K4)
2. Frame solutions to various challenges of e-government projects. (K5)
3. Find out the best practices of e-governance projects(K5)

Detailed content of the module:

4.1 Focusing on Indian initiatives and their impact on citizens;
4.2 Sharing of case studies to highlight best practices in managing e-Governance projects in Indian context.

Module 5

No. of Class hours: 6

Learning Outcomes of the module:

1. Identify and analyse the current practices of the project of e-government services through a case study of India (K5)
2. Recognise the main challenges of e-government and the possible mechanisms and technologies to make more developments. (K3)
3. Develop mini projects on e-governance projects. (K5)

Detailed content of the module:

5.1 Analyse e-governance sites (CSC, eSeva, etc) as part of Tutorials.

5.3. Analyse e-governance sites (Post Office, Passport Seva Kendra, etc) as part of Tutorials.
5.2 Mini Projects by students in groups-primarily evaluation of various e-governance projects.

Reference Books:

1. Managing Transformation –Objectives to Outcomes. J Satyanarayana, Prentice Hall India
2. The State, IT and Development. Kenneth Kenniston, RK Bagga and Rohit Raj Mathur, Sage Publications India Pvt Ltd.
3. e-Government -The Science of the Possible. J Satyanarayana, Prentice Hall, India
4.http://www.csi-sigegov.org/publications.php
5. https://negd.gov.in
6. https://www.nisg.org/case-studies-on-e-governance-in-india

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Internet of Things (IoT)

Course Code	:	CSPC 502
Course Title	:	Internet of Things
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	PC

Course Outcome:
1. Understand the concepts of Internet of Things (K3)
2. Analyze basic protocols in wireless sensor network (K4)
3. Design IoT applications in different domain and be able to analyse their performance(K5)
4. Implement basic IoT applications on embedded platform(K5)

Module 1:
No of class hours: 04
Learning Outcomes of the module:
1. Illustrate what IoT is and how it works today (K3)
2. Recognise the factors that contributed to the emergence of IoT (K4)
3. Design and program IoT devices (K4)

Detailed content of the module:

1.1 Introduction to IoT;
1.2 Sensing;
1.3 Actuation

Module 2:
No of class hours: 07

Learning Outcomes of the module:
1. Analyse the basics of IoT networking (K4)
2. Distinguish and implement various communication protocols(K4)
3. Understand the various types of sensor network (K3)

Detailed content of the module:

2.1 Basics of IoT Networking,
2.2 Communication Protocols,
2.3 Sensor networks

Module 3
No of class hours: 7

Learning Outcomes of the module:
1. Implement various programming on the Arduino (K4)
2. Differentiate between the levels of the IoT stack (K3)
3. Familiarise with the key technologies and protocols employed at each layer of the stack(K3)

Detailed content of the module:

3.1 Introduction to Arduino programming
3.2 Integration of Sensors/Actuators to Arduino

Module 4
No of class hours: 7

Learning Outcomes of the module:
1. Design and implement the concepts of IoT with Raspberry Pi (K5)
2. Perform data analytics and draw conclusions. (K4)
3. Perform case study of the various uses of IoT in various sectors of the society(K4)

Detailed content of the module:

4.1 Implementation of IoT with Raspberry Pi;
4.2 Data Handling Analytics
4.3 Case Studies: Agriculture, Healthcare, Activity Monitoring

Module 5
No of class hours: 6

Learning Outcomes of the module:
1. Understand the ethical issues in IoT (K3)
2. Analyze the implementational environment and identify probable ethical solution to address any issue. (K4)

Detailed content of the module:

Ethics in IoT:

5.1 Characterizing the IoT, Privacy, Control – Disrupting Control, Crowd sourcing;
5.2 Environment – Physical thing, Electronics, Internet service;
5.3 Solutions – The IoT as a part of the solution, cautious optimism, the open IoT definition.

Reference Books:

1. https://nptel.ac.in/noc/individual_course.php?id=noc17-cs22
2. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj
   and Anupama C. Raman (CRC Press)
3. Internet of Things by Dr. Jeeva Jose, Khanna Publishing House (Edition 2017)
4. "Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti (Universities Press)
5. Internet of Things: Architecture and Design Principles, Raj Kamal, McGraw Hill
6. Designing the Internet of Things – Adrian McEwen & Hakim Cassimality Wiley India, ISBN: 9788126556861

Web Technologies

Course Code	:	CSPC 503
Course Title	:	Web Technologies
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme core course

Course Outcome:
1. Realize the important concepts of website development tools and languages (K4)
2. Design and plan website developments. (K5)
3. Analyse the performances of website design. (K4)
4. Comprehend the database activities of dynamic websites. (k3)

Module 1:
No of Class Hours: 5
To provide basic skills on tools, languages and technologies related to website development. Learnings from this course may be used in the Mini Project and summer internship. Student will be able to develop/build a functional website with full features.

Learning Outcomes of the Module:
1. Realize the basic concepts of tools, languages and technologies related to website development. (K3)
2. Implement webservers for various operations. (K4)
3. Planning and designing of websites and for efficient navigations. (K4)

Detailed content of the module:

1.1 Introduction to WWW Protocols and programs, secure connections, application and development tools, the web browser
1.2 What is server, setting up UNIX and LINUX web servers
1.3 Logging users
1.4 Dynamic IP Web Design: Web site design principles, planning the site and navigation

Module 2:
No of Class Hours: 5

Learning Outcomes of the Module:
1. Analyse web system architectures and their performances. (K5)
2. Demonstrate the utilities of web proxies and load balancers (K4)
3. Comprehend web application architectures. (K3)

Detailed content of the module:

2.1 Web Systems Architecture of Web based systems- client/server (2-tier) architecture,
2.2 3-Tier architecture

2.3 Building blocks of fast and scalable data access Concepts - Caches-Proxies- Indexes-Load Balancers- Queues
2.4 Web Application architecture (WAA)

Module 3:
No of Class Hours: 5
Learning Outcomes of the Module:
1. Develop client-side scripting for multiple functionalities (K5)
2. Implement advanced and web browsers environment. (K4)
3. Create project plans for developing web-based applications (K5)

Detailed content of the module:

3.1Javascript Client-side scripting, what is Javascript, simple Javascript, variables
3.2 Functions, conditions, loops and repetition
3.3 Advance scripting Javascript and objects
3.4 Javascript own objects, DOM and web browser environments
3.5 Forms and validations DHTML: Combining HTML
3.6 CSS and Javascript, events and buttons, controlling your browser

Module 4:
No of Class Hours: 5

Learning Outcomes of the Module:
1. Develop Ajax based web applications(K4)
2. Implement PHP database programs for web-based applications(K4)
3. Analyse various database operations in the advanced PHP databases (K5)

Detailed content of the module:

4.1 Ajax: Introduction advantages & disadvantages
4.2 Ajax based web application, alternatives of ajax XML, XSL and XSLT
4.3 Introduction to XML, uses of XML, simple XML, XML key components
4.4 DTD and Schemas, XML with application, XSL and XSLT. Introduction to Web Services

Module 5:
No of Class Hours: 5

Learning Outcomes of the Module:
1. Develop Ajax based web applications(K4)
2. Implement PHP database programs for web-based applications(K4)
3. Analyse various database operations in the advanced PHP databases (K5)

Detailed content of the module:

5.1 PHP server-side scripting, Arrays, function and forms

5.2 Advance PHP Databases: Basic command with PHP examples, Connection to server, creating database
5.3 Selecting a database, listing database, listing table names creating a table, inserting data
5.4 Altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs.

Reference Books:

1. "Web Technologies--A Computer Science Perspective", Jeffrey C. Jackson,
2. "Internet & World Wide Web How to Program", Deitel, Deitel, Goldberg, Pearson Education
3. "Web programming- Building Internet Application", Chris Bales
4. Web Applications: Concepts and Real-World Design, Knuckles.

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Networking Lab

Course Code	:	CSPC 504
Course Title	:	Networking Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	-----
Course Category	:	Programme core course

Course outcomes:

1. Understanding of computer networks, issues, limitations, options available. (k3)
2. Able to configure basic small LAN and connect computers to it. (K4)
3. Design various types of networks and compare their performances. (K5)
4. Analyse the performances of various network protocols.(K5)

Course Content:

S.No.	Topics for Practice
1.	Showing various types of networking cables and connectors, identifying them clearly.
2.	Looking at specifications of cables and connectors of various companies on Internet, find out differences.
3.	Making patch cords using different types of cables and connectors - crimping, splicing, etc
4.	Demonstration of different type of cable testers, using them for testing patch cords prepared by the students in Lab and standard cables prepared by professionals
5.	Configuring computing devices (PC, Laptop, Mobile, etc) for network, exploring different options and their impact – IP address, gateway, DNS, security options, etc
6.	Showing various networking devices – NICs, Hub, Switch, Router, WiFi access point, etc.
7.	Looking at specifications of various networking devices various companies on

	Internet, find out differences.
8.	Network simulation tool (e.g. Cisco Packet Tracer)
9.	Setting up a small wired LAN in the Lab
10.	Setting up a small wireless LAN in the Lab

Reference Books:
1. Cisco press books on CCNA
2. User manual of networking devices available in the lab
3. Wiki pages on networking devices

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Web Technology Lab

Course Code	:	CSPC 505
Course Title	:	Web Technology Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	-----
Course Category	:	Programme core course

Course outcomes: Student will be able to program web applications using and will be able to do the following:
1. Use LAMP Stack for web applications and Tomcat Server for Servlets and JSPs (K6)
3. Write simple applications with Technologies like HTML, Javascript, AJAX, PHP, Servlets and JSPs (k4)
4. Connect to Database and get results (k4)
5. Parse XML files using Java (DOM and SAX parsers) (k4)

Course Content:

S.No.	Topics for Practice
1.	Coding Server Client Programs
2.	Developing Web Application using HTML, JavaScript
3.	Developing Advanced Web Application Programs using CSS
4.	Practicing PHP : Basics
5.	Practicing PHP : Web Application Development
6.	Practicing PHP: MySql - tiered Applications
7.	Developing a fully functional Web Service Application using all the technologies learned in this course.
8.	Write applications using AJAX, JSP

9.	Develop applications using servlets
10.	Perform database accessibility with the websites

Reference Books:

1. "Web Technologies--A Computer Science Perspective", Jeffrey C. Jackson.
2. "Internet & World Wide Web How to Program", Deitel, Deitel, Goldberg, Pearson Education
3. "Web programming- Building Internet Application", Chris Bales
4. Web Applications: Concepts and Real-World Design, Knuckles

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Distributed Systems

Course Code	:	CSPE 506-1
Course Title	:	Distributed Systems
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	Concept of Operating Systems, Computer Network, JAVA
Course Category	:	Programme Elective Course

Course Outcomes:

- To learn the principles, architectures, algorithms and programming models used in distributed systems.
- To examine how existing systems have applied the concepts of distributed systems in designing large systems.
- To design sample distributed systems.

Detailed Course Contents:

Module-1:

Class Hours: 3

Characterization of Distributed Systems: Introduction, Examples of Distributed systems, Resource sharing and web, challenges.
System Models: Introduction, Architectural and Fundamental models.

Module-2:

Class Hours: 6

Time and Global States: Introduction, Clocks, Events and Process states, Synchronizing physical clocks, Logical time and Logical clocks, Global states, Distributed Debugging.

Coordination and Agreement: Introduction, Distributed mutual exclusion, Elections, Multicast Communication, Consensus and Related problems.

Module-3:

Class Hours: 7

Inter Process Communication: Introduction, The API for the internet protocols, External Data Representation and Marshalling, Client-Server Communication, Group Communication, Case Study: IPC in UNIX.

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects, Remote Procedure Call, Events and Notifications, Case study-Java RMI.

Module-4:

Class Hours: 7

Distributed File Systems: Introduction, File service Architecture, Case Study1: Sun Network File System, Case Study 2: The Andrew File System.

Name Services: Introduction, Name Services and the Domain Name System, Directory Services, Case study of the Global Name Service.

Distributed Shared Memory: Introduction Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, other consistency models.

Module-5:

Class Hours: 7

Transactions and Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

REFERENCES:

1. Distributed Systems : Principles and paradigms by Andrew S. Tanenbaum, Maarten Van Steen, Second Edition, Published by PHI.

2. Distributed Systems : An Algorithm Approach, Sukumar Ghosh, Chapman & Hall/CRC, Published by Taylor &Fransis Group, 2007.

3. Distributed Systems : Concepts and Design by George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, Fifth Edition, Published by Pearson

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Cloud Computing

Course Code	CSPE 506-2
Course Title	Cloud Computing
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	--
Course Category	Programme Elective Course

Course Outcomes: - After the completion of the course, the students will be able to

1. Realize the need of cloud computing, cloud essentials, benefits, challenges, limitations, usage and applications. (K4)
2. Choose appropriate cloud models, cloud application architecture, cloud computing architecture and various infrastructure to model real world-problems (K5)
3. Compare the various cloud services and determine the security issues for the users to place the very sensitive data housed on-site (K3)
4. Illustrate the concepts of virtualization, virtual cluster and different approaches to cloud computing like Aneka, Autonomic computing engine (K3)

Module- 1: Introduction to Cloud computing
Number of Class hours:6

Learning Outcomes:

1. Demonstrate the conceptsof cloud and their evolutions. (K3)
2. Investigate various cloud models and architecture. (K4)
3. Analyse the various scaling of cloud infrastructure (K3)

Detailed content of the module:
1.1 Evolution of cloud, Essentials, Cloud Computing definition
1.2 Benefits and Challenges, Limitations, Usage and Applications
1.3 Business Models around Cloud Computing, Characteristics, Cloud Adoption.
1.4 Cloud models: Introduction, Collaboration to cloud, Cloud Models
1.5 Cloud Applications and Architecture, Cloud Computing Architecture
1.6 Cloud Infrastructure Models
1.7 Cloud Infrastructure Self Service, Scaling a cloud infrastructure.

Module- 2: Cloud Services
Number of class hours: 6

Learning Outcomes:

1. Exemplify the various services in respect to storage and database. (K3)
2. Examine the various management scheme and security of services of the cloud. (K4)
3. Implement the testing of cloud services and the infrastructure. (K5)

Detailed content of the module:

2.1 Introduction to Services, Storage as a Service, Database as a Service
2.2 Information as Service, Process as a Service, Application as a Service
2.3 Management/Governance as Service, Platform as a Service, Security as a Service
2.4 Testing as Service, Integration as Service, Infrastructure as Service

Module- 3: Software and Service
Number of class hours: 6

Learning Outcomes:
1. Identify the aspects of device integration and the providers (K3)
2. Exemplify the concepts of various cloud file structures. (K3)
3. Differentiate the various features of Hadoop framework (K4)

Detailed content of the module:
3.1 Introduction, Mobile Device Integration
3.2 Providers, Microsoft Online Intuit Quick base
3.3 Cast Iron Cloud, Bungee Connect
3.4 Introduction to Map Reduce, Google File System,
3.5 Hadoop framework, Hadoop Distributed File System

Module- 4: Visualization for Cloud
Number of class hours: 6

Learning Outcomes:
1. Identify the notions of virtualization architecture along with their pros and cons.(K3)
2. Differentiate the different types of virtualization in clouds. (K4)
3. Illustrate virtual desktop infrastructure (K3)

Detailed content of the module:
4.1 Introduction, Pros and Cons of Virtualization
4.2 Virtualization Architecture, Virtualization Machine
4.3 Virtualization in Clusters/Grid Context, Virtual Network
4.4 Types of Virtualization, Virtual Machine Monitor
4.5 Virtual Desktop Infrastructure.

Module- 5: Visualization for Cloud
Number of class hours: 6

Learning Outcomes:
1. Identify the types of clouds and their functionalities(K3)
2. Integrate private and public clouds (K4)
3. Analyse comet cloud architecture and their applications (K4)

Detailed content of the module:

5.1 Cloud Computing: Introduction, Types of clouds, Cloud Comparing Approaches
5.2 Aneka Integration of private and public cloud, Aneka Cloud Platform
5.3 Introduction, Resource Provisioning Service, Aneka Hybrid Cloud Implementation
5.4 Comet Cloud Architecture, Autonomic Behaviour, Comet Cloud
5.5 Overview of Comet Cloud Based Applications, Implementation.

Reference Books: -

1. Cloud Computing, M.N RAO, PHI Learning Private Limited, ISBN: 978-81-203-5073-1
2. Cloud Computing – A practical approach for learning and implementation Pearson A. Srinivasan, J. Suresh
3. Cloud Computing A hands-on-Approach, universities Press ArshdeepBahga and Vijay Madisetti
4. Cloud Computing – Concepts, Technology and Architecture Pearson Thomas Erl

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Data Science

Course Code	:	CSPE 506-3
Course Title	:	Data Science
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme Elective Course

Course Outcome:

1. Explore the data mining concepts to develop programming abilities (K4)
2. Demonstrate proficiency with statistical analysis of data. (K5)
3. Build and access data-based models (K6)
4. Execute statistical analyses with professional statistical software. (K4)

Module 1
No. class hours: 6
Learning Outcomes of the Module:

1. Recognize the data mining concepts and distinguish the various systems of data mining(K3)
2. Integrate data mining systems with data warehouse system(K5)
3. Execute innumerable pre-processing of data(K5)
4. Apply data cleaning and discretization for multiple processing(K4)

Detailed contents of the Module:

1.1 Introduction Motivation, Importance, Definitions
1.2 Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems

1.3 Data Mining Task Primitives, Integration of a Data Mining System with A Database or Data Warehouse System
1.4 Major Issues in Data Mining, Types of Data Sets and Attribute Values
1.5 Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity.
1.5 PREPROCESSING: Data Quality, Major Tasks in Data Pre-processing, Data Reduction
1.6 Data Transformation and Data Discretization, Data Cleaning and Data Integration.

Module 2
No. Class hours: 6
Learning Outcomes of the Module:
1. Realize on-line analytical processing of data warehouse concepts (K3)
2. Design various data warehouse for effective processing (K5)
3. Implement data computation(K5)

Detailed contents of the Module:
2.1 Data Warehousing and on-line Analytical Processing Data Warehouse basic concepts
2.2 Data Warehouse Modeling - Data Cube and OLAP
2.3 Data Warehouse Design and Usage
2.4 Data Warehouse Implementation
2.5 Data Generalization by Attribute-Oriented Induction, Data Cube Computation.

Module 3
No. Class hours:6
Learning Outcomes of the Module:
1. Apply patterns for mining of data (K5)
2. Implement various association and correlation on various itemset (K4)
3. Recognize association rules for frequent patterns (K3)

Detailed contents of the Module:
3.1 Patterns, Associations and Correlations Mining Frequent Patterns
3.2 Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset
3.3 Mining Methods, Pattern Evaluation Methods, Applications of frequent pattern and associations.
3.4 Frequent Patterns and Association Mining: A Road Map, Mining Various Kinds of Association Rules
3.5 Constraint-Based Frequent Pattern Mining, Extended Applications of Frequent Patterns.

Module 4
No. Class hours: 6
Learning Outcomes of the Module:
1. Analyse methodologies to improve classification accuracy (K5)
2. Recognize web mining algorithms (k3)
3. Implement various clustering and partitioning techniques(K4)

Detailed contents of the Module:
4.1 Classification Basic Concepts, Decision Tree Induction, Bayesian Classification Methods

4.2 Rule-Based Classification, Model Evaluation and Selection
4.4 Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification
4.5 Classification by Neural Networks, Support Vector Machines, Pattern-Based Classification, Lazy Learners (or Learning from Your Neighbors).

Module 5
No. Class hours: 6
Learning Outcomes of the Module:
1. Analyse clustering structures and partitioning methods (K5)
2. Recognize outlier detection techniques(k3)
3. Implement web mining and HITS algorithms(K4)

Detailed contents of the Module:
5.1 Cluster Analysis Basic Concepts of Cluster Analysis, Clustering Structures, Major Clustering Approaches, Partitioning Methods
5.2 Hierarchical Methods, Density-Based Methods, Model-Based Clustering, Why outlier analysis,
5.3 Identifying and handling of outliers, Outlier Detection Techniques.
5.4 WEB MINING: Basic concepts of web mining, different types of web mining,
5.5 PAGE RANK Algorithm, HITS Algorithm

Reference Books:
1. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier
2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, Pearson Education
3. Amitesh Sinha, Data Warehousing, Thomson Learning, India.
4. Xingdong Wu, Vipin Kumar, the Top Ten Algorithms in Data Mining, CRC Press, UK.
Course outcomes:

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Mobile Computing

Course Code	:	CSPE 507-1
Course Title	:	Mobile Computing
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme Elective Course

Course Outcome:
1. Recognize the basic concepts of wireless communications. (K3)
2. Analyse security, energy efficiency, mobility, scalability in wireless communications. (K4)
3. Demonstrate basic skills for cellular network designs. (K3)
4. Develop and deploy basic mobile applications(K6)

Module 1:
No. Class hours: 6
Learning Outcomes of the Module:
1. Identify the elementary perceptions of mobile applications. (K3)
2. Apply Android development tools for application development (K4)
3. Create Android Virtual devices (K4)

Detailed contents of the Module:
1.1 A brief history of Mobile, Types of mobile phone generations
1.2 The Mobile Ecosystem, Types of Mobile Applications
1.3 Mobile Information Architecture Android Versions, Features of Android
1.4 Android Architecture, Installing Android SDK Tools, Configuring Android in Eclipse IDE
1.5 Android Development Tools (ADT), Creating Android Virtual Devices (AVD)

Module 2:
No. Class hours: 6
Learning Outcomes of the Module:
1. Create android application programs (K4)
2. Recognize numerous android application components (K3)
3. Explore intent types and linking activities(K4)

Detailed contents of the Module:
2.1 Creating first android application, Anatomy of android application
2.2 Deploying Android app on USB connected Android device
2.3 Android application components, Activity life cycle, understanding activities
2.4 Exploring Intent objects, Intent Types
2.5 Linking activities using intents

Module 3:
No. Class hours: 6
Learning Outcomes of the Module:
1. Establish interactions between fragments (K3)
2. Implement various types of view (K4)
3. Device multiple UI event handling mechanisms (K4)

Detailed contents of the Module:
3.1 Fragments life cycle, Interaction between fragments, Understanding the components of a screen (Layouts)
3.2 Adapting to display orientation, Action Bar
3.3 Views (UI Widgets)-Button, Toast, ToggleButton, CheckBox, RadioButton
3.4 Spinner, WebView, EditText, DatePicker, TimePicker, ListView, ProgressBar
3.5 Analog and Digital clock, Handling UI events,
3.6 List fragment, Dialog fragment

Module 4:
No. Class hours: 6
Learning Outcomes of the Module:
1. Implement menu options for popups, images and media players(K4)
2. Device alarm managers, SMS, Email and media players(K4)
3. Create telephony manager and storing of data persistently (K5)

Detailed contents of the Module:
4.1 Menus-Option, Context, Popup, Images-ImageView, ImageSwitcher, AlertDialog
4.2 Alarm manager, SMS, E-mail, Media Player
4.3 Using camera, recording video
4.4 Handling Telephony Manager, Storing the data persistently-Data Storage Options: preferences

Module 5:
No. Class hours: 6
Learning Outcomes of the Module:
1. Demonstrate storage and content provider through various data structures(K4)
2. Device SQLite database operations (K4)
3. Create connectivity in SQLite and deploy APK files(K5)

Detailed contents of the Module:
5.1 Internal Storage, External Storage, Content Provider
5.2 The SQLite database, Connecting with SQLite database and operations-Insert, Delete, Update, Fetch,
5.3 Publishing android applications, Deploying APK files

Reference Books:
1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley Publishing, Inc.
2. Pradeep Kothari, "Android Application Development Black Book", DreamTech Press
3. James C. Sheusi, "Android Application Development for Java Programmers", Cengage Learning
4. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
5. Sayed Y Hashimi and Satya Komatineni(2009), "Pro Android", Wiley India Pvt Ltd
6. Reto Meier, Professional Android 4 Application Development, Wiley India Pvt Ltd

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Software Testing

Course Code	:	CSPE 507-2
Course Title	:	Software Testing
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme Elective Course

Course Outcome:
1. Inculcate essential software testing knowledge and skills, required to reasonably test a system under development in a systematic manner. (K4)
2. Analyse software functional and non-functional testing (K3)
3. Devise methods to execute test cases of different types for a sample system(K4)

Module 1:
No. Class hours: 6
Learning Outcomes of the Module:
1. Demonstrate fundamental concepts for software testing (K3)
2. Analyse software testing life cycle (K4)
3. Illustrate various types of tests performed on software for quality measurement(K3)

Detailed contents of the Module:
1.1 Basics Introduction to Software Quality basics: Verification and validation
1.2 Quality perspectives, Testing terminology, Software Testing Life Cycle (STLC)
1.3 "V" model of Testing, QA process
1.4 Cost of testing, types of tests,

Module 2
No. Class hours: 6
Learning Outcomes of the Module:
1. Analyse test cases and draw conclusions to improve software quality(K4)
2. Determine test case scenarios for software requirements (K5)
3. Establish user acceptance tests for multiple requirements(K3)

Detailed contents of the Module:
2.1 Writing test cases, Functional Testing
2.2 Non-functional testing, (Performance testing)
2.3 UI testing. Preparing test data, Writing Unit test
2.4 Integration test and User Acceptance Tests
2.5 Preparing test scenarios from Software requirements

Module 3
No. Class hours: 6
Learning Outcomes of the Module:
1. Perform test executions of the software(K3)
2. Establish test planning and strategies for quality improvement(K5)
3. Determine various test coverage and reporting(K4)

Detailed contents of the Module:
3.1 Test Execution and Management test execution
3.2 Test Oracles, test planning
3.3 Test strategy including when to stop testing
3.4 Test-coverage - Traceability matrix, JIRA, Bugzilla and other bug tracking tools
3.5 Test data mining, test reporting.

Module 4
No. Class hours: 6
Learning Outcomes of the Module:
1. Perform performance test cases for different types of test (load, stress, benchmarking, etc.) (K5)
2. Analyse automated test for User interface (K4)
3. Demonstrate in writing-executing test scripts for a sample system (K4)

Detailed contents of the Module:
4.1 Test Automation, Why automation
4.2 When not to automate, Writing simple automated test cases
4.3 Learn and practice any one automated testing framework like Selenium
4.4 Other quality Assurance Quality and Defect management - Code reviews,
4.5 Quality tools, Change management, version control

Module 5
No. Class hours: 6
Learning Outcomes of the Module:
1. Illustrate the need for tools and the types. (K5)
2. Analyse testing process management tools. (K4)
3. Demonstrate the use of tools in testing process (K4)

Detailed contents of the Module:
5.1 Need for Tools, Classification of Tools, Functional / Regression Testing Tools
5.2 Performance / Load Testing Tools, Testing Process Management Tools, Benefits of Tools
5.3 Risks Associated with the Tools, does your Organization Need Tools, Selecting Tools,
5.4 Introducing the tools in the Testing Process

Reference Books/Resources:
1. Software Engineering – A Practitioner's Approach, 7th Edition, Roger Pressman.
2. Bugzilla (https://www.bugzilla.org/)
3. JIRA (https://www.atlassian.com/software/jira)

FOSS

Course Code	:	CSPE 507-3
Course Title	:	FOSS(Free and Open-Source Software)
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme Elective Course

Course Outcome:

1. Exposure to free and open-source software philosophy and tools. (K4)
2. Implement server administrations for secure environment. (k5)
3. Find and evaluate FOSS alternatives for any software requirement. (K4)
4. Analyse FOSS case studies for better understanding and implementation (K3)

Module 1:

No. Class hours: 6

Learning Outcomes of the Module:

1. Establish the FOSS philosophy for community-based software development(K3)
2. Create guidelines to work with the FOSS community (K4)
3. Determine the requirements for free open-source software(k5)

Detailed contents of the Module:

1.1 FOSS PHILOSOPHY: Understanding the FOSS Community and FOSS Philosophy
1.2 Benefits of Community based Software Development
1.3 Guidelines for working with FOSS community
1.4 Requirements for being open, free software Open-source software,
1.5 FOSS Licensing Models, FOSS examples

Module 2:

No. Class hours: 6

Learning Outcomes of the Module:

1. Perform Linux installation and hardware configurations (K5)
2. Analyse kernel operations during boot time (K3)
3. Execute system administration functions for keeping the server secure(K5)

Detailed contents of the Module:

2.1 LINUX Installation and Hardware Configuration, Boot Process
2.2 Dual-Booting Linux and other Operating Systems
2.3 Kernel Options during Boot
3.4 X Windows System Configuration
3.5 System Administration (Server Administration, Backup and Restore Procedures, Strategies for keeping a Secure Server)

Module 3:
No. Class hours: 6
Learning Outcomes of the Module:
1. Acquire the concepts of programming tools and techniques (K5)
2. Write programs using Java/Python/Perl (K4)
3. Establish database connectivity with Mysql, PostgreSQL (k5)

Detailed contents of the Module:
3.1 Programming Tools and Techniques
3.2 Libreoffice Tools; Samba: Cross platform
3.3 Introduction about LAMP, Introduction to Programming using languages like Java /Python / Perl
3.4 Database Systems Mysql, PostgreSQL or equivalent

Module 4:
No. Class hours: 6
Learning Outcomes of the Module:
1. Implement mobile programming for various uses (K4)
2. Explore various FOSS tools and applications through various case studies (K5)
3. Implement various examples of the FOSS Case studies(K4)

Detailed contents of the Module:
4.1 Open-Source UML Tools; Introduction to Mobile Programming
4.2 Version Control Systems like SVN, Git or equivalent; Project Management Tools
4.3 Bug Tracking Systems; Package Management Systems
4.4 FOSS Case Studies
4.5 Some example case studies of FOSS implementation

Module 5
No. Class hours: 8
Learning Outcomes of the Module:
1. Recognize infrastructure need for open-source project and archiving facilities (K4)
2. Explore community building necessities to maintain bug database, newgroup, etc. (K5)
3. Apprehend the free software licensing and code contamination penalty. (K4)

Detailed contents of the Module:
5.1 Infrastructure for an Open-Source Project, Public code archive, Project documentation
5.2 Bug database, Open mailing lists and newsgroup, Project website, Building a Community
5.3 Joining an Existing Open-Source Project, become a community member, adopt development process of OSS
5.4 Get the contributions accepted, Ending an Open-Source Project
5.5 Legal Impacts of Open Software and Free Software, Statutory Development Related to Software Contracts, Self-Enforcing Nature of Open Source and Free Software Licenses
5.6 Negative Effects of Open Source and Free Software Licensing, Chain-of-title problem, Code contamination penalty, Intellectual property liability, Enforcement of license

Reference Books:

1. Linux in a Nutshell, by Ellen Siever
2.Philosophy of GNU URL: http://www.gnu.org/philosophy
3.Linux Administration URL: http://www.tldp.org/LDP/lame/LAME/linux-admin-madeeasy/.
4.Version control system URL: http://git-scm.com/.
4.Samba: URL : http://www.samba.org/.
5. Libre office: http://www.libreoffice.org/.

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Summer Internship-II

Course Code	CSSI509
Course Title	Summer Internship-II
Number of Credits	3 (L: 0, T: 0, P: 0)
Prerequisites	Fundamental and basic practical skills of relevant discipline/programme
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 4th Semester	6 Weeks	Industrial/Govt./NGO/MSME/ Rural Internship/Innovation / Entrepreneurship ##	3	120 Hours

(##During the summer vacation after 4th Semester, students are ready for industrial experience. Therefore, they may choose to undergo Internship /Innovation /Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case a student want to pursue his/her family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the TPO.)

Course Outcome: -

After completion of the course, students will be able to:

C.O.1: Describe a better understanding of the engineering / technological workplace(K2).

C.O.2: Develop and demonstrate workplace competencies necessary for professional and academic success (K2).

C.O.3: Classify career preferences and professional goals (K3).

C.O.4: Develop preliminary portfolio including work samples from the internship (K2).

C.O.5: Increase competitiveness for full-time engineering employment / start-up (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-II is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	Credit	Schedule	Total Duration	Sub Activity Head	Proposed Document as Evidence	Evaluated by	Performance appraisal/ Maximum points/ activity
Innovation / IPR / Entrepreneurship	3	Summer Vacation after 4th Semester	6 Weeks	Participation in innovation related completions for eg. Hackathons etc.	Certificate	Faculty Mentor	Satisfactory/ Good/ Excellent
				Development of new product/ Business Plan/ registration of start-up	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.	Certificate	President/ Convener of ICC	Satisfactory/ Good/ Excellent
				Work experience at family business	Declaration by Parent	TPO	Satisfactory/ Good/ Excellent
Internship	3	Summer Vacation after 4th Semester	6 Weeks	(Internship with Industry/ Govt. / NGO/ PSU/ Any Micro/ Small/ Medium enterprise/ Online Internship	Evaluating Report	Faculty Mentor/ TPO/ Industry supervisor	Satisfactory/ Good/ Excellent
Rural Internship	3	Summer Vacation after 4th Semester	6 Weeks	Long Term goals under rural Internship	Evaluating Report	Faculty Mentor/ TPO/ NSS/ NCC head	Satisfactory/ Good/ Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

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Major Project (Part- I)

Course Code	CSPR510
Course Title	Major Project (Part-I)
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms. (K3)

Course Content:-

The major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

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Semester VI

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-21	CSPC601	Wireless and Mobile Network	3	0	0	3	3
2	Programme core course-22	CSPC602	Fundamentals of AI	2	0	0	2	2
3	Programme elective course-4	CSPE603	1. Advance Computer Networks/ 2. Information Security / 3. Network Forensics	3	0	0	3	3
4	Humanities and Social Science course	HSS604	Entrepreneurship and Start-up's	3	1	0	4	4
5	Open elective-2	**OE05	To be offered by other departments	3	1	0	4	4
6	Mandatory Course-2	AU606	Indian Constitution	2	0	0	2	0
7	Major Project	CSPR607	Project part-II	0	0	6	6	3
8	Seminar	CSSE608	Seminar	2	0	0	2	1
			Total				**26**	**20**

Wireless and Mobile Network

Course Code	CSPC601
Course Title:	Wireless and mobile network
Number of credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL

Course Outcomes: After completing the course, the students will be able to

C.O.1: Explain cellular system, 2G/3G/4G/5G mobile network, Frequency reuses and channel interferences (K2).

C.O.2: Demonstrate concepts related to wireless propagation (K2).

C.O.3: Explain concepts of wireless antenna (K2).

C.O.4: Explain different multiplexing techniques (K2).

C.O.5: Illustrate the concepts and applications of Bluetooth, RFID, WLAN and WiMAX (K2).

Course Contents:

Module 1: Overview of Cellular Systems. **No. of lectures:** 8

Learning Outcomes: Students will be able to explain

1. Basics of data cellular systems.
2. Evolution of 2g/3G/4G/5G mobile network concept.
3. Frequency reuses and channel interferences.

Overview of Cellular Systems, Evolution 2g/3G/4G/5G Cellular Concepts – Frequency reuse, Co channel and Adjacent channel Interference

Module 2: Wireless propagation **No. of lectures**: 8

Learning Outcomes: Students will be able to explain

1. Wireless propagation, budget, loss, noise, fading and shadowing.

Wireless propagation Link budget, Free-space path loss, Noise figure of receiver Multipath fading, Shadowing, Fading margin, shadowing margin.

Module 3: Wireless Antenna **No. of lectures**: 8

Learning Outcomes: Students will be able to explain

1. Types of wireless antenna.
2. Wireless channel, capacity and MIMO technology for wireless antenna.

Antenna diversity, wireless channel capacity and MIMO.

Module 4: Overview of multiplexing techniques. **No. of lectures:** 6

Learning Outcomes: Students will be able to explain

1. Multiplexing and different multiplexing techniques.
2. LTE technology.

Overview of CDMA, OFDM and LTE.

Module 5: Wireless Networking Technologies. **No. of lectures:** 6

Learning Outcomes: Students will be able to explain

1. Classification of Bluetooth technologies.
2. Concepts and applications of RFID
3. Demonstrate WLAN and WiMAX technologies.

Overview of Bluetooth technologies, RFID, WLAN and WiMAX.

References:

S. No.	Title of Book	Author	Publication
1	Wireless Communications – Principles and Practice	T. S. Rappaport	(2nd edition) Pearson ISBN 9788131731864
2	Modern Wireless Communications	Haykin& Moher	Pearson 2011 (Indian Edition) ISBN : 978-8131704431

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Fundamentals of AI

Course Code	CSPC602
Course Title	Fundamentals of AI
Number of Credits	2 (2:0:0)
Prerequisites	Basic knowledge of algorithm and searching technique.
Course Category	Programme core course

Course Outcomes: -

Upon successful completion of this course, students will be able to

1) Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations. **(K1)**

2) Understand and implement search and game algorithms. **(K1, K2)**

3) Explain basic concepts, methods and theories for search. **(K2)**
4) Account for classical planning of proactive agents. **(K1)**
5) Apply basic principles of AI in solutions that require problem solving, inference, knowledge representation, and learning.**(K3)**

Module- 1: Introduction

Number of class hours: 4

After completing this module students will be able to

1) Understand basic concepts and history behind AI. **(K2)**
2) Explain Symbol system. **(K2)**
3) Identify agents of AI. **(K2)**

Detailed content of the unit:

Overview and Historical Perspective of AI, Turing test, Physical Symbol Systems and the scope of Symbolic AI, Agents of AI.

Module- 2: Searching

Number of class hours: 6

Suggestive Learning Outcomes:
After completing this module students will be able to

4) Understand basic concepts of search mechanism in AI. **(K2)**
5) Explain different types of Heuristic and Randomized Search. **(K2)**
6) Apply search in problem solving. **(K3)**

Detailed content of the unit:

Heuristic Search: Best First Search, Hill Climbing, Beam Search, Tabu Search.
Randomized Search: Simulated Annealing, Genetic Algorithms, Ant Colony Optimization.

Module-3: Path Finding Algorithms

Number of class hours: 5

After completing this module students will be able to

1) Explain different optimal pathfinding techniques. **(K1)**
2) Describe Rule based system. **(K1)**
3) Understand and apply game playing algorithm.**(K2)**

Detailed content of the unit:

Finding Optimal Paths: Branch and Bound, A*, IDA*, Divide and Conquer approaches, Beam Stack Search.
Problem Decomposition: Goal Trees, AO*, Rule Based Systems, Rete Net.
Game Playing**:** Minimax Algorithm, AlphaBeta Algorithm, SSS*.

Module-4: Planning and Constraint Satisfaction

Number of class hours: 5

After completing this module students will be able to

1) Understand and explain forward and backward search. **(K2)**
2) Understand basic concept of planning and propagation.**(K2)**

Detailed content of the unit:

Planning and Constraint Satisfaction: Domains, Forward and Backward Search, Goal Stack Planning, Plan Space Planning, Graphplan, Constraint Propagation.

Module- 5 :Logic and Inferences
Number of class hours: 5

After completing this module students will be able to

1) Differentiate between various types of Logic. **(K2)**
2) Understand and demonstrate chaining in AI. **(K2)**

Detailed content of the unit:

Logic and Inferences: Propositional Logic, First Order Logic, Soundness and Completeness, Forward and Backward chaining.

References: -

1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India)
2. https://nptel.ac.in/courses/106106126/
3. Stefan Edelkamp and Stefan Schroedl. Heuristic Search, Morgan Kaufmann.
4. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, A K Peters/CRC Press
5. Elaine Rich and Kevin Knight. Artificial Intelligence, Tata McGraw Hill.
6. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, Prentice Hall
7. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House.

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Advance Computer Networks

Course Code	CSPE603-1
Course Title	Advance Computer Networks
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	-
Course Category	Programme elective course

Course Outcomes: -

After the completion of the course Student will be able to

1) Implement of Network Layer Protocols. (K1)
2) Configure IPv6 Network (K3)
3) Choose Routing protocol in the given network situation (K2)
4) Implement of Network Layer Protocols. (K2)
5) Configure various Application Layer protocol. (K3)

Course Content: -

Module- 1: Network Layer and Protocol

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the significance of the given field in the packet format of Internet Protocol. (K2)
2) Implement IP address for the given network. (K1)
3) Understand the significance of the given field in the packet format of ICMPv4. (K2)
4) Understand the given inefficiency in Mobile IP.(K1)

Detailed content of the unit: - IP Addressing, address space, notations, Classfull addressing, Classfull addressing, Network Address Translation(NAT), IP Datagram format, Fragmentation, ICMPv4 messages, Debugging tools, ICMP Checksum, Mobile IP addressing, Agents, Three phases, Inefficiency in Mobile IP, VPN Technology

Module- 2: Next Generation IP

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Map the given IPv4 Address to IPv6 Address. (K3)
2) Describe the function of given step in the stateless auto configuration process. (K2).

3) Outline the given strategy of Transition from IPv4 to IPv6. (K1)
4) Understand the significance of the given field in Datagram format of IPv6. (K2)

Detailed content of the unit: - IPv6 Addressing representation, address space, address space allocation, Autoconfiguration, Renumbering, Transition from IPv4 to IPv6, Duel stack, Tunneling, Header Translation, IPv6 Protocol packet format, Extension header.

Module- 3: Unicast and Multicast Routing Protocols
Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-
1) Understand the relevant routing Protocol for the given network situation. (K2)
2) Compare Dynamic Routing and Static Routing on the given aspect. (K1)
3) Calculate shortest paths from a single source vertex to all the other vertices in the given weighted digraph. (K3)
4) Understand the functioning of the multicast routing protocol. (K1)

Detailed content of the unit: - Inter-domain, intra-domain Routing, Distance Vector Routing, Bellman-Ford Algorithm, Link state Routing, Path Vector Routing, Unicast Routing Protocols Internet structure, Routing Information Protocol (RIP), Open Shortest Path First(OSPF), Border Gateway Protocol Version 4 (BGP4), Unicast, Multicast, Broadcast, Multicast Distance Vector(DVMRP), Multicast Link State(MOSPF), Protocol Independent Multicast (PIM),

Module- 4: Transport Layer Protocols

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Understand the significance of the UDP Packet Format. (K2)
2) Understand the concept of State Transition of TCP. (K2)
3) Understand the significance of the TCP Packet Format. (K2)
4) Understand the significance of the SCTP Packet Format. (K2)

Detailed content of the unit: - User Datagram Protocol, UDP Services, UDP Applications, TCP Services, TCP features, Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers, Options, SCTP Services, SCTP Features, Packet Format, An SCTP Association, Flow Control, Error Control.

Module- 5: Application Layer Protocols

Number of class hours: 6 Hrs
Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the function of Application Layer Protocol. (K1)
2) Understand the function of FTP, Email architecture. (K2)
3) Understand the process of resolving the given host name into IP Address using DNS. (K3).
4) Working with Remote Control Protocol. (K3)

Detailed content of the unit: - WWW, HTTP, FTP, TFTP, Email Architecture, Web based mail, Email Security, SMTP, POP, IMAP and MIME, SNMP, Concept of Domain space, DNS Operation, DHCP-Static and Dynamic Allocation, DHCP Operation, TELNET, SSH, Intrusion detection system (IDS), Intrusion prevention system (IPS)

References: -

1) Advanced Computer Network, BM Harwani and DT Editorial Services, Dreamtech
2) Computer Networks, Andrew S. Tanenbaum(Author), PHI Learning.
3) Internetworking with TCP/IP, Comer Douglas E., Prentice Hall of India Private Limited
4) Computer Networks, Natalia Olifer, Victor Olifer, Wiley.

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Information Security

Course Code	CSPE603-2
Course Title	Information Security
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	-
Course Category	Programme elective course

Course Outcomes: -

After the completion of the course Student will be able to

1) Understand the concept of Information Security and CIA TRIAD. (K2)
2) Understand the concept of Application Security, encryption and Cryptography (K2)
3) Understand the concept of security measures and risk management (K2)
4) Understand the knowledge of Cyber laws in cases of various crimes. (K2)

Course Content: -

Module- 1: Introduction to Information Systems and Security

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of Information Security. (K1)
2) Understand the significance of CIA TRIAD. (K2)
3) Understand the need of cyber security. (K2)
4) Understand the threats to Information Systems. (K2)

Detailed content of the unit: - Information Systems, Types of IS, Development of IS, Introduction to Information Security, Need for Information Security,Understanding CIA TRIAD, Threats to Information Systems, Information Assurance, Cyber Security

Module- 2: Introduction to Application Security and Counter Measures

Number of class hours: 8 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of Application Security. (K1)
2) Understand the significance of the security threats to eCommerce and Digital payment system. (K2)
3) Understand the need of Cryptography and Encryption. (K2)
4)

Detailed content of the unit: - Introduction to Application Security, Data Security Considerations, Security Technologies, Security Threats, Security Threats to E-Commerce, E-Cash and Electronic Payment System, Credit/Debit/Smart Cards, Digital Signature, Cryptography and Encryption

Module- 3: Introduction to Security Measures

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

5) Understand the role of risk management in the field of information security. (K2)
6) Understand the concept of security architecture and design. (K2)
7) Understand the concept of physical security and backup security. (K2)

Detailed content of the unit: - Secure Information System Development, Application Development Security, Information Security Governance and Risk Management, Security Architecture and Design, Security Issues in Hardware, Data Storage, and Downloadable Devices, Physical Security of IT Assets, Backup Security Measures

Module- 4: Introduction to Security Policies

Number of class hours: 4 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of security policy. (K2)
2) Understand the concept of security standards. (K2)

Detailed content of the unit: Need for an Information Security Policy, Information Security Standards - ISO, Introducing Various Security Policies and Their Review Process,

Module- 5: Cyber Laws

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the significance of cyber law. (K1)
2) Knowledge of IT Act 2000 and Amendments in 2008. (K2)
3) Knowledge of Intellectual Property Issues, Patent Copyright. (K2)

Detailed content of the unit: - Introduction to Indian Cyber Law, Objective and Scope of the IT Act 2000 & Amendments in 2008, Need for Enactment of Information Technology Act, 2000, Objectives of IT Legislation in India, IT Act 2000 legislation deals with, Salient Features of I.T Act, Applicability of IT Act, Chapters in the Act, Schedules in the Act, Need for IT Amendment Act 2008 (ITAA), Case Studies as per selected IT Act Sections, Intellectual Property Issues, Overview of Intellectual-Property- Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License

References: -

1) Introduction to Information Security and Cyber Laws, Surya Prakash Tripathi, Ritendra Goel, Praveen Kumar Shukla, Dreamtech Press
2) Cryptography and Information Security, V. K. Pachghare, PHI Learning
3) Cyber Law & Cyber Crimes Simplified, Adv. Prashant Mali, Cyber Infomedia

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Network Forensics

Course Code	CSPE603-3
Course Title	Network Forensics
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	-
Course Category	Programme elective course

Course Outcomes: -

After the completion of the course Student will be able to

1) Understand the concept of Network Forensics and its uses. (K1)
2) Understand the concept of Traffic Analysis for Network Forensics. (K2)
3) Understand the concept of Network Intrusion Detection and Analysis (K2)
4) Understand the concept of Wireless Network Forensics. (K2)
5) Understand the concept of Network Tunneling & Malware Forensics. (K2)

Course Content: -

Module- 1: Foundation of Network Forensic

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of Investigation Strategy. (K2)
2) Understand the concept of Digital Evidence Acquisition. (K1)
3) Understand the concept of Network Forensics Investigation Methodology. (K2)

Detailed content of the unit: - Practical Investigative Strategies, Real-World Cases, Footprints, Concepts in Digital Evidence, Challenges Relating to Network Evidence, Network Forensics Investigative Methodology (OSCAR), Sources of Network-Based Evidence, Principles of Internetworking, Internet Protocol Suite, Physical Interception, Traffic Acquisition Software, Active Acquisition

Module- 2: Traffic Analysis

Number of class hours: 8 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept Traffic analysis. (K1)
2) Understand the concept of packet analysis, Statically Flow Analysis. (K2)
3) Understand the concept of Wireless Network Forensics. (K2)

Detailed content of the unit: - Packet Analysis, Protocol Analysis, Packet Analysis, Flow Analysis, Higher-Layer Traffic Analysis, Statistical Flow Analysis, Process Overview, Sensors, Flow Record Export Protocols, Collection and Aggregation, Analysis, IEEE Layer 2 Protocol Series, Wireless Access Points (WAPs), Wireless Traffic Capture and Analysis, Common Attacks, Locating Wireless Devices

Module- 3: Network Intrusion Detection and Analysis
Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of NIDS. (K2)
2) Understand the concept of packet logging, Snort. (K2)

Detailed content of the unit: - Why Investigate NIDS/NIPS, Typical NIDS/NIPS Functionality, Modes of Detection, Types of NIDS/NIPSs, NIDS/NIPS Evidence Acquisition, Comprehensive Packet Logging, Snort.

Module- 4: Network Devices and Servers
Number of class hours: 4 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of Event Log Aggregation, Correlation, and Analysis. (K2)
2) Understand the concept of Network Log Architecture. (K2)
3) Clarify the knowledge of network devices(K1)
4) Uses of difference tools for analysis. (K3)

Detailed content of the unit: Event Log Aggregation, Correlation, and Analysis, Sources of Logs, Network Log Architecture, Collecting and Analysing Evidence, Storage Media, Switches, Routers, Firewalls, Interfaces, Logging, Why Investigate Web Proxies, Web Proxy Functionality, Evidence, Squid, Web Proxy Analysis, Encrypted Web Traffic

Module- 5: Network Tunneling&Malware Forensics
Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of network tunnelling. (K2)
2) Understand the concept of Malware. (K1)
3) Understand the Network Behavior of Malware.(K2)

Detailed content of the unit: - Tunneling for Functionality, Tunneling for Confidentiality, Covert Tunneling, Trends in Malware Evolution, Network Behavior of Malware, The Future of Malware and Network Forensics

References: -

1) Network Forensics: Tracking Hackers through Cyberspace, Sherri Davidoff, Jonathan Ham, Pearson Prentice Hall
2) Learning Network Forensics, Samir Datt, Ingram
3) Fundamentals of Network Forensics, Joshi, R.C., Pilli, Emmanuel S., Springer
4) Network Forensics, Ric Messier, Wiley

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Entrepreneurship and Start-ups

Course Code	:	HSS 604
Course Title	:	Entrepreneurship and Start-ups
Number of Credits	:	4 (L:3, T:1, P:0)
Prerequisites (Course code)	:	None
Course Category	:	HSS

CO1 Understand the basic concepts of Entrepreneurship and Startups.

CO2 Illustrate skills of discovering business ideas, visualizing and planning a business.

CO3 Analyze market and business risk for strategy development.

CO4 Demonstrate skills of organizational management.

CO5 Exhibit knowledge of financing methods, institutions and skills for communication of ideas.

Course Content:

Unit1-Introduction and Basics of Entrepreneurship and Start–Ups

Suggestive Learning Outcomes:

(1) Describe the Basic Elements of Entrepreneur and Entrepreneurship

(2) Distinguish between Entrepreneur, Manager and Intrapreneur

Content:

- Definitions, Traits of an entrepreneur, Factors influencing entrepreneurship, Types and Functions of Entrepreneurs, Need for promotion of entrepreneurship, Intrapreneur, Motivation
- Role of Entrepreneurs in Economic Development
- Similarities/differences between - Entrepreneur and Manager, Entrepreneur and Intrapreneur.

Unit2–Business Ideas and their implementation

Suggestive Learning Outcomes:

(1) Illustrate different Types of Business Planning and Business Structure
(2) Select specific Institutions Assisting Entrepreneur

Content:

- Discovering ideas
- Visualizing the business
- Business Plan, - Types of planning, Importance of planning, Steps in planning
- Types of Business Structures
- Institutions assisting entrepreneur

Unit3–**Idea to Start-up**

Suggestive Learning Outcomes:

(1) Identify Steps for Starting a SSI
(2) Predict the Target Market and Associated Risk

Content:

- Market analysis – Identifying the target market
- Competition evaluation and Strategy Development
- Steps for starting a small enterprise
- Risk analysis

Unit4–Management of Enterprise

Suggestive Learning Outcomes:

(1) Apply the Basic Accounting Concepts in Business
(2) Demonstrate Knowledge of Pricing, Positioning and Advertising of Products

Content:

- Recruitment and management of talent.
- Determinants of Price, Pricing methods in practice.
- Market Positioning, Advertising and Sales Promotion
- Accounting - Understanding basics of Transaction, Journal, Ledger, Cashbook, Trial Balance, Cost Sheet and Final Accounts through simple problems

Unit5-Financing and Communication of Ideas

Suggestive Learning Outcomes:

(1) Exhibit Knowledge of various Financial Institutions and Financing Methods
(2) Illustrate Business Ideas through Communication Skills

Content:

- Financial Institutions
- Financing methods available for start-ups in India
- Communication of Ideas to potential investors–Investor Pitch

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN–978-0984999392
2.	The Lean Startup: How Today's Entre-preneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN–978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN–978-0755388974
4.	Entrepreneurship	Alpana Trehan	Dreamtech PressISBN: 978-93-5004-026-3

5	Marketing and Sales Management	D C Kapoor	S Chand and Company Ltd. ISBN: 81-219-2430-8
S.No.	**Title of Book**	**Author**	**Publication**
6	Business Economics	H L Ahuja	S Chand and Company Ltd. ISBN: 81-219-1791-3
7	Financial Accounting (Principles and Practice)	Jawahar Lal & Seema Srivastava	S Chand Publishing
8	Accounting for Management	N.P. Srinivasan & Sakthivel Murugan	S Chand Publishing
9	Marketing	Harsh V Verma and Ekta Duggal	Oxford University Press ISBN: 0-19-945910-X
10	Marketing (Asian Edition)	Paul Baines, Chris Fill, Kelly Page and Piyush K. Sinha	Oxford University Press
11	Entrepreneurship	Rajeev Roy	Oxford University Press ISBN: 0-19-807263-5
12	Entrepreneurship Development	Kumar S Anil	New Age Publishers
13	Human Resource Management	Uday Kumar Haldar and Juthika Sarkar	Oxford University Press
14	Fundamentals of Entrepreneurship	S K Mohanty	Prentice Hall of India Private Limited ISBN: 81-203-2867-1
15	Entrepreneurship Development	S S khanka	S Chand and Company Ltd. ISBN: 81-219-1801-4

SUGGESTED SOFTWARE/LEARNINGWEBSITES:

a. https://www.fundable.com/learn/resources/guides/startup
b. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/
c. https://www.finder.com/small-business-finance-tips
d. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

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Indian Constitution

Course Code	:	AU606
Course Title	:	Indian Constitution
Number of Credits	:	0 (L: 2, T:0; P:0)
Prerequisites	:	None
Course Category	:	AU

Course Outcomes:

CO1. Illustrate Preamble, Basic Structure, Fundamental Rights and Duties of Indian Constitution(K3).

CO2. Discuss the Structure of The Indian Union Government (K2).

CO3. Memorize the Role andPower of Governor, Chief Minister and Council ofMinisters and explain the role of State Secretariat (K2).

CO4. Describe the role of Local Administration (K2).

CO5. Explain the Role andFunctioning of Election Commission (K2).

Detailed Course Content:

Module: 1 – The Constitution – Introduction

Number of Class hours:06

Learning Outcomes:

1. Describe the History of the Making of the IndianConstitution (K2)
2. Illustrate Preamble and the Basic Structure of Indian Constitution (K3)
3. Illustrate the Fundamental Rights and Duties set by Indian Constitution (K3)

Detailed content of the unit:

1. The History of the Making of the IndianConstitution
2. Preamble and the Basic Structure, and itsinterpretation
3. Fundamental Rights and Duties and theirinterpretation
4. State PolicyPrinciples

Module: 2 – Union Government

Number of Class hours:06

Learning Outcomes:

1. Discuss the Structure of the IndianUnion Government (K2).
2. Memorize the Role and Power of President, Prime Minister and Council of Ministers of India (K1)
3. Explain the role of Lok Sabha and RajyaSabha (K2)

Detailed content of the unit:

1. Structure of the IndianUnion
2. President – Role andPower
3. Prime Minister and Council ofMinisters
4. Lok Sabha and RajyaSabha

Module: 3 – State Government

Number of Class hours:06

Learning Outcomes:

1. Memorize the Role and Power of Governor, Chief Minister and Council ofMinisters of a state(K1)
2. Explain the role of StateSecretariat (K2)

Detailed content of the unit:

1. Governor – Role andPower
2. Chief Minister and Council ofMinisters
3. StateSecretariat

Module: 4 – Local Administration

Number of Class hours:06

Learning Outcomes:

1. Describe the role of District Administration (K2)
2. Explain the role of MunicipalCorporation (K2)
3. Discuss the role of Zila Panchayat (K2)

Detailed content of the unit:

1. DistrictAdministration
2. MunicipalCorporation
3. Zila Panchayat

Module: 5 – Election Commission

Number of Class hours:06

Learning Outcomes:

1. Explain the Role andFunctioning of Election Commission (K2)
2. Classify the role and functioning of Chief ElectionCommissioner and State Election Commissioner (K2).

Detailed content of the unit:

1. Role andFunctioning of Election commission
2. Chief ElectionCommissioner
3. State ElectionCommission

Suggested Learning Resources:

S. No.	Title of Book	Author	Publication
1.	Ethics and Politics of the In- dian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi, 2008
2.	The Constitution of India	B.L. Fadia	Sahitya Bhawan; New edition (2017)
3.	Introduction to the Consti- tution of India	DD Basu	Lexis Nexis; Twenty-Third 2018 edition

Suggested Software/Learning Websites:

a. https://www.constitution.org/cons/india/const.html
b. http://www.legislative.gov.in/constitution-of-india
c. https://www.sci.gov.in/constitution
d. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/

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Major Project (part- II)

Course Code	CEPR-607
Course Title	Major Project (Part-II)
Number of Credits	3 (L: 0, T: 0, P: 6)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms (K3).

Course Content:-

The major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should provide the scope to develop the following by the students-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

Seminar

Course Code	CSSE608
Course Title	Seminar
Number of Credits	1 (L: 0, T: 0, P: 1)
Prerequisites	Nil
Course Category	Seminar presentation

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Demonstrate a thorough and systematic understanding of a seminar topic (K2).

C.O. 2: Identify the methodologies and professional way of documentation and communication (K3).

C.O.3: Demonstrate the ability to construct a report consistent with expectations of the topic, including an appropriate organization, style, voice, and tone (K3).

C.O.4: Develop the ability to follow discussions, oral arguments, and presentations, noting main points or evidence and tracking through different comments given by the audience (K3).

C.O.5: Developthe communication skill as a speaker (K3).

Course Content:-

The seminar topics may be any aspect of the science and technology, entrepreneurship or any contemporary social issues to be solved by specific branch of engineering and technology (For example, Water logging problems in a particular city may be a seminar topic for Civil Engineering Students) must be approved by the instructor in advance.

The course should have the following-

7) Practice speaking in front of a scientific audience.
8) Explore topics in detail.
9) Research topics and organize presentations.
10) To improve as speakers, each student will receive feedback from the fellow students and the instructor.
11) PowerPoint, Key Note or overheads are acceptable media for Visual aids. Visual aids should look professional and be readable in the entire room; use spell check and proofread for typographical errors.
12) Students have to submit a hard copy contains detailed outline (4-5 pages) of their presentation and also a brief abstract (one or two paragraphs; **250 words max.**) describing their presentation.
13) Each student will give 20-minute presentations followed by 3 minutes of question-answer session.

Proposal Seminar Format for Students:

- Introduce yourself.
- Give an introduction and background information on your topic. What relevant research has been performed previously?
- State the problem(s) that remain unanswered.
- Clearly state your objectives and give the specific hypotheses you wish to test.
- Describe the methodology you will use to test your hypotheses. Be sure you fully understand your chosen methods. Give reasons why you chose these methods over other approaches.
- Present any data you have collected thus far.
- Describe what remains to be done, and what you expect to find.
- Explain the significance of your findings (or potential future findings).

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