Tripura University
National Education Policy - 2020 (NEP-2020)

Model Curriculum Structures for Bachelor of Science (Basic and Honours) Programmes with Computer Science as Major and Minor Courses

Model Syllabus for 1st to 8th Semesters

Bachelor of Science (Basic and Honours) Programmes with Computer Science as Major and Minor Courses

YEAR I

SEMESTER 1			
Course Code	**Course Title**	**Credits**	**Mark**
DSC1101	Discrete Structures	4 (Th)	100 (IA=40 + ESE=60)
DSC1102	Computer Fundamentals and Programming in C	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Minor 1 (Any Faculty except Major)	4	100 (IA=40 + ESE=60)
	Skill Enhancement course 1	4	100 (IA=40 + ESE=60)
	Co-curricular 1	2	100 (IA=40 + ESE=60)
Total Credits		**18**	**500**

SEMESTER 2			
Course Code	**Course Title**	**Credits**	**Mark**
DSC1201	Data structure	4 (Th)	100 (IA=40 + ESE=60)
DSC1202	Microprocessor	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Minor 2 (Any Faculty except Major)	4	100 (IA=40 + ESE=60)
	Ability enhancement courses (language) – 1 (Any Faculty except Major)	4	100 (IA=40 + ESE=60)
	Co-curricular 2	2	100 (IA=40 + ESE=60)
Total Credits		**18**	**500**

Students exiting the programme after securing 40 credits will be awarded Certificate in Faculty in the relevant Discipline/Subject provided they secure 4 credits in work based vocational courses offered during summer term of internship/Apprenticeship in addition to 6 credits from skill-based courses earned during first and second semester

YEAR II

SEMESTER 3			
Course Code	**Course Title**	**Credits**	**Mark**
DSC2301	Fundamentals of DBMS	4 (Th)	100 (IA=40 + ESE=60)
DSC2302	Object oriented programming concepts and programming in JAVA	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Minor 3 (Any Faculty except Major)	4	100 (IA=40 + ESE=60)
	Skill Enhancement course 2	4	100 (IA=40 + ESE=60)
	Co-curricular 3	2	100 (IA=40 + ESE=60)
Total Credits		**18**	**500**

SEMESTER 4			
Course Code	**Course Title**	**Credits**	**Mark**
DSC2401	Computer Network	4 (Th)	100 (IA=40 + ESE=60)
DSC2402	Programming in Python	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Minor 4 (Any Faculty except Major)	4	100 (IA=40 + ESE=60)
	Ability enhancement courses (language) – 2 (Any Faculty except Major)	4	100 (IA=40 + ESE=60)
	Co-curricular 4	2	100 (IA=40 + ESE=60)
Total Credits		**18**	**500**

Students exiting the programme after securing 40 credits will be awarded UG Diploma in the relevant Discipline/Subject provided they secure 4 credits in skill based vocational courses offered during first year and second year summer term

YEAR III

SEMESTER 5			
Course Code	**Course Title**	**Credits**	**Mark**
DSC3501	Internet Technology	4 (Th)	100 (IA=40 + ESE=60)
DSC3502	Operating System concept	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Optional-1	4 (Th)	100 (IA=40 + ESE=60)
DSC3503	Technical Writing & Minor Project	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Minor 5 (Any Faculty except Major)	4	100 (IA=40 + ESE=60)
Total Credits		**20**	**500**

SEMESTER 6			
Course Code	**Course Title**	***Credits***	**Mark**
DSC3601	Design & analysis of Algorithm	4 (Th)	100 (IA=40 + ESE=60)
DSC3602	Software Engineering	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Optional -2	4 (Th)	100 (IA=40 + ESE=60)
DSC3603	Project	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Minor 6 (Any Faculty except Major)	4	100 (IA=40 + ESE=60)
Total Credits		**20**	**500**

YEAR IV

SEMESTER 7			
Course Code	**Course Title**	**Credits**	**Mark**
DSC4701	Computer organization and Architecture	4 (Th)	100 (IA=40 + ESE=60)
DSC4702	Artificial Intelligence	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Optional -3	4 (Th)	100 (IA=40 + ESE=60)
DSC4703	Research Project / Dissertation Phase 1	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Minor 7 (Any Faculty except Major)	4	100 (IA=40 + ESE=60)
Total Credits		**20**	**400**

SEMESTER 8			
Course Code	**Course Title**	**Credits**	**Mark**
DSC4801	Data warehousing and data mining	4 (Th)	100 (IA=40 + ESE=60)
DSC4802	Research project /Dissertation Phase-2	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Optional -4	4 (Th)	100 (IA=40 + ESE=60)
DSC4803	Presentation and viva-voice	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
	Minor 8 (Any Faculty except Major)	4	100 (IA=40 + ESE=60)
Total Credits		**16**	**400**

ELECTIVE SUBJECTS(DEPARTMENTAL) (8 CREDITS) TO BE COMPLETED IN 3RD YEAR (SEMESTER 5-6) (GROUP – I)

Course Code	Course Title	Credits	Mark
DSC-O1	Cloud Computing	4	100 (IA=40 + ESE=60)
DSC-O2	Cyber Security & Cyber Law	4	100 (IA=40 + ESE=60)
DSC-O3	Big Data	4	100 (IA=40 + ESE=60)
DSC-O4	Digital Marketing	4	100 (IA=40 + ESE=60)
DSC-O5	Distributed Computing	4	100 (IA=40 + ESE=60)
DSC-O6	E-Commerce	4	100 (IA=40 + ESE=60)
DSC-O7	Formal Languages & Automata Theory	4	100 (IA=40 + ESE=60)
DSC-O9	Internet of Things	4	100 (IA=40 + ESE=60)

ELECTIVE SUBJECTS(DEPARTMENTAL) (8 CREDITS) TO BE COMPLETED IN 4TH YEAR(SEMESTER 7-8) (GROUP- II)

Course Code	Course Title	Credits	Mark
DSC-O10	Adhoc & Sensor Network	4	100 (IA=40 + ESE=60)
DSC-O11	Advanced DBMS	4	100 (IA=40 + ESE=60)
DSC-O12	Deep Learning	4	100 (IA=40 + ESE=60)
DSC-O13	Digital Signal Processing	4	100 (IA=40 + ESE=60)
DSC-O14	Information & System Security	4	100 (IA=40 + ESE=60)
DSC-O15	Numerical Methods	4	100 (IA=40 + ESE=60)
DSC-O16	Mobile Computing	4	100 (IA=40 + ESE=60)
DSC-O17	Soft Computing	4	100 (IA=40 + ESE=60)

SKILL COURSES

Odd Semester			
Course Code	**Course Title**	**Credits**	**Mark**
For Non-Computer Science Students			
CSK I	Computer Fundamentals	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
For Computer Science Students			
CSK III	Introduction to Web Design (HTML & CSS)	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]

Even Semester			
Course Code	**Course Title**	**Credits**	**Mark**
For Non-Computer Science Students			
CSK II	Programming using Python	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]
For Computer Science Students			
CSK IV	Advanced PC Hardware and Networking Components	2(Th)+2(P)	100 [Th: 60 (IA=24 + ESE=36) P: 40 (IA=16 + ESE=24)]

IA: Internal assessment

ESE: End Semester Examination

Year I
Semester-1

Course Code: DSC1101	Course Title: Discrete Structures
Course Credits: 04 (Th)	Hour of Teaching/Week: 04

Unit-I

1**. Introduction**
Sets - finite and Infinite sets, uncountably Infinite Sets; functions, relations, Properties of Binary Relations, Closure, Partial Ordering Relations; counting - Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion.

2. **Growth of Functions**
Asymptotic Notations, Summation formulas and properties, Bounding Summations, approximation by Integrals.

3. **Recurrences**
Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem.

Unit-II

4. **Graph Theory**
Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representaion, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees

5. **Prepositional Logic**
Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory

Suggested Readings:
1. C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition, Tata McGraw Hill, 1985. 2. Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition, McGraw Hill, 2006.
3. T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009.
4. M. 0. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms, John Wiley Publication, 1988.
5. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009.
6. D.J. Hunter, Essentials of Discrete Mathematics, Jones and Bartlett Publishers, 2008

Course Code: DSC1102	Course Title: Computer Fundamentals and Programming in C
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Confidently operate Desktop Computers to carry out computational tasks.
- Understand working of Hardware and Software and the importance of operating systems.
- Understand programming languages, number systems, peripheral devices, networking, multimedia and internet concepts.
- Read, understand and trace the execution of programs written in C language.
- Write the C code for a given problem.
- Perform input and output operations using programs in C.
- Write programs that perform operations on arrays.

Course Content:

Unit-I

Fundamentals of Computers: Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organisation of a Digital Computer; Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples.

Unit-II

Introduction to C Programming: Over View of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C. C Programming Basic Concepts: C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants. Input and output with C: Formatted I/O functions - printf and scanf, control stings and escape sequences, output specifications with printf functions; Unformatted I/O functions to read and display single character and a string - getchar, putchar, gets and puts functions.

C Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associatively; Evaluation of arithmetic expressions; Type conversion.

Control Structures: Decision making Statements - Simple if, if_else, nested if_else, else_if ladder, Switch-case, goto, break & continue statements; Looping Statements - Entry controlled and Exit controlled statements, while, do-while, for loops, Nested loops.

Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation. Strings: Declaring & Initializing string variables; String handling functions -strlen, strcmp, strcpy and strcat; Character handling functions - toascii, toupper, tolower, isalpha, isnumeric etc. Pointers in C: Understanding pointers - Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays; Pointer Arithmetic; Advantages and disadvantages of using pointers;

User Defined Functions: Need for user defined functions; Format of C user defined functions; Components of user defined functions - return type, name, parameter list, function body, return statement and function call; Categories of user defined functions - With and without parameters and return type.

User defined data types: Structures - Structure Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, comparing structure variables, Array of Structures; Unions - Union definition; difference between Structures and Unions.

Practice Lab

The following activities be carried out/ discussed in the lab during the initial period of the semester.

1. Basic Computer Proficiency
   a. Familiarization of Computer Hardware Parts
   b. Basic Computer Operations and Maintenance.
   c. Do's and Don'ts, Safety Guidelines in Computer Lab
2. Familiarization of Basic Software – Operating System, Word Processors, Internet Browsers, Integrated Development Environment (IDE) with Examples.
3. Type Program Code, Debug and Compile basic programs covering C Programming fundamentals discussed during theory classes.

Programming Lab

1. WAP to print the sum and product of digits of an integer.
2. WAP to reverse a number.
3. WAP to compute the sum of the first n terms of the following series
   S = 1+1/2+1/3+1/4+.....
4. WAP to compute the sum of the first n terms of the following series
   S =1-2+3-4+5.....
5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7. WAP to compute the factors of a given number.
8. Write a macro that swaps two numbers. WAP to use it.
9. WAP to print a triangle of stars as follows (take number of lines from user):

```
*
**
* **
*** *
*****
* ****
*****
```

   (modify the patterns of the asterisks in different ways)

10. WAP to perform following actions on an array entered by the user:
    a. Print the even-valued elements
    b. Print the odd-valued elements
    c. Calculate and print the sum and average of the elements of array
    d. Print the maximum and minimum element of array
    e. Remove the duplicates from the array
    f. Print the array in reverse order

11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12. Write a program that swaps two numbers using pointers.
13. Write a program in which a function is passed address of two variables and then alter its contents.
14. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays 6 the value of area and circumference from the main() function.
15. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions.
16. Write a menu driven program to perform following operations on strings:
    a. Show address of each character in string
    b. Concatenate two strings without using strcat function.
    c. Concatenate two strings using strcat function.
    d. Compare two strings
    e. Calculate length of the string (use pointers)
    f. Convert all lowercase characters to uppercase
    g. Convert all uppercase characters to lowercase
    h. Calculate number of vowels
    i. Reverse the string
17. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
18. WAP to display Fibonacci series (i) using recursion, (ii) using iteration
19. WAP to calculate Factorial of a number (i) using recursion, (ii) using iteration
20. WAP to calculate GCD of two numbers (i) with recursion, (ii) without recursion.
21. Create a matrix. Write a menu-driven program to perform following matrix operations (2-D array implementation):
    a) Sum b) Difference c) Product d) Transpose
22. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
23. Write a program to retrieve the student information from file created in previous question and print it in following format: Roll No. Name Marks
24. Copy the contents of one text file to another file, after removing all whitespaces.
25. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.
26. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers. The program will print the array elements in ascending and descending order.

(The list of programs above are suggestive and indicative only)

Semester-2

Course Code: DSC1201	Course Title: Data structure
Course Credits: 04 (Th)	Hour of Teaching/Week: 04

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.

- Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs.
- Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs.
- Demonstrate different methods for traversing trees.
- Compare alternative implementations of data structures with respect to performance.
- Describe the concept of recursion, give examples of its use.
- Discuss the computational efficiency of the principal algorithms for sorting and searching.

Course Content:

Unit-I

Introduction to data structures: Definition; Types of data structures - Primitive & Non-primitive, Linear and Non-linear; Operations on data structures. Algorithm Specification, Performance Analysis, Performance Measurement Recursion: Definition; Types of recursions; Recursion Technique Examples - Fibonacci numbers, GCD, Binomial coefficient nCr, Towers of Hanoi; Comparison between iterative and recursive functions.

Arrays: Basic Concepts – Definition, Declaration, Initialisation, Operations on arrays; Types of arrays; Arrays as abstract data types (ADT); Representation of Linear Arrays in memory; Traversing linear arrays; Inserting and deleting elements; Sorting – Selection sort, Bubble sort, Quick sort, Selection sort, Insertion sort; Searching - Sequential Search, Binary search; Iterative and Recursive searching; Multidimensional arrays; Representation of multidimensional arrays; Sparse matrices.

Dynamic memory allocation: Static & Dynamic memory allocation; Memory allocation and deallocation functions - malloc, calloc, realloc and free. Linked list: Basic Concepts – Definition and Representation of linked list, Types of linked lists - Singly linked list, Doubly liked list, Header liked list, Circular linked list; Representation of Linked list in Memory; Operations on Singly linked lists – Traversing, Searching, Insertion, Deletion; Memory allocation; Garbage collection.

Unit-II

Stacks: Basic Concepts – Definition and Representation of stacks; Operations on stacks, Applications of stacks; Infix, postfix and prefix notations; Conversion from infix to postfix using stack; Evaluation of postfix expression using stack; Application of stack in function calls.

Queues: Basic Concepts – Definition and Representation of queues; Types of queues - Simple queues, Circular queues, Double ended queues, Priority queues; Operations on Simple queues;

Trees: Definition; Tree terminologies –node, root node, parent node, ancestors of a node, siblings, terminal & non-terminal nodes, degree of a node, level, edge, path, depth; Binary tree: Type of binary trees - strict binary tree, complete binary tree, binary search tree and heap tree; Array representation of binary tree. Traversal of binary tree; preorder, inorder and postorder traversal; Reconstruction of a binary tree when any two of the traversals are given.

Text Books 1.

Satraj Sahani: Fundamentals of Data Structures

References:

1. Tanenbaum: Data structures using C (Pearson Education)
2. Kamathane: Introduction to Data structures (Pearson Education)
3. Y. Kanitkar: Data Structures Using C (BPB)
4. Kottur: Data Structure Using C
5. Padma Reddy: Data Structure Using C
6. Sudipa Mukherjee: Data Structures using C – 1000 Problems and Solutions (McGraw Hill Education, 2007))

Course Code: DSC-1202	Course Title: Microprocessor
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course outcome:

On completion of this course the student will be able to:

- Describe the architecture & organization of 8085 & 8086 Microprocessor.
- Understand and classify the instruction set of 8085/8086 microprocessor and distinguish the use of different instructions and apply it in assembly language programming.
- Relate the addressing modes used in the instructions.
- Realize the Interfacing of memory & various I/O devices with 8085/8086 microprocessor.
- Familiarise the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor.
- Interface various pheripheral IC's with Intel 8085/8086 microprocessor for its various applications.

Unit-I

Microprocessor architecture: Internal architecture, Programming Model, Addressing modes, Data movement instructions

Microprocessor programming: Register Organization, instruction formats, Program control instructions, assembly language

Unit-II

Interfacing: Bus timings, Memory address decoding, cache memory and cache controllers, I/O interface, keyboard, timer, Interrupt controller, DMA controller, video controllers, communication interfaces. Data transfer schemes: Synchronous data transfer, asynchronous data transfer, interrupt driven data transfer, DMA mode data transfer.

Microprocessor controllers: I/O controllers, interrupt controller, DMA controller, USART controller. Advance microprocessor architecture: CISC architecture, RISC architecture, superscalar architecture, multicore architecture

Practical

ASSEMBLY LANGUAGE PROGRAMMING

1. Write a program for 32-bit binary division and multiplication
2. Write a program for 32-bit BCD addition and subtraction
3. Write a program for Linear search and binary search
4. Write a program to add and subtract two arrays
5. Write a program for binary to ascii conversion
6. Write a program for ascii to binary conversion
7. Write a program in 8085 microprocessor for addition of two 8 bit numbers.
8. Write a program in 8085 microprocessor for addition of two 16 bit numbers.
9. Write a program in 8085 microprocessor for subtraction of two 8 bit numbers.
10. Write a program in 8085 microprocessor for multiplication and division of two 8 bit numbers.

N.B. Students may practice other related programs also.

Reference:

1. An Introduction to Microprocessor 8085, by D.K. Kaushik,
2. Fundamentals of Microprocessors and Microcontrollers by B. Ram.
3. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh Gaonkar.

Semester-3

Course Code: DSC2301	Course Title: Fundamentals of DBMS
Course Credits: 4(Th)	Hour of Teaching/Week: 04

Course Outcomes (COs):
On completion of this course the student will be able to:

- Define database concepts and its architectural components.
- Explain the various data models used for designing a database.
- Use entity relationship and relational models to design a database.
- Employ relational operations and entity relationship mapping concepts to design the behavior and structure of a database.
- Use transaction management concepts, inference rules and normalization to optimize database operations.
- Write SQL and PL/SQL codes to operate and manage database management system.

Course Content:

Unit-I

Introduction: Characteristics of database approach, data models, database system architectureand data independence.
Entity Relationship (ER) Modeling: Entity types, relationships, constraints
Relation data model Relational model concepts: relational constraints, relational algebra, SQL queries.
Transaction Processing: ACID properties, concurrency control

Unit-II

Database design: Mapping ER model to relational database, functional dependencies, Lossless decomposition, Normalization.
File Structure and Indexing :Operations on files, File of unordered and ordered records, overview of file organizations, indexing structures for files (primary index, secondary index, clustering index), multilevel indexing using B and B+ trees.

Course Code: DSC2302	Course Title: Object oriented programming concepts and programming in JAVA
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course Outcomes:
On completion of this course the student will be able to:

- Students will understand the need of object oriented programming, fundamental concepts and will be able to solve computational problems using basic constructs like if-else, control structures, array, strings in Java environment.
- Student will understand how to model the real world scenario using class diagram and be able to exhibit communication between objects using sequence diagram.
- Students will be able to implement relationships between classes.
- Students will be able to demonstrate various collection classes.
- Students will be able to create and user interfaces and packages.
- The students will be able to demonstrate programs on exceptions, multithreading and applets

Course Content:

Unit-I

Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

Inheritance, **Interfaces, Packages, Enumerations, Autoboxing and Metadata** :
Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

Unit-II

Introduction to Java: Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords, Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, doing basic program Output, Decision making constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods)

Arrays, Strings and 1/0 : Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple 1/0 using System.out and the Scanner class, Byte and Character streams, Reading/ Writing from console and files.

Exception Handling, Threading:
Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads.

Applets and Event Handling : Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GU is using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, text fields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Reference:

1. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
2. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley"The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
3. Joshua Bloch, "Effective Java" 2nd Edition,Publisher: Addison-Wesley, 2008.
4. E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.2009.
5. Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.
6. "Head First Java", Orielly Media Inc. 2nd Edition, 2005.
7. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

Practical:

Programming in Java

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number

3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of .length in case of a two dimensional array
5. To convert a decimal to binary number.
6. To check if a number is prime or not, by taking the number as input from the keyboard.
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument.
8. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(, setLength(), append(), insert(), concat()and equals().
9. Write a program to create a distance class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer.
10. Modify the distance class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type).
12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword.
13. Write a program to show the use of static functions and to pass variable length arguments in a function.
14. Write a program to demonstrate the concept of boxing and unboxing.
15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
16. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate fibonacii series is given in a different file belonging to the same package.
17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages.
18. Write a program DivideByZero that takes two numbers a and b as input, computes alb, and invokes Arithmetic Exception to generate a message when the denominator is zero.
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
21. Write a program to demonstrate priorities among multiple threads.
22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
23. Write a program to create URL object, create a URL Connection using the openConnection() method and then use it examine the different components of the URL and content.
24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
25. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet's window.
26. Write a program to get the URL/location of code (i.e. java code) and document (i.e. html file).
27. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
28. Write a program to demonstrate different keyboard handling events.
29. Write a program to generate a window without an applet window using main() function.
30. Write a program to demonstrate the use of push buttons.

Reference:

1. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
2. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley"The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
3. Joshua Bloch, "Effective Java" 2nd Edition,Publisher: Addison-Wesley, 2008.
4. E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.2009.
5. Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.
6. "Head First Java", Orielly Media Inc. 2nd Edition, 2005.
7. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

Semester-4

Course Code: DSC2401	Course Title: Computer Network
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Course Outcome:

On completion of this course the student will be able to:

- Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission.
- Apply channel allocation, framing, error and flow control techniques.
- Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.
- Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.
- Explain the functions offered by session and presentation layer and their Implementation.
- Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN.

Detailed Syllabus:

Unit – I

1. Introduction to Computer Networks:
   Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.
2. Data Communication Fundamentals and Techniques: Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation; multiplexing techniques- FDM, TDM; transmission media.
3. Networks Switching Techniques and Access mechanisms: Circuit switching; packet switching - connectionless datagram switching, connectionoriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

Unit – II

4. Data Link Layer Functions and Protocol: Error detection and error correction techniques; data-link control - framing and flow control; error recovery protocols - stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.

5. Multiple Access Protocol and Network: CSMA/CD protocols; Ethernet LANs; connecting LAN and back-bone networks - repeaters, hubs, switches, bridges, router and gateways;
6. Networks Layer Functions and Protocols: Routing; routing algorithms; network layer protocol of Internet-IP protocol, Internet control protocols.
7. Transport Layer Functions and Protocols: Transport services - error and flow control, Connection establishment and release- three way handshake.
8. Overview of Application layer protocol: Domain Name System, World Wide Web and Hyper Text Transfer Protocol, Electronic mail, File Transfer Protocol, Remote login, Network management, Data compression, Cryptography – basic concepts.

Text books and References:

1. Behrouz Forouzan, "Data Communication and Networking", McGraw Hill
2. Andrew Tanenbaum "Computer Networks", Prentice Hall.
3. William Stallings, "Data and Computer Communication", Pearson.
4. Kurose and Ross, "Computer Networking- A Top-Down Approach", Pearson.
5. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann
6. W. A. Shay, "Understanding Communications and Networks", Cengage Learning.
7. D. Comer, "Computer Networks and Internets", Pearson.
8. Behrouz Forouzan, "TCP/IP Protocol Suite", McGraw Hill.

Course Code: DSC2402	Course Title: Programming in Python
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course outcome:

On completion of this course the student will be able to:

- Develop algorithmic solutions to simple computational problems.
- Develop and execute simple Python programs.
- Develop simple Python programs for solving problems.
- Structure a Python program into functions.
- Represent compound data using Python lists, tuples, and dictionaries.
- Read and write data from/to files in Python Programs

Detailed syllabus:

Unit I

Introduction to Python Programming: Python Interpreter and Interactive Mode– Variables and Identifiers – Arithmetic Operators – Values and Types – Statements, Reading Input, Print Output, Type Conversions, The type() Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: The if, The if…else, The if…elif…else Decision Control Statements, Nested if Statement, The while Loop, The for Loop, The continue and break Statements.

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Unit-II

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list Parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance The Polymorphism.

Functional Programming: Lambda. Iterators, Generators, List Comprehensions.

References:

1. Introduction to Python Programming. Gowrishankar S, Veena A. CRC Press, Taylor & Francis Group, 2019
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
(http://greenteapress.com/wp/think- python/)

Suggested Reading:

1. Learning To Program With Python. Richard L. Halterman. Copyright © 2011
2. Python for Everybody, Exploring Data Using Python 3. Dr. Charles R. Severance. 2016

Practical

1. Write a program that takes two integers as command line arguments and prints the sum of two integers.
2. Program to display the information: Your name, Full Address, Mobile Number, College Name, Course Subjects.
3. Program to find the largest number among 'n' given numbers.
4. Program that reads the URL of a website as input and displays contents of a webpage.
5. Program to find the sum of all prime numbers between 1 and 1000.
6. Program that reads set of integers and displays first and second largest numbers.
7. Program to print the sum of first 'n' natural numbers.
8. Program to find the product of two matrices.
9. Program to find the roots of a quadratic equation
10. Write both recursive and non-recursive functions for the following:
    To find GCD of two integers
    To find the factorial of positive integer
    To print Fibonacci Sequence up to given number 'n'
    To convert decimal number to Binary equivalent
11. Program with a function that accepts two arguments: a list and a number 'n'. It should display all the numbers in the list that are greater than the given number 'n'.
12. Program with a function to find how many numbers are divisible by 2, 3,4,5,6 and 7 between 1 to 1000.

13. Program that accept a string as an argument and return the number of vowels and consonants the string contains.
14. Program that accepts two strings S1, S2, and finds whether they are equal are not.
15. Program to count the number of occurrences of characters in a given string.
16. Program to find whether a given string is palindrome or not.
17. Program with a function that takes two lists L1 and L2 containing integer numbers as parameters. The return value is a single list containing the pair wise sums of the numbers in L1 and L2.
18. Program to read the lists of numbers as L1, print the lists in reverse order without using reverse function.
19. Write a program that combines lists L1 and L2 into a dictionary.
20. Program to find mean, median, mode for the given set of numbers in a list.
21. Program to find all duplicates in the list.
22. Program to o find all the unique elements of a list.
23. Program to find max and min of a given tuple of integers.
24. Program to find union, intersection, difference, symmetric difference of given two sets.
25. Program to display a list of all unique words in a text file.
26. Program to read the content of a text file and display it on the screen line wise with a line number followed by a colon.
27. Program to analyse the two text files using set operations.
28. Write a program to print each line of a file in reverse order.
29. Program to implement the inheritance.
30. Program to implement the polymorphism.
31. Programs to implement Linear search and Binary search.
32. Programs to implement Selection sort, Insertion sort

Year III

Semester –5

Course Code: DSC3501	Course Title: Internet Technology
Course Credits: 4(Th)	Hour of Teaching/Week: 04

Courses outcome:

On completion of this course, students will be able to:

- Have a clear understanding of the Internet and the evolution of the Internet.
- Develop business web pages using XHTML and to make enhancement by script languages such as JavaScript.
- Use advanced web authoring software to aid the development of webpage as well as maintenance of a web site.
- Apply various Internet technologies in different business applications legally and ethnically.

Detailed syllabus:

Unit I

Introduction: Network address translation, Subnet Masking, Difference between Intranet and Internet, Working of Internet, Dynamic and Static Routing, Domain Name Server , networking tools - ipconfig, ping, netstat. Introduction to Internet Protocols: HTTP, HTTPS, FTP, SMTP, IMAP, POP3, VoIP.

Web Servers: Introduction, Working, Configuring, Hosting and Managing a Web server, Proxy Servers: Introduction, Working, Type of Proxies, setting up and managing a proxy server Client-side Technologies, Server-side Technologies and hybrid technologies.

Unit II

Javascript, jQuery, JSON, NODE.js, BOOTSTRAP, Introduction to forums, blogging, portfolio, developing a responsive website, Combining Web Applications and Mobile Applications.

Search Engines - components, working, optimization, Crawling, BOTS. Introduction to cookies and sessions, Introduction to e-commerce websites and e-carts.

References

1. Bayross, I. (2013). Web enabled commercial application development using HTML, JavaScript, DHTML and PHP. 4th edition. BPB Publication.
2. DComer. (2018). The Internet Book: Everything You need to know about Computer networking and how the internet works. 5th edition. CRC Press.
3. Duckett, J.(2014). JavaScript and JQuery: Interactive Front-End Web Development. Wiley.

Course Code: DSC3502	Course Title: Operating System Concept
Course Credits: 2(Th)+2(Th)	Hour of Teaching/Week: 06

Course Outcome:

On completion of this course the student will be able to:

- Use the features of types of operating systems, functions, structure, and operations on the processes executing in the system to solve the problems.
- Employ the knowledge scheduling algorithms to solve the real life problems.
- Examine the deadlocks occurred in the real world applications and will be able to provide the remedial measures to avoid the deadlock situation.
- Employ the concepts of memory management including virtual memory and resource sharing among the user application processes.
- Solve the problems related to file system interface and implementation, disk management and protect the system.

Detailed Syllabus:

Unit – I

1. Introduction Basic OS functions, resource abstraction, types of operating systems– multiprogramming systems, batch systems , time sharing systems; operating systems for personal computers & workstations, process control & real time systems.

2. Operating System Organization Processor and user modes, kernels, system calls and system programs.

3. Process Management System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for interprocess communication; deadlocks.

Unit-II

4. Memory Management Memory Organization, Storage Hierarchy, Storage Management Strategies, Swapping, Contiguous & Non Contiguous Memory Allocation, Virtual memory: Paging, Segmentation, Segmentation with Paging, Notion of Locality and working sets, thrashing, page replacement algorithms.

5.File-System Interface And Implementation: File Concepts, File Organization, Access Methods, Directory Structure, File-system Mounting, File Sharing and Protection, File-system Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management

6. Protection and Security Goals of Protection, Domain of Protection, Implementation of Access Matrix, Languagebased Protection. The security Problem, User Authentication, Program Threats, System Threats, Securing Systems and Facilities, Intrusion Detection, Cryptography, ComputerSecurity Classifications.

Practical

1. WAP to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)
2. WAP to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)
3. WAP to print file details including owner access permissions, file access time, where file name is given as argument.
4. WAP to copy files using system calls.
5. WAP to implement FCFS scheduling algorithm.
6. WAP to implement Round Robin scheduling algorithm.
7. WAP to implement SJF scheduling algorithm.
8. WAP to implement non-preemptive priority based scheduling algorithm.
9. WAP to implement preemptive priority based scheduling algorithm.
10. WAP to implement SRJF scheduling algorithm.
11. WAP to calculate sum of n numbers using thread library.
12. WAP a program to implement first-fit, best-fit and worst-fit allocation strategies.

Reference:

1. Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications, 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education, 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition, Pearson Education, 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles, 5th Edition, PHI, 2008.
5. M. Milenkovic, Operating Systems - Concepts and design, Tata McGraw Hill, 1992

Course Code: Dependent on the Course selected	Course Title: Any one from discipline specific elective subject(Optional Group-1).
Course Credits: 4Th	Hour of Teaching/Week: 04

Course Code: DSC3503	Course Title: Technical Writing & Minor Project.
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course Outcome:

Following are the course outcomes:

- Clearly convey specialized information from a technical field to a non-specialized audience.
- Identify and use appropriate formats and conventions derived from individual disciplines.
- Assess effectiveness and validity of information sources, such as web sites, business documents, and professional journals.

- Develop strategies for information design, to include producing visually enhanced documents.
- Summarize larger texts in clear, direct style for practical applications.
- Design and produce a research project appropriate to the student's major and/or career interests.
- Edit documents with peer exchange and according to professional guidelines.
- Enhance the creativity.

Detailed Syllabus:

Unit I

Modes of technical communication: Reports, Technical papers, book chapters, Manuals, Posters. Structure of a technical document. Copyright issues in technical writing: existing laws, open sources, permission procedure. How to write a good technical paper?

Proper procedure in citing already published works, Referencing styles. Common mistakes of English in scientific documents. Proper way of writing and citing equations. Proper use of figures and tables. Writing a good review paper. Writing of abstract, synopsis, cover letters, responses, discussion and keywords

Unit II

Minor project study and implimentation
References:

1. Alred, G. J., Brusaw, C. T., & Oliu, W. E. Handbook of technical writing. 9th edition. Bedford/St. Martin, 2009

2. Parija, S.C. & Kate, V. (Ed.), Writing and publishing a scientific research paper, Springer/Singapore, 2017

Semester -6

Course Code: DSC3601	Course Title: Design & analysis of Algorithm
Course Credits: 4(Th)	Hour of Teaching/Week: 04

Course Outcome:

- To develop the ability to analyze the running time and prove the correctness of basic algorithms.
- To be able to design efficient algorithms for moderately difficult computational problems, using various algorithm design techniques taught in the course.
- Able to Describe the classes P, NP, and NPComplete and be able to prove that a certain problem is NP-Complete
- To be able to do performance analysis of simple approximation algorithms.

Detailed Syllabus:

Unit – I

1. Introduction Definition, Asymptotic notations and complexity analysis (best, worst, and average case), notions of optimality.
2. Algorithm Design Techniques Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.
3. Sorting and Searching Techniques Elementary sorting techniques – Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques - Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Searching Techniques, Medians & Order Statistics, complexity analysis.
4. Advanced Analysis Technique Amortized analysis.

Unit-III

5. GRAPHS AND GRAPH ALGORITHMS: Definition, Representations of graphs, Depth first search, Breadth first search. Kruskal's and Prim's algorithm for minimum spanning tree, Dijkstra's single source shortest path algorithm, Floyd-Warshall all-pairs shortest path algorithm.

6. COMPUTATIONAL COMPLEXITY: Introduction to NP completeness, The classes P and NP, Polynomial Reduction, NP Hard and NP Complete Problems Introduction to branch-and-bound, backtracking, and approximation algorithms.

Reference:

1. Introduction to Algorithms by Thomas H.Corman, Charles E. Leiserson and Ronald L. Rivest, PHI. 2. Fundamentals of Algorithms by Bassard Bratley, PHI.
3. The Design and Analysis of Computer Algorithms by Alfred V. Aho, John E. Hopcroft and J.D. Ullman, Addison Wesley Publishing Company.
4. Computer Algorithms by E. Horowitz, S. Sahni & S. Rajsekaran, Golgotia Publications (P) Ltd.

Course Code: DSC3602	Course Title: Software Engineering
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Courses Outcome:

- Explain the fundamental concepts of Software Engineering Lifecycle models.
- Summarize the software requirement specifications and the SRS documents.
- Describe software engineering layered technology and Process frame work.
- Examine the various design and development solutions with proper analysis.
- Demonstrate the competence in communication, planning, analysis, design, construction, and development of software as per the requirements.
- Demonstrate the software project management skills through case studies.

Detailed Syllabus:

Unit – I

1. Introduction The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

2. Requirement Analysis Software Requirement Analysis, Initiating Requirement Engineering Process, Requirement Analysis and Modelling Techniques, Flow Oriented Modelling, Need for SRS, Characteristics and Components of SRS.

3. Software Project Management Estimation in Project Planning Process, Project Scheduling.
4. Risk Management Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan.

Unit – II

5. Quality Management Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects.
6. Design Engineering Design Concepts, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modelling Component Level Design.

7. Testing Strategies & Tactics. Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White-Box Testing and their type, Basis Path Testing.

Practical
Sample Projects

1. Criminal Record Management: Implement a criminal record management system for jailers, police officers and CBI officers.
2. DTC Route Information: Online information about the bus routes and their frequency and fares.
3. Car Pooling: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.
4. Patient Appointment and Prescription Management System
5. Organized Retail Shopping Management Software
6. Online Hotel Reservation Service System
7. Examination and Result computation system
8. Automatic Internal Assessment System
9. Parking Allocation System
10. Wholesale Management System

Reference:

1. R.S. Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw Hill, 2009. 2. P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.
3. K.K. Aggarwal and Y. Singh, Software Engineering (2nd Edition), New Age International Publishers, 2008
4. Sommerville, Software Engineering (8th edition), Addison Wesley, 2006.
5. D. Bell, Software Engineering for Students (4th Edition), Addison-Wesley, 2005.
6. R. Mall, Fundamentals of Software Engineering (2nd Edition), Prentice-Hall of India, 2004.

Course Code: Dependent on the Course selected	Course Title: Any one from discipline specific elective subject(Optional Group-1).
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

DSC3603	Course Title: Project
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course Objective:

- Enhance the creativity and thinking capacity.

Detailed Syllabus:
Project activity assigned by the supervisor will be carried out.

Year IV
Semester-7

Course Code: DSC4701	Course Title: Computer organization and Architecture
Course Credits: 4 (Th)	Hour of Teaching/Week: 4

Course outcome:

- Identify basic computer elements & Explain the basic structure, organization of different computer units.
- Demonstrate programming proficiency using various addressing modes and instruction set. CO3: Design Micro programmed control unit and Develop Arithmetic algorithms.
- Discuss the concepts of Memory and I/O organization
- Compare the commercially available processor architectures (Pentium & Athlon) and examine the architectural features of advanced processors.

Detailed Syllabus:

Unit I

Number Systems and Conversions – Boolean Algebra and Simplification – Minimization of Boolean Functions – Karnaugh Map, Logic Gates – NAND – NOR Implementation.

Design of Combinational Circuits – Adder / Subtracter – Encoder – Decoder – MUX / DEMUX – Comparators, Flip Flops – Triggering – Master – Slave Flip Flop – State Diagram and Minimization – Counters – Registers.

Functional units – Basic operational concepts – Bus structures – Performance and Metrics – Instruction and instruction sequencing – Addressing modes – ALU design – Fixed point and Floating point operation.

Unit II

Processor basics – CPU Organization – Data path design – Control design – Basic concepts – Hard wired control – Micro programmed control – Pipeline control – Hazards – Super scalar operation.

Memory technology – Memory systems – Virtual memory – Caches – Design methods – Associative memories – Input/Output system – Programmed I/O – DMA and Interrupts – I/O Devices and Interfaces - Multiprocessor Organization – Symmetric multiprocessors – Cache Coherence – Clusters: Non Uniform Memory AccessVector Computation.

Course Code: DSC4702	Course Title: Artificial Intelligence
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 6

Course Outcome:

Course Outcomes Upon successful completion of the course, the students will be able to

- Solve basic AI based problems.
- Define the concept of Artificial Intelligence.
- Apply AI techniques to real-world problems to develop intelligent systems.
- Select appropriately from a range of techniques when implementing intelligent systems.

Detailed Syllabus:

Unit – I

Introduction: Introduction to artificial intelligence, background and applications, Turing test, rational agents, intelligent agents, structure, behaviour and environment of intelligent agents.
Knowledge Representation: Propositional logic, first order predicate logic, resolution principle, unification, semantic nets, conceptual dependencies, frames, scripts, production rules, conceptual graphs.

Reasoning with Uncertain Knowledge: Uncertainty, non-monotonic reasoning, truth maintenance systems, default reasoning and closed world assumption, Introduction to probabilistic reasoning, Bayesian probabilistic inference, introduction to fuzzy sets and fuzzy logic, reasoning using fuzzy logic.

Unit – II

Problem Solving and Searching Techniques: Problem characteristics, production systems, control strategies, breadth first search, depth first search, hill climbing and its variations, heuristics search techniques: best first search, A* algorithm, constraint satisfaction problem, means-end analysis. **Game Playing**: introduction to game playing, min-max and alpha-beta pruning algorithms.

Prolog Programming: Introduction to Programming in Logic (PROLOG), Lists, Operators, basic Input and Output.
Understanding Natural Languages: Overview of linguistics, Chomsky hierarchy of grammars, parsing techniques.

Practical

1. Write a prolog program to calculate the sum of two numbers.
2. Write a Prolog program to implement max(X, Y, M) so that M is the maximum of two numbers X and Y.
3. Write a program in PROLOG to implement factorial (N, F) where F represents the factorial of a number N. 60
4. Write a program in PROLOG to implement generate_fib(N,T) where T represents the Nth term of the fibonacci series.
5. Write a Prolog program to implement GCD of two numbers.
6. Write a Prolog program to implement power (Num,Pow, Ans) : where Num is raised to the power Pow to get Ans.
7. Prolog program to implement multi (N1, N2, R) : where N1 and N2 denotes the numbers to be multiplied and R represents the result.

8. Write a Prolog program to implement memb(X, L): to check whether X is a member of L or not.
9. Write a Prolog program to implement conc (L1, L2, L3) where L2 is the list to be appended with L1 to get the resulted list L3.
10. Write a Prolog program to implement reverse (L, R) where List L is original and List R is reversed list.

Reference

1. Rich, E. & Knight,K. (2012). Artificial Intelligence. 3rd edition. Tata McGraw Hill.
2. Russell, S.J. & Norvig, P. (2015) Artificial Intelligence - A Modern Approach. 3rd edition. Pearson Education

Course Code: Dependent on the Course selected	Course Title: Any one from discipline specific elective subject(Optional Group-2).
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Course Code: DSC4703	Course Title: Research project /Dissertation Phase-1
Course Credits: 04	Hour of Teaching/Week: 2(Th)+2(P)

Course Objective:

- Enhance the creativity and thinking capacity.

Detailed Syllabus:
Project activity assigned by the supervisor will be carried out.

Semester-8

Course Code: DSC4801	Course Title: Data warehousing and data mining
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Course Outcome:
The Student will be able to:

- Identify the key process of Data mining and Warehousing.
- Apply appropriate techniques to convert raw data into suitable format for practical data mining tasks.
- Analyze and compare various classification algorithms and apply in appropriate domain.
- Evaluate the performance of various classification methods using performance metrics.
- Make use of the concept of association rule mining in real world scenario.
- Select appropriate clustering and algorithms for various applications.
- Extend data mining methods to the new domains of data

Detailed Syllabus:

Unit – I

Data Mining:- Concepts and Applications, Data Mining Stages, Data Mining Models, Data Warehousing (DWH) and On-Line Analytical Processing (OLAP), Need for Data Warehousing, Challenges, Application of Data Mining Principles, OLTP Vs DWH, Applications of DWH.

Data Preprocessing: Data Preprocessing Concepts, Data Cleaning, Data integration and transformation, Data Reduction, Discretization and concept hierarchy.

Classification Models: Introduction to Classification and Prediction, Issues regarding classification and prediction, Decision Tree- ID3, C4.5, Naive Bayes Classifier.

Rule based classification- 1R. Neural Networks-Back propagation. Support Vector Machines, Lazy Learners-K Nearest Neighbor Classifier. Accuracy and error Measuresevaluation. Prediction:-Linear Regression and Non-Linear Regression.

Unit – II

Association Rules Mining: Concepts, Apriori and FP-Growth Algorithm. Cluster Analysis: Introduction, Concepts, Types of data in cluster analysis, Categorization of clustering methods. Partitioning method: K-Means and K-Medoid Clustering.

Hierarchical Clustering method: BIRCH. Density-Based Clustering –DBSCAN and OPTICS. Advanced Data Mining Techniques: Introduction, Web Mining- Web Content Mining, Web Structure Mining, Web Usage Mining. Text Mining. Graph mining:- Apriori based approach for mining frequent subgraphs. Social Network Analysis:- characteristics of social networks. Link mining:- Tasks and challenges.

Text Books:

1. Dunham M H, “Data Mining: Introductory and Advanced Topics”, Pearson Education, New Delhi, 2003.
2. Jaiwei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Elsevier, 2006.

References:

1. M Sudeep Elayidom, “Data Mining and Warehousing”, 1st Edition, 2015, Cengage Learning India Pvt. Ltd.
2. Mehmed Kantardzic, “Data Mining Concepts, Methods and Algorithms”, John Wiley and Sons, USA, 2003.
3. Pang-Ning Tan and Michael Steinbach, “Introduction to Data Mining”, Addison Wesley, 2006.

Course Code: DSC4802	Course Title: Research project /Dissertation Phase-2
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course Objective:

- Enhance the creativity and thinking capacity.

Detailed Syllabus:

Project activity assigned by the supervisor will be carried out.

Course Code: Dependent on the Course selected	Course Title: Any one from discipline specific elective subject (Optional Group-2).
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Course Code: DSC4803	Course Title: Presentation and viva-voice
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course Objective:

- Enhance the presentation and thinking capacity.

Detailed Syllabus:
Presentation will be done based on the project activities carried out.

Skill Courses

Course Code: CSK I	Course Title: Computer Fundamentals
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course outcome:

At the end of the course, students should be able to:

- Underastand the functions of different parts of Computer
- Troubleshoot the problems in Computer
- Perform the office and other typing activities in the computer.

Detailed Syllabus:

Introduction: Introduction to computer system, uses, types.

Data Representation: Number systems and character representation, binary arithmetic

Human Computer Interface: Types of software, Operating system as user interface, utility programs

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter.

Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks.

Computer Organisation and Architecture: C.P.U., registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.

Overview of Emerging Technologies: Bluetooth, cloud computing, big data, data mining, mobile computing and embedded systems.

Practical

Practical exercises based on MS Office/ Open Office tools using document preparation and spreadsheet handling packages.

MS Word

i. Prepare **a grocery list** having four columns (Serial number, The name of the product, quantity and price) for the month of April, 06.

- Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.
- The headings of the columns should be in 12-point and bold.
- The rest of the document should be in 10-point Times New Roman.
- Leave a gap of 12-points after the title.

ii. Create a telephone directory.

- The heading should be 16-point Arial Font in bold
- The rest of the document should use 10-point font size
- Other headings should use 10-point Courier New Font.
- The footer should show the page number as well as the date last updated.

iii. Design a time-table form for your college.

- The first line should mention the name of the college in 16-point Arial Font and should be bold.

- The second line should give the course name/teacher‘s name and the department in 14-point Arial.
- Leave a gap of 12-points.
- The rest of the document should use 10-point Times New Roman font.
- The footer should contain your specifications as the designer and date of creation.

iv. BPB Publications plans to release a new book designed as per your syllabus. Design the first page of the book as per the given specifications.

- The title of the book should appear in bold using 20-point Arial font.
- The name of the author and his qualifications should be in the center of the page in 16-point Arial font.
- At the bottom of the document should be the name of the publisher and address in 16-point Times New Roman.
- The details of the offices of the publisher (only location) should appear in the footer.

v. Create the following one page documents.

a) Compose a note inviting friends to a get-together at your house, including a list of things to bring with them.
b) Design a certificate in landscape orientation with a border around the document.
c) Design a Garage Sale sign.
d) Make a sign outlining your rules for your bedroom at home, using a numbered list.

vi. Create the following documents:

a) A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.
b) Use a newsletter format to promote upcoming projects or events in your classroom or college.

7. Convert following text to a table, using comma as delimiter

Type the following as shown (do not bold).

Color, Style, Item
Blue, A980, Van
Red, X023, Car
Green, YL724, Truck
Name, Age, Sex
Bob, 23, M
Linda, 46, F
Tom, 29, M

10. Wrapping of text around the image.

11. Following features of menu option must be covered

FILE Complete menu
EDIT Complete menu
VIEW Complete menu
INSERT Complete menu
FORMAT Complete menu
TABLE Complete menu
WINDOW Complete menu
HELP Complete menu
TOOLS All options except Online collaboration, Tools on Macro, Templates

12. 1. Enter the Following data in Excel Sheet

REGIONAL SALES PROJECTION

State	Qtr1	Qtr2	Qtr3	QTR4	Qtr Total	Rate Amount
Delhi	2020	2400	2100	3000	15	
Punjab	1100	1300	1500	1400	20	
U.P.	3000	3200	2600	2800	17	
Haryana	1800	2000	2200	2700	15	
Rajasthan	2100	2000	1800	2200	20	

TOTAL

AVERAGE

a) Apply Formatting as follow:
   i. Title in TIMES NEW ROMAN
   ii. Font Size - 14
   iii. Remaining text - ARIAL, Font Size -10
   iv. State names and Qtr. Heading Bold, Italic with Gray Fill Color.
   v. Numbers in two decimal places.
   vi. Qtr. Heading in center Alignment.
   vii. Apply Border to whole data.
b) Calculate State and Qtr. Total
c) Calculate Average for each quarter
d) Calculate Amount = Rate * Total.

13. Given the following worksheet

	A	B	C	D
1	Roll No.	Name	Marks	Grade
2	1001	Sachin	99	
3	1002	Sehwag	65	
4	1003	Rahul	41	
5	1004	Sourav	89	
6	1005	Har Bhajan	56	

Calculate the grade of these students on the basis of following guidelines:

If Marks	Then Grade
>= 80	A+
>= 60 < 80	A
>= 50 < 60	B
< 50	F

14. Given the following worksheet

	A	B	C	D	E	F	G
1	Salesman			Sales in (Rs.)			
2	No.	Qtr1	Qtr2	Qtr3	Qtr4	Total	Commission
3	S001	5000	8500	12000	9000		
4	S002	7000	4000	7500	11000		
5	S003	4000	9000	6500	8200		
6	S004	5500	6900	4500	10500		
7	S005	7400	8500	9200	8300		
8	S006	5300	7600	9800	6100		

Calculate the commission earned by the salesmen on the basis of following Candidates:

If Total Sales	Commission
< 20000	0% of sales
> 20000 and < 25000	4% of sales
> 25000 and < 30000	5.5% of sales
> 30000 and < 35000	8% of sales
>= 35000	11% of sales

The total sales is sum of sales of all the four quarters.

15. A company XYZ Ltd. pays a monthly salary to its employees which consists of basic salary, allowances & deductions. The details of allowances and deductions are as follows:

Allowances

- HRA Dependent on Basic
  - 30% of Basic if Basic <=1000
  - 25% of Basic if Basic>1000 & Basic<=3000
  - 20% of Basic if Basic >3000
- DA Fixed for all employees, 30% of Basic
- Conveyance Allowance Rs. 50/- if Basic is <=1000
  Rs. 75/- if Basic >1000 & Basic<=2000
  Rs. 100 if Basic >2000
- Entertainment Allowance NIL if Basic is
  <=1000 Rs. 100/- if Basic > 1000

Deductions

- Provident Fund 6% of Basic
- Group Insurance Premium Rs. 40/- if Basic is <=1500
  Rs. 60/- if Basic > 1500 & Basic<=3000
  Rs. 80/- if Basic >3000

Calculate the following:
Gross Salary = Basic + HRA + DA + Conveyance + Entertainment
Total deduction = Provident Fund + Group Insurance Premium
Net Salary = Gross Salary – Total Deduction

Text Books:

1. A. Goel, Computer Fundamentals, Pearson Education, 2010.
2. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006
3. P. K.Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers, 2007

Course Code: CSK II	Course Title: Programming using Python
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course outcome:
At the end of the course, students should be able to:

- Describe the components of a computer and notion of an algorithm.
- Apply suitable programming constructs and built-in data structures to solve a problem.
- Develop, document, and debug modular python programs.

- Use classes and objects in application programs and visualize data.

Unit I

Computer Fundamentals and Problem Solving: Basic Computer Organization: CPU, memory, I/O Units. Problem solving using computer, notion of an algorithm.

Introduction to Python Programming: Python interpreter/shell, indentation; identifiers and keywords; literals, numbers, and strings; operators (arithmetic operator, relational operator, Boolean operator, assignment, operator, ternary operator and bitwise operator) and expressions.

Creating Python Programs: Input and output statements, defining functions, control statements (conditional statements, loop control statements, break, continue and pass, exit function.), default arguments, errors and exceptions.

Unit II

Strings and Lists: String class, built-in functions for string, string traversal, string operators and operation

Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries, File handling through libraries.ons; Lists creation, traversal, slicing and splitting operations, passing list to a function.

Built-in data structures: Tuples, sets, dictionary, stacks, and queues; searching and sorting.

Practical

1. Execution of expressions involving arithmetic, relational, logical, and bitwise operators in the shell window of Python IDLE.
2. Write a Python program to illustrate the various functions of math module.
3. Write a Python program to produce a table of sins, cosines and tangents. Make a variable x in range from 0 to 10 in steps of 0.2. For each value of x, print the value of sin(x), cos(x) and tan(x).
4. Write a program that reads an integer value and prints “leap year” or “not a leap year”
5. Write a menu driven program to calculate the area of given building. Accept suitable inputs and use suitable assertions.
6. Write a Python function that takes a number as an input from the user and computes its factorial.
7. Write a Python function to generate the Fibonacci sequence till a given number “n”.
8. Write a function that takes a number as an input and finds its reverse and computes the sum of its digits.
9. Write a function that takes two numbers as input parameters and returns their least common multiple.
10. Write a function that takes a number as an input and determine whether it is prime or not.
11. Write a function that finds the sum of the
    a) first n odd terms
    b) first n even terms
    c) 1, 2, 4, 3, 5, 7, 9, 6, 8, 10, 11, 13.. till n-th term
12. Write a Python function that takes a string as an input from the user and determines whether it is palindrome or not.
13. Write a function that takes a sentence as input from the user and calculates the frequency of each letter. Use a variable of dictionary type to maintain the count.

14. Write a Python function that prints a dictionary where the keys are numbers between 1 and 5 and the values are cubes of the keys.

15. Consider a tuple t1=(1,2,5,7,9,2,4,6,8,10). Write a program to perform following operations:
    a. Print half the values of tuple in one line and the other half in the next line.
    b. Print another tuple whose values are even numbers in the given tuple.
    c. Concatenate a tuple t2=(11,13,15) witht1.
    d. Return maximum and minimum value from this tuple.

16. Write a function called "check_duplicates" that takes a list and returns true if there is any element that appears more than once. Also find the frequency of that element. The original list should not be modified.

17. Write a program to implement a class for finding area and perimeter of a rectangle. Write constructor, destructor, and functions for calculating area and perimeter.

18. Write a menu driven program to perform the following functions on strings:
    a. Find the length of string
    b. Return maximum of three strings
    c. Accept a string and replace every successive character with '#' Example- For Given string 'Hello World' returned string is 'H#l#o W#r#d'.
    d. Find number of words in the given string

19. Write a Python program to perform the following using list:
    a. Check if all elements in list are numbers or not
    b. If it is a numeric list, then count number of odd values in it
    c. If list contains all Strings, then display largest String in the list
    d. Display list in reverse form
    e. Find a specified element in list
    f. Remove the specified element

Text book:

1. Guttag, J.V. (2016). Introduction to computation and programming using Python. 2nd edition. MIT Press.

2. Taneja, S., Kumar, N. (2018). Python Programming- A modular Approach. Pearson Education India.

Reference book:

1. Kamthane, A. N., & Kamthane, A.A. (2017) Programming and Problem Solving with Python, McGraw Hill Education.

2. Liang, Y. D. (2013). Introduction to Programming using Python. Pearson Education.

Course Code: CSK III	Course Title: Introduction to Web Design (HTML & CSS)
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course Objectives:

- Define the principle of Web page design.
- Define the basics in web design.
- Visualize the basic concept of HTML.
- Recognize the elements of HTML.
- Introduce basics concept of CSS.

- Develop the concept of web publishing

Detailed Syllabus:

Unit : I

Web Design Principles: Basic principles involved in developing a web site, Planning process, Five Golden rules of web designing, Designing navigation bar, Page design, Home Page Layout, Design Concept.

Basics in Web Design: Brief History of Internet, What is World Wide Web, Why create a web site, Web Standards, Audience requirement.

Introduction to HTML: What is HTML, HTML Documents, Basic structure of an HTML document, Creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags.

Unit : II

Elements of HTML: Introduction to elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls, Introduction to Cascading Style Sheets

Concept of CSS: Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model (Introduction, Border properties, Padding Properties, Margin properties), CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Color, Creating page Layout and Site Designs, Introduction to Web Publishing or Hosting

Creating the Web Site: Saving the site, Working on the web site, Creating web site structure, Creating Titles for web pages, Themes-Publishing web sites.

Practical

Experiments related to the syllabus

Text books:

1. Kogent Learning Solutions Inc., HTML 5 in simple steps, Dreamtech Press
2. A beginner's guide to HTML NCSA,14th May,2003
3. Murray,Tom/Lynchburg, Creating a Web Page and Web Site, College, 2002
4. Murray,Tom/Lynchburg, Creating a Web Page and Web Site, College,2002

Reference books

1. Web Designing & Architecture-Educational Technology Centre, University of Buffalo
2. Steven M. Schafer, HTML, XHTML, and CSS Bible, 5ed Wiley India
3. John Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wiley India
4. Ian Pouncey, Richard York, Beginning CSS: Cascading Style Sheets for Web Design, Wiley India.
5. Kogent Learning, Web Technologies: HTML, Javascript, Wiley India

Course Code: CSK IV	Course Title: Advanced PC Hardware and Networking Components
Course Credits: 2(Th)+2(P)	Hour of Teaching/Week: 06

Course outcomes:

- Enable to handle and repair laptops, tablets.
- Enable to identify the faults and troubleshoot.
- Enable to establish secured wireless network for given assignment.

Detailed Syllabus:

Unit: I

Introduction to Portable Mobile Computers, Laptops, Tablets: Types and classes of portable computers: - Laptops, Notebooks, Tablets, Smart Phones, Palmtops. Portable System models and configurations from different manufacturers: - IBM, DELL, Apple, Samsung, HP, Toshiba, Fujitsu, Acer, Compact Version Operating Systems and applications for portable Computers: - WINDOWS 8, Android and various various releases, various flavors of Linux that being loaded on handheld devices, Apple Macintosh and iOS. Low powered Portable system Processors and Graphics Processors GPU:- Intel Mobile Pentium, Mobile Celeron Processors, ARM Cortex processors, AMD Mobile Athlon-4 and Mobile Duron. Mobile processor packaging and compact Motherboards.

Compact devices used in Portable Mobile Computers: Compact Hard Drives, CD/DVD R/W used in Mobile computers. Various type of secondary memory deployed in compact devices like Compact FLASH, MicroSD Cards, Wireless blutooth based Keyboards and mouse: - Inbuilt and External keyboards, Compact multimedia keyboards, TrackPoint, Touchpad's, Wireless mouse.

Specialized output devices used in Portable Mobile Computers: Display used in portable computers:- Dual Scan(passive Matrix) Displays. Active Matrix, Flat- Panel LCD/LED/AMOLED/IPS Displays, Active TFT Displays, touch panel, etc.

Unit: II

Interfacing used with Portable Mobile Computers: PCMCIA Cards:- PCMCIA Ethernet LAN card, PCMCIA Wireless Card. Type –I, Type –II Type –III types of cards, and their slots. Infrared ports, Docking Stations, USB port, OTG USB, Mini USB, HDMI, micro HDMI port, etc.

Preventive maintenance for Portable Mobile Computers: Power Supply constraints, Battery charging, Handling and Storage, Cleaning of Displays, Running diagnostic software tools, Antivirus Software, Handling Plug-in /Plugout Hardware.

Portable Mobile Computers in wireless LANS: Wireless Standards :- IEEE 802. 11(a/b/g/n/ac), 802. 16, (Wi-max) RF Data Communication. Types of wireless networks IBSS Ad-Hoc, BSS and ESS Network, Fundamentals and deployment, Key Characteristics of 802.11 Wireless LANs, Typical Range of 802. 11a/b/g/n/ac WLAN, Access Point, Bridging, Wireless Router A WLAN Architecture.

Practical

1. Visit the Websites (IBM.com, hp.com, dell.com etc.) and get the configurations of various models of portable computer, laptops and notebooks.
2. A customer has lost the driver CD of an IBM ThinkPad series Laptop. Download all the drivers and Burn a CD for this system.
3. An old Laptop doesn't support a hard disk size >10 GB. Download a latest version of the BIOS and carefully upgrade the BIOS of the given System.

4. A Laptop hard disk has to be connected to a PC IDE port. Suggest a suitable converter.
5. Connect a PC IDE disk to a Laptop system on a USB port.
6. Using Infrared port, transfer files between two Laptops.
7. A customer wants to communicate between some model of a Nokia mobile phone, and a Laptop. Download a suitable driver, and communicate using infrared ports on two systems.
8. Install a PCMCIA WLAN card on a laptop & establish a connection with wireless access point in the vicinity.
9. Connect two Laptops in peer configuration using Radio based wireless LAN card.
10. Install PCMCIA Ethernet card on an old laptop, which doesn't have an inbuilt Ethernet card.
11. Configure wireless router/ Access point for establishing secured wireless network.
12. Remotely access the wireless router for its configuration and disable the configuration through wireless access.

Text books:

1. PC Hardware: The Complete Reference, Craig Zacker (Author), John Rourke, 2017
2. Data and Computer Communications, 10/e, Stallings William, 2017.
3. Computer Hardware & Networking (2nd Ed.), 2021.

OPTIONAL PAPERS GROUP - I

Course Code: DSC-O1	Course Title: Cloud Computing
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Course Objective:
After completion of this course students will be able to understand:

- Basics of cloud computing along with virtualization.
- Cloud and virtualization along with it how one can migrate over it.

Detailed syllabus:

Unit – I

Origins of Cloud computing – Cloud components - Essential characteristics – On-demand selfservice, Broad network access, Location independent resource pooling ,Rapid elasticity, Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS

and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

Unit-II

Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture (User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud

Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

Text & References:

Text:

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010.
2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.

References:

1. Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010.
2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011.

Course Code: DSC-O2	Course Title: Cyber Security & Cyber Law
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Course objective:

The course will cover the basics of information security & spread awareness of this field to help the participants understand the importance of security in their daily lives in the IT field.

Detailed syllabus:

Unit – I

Definitions: Protection, Security, risk, threat, vulnerability, exploit, attack, confidentiality, integrity, availability, non-repudiation, authentication , authorization, codes, plain text, encryption, decryption, cipher text, key, ciphers, Symmetric and asymmetric cryptography, Public key , private key ,Crypt analysis,, Cyber forensics. Substitution cipher (Caesar), Transposition cipher (Rail-Fence)

Risk analysis, process, key principles of conventional computer security, security policies, data protection, access control, internal vs external threat, security assurance, passwords, access control, computer forensics and incident response.

CYBER ATTACKS (definitions and examples): Denial-of-service attacks, Man-in-the middle attack, Phishing, spoofing and spam attacks, Driveby attack, Password attack, SQL injection attack, Cross-

site scripting attack, Eavesdropping attack, Birthday attack, Malware attacks, Social Engineering attacks.

Unit – II

Brief Introduction of handling the attacks described in UNIT 3. Firewalls, logging and intrusion detection systems, e-mail security, security issues in operating systems, ethics of hacking and cracking.

Definitions: Digital Signature and Electronic Signature, Digital Certificate i. Penalty and compensation for damage to computer etc. ii. Tampering with computer source documents iii. Punishment for sending offensive messages through communication service etc. iv. Punishment for dishonestly receiving stolen computer resource or communication device v. Punishment for identity theft vi. Punishment for cheating by impersonation by using computer resource vii. Punishment for violation of privacy viii. Punishment for cyber terrorism ix. Punishment for publishing or transmitting obscene material in electronic form x. Punishment for publishing or transmitting of material containing sexually explicit act, etc. in electronic form xi. Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic for xii Breach of confidentiality and privacy.

Brief introduction of IT infrastructure in India, National agencies handling IT.

References:
[1]. Merkow, M., & Breithaupt, J.(2005) Information Security Principles and Practices. 5th edition. Prentice Hall.
[2]. Snyder, G.F. (2010). Network Security, Cengage Learning.
[3]. Whitman, M. E. & Mattord, H. J. (2017) Principles of Information Security. 6th edition. Cengage Learning.

Additional Resources:
[1]. Basta, A., & Halton, W., (2010) Computer Security: Concepts, Issues and Implementation, Cengage Learning India.
[2] Charles P. Pfleeger, Shari Lawrence Pfleeger, Security in Computing, 4 th Edition.
[3] Sushila Madan, Cyber Crimes and Laws, Scholar Tech Press (MKM Publishers Pvt. Ltd) Second Revised Edition, 2017.

Course Code: DSC-O3	Course Title: Big Data
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Detailed Syllabus:

Unit - I

Getting an overview of Big Data: Introduction to Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Big Data Analytics, Advantages of Big Data Analytics. Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, Cloud

Computing and Big Data, Features of Cloud Computing, Cloud Deployment Models, Cloud Services for Big Data, Cloud Providers in Big Data Market.

Understanding Hadoop Ecosystem: Introducing Hadoop, HDFS and MapReduce, Hadoop functions, Hadoop Ecosystem. Hadoop Distributed File System- HDFS Architecture, Concept of Blocks in HDFS Architecture, Namenodes and Datanodes, Features of HDFS. MapReduce. Introducing HBase- HBase Architecture, Regions, Storing Big Data with HBase, Combining HBase and HDFS, Features of HBase, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie.

Unit - II

Understanding MapReduce Fundamentals and HBase: The MapReduceFramework ,Exploring the features of MapReduce, Working of MapReduce, Techniques to optimize MapReduce Jobs, Hardware/Network Topology, Synchronization, File system, Uses of MapReduce, Role of HBase in Big Data Processing- Characteristics of HBase. Understanding Big Data Technology Foundations: Exploring the Big Data Stack, Data Sources Layer, Ingestion Layer, Storage Layer, Physical Infrastructure Layer, Platform Management Layer, Security Layer, Monitoring Layer, Visualization Layer.

Storing Data in Databases and Data Warehouses: RDBMS and Big Data, Issues with Relational Model, Non – Relational Database, Issues with Non Relational Database, Polyglot Persistence, Integrating Big Data with Traditional Data Warehouse, Big Data Analysis and Data Warehouse.
NoSQL Data Management: Introduction to NoSQL, Characteristics of NoSQL, History of NoSQL, Types of NoSQL Data Models- Key Value Data Model, Column Oriented Data Model, Document Data Model, Graph Databases, Schema-Less Databases, Materialized Views, CAP Theorem.

Text book:
1. BIG DATA, Black Book TM, DreamTech Press, 2016 Edition.
Reference books:
2. Seema Acharya, SubhasniChellappan , “BIG DATA and ANALYTICS”, Wiley publications, 2016.
3. Nathan Marz and James Warren, “BIG DATA- Principles and Best Practices of Scalable Real-Time Systems”, 2010.

Course Code: DSC-O4	Course Title: Digital Marketing
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Course objective:
To understand the basic Concepts of Digital marketing and the road map for successful Digital marketing strategies.

Detailed Syllabus:

Unit – I

Fundamentals of Digital marketing & Its Significance, Traditional marketing Vs Digital Marketing, Evolution of Digital Marketing, Digital Marketing Landscape, Key Drivers, Digital Consumer & Communities, Gen Y & Netizen’s expectation & influence wrt Digital Marketing.

The Digital users in India, Digital marketing Strategy- Consumer Decision journey, POEM Framework, Segmenting & Customizing messages, Digital advertising Market in India, Skills in Digital Marketing, Digital marketing Plan.

Unit – II

Terminology used in Digital Marketing, PPC and online marketing through social media, Social Media Marketing, SEO techniques, Keyword advertising, Google web-master and analytics overview, Affiliate Marketing, Email Marketing, Mobile Marketing.

Display adverting, Buying Models, different type of ad tools, Display advertising terminology, types of display ads, different ad formats, Ad placement techniques, Important ad terminology, Programmatic Digital Advertising.

Text book:

1. Digital Marketing –Kamat and Kamat-Himalaya.
2. Marketing Strategies for Engaging the Digital Generation, D. Ryan.
3. Digital Marketing, V. Ahuja, Oxford University Press.
4. Digital Marketing, S.Gupta, McGraw-Hill.
5. Quick win Digital Marketing, H. Annmarie , A. Joanna, Paperback edition.

Course Code: DSC-O5	Course Title: Distributed Computing
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Detailed Syllabus:

Unit- I

Introduction to DS, Message Passing, Leader Election, Distributed Models, Causality and Logical Time

Logical Time, Global State & Snapshot and Distributed Mutual Exclusion-Non-Token and Quorum based approaches

Distributed Mutual Exclusion-Token based approaches, Consensus & Agreement, Checkpointing & Rollback Recovery

Deadlock Detection, DSM and Distributed MST

Unit-II

Termination Detection, Message Ordering & Group Communication, Fault Tolerance and Self-Stabilization

Distributed Randomized Algorithms, DHT and P2P Computing

Case Studies: GFS, HDFS, Map Reduce and Spark

Case Studies: Sensor Networks, Authentication & Security in DS

Text books:

1. Distributed Computing: Principles, Algorithms, and Systems, Coulouris , 2008.
2. Distributed Computing, Sunita Mahajan, 2013.

Course Code: DSC-O6	Course Title: E-Commerce
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Course Objectives:

1. To provide an analytical framework to understand the emerging world of e-commerce
2. To make the learners familiar with current challenges and issues in e-commerce
3. To develop the understanding of the learners towards various business models
4. To enable to understand the Web- based Commerce and equip the learners to assess e-commerce requirements of a business
5. To develop understanding of learners relating to Legal and Regulatory Environment and Security issues of E-commerce.

Detailed Syllabus:

Unit – I

Evolution of E-Commerce-Introduction, History/ Evolution of Electronic Commerce, Roadmap of E-Commerce in India, Main activities, Functions and Scope of E-Commerce.

Benefits and Challenges of E-Commerce, E-Commerce Business Strategies for Marketing, Sales and Promotions.

Business Models of E-Commerce- Characteristics of Business to Business(B2B), Business to Consumers (B2C), Business to Government (B2G)

Concepts of other models of E-commerce. Business to Consumer E-Commerce process, Business to Business E-Commerce- Need and Importance, alternative models of B2B E-Commerce.

E-Commerce Sales Product Life Cycle (ESLC) Model

World Wide Web-Reasons for building own website, Benefits of Website, Registering a Domain Name, Role of web site in B2C E-commerce; push and pull approaches; Web site design principles.

EDI and paperless trading; Pros & Cons of EDI; Related new technologies use in E-commerce.

Applications of E-commerce and E-enterprise – Applications to Customer Relationship Management- Types of E-CRM, Functional Components of E-CRM.

Managing the E-enterprise- Introduction, Managing the
E-enterprise, Comparison between Conventional and
E-organisation, Organisation of Business in an E-enterprise,
Benefits and Limitations of E- enterprise

Unit – II

E-Marketing- Scope and Techniques of E-Marketing, Traditional web promotion; Web counters; Web advertisements, Role of Social media.

E-Commerce Customer Strategies for Purchasing and support activities, Planning for Electronic Commerce and its initiates, The pros and cons of online shopping, Justify an Internet business.

Electronic Payment System-Characteristics of E-payment system, SET Protocol for credit card payment, prepaid epayment service, post-paid E-payment system, Types of payment systems.

Operational, credit and legal risks of E-payment system, Risk management options for E-payment systems, Set standards / principles for E-payment

Introduction to Cyber Laws-World Scenario, Cyber-crime & Laws in India and their limitations, Hacking, Web Vandals, E-mail Abuse, Software Piracy and Patents.

Taxation Issues, Protection of Cyber Consumers in India and CPA 1986, Importance of Electronic Records as Evidence.
Security Issues in E-Commerce- Risk management approach to Ecommerce Security - Types and sources of threats, Protecting electronic commerce assets and intellectual property.
Security Tools, Client server network security, Electronic signature, Encryption and concepts of public and private key infrastructure

Text books:

1. Laudon, Kenneth C. and Carol Guercio Traver (2002) E-commerce: business, technology, society. (New Delhi : Pearson Educatin).
2. Awad, Elias M. (2007), Electronic Commerce: From Vision to Fulfillment (NewDelhi : Pearson Education).
3. Kalakota, Ravi and Marcia Robinson (2001). Business 2.0: Roadmap for Success (NewDelhi : Pearson Education).
4. Smith, P.R. and Dave Chaffey (2005), eMarketing eXcellence; The Heart of eBusiness (UK : Elsevier Ltd.)
5. Vivek Sood Cyber Laws Simplified-TMH (2001)
6. Vakul Sharma Handbook of cyber Laws-Macmillan (2002)
7. Sundeep Oberol e Security and you-TMH (2001)
8. Greenstein & Feinman Electronic Commerce-Security, Risk Mgt and Control-TMH (2000)
9. Adam Nabll R. (Editor) Electronic Commerce: Technical Business and Legal Issues.
10. Diwan, Prag and Sharma Electronic Commerce-a Manager's Guide to E-Business
11. Bharat Bhasker, Electronic Commerce – Frame work technologies and Applications, 3rd Edition- Tata McGrawHill Publications, 2008.
12. Kamlesh K.Bajaj and Debjani Nag, Ecommerce- the cutting edge of Business, Tata McGrawHill Publications, 2008
13. Kalakota et al, Frontiers of Electronic Commerce, Addison Wesley, 2004
14. E- Commerce Strategies, Technology and applications (David) Tata McGrawHill
15. Introduction to E-commerce (jeffrey) Tata- Mcgrawhill
16. E-Business and Commerce- Strategic Thinking and Practice (Brahm) biztantra
17. Web Technology : Ramesh Bangia

Course Code: DSC-O7	Course Title: Formal Languages & Automata Theory
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

The student will be able to:

- Understand the basic properties of formal languages and grammars.
- Differentiate regular, context-free and recursively enumerable languages.
- Make grammars to produce strings from a specific language.
- Acquire concepts relating to the theory of computation and computational models including decidability and intractability.

Detailed Syllabus:

Unit - I

Introduction: Alphabets, Strings and Languages, Automata and Grammars, Regular Languages, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation, State transition graph, Transition table, Language of DFA; Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem, FA with output - Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Regular Expression (RE): Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages, Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages.

Unit –II

Grammar Formalism: Regular grammars-Right linear and left linear grammars, Equivalence between regular linear grammar and FA; Context Free Grammar, Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs; Normal forms for CFGs - CNF and GNF, Closure properties of CFLs; Decision Properties of CFLs-Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

Turing Machine (TM): Basic model, Definition and representation, Instantaneous Description, Language acceptance by TM, Computable functions, Types of Turing machines, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs, Post correspondence problem (PCP), Modified PCP.

Text book:

1. Hopcroft and Ullman, "Introduction to Automata Theory, Languages and Computation", 2nd edition, Pearson/Prentice Hall India, 2007.

Reference Books:

1. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", 2nd edition, Pearson/Prentice Hall India, 2004.
2. Martin J. C., "Introduction to Languages and Theory of Computations", 2nd edition, Tata McGraw Hill, 2005.
3. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", 2nd edition, Pearson/Prentice Hall India, 2009.

Course Code: DSC-O8	Course Title: Internet of Things
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Course Outcomes:

On completion of the course, student will be able to

1. Understand the various concepts, terminologies and architecture of IoT systems.
2. Use sensors and actuators for design of IoT.
3. Understand and apply various protocols for design of IoT systems.
4. Use various techniques of data storage and analytics in IoT.
5. Understand various applications of IoT.
6. Understand APIs to connect IoT related technologies.

Detailed syllabus:

Unit - I

Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.

Sensors Networks: Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus. IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols

Unit - II

Data Handling& Analytics: Introduction, Bigdata, Types of data, Characteristics of Big data, Data handling Technologies, Flow of data, Data acquisition, Data Storage, Introduction to Hadoop. Introduction to data Analytics, Types of Data analytics, Local Analytics, Cloud analytics and applications.

Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

Text Books:

1. Hakima Chaouchi, ― "The Internet of Things Connecting Objects to the Web" ISBN: 978-1-84821-140-7, Wiley Publications
2. Olivier Hersent, David Boswarthick, and Omar Elloumi, ― "The Internet of Things: Key Applications and Protocols", WileyPublications
3. Vijay Madisetti and ArshdeepBahga, ― "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
4. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016.
5. Keysight Technologies, "The Internet of Things: Enabling Technologies and Solutions for Design and Test", Application Note, 2016.

Reference books:

1. Daniel Minoli, ― "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications

2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
3. https://onlinecourses.nptel.ac.in/noc17_cs22/course
4. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

OPTIONAL PAPERS GROUP - II

Course Code: DSC-O11	Course Title: Adhoc & sensor network
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Detailed syllabus:

Unit - I

AD HOC Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks. AD Hoc wireless Internet. MAC Protocols for Ad Hoc wireless Networks: Introduction. Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention – Based Protocols. Contention - Based Protocols with reservation Mechanisms, Contention Based MAC Protocols with Scheduling Mechanisms.

Routing protocols: Introduction. Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks. Classification of Routing Protocols, Table -Driven Routing Protocols. On - Demand Routing Protocols, Hybrid Routing Protocols, Routing Prorocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols. Transport layer and Security Protocols: Introduction, Issues in Design a Transport Layer Protocol, TCP over Ad Hoc Wireless Networks. Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

Unit - II

Quality of service: Introduction. Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions. Network Layer Solutions, QoS Frameworks for Ad Hoc Wireless Networks.

Energy Management: Introduction, Need for Energy Management in Ad Hoc Wireless Networks. Classification of Ad Hoc Wireless Networks. Battery Management Schemes.

Wireless sensor networks: Introduction, Sensor Network Architecture. Data Dissemination. Data Gathering. MAC Protocols for Sensor Networks, Location Discovery. Quality of a Sensor Network, Evolving Standards, Other Issues.

Text book:

l. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj. 2004, PHI.
2. Wireless Ad- hoc and Sensor Networks: Protocols. Performance and Control Jagannathan Sarangapani. CRC Press.
3. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh, l ed, Pearson Education.
4. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer

Course Code: DSC-O11	Course Title: Advanced DBMS
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Detailed syllabus:

Unit I

Overview of DBMS – Database design – Query processing. Data modeling – ER – EER –Object Oriented Databases – Object Relational Databases, Document oriented Databases – Background of NoSQL – XML document – Structure of XML Data – XML Document Schema – Querying and Transformation – API – Storage of XML Data – XML Applications.

Information Retrieval Systems, Databases – Multidimensional Indexes – Data Cubes, Grid Files, R-trees.

Unit II

Distributed Databases – Data Distribution – Distributed Transactions, Parallel Databases – Performance measure – Parallel operations for relational operations, Information Integration – Federated Database – Data Warehouses – Mediators – Schema matching methods.

Text books:

1. Silberschatz, Korth and Sudarshan, "Database Concepts", Sixth Edition, Tata McGraw Hill, 2010.

Resource books:

1. Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom, "Database Systems: The Complete Book", Pearson, 2011.
2. Niall O'Higgins, "Mongo D B and Python", O'reilly, 2011.

Course Code: DSC-O12	Course Title: Deep Learning
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Detailed syllabus:

Unit - I

The Neural Network–Limits of Traditional Computing–Machine Learning–Neuron–FF Neural Networks–Types of Neurons –Soft max output layers

Tensorflow–Variables–Operations–Placeholders–Sessions–SharingVariables–Graphs–Visualization

Convolution Neural Network–Feature Selection–Max Pooling–Filters and Feature Maps–Convolution Layer–Applications

Unit - II

Recurrent Neural Network–Memory cells–sequence analysis–word 2vec- LSTM— Memory augmented Neural Networks–NTM—Application

Reinforcement Learning –MDP–Q Learning– Applications

Text book:

1. Nikhil Buduma, Nicholas Locascio, ― Fundamentals of Deep Learning: Designing Next Generation Machine Intelligence Algorithms, O'Reilly Media, 2017.

Reference book:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ‖Deep Learning (Adaptive Computation and Machine Learning series‖, MIT Press, 2017.

Course Code: DSC-O13	Course Title: Digital Signal Processing
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Course outcome:

On completion of the subject the student must be able to:

- Perform time, frequency and z-transform analysis on signals and systems.
- Understand the inter relationship between DFT and various transforms.
- Understand the significance of various filter structures and effects of rounding errors.
- Design a digital filter for a given specification.
- Understand the fast computation of DFT and Appreciate the FFT processing.
- Understand the trade-off between normal and multi rate DSP techniques and finite length word effects

Detailed syllabus:

Unit - I

Introduction to Digital Signal Processing: Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, Linear Shift Invariant Systems, Stability, and Causality, Realization of Digital Filters: Solution of Difference Equations Using Z-Transform, Realization of Digital Filters - Direct, Canonic forms.

Discrete Fourier Transforms: Properties of DFT. Linear Convolution of Sequences using DFT. Computation of DFT: Over-lap Add Method, Over-lap Save Method. Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

Unit - II

IIR Digital Filters: Analog Filter Approximations - Butterworth and Chebyshev, Design of IIR Digital filters from Analog Filters, Bilinear Transformation Method.

FIR Digital Filters: Characteristics of FIR Digital Filters. Design of FIR Filters: using Window Techniques, Comparison of IIR & FIR filters.

Multirate Digital Signal Processing: Introduction, Down sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion, Applications of Multi Rate Signal Processing.

Text book:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009.
3. Fundamentals of Digital Signal Processing – Loney Ludeman, John Wiley, 2009

Reference book:

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008.
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, b Thomson, 2007.
3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj and C.Gnanapriya, TMH, 2009.
4. Discrete Systems and Digital Signal Processing with MATLAB – Taan S. EIAli, CRC press, 2009.
5. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009.
6. Digital Signal Processing - Nagoor Khani, TMG, 2012.

Course Code: DSC-O14	Course Title: Information & Security
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Course outcome:

1. Understand the features, development and use of information systems.
2. Identify the various types of information system risks, threats and pitfalls.
3. Analyze the security approaches applied
4. Compare the approaches in the context of achieving security goals
5. Create awareness about cyber laws and cyber crimes and cyber ethics.

Detailed syllabus:

Unit - I

Introduction to Information Systems: components, categories, types, individuals involved, steps in developing information systems, Information Assurance, security challenges, need for cyber security, Information Security Risk analysis: use and benefits of risk analysis, risk analysis model, risk assessment, risk equation, risk management, trusted computing.

Cyber Security Threats and vulnerabilities: types of threats, attacks, malwares, firewalls, hacking, network and services attack, IDPS, honeypots, cryptography and cryptanalysis, network behaviour analysis, Intrusion Detection Systems: Types and components of IDS- Network based, Host Based, Hybrid IDS, wireless IDPS

Unit - II

Security policies: needs and uses, policy development, types of security policies, steps in policy review process, Security Standards- ISO, Intellectual property rights, patents, trademarks, copyrights, software licensing, e-contracts, Cyber laws in India.. Security and Law:-Regulations in India- IT Act 2000/2008, Cyber Crime- cyber law, Indian Copyright Act, Indian Contract Act , Consumer Protection Act, Future Trends –The Law of Convergence.

Cybercrimes and cyber ethics: cyber space, cyber crimes-nature and scope of cyber crimes, types and categories of cybercrimes, penalty for cybercrimes under IT Act, digital foot prints, cyber forensics, Cyber ethics- concerns and responsibilities.

Text book:

1. Fundamentals of Cyber Security, Mayank bhushan, BPB publication, First Edition 2017.

Reference book:

1. Security in Computing, Charles P.Pfleeger, Shari Lawrence Pfleeger, Pearson Publication, Fifth Edition 2015
2. Introduction to Information Security and Cyber Law, Surya Prakash Tripathi, Dreamtech Press, 2014

Course Code: DSC-O15	Course Title: Numerical Methods
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Detailed Syllabus:

Unit – I

Floating point representation of numbers, Arithmetic operations with normalised floating point numbers and its consequences, Errors in numbers, Binary representation of numbers. Solution of Transcendental and polynomial equations: Bi-section method, Regula-falsi method, Newton-Raphson method, Secant method, Iteration Method.

Unit- II

Solution to simultaneous linear and algebraic equations: Gauss elimination method, pivoting, ill-conditioned equations, Gauss-Seidal iterative method. Finite difference and Interpolation : Difference operators, Divided differences, (Definition and properties), relations among operators, Newton-Gregory formulae for forward and backward interpolation, Newton's interpolation formula for divided differences, Lagrange's interpolation formula, truncation error in various interpolation formula.

Text book:

1. S. Balachandra Rao and C.K. Shantha: „Numerical Methods with Programs in BASIC, FORTRAN & PASCAL‟ University Press (INDIA) Ltd., Edition, 1992.
2. Bala Guruswamy: “Computer Oriented Numerical Methods”.
3. H.C. Saxena: “Calculus of Finite Differences and Numerical Analysis”, S. Chand and Sons, Delhi, E

Reference book:

1. B.S. Grewal: Numerical Methods, Khanna Publishers, 2004
2. S.S. Sastri: Introductory Methods of Numerical Analysis, PHI Ltd.

Course Code: DSC-O16	Course Title: Mobile Computing

Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Detailed syllabus:

Unit- I

Cellular systems- Frequency Management and Channel Assignment- types of handoff and their characteristics, dropped call rates & their evaluation -MAC – SDMA – FDMA –TDMA –CDMA – Cellular Wireless Networks.

Telecommunication systems – GSM – GPRS - Satellite Networks ,Wireless LAN – IEEE 802.11 - Architecture – services – MAC – Physical layer – IEEE 802.11a -802.11b standards – HIPERLAN – Blue Tooth

Unit – II

Mobile IP – Dynamic Host Configuration Protocol - Routing – DSDV – DSR – Alternative Metrics. Traditional TCP, Mobile TCP

WAP Model- Mobile Location based services -WAP Gateway –WAP protocols – WAP user agent profile- caching model-wireless bearers for WAP - WML – WML Scripts

Database Issues : Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

Text book:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2003.
2. William Stallings, “Wireless Communications and Networks”, Pearson Education, 2002.

Reference Books:

1. KavehPahlavan, PrasanthKrishnamoorthy, “Principles of Wireless Networks”, PHI/Pearson Education, 2003.
2. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003..
3. Raj Kamal, “Mobile Computing”,Oxford University Press, 2007
4. Asoke K. Talukdar, “Mobile Computing”, Tata McGraw-Hill Education,2010.
5. Mohammad Ilyas , Imad Mahgoub,” Mobile Computing Handbook” ,AUERBACH,2004.
6. Vilas S. Bagad , “Mobile Computing Introduction”, Technical Publications,2014
7. DR SANJAY Sharma, “Mobile Computing”,S.K. Kataria & Sons Publication,2014.
8. Dr. Ashish N.Jani, Dr. N.N. Jani , Neeta Kanabar ,” Mobile Computing – Technologies and Applications”, 2010
9. Pattnaik, Prasant Kumar, Mall, Rajib, “Fundamentals of Mobile Computing”, Second Edition, PHI Learning Pvt. Ltd., 2015.

Course Code: DSC-O17	Course Title: Soft Computing
Course Credits: 4 (Th)	Hour of Teaching/Week: 04

Detailed syllabus:

Unit I

Basic Concepts – Single Layer Perception – Multilayer Perception – Supervised and Unsupervised Learning – Back Propagation networks – Kohnen's self-organizing networks – Hop field networks – Distance measures.

FUZZY sets, properties, Membership functions Fuzzy operations, Applications.

Unit II

Classification and Regression Trees – Data Clustering Algorithms – Rule based Structure identification.

Neuro-Fuzzy Systems.

Evolutionary Computation – Survival of the Fittest – Fitness Computation – Crossover – Mutation – Reproduction – Rank space Method. Case Studies: Applications of soft computing.

Text Books / Reference

1. Laurence Fausett,"Fundamentals of Neural Networks", Seventh Edition, Dorling Kindersley (India) P. Ltd 2006.
2. Satish Kumar – "Neural Networks – A Classroom Approach", Tata McGraw-Hill, 2004.
3. Timothy J.Rose, "Fuzzy Logic with Engineering Applications", Third Edition, John Wiley, 2010.
4. J.S.R Jang,C.T Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", Second Edition, Prentice Hall of India, 2002.
5. D.E.Goldberg "Genetic Algorithms in search, optimization and Machine learning", Second Edition, Addison Wesley, 2007.