

# Semester 1

**Course Title: Human Computer Interaction**

**Course Objectives:**

The objectives of the course are:

- The students are able to recognize the theories influencing Human Computer Interaction(HCI)
- The students are able to recognize how the requirements and challenges in developing computers with good level of HCI.
- The students think about how advanced computing facilities can be used to design one system which is capable of serving a large diverse population.

**Pre-requisites:** Knowledge of Fundamentals of Computers

**Course Contents/Syllabus:**

	Weightage (%)
<b>Module I : Introduction</b>	20%
Introduction to Interaction Design, I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.	
<b>Module II: : Design and Software Process</b>	30%
Design, Process of Design, Screen Design and Layout, Universal design Principles, Iteration and Prototyping. Human Computer Interaction in the software process-The software life cycle, Usability Engineering, Iterative design and prototyping. Design Rules-Standards, Guidelines, Golden Rules and Heuristics. HCI Patterns - Task centred System Design and User Centred Design & Prototyping.	

<b>Module III : Evaluation</b>	10%
Goals of Evaluation, Evaluation through Experts, Evaluation through users. Choosing an Evaluation method.	
<b>Module IV : Models and Theories</b>	30%
Cognitive Models, Challenges of using the Display based system Communication and Collaboration Models, Task Decomposition- Knowledge Based Analysis, Dialog Notation and semantics. Standard Formalisms, Interaction Models, Hypertext, Multimedia, World Wide Web.	
<b>Module V: Research Framework</b>	10%
Speech Interfaces, Information Visualization, Ubiquitous Computing, Case studies.	

### Course Learning Outcomes:

After completion of this course, the student will be able to:

1. Understand the Computer and Human-Computer Interaction (HCI).
2. Students are able to analyse Interfaces' Design and Prototyping.
3. **Apply** an interactive design process and universal design principles to designing HCI systems.
4. Students should have a clear understanding of HCI principles that influence a system's interface design, before writing any code.
5. **Describe** and use HCI design principles, standards and guidelines.
6. Students will have the skills to understand why evaluation is important, what needs to be evaluated, where that evaluation should take place, and when in the product lifecycle evaluation is needed.
7. Students should be able to understand core cognitive aspects of interaction design.
8. Students will be able to **Analyse** the multi- disciplinary of the subject by presenting research dimensions on various areas such as speech recognition, ubiquitous computing

## Course Title: C Programming

### Course Objectives:

The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e. C. This Course guides the students to read, write and modify C programs and to implement basic projects

**Pre-requisites: Basic Computer Knowledge**

### Course Learning Outcomes:

After successful completion of this course, the student will be able to

- Apply the fundamental of programming language such as variables, values, types, assignment, control flow, handling files.
- Analyze the principles of an imperative, functional, logic oriented programming language.
- Assess programming languages critically and in a scientific manner.
- Develop, test, debug, and document programs in C.

Course Title	
	<b>Weightage (%)</b>
<b>Module I : Introductions</b>	<b>15</b>
<b>Descriptors/Topics :</b> Basic Computer Organization, Computer Hardware Components, Primary Memory – RAM, ROM, Secondary Memory, Types of Softwares, Introduction to Compilers, Interpreters, Assembler, Linker, Loader, Introduction to C compiler and its different versions, Basic Operating System Concepts, Functions of Operating system Types of Operating System.	
<b>Module II: Programming in C</b>	<b>20</b>
<b>Descriptors/Topics</b> History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data	

types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.	
<b>Module III : Fundamental Features in C</b>	<b>20</b>
C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.	
<b>Module IV : Arrays and Functions</b>	<b>20</b>
<b>Descriptors/Topics</b> One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations. Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.	
<b>Module V: Advanced features in C</b>	<b>20</b>
<b>Descriptors/Topics</b> Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments. Strings and C string library. Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments. File Handling	

### Pedagogy for Course Delivery:

Subjects will be taught using lectures and practicals based methods. Focus will be on making student understand the basics of 'C' programming.

### Selfwork/PSDA

s.no.

Activities

1

For each of the statement below assuming  $y=20$  before of the statement, what are the values of  $x$  after execution.

(i)  $x=y==y--;$

(ii)  $x=5*y++$

For (i)  $y--$  gives 20 then decreases the value of  $y$  to 19. So  $y==y--$  is false and gives 0 which is assigned to  $x$ . Therefore value of  $x$  is 1.

For (ii)  $y++$  gives 20 which is multiplied by 5 and assigned to  $x$ . Therefore value of  $x$  is 100.

2

Build a program in c to find the simple interest when the principle amount and number of years is entered through keyboard. The rate of interest is 5.75 fixed,

[simple interest= (principle\*year\*rate)/100]

3

Build a simple console application Customer Billing System Project. The design will demonstrate the practical use of C programming language and its features as wells as to generate an application which can be used in any departmental store, shops, cafes etc. for billing to the customer. This application is used to keep the records such as name, address, mobile number, paid amount, due amount, payment date etc. of regular costumer. Moreover, if we have a new customer, we can add and edit the account at any time

4

Build a program to find percentage, total marks and status(first division/second division/third division/fail) of a student by taking five subjects with the help of nested if-else.

5

Build a Calendar in C programming language is a console application without graphics. To make the calendar look colorful, many windows properties have been used in this project. Besides the color used in backgrounds, the days of the month are white and the vacations (Sundays) are indicated using the red foreground color.

In this mini project, we should be able to find out the day corresponding to a given date and view the days and dates corresponding to a particular month+year.

6

Using C program build a Employee Management system.In this project, you can manage employee records – add, list, modify and delete records.

Understanding this project will help you learn how to add, view, change and remove data using file handling.Here, you can list the employees' record but search employee by employee Id.

7

Student Record System uses files as database to perform file handling operations such as add, search, modify and delete records to manage students' records. In this project, you can also generate mark-sheet for students.

8

Build the Telecom Billing System, to perform and manage billing operations like they do in Telecom companies. Here, you can add records with name, phone number and the amount of payment. You can view, modify, search and delete existing records.

9

C Snake Game is a simple console application without graphics. In this project, you can play the popular “Snake Game” just like you played it elsewhere. You have to use the up, down, right or left arrows to move the snake.

Foods are provided at the several co-ordinates of the screen for the snake to eat. Every time the snake eats the food, its length will be increased by one element along with the score.

10

The Tic-Tac-Toe game is very popular. It’s fun when you play with paper and pencil. Develop a mini project in C Tic Tac Toe game – a simple console application without graphics.

It is the same noughts and crosses or the Xs and Os, the other names for Tic-Tac-Toe, you’ve played with paper and pencil. This mini game project is written in C language in a very simple manner; it is complete and totally error-free.

11

Build a project for Billing System in a School. We should perform billing or accounting operations under two account types: one for the students and one for teachers and staffs. School Billing System is a console application without graphic. In this project, you can add, record, modify, search and delete the records of both account types. In addition to that, this mini project in C allows you to display fees, dues, total and advance of students, and salary-related information of teachers and staffs.

For the entry of records, current date and month is asked. Then, you can select the account type, and perform billing operations like I mentioned above. In the add record, the name, class and roll no. of the student is asked, and it is similar for all other functions as well as the teachers account

12

In this project, a number of questions are asked, and the user is awarded cash prize for each correct answer given. In quiz game, questions are chosen in such a way that they cover all fields of a typical quiz contest. The user's general knowledge is tested with quiz questions regarding science, technology, movies, sports, general health, geography and many more

### ***Text & References:***

#### ***Text:***

- E. Balagurusamy, "Problem Solving through C language", TMH publication, Fourth Edition, 2008.
- Peter Nortons, "Introduction to Computers", TMH, Sixth Edition,2006.
- Brian W. Kernighan, [Dennis M. Ritchie](#), "C Programming Language", 2nd Edition,1988.

#### ***References:***

- Yashwant Kanetkar, "Let us C", BPB Publication,8<sup>th</sup> Edition 2008.
- P.K. Sinha, "Computer Fundamentals", BPB Publications, 4<sup>th</sup> Revised Edition, 2004.
- Yashwant Kanetkar, "Understanding Pointers in 'C' ", BPB Publications,,3<sup>rd</sup> Edition,2003

## **Course Title: Computer and Information Technology**

### **Course Objectives:**

The course objective is to

- Provide the basic knowledge of computer system, its history
- Provide basic knowledge of architecture and components of a computer system
- Provide knowledge about number systems and their conversions
- Provide skills to programming concepts like flowchart, algorithms and pseudocode

**Pre-requisites: None**

### **Student Learning Outcomes:**

- Explain the architecture and different units of a computer system.
- Describe different number systems and their conversions
- Categorize the use of Information Technology system basics
- Explain the use of operating system,
- Explain concept of programming concepts

<b>Course Content</b>	<b>Weightage (%)</b>
<b>Module I :</b>	<b>20</b>



<b>Descriptors/Topics :</b> Introduction to computers; History and Evolution; Generation of Computer; Applications of Computers; Capabilities and Limitations; Components of a computer system - Control Unit, ALU, I/ O Devices, Memory – RAM, ROM, EPROM, PROM, Flash Memory and other types of memory;	
<b>Module II:</b>	<b>20</b>
<b>Descriptors/Topics ;</b> Introduction to Number Systems – Binary, Hexadecimal, Octal, BCD; Conversion between number systems; One’s Complement; Two’s Complement; Boolean Algebra and Laws;	
<b>Module III :</b>	<b>20</b>
<b>Descriptors/Topics ;</b> Introduction to IT; Need of IT; Introduction to information storage and processing; Role and Applications of IT; Internet; WWW; Different Type of software; Introduction to information systems; Business data processing;	
<b>Module IV :</b>	<b>20</b>
<b>Descriptors/Topics :</b> Operating System: Definition and use; Types of OS: Batch Processing, Multiprogramming, Multi-Tasking, Multiprocessing; Data Communication	
<b>Module V:</b>	<b>20</b>
<b>Descriptors/Topics :</b> Introduction to Programming Concepts – Define program; Process of programming; Algorithms; Introduction to flowcharts; Basic symbols and drawing of flow charts; Advantages and limitations of flow charts; Pseudocodes – Sequence logic, Selection logic, Iteration logic, Advantage and disadvantages;	

**Text Books:**

1. Gill, Nasib S.: Essentials of Computer and Network Technology, Khanna Book Publishing Co., New Delhi.
2. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.
3. Chhillar, Rajender S.: Application of IT in Business, Ramesh Publishers, Jaipur.
4. Donald Sanders: Computers Today, McGraw-Hill Publishers.
5. Davis: Introduction to Computers, McGraw-Hill Publishers.
6. V. Rajaraman : Fundamental of Computers, Prentice-Hall India Ltd., New Delhi.
7. Learning MS-Office2000 by R Bangia (Khanna Book Pub)
8. Teach yourself MS-Office by Sandler (BPB Pub).
9. Using MS-Office by Bott( PHI). Note: Latest and additional good books may be suggested and added from time to time , covering the syllabus

**Course Name: Basic Mathematics**

**Course Objective:**

The Objective of this course is to

- aimed to solve standard topical text book-level problems by analytical means
- Apply multiple concepts in the solution of a more sophisticated problem, which may be derived from a scientific application or from basic application.
- Model a topical problem from math, solve the problem, and report the results in the original problem context.

**Pre-requisites:**

Basic knowledge of Mathematics

**Student Learning Outcomes:**

After completion of the course, The student will be able to:

- To solve standard topical text book-level problems by analytical means.
- To apply multiple concepts in the solution of a more sophisticated problem, which may be derived from a scientific application or from basic application.
- To solve a topical in the original problem context.

**Course Contents/Syllabus:**

	<b>Weightage (%)</b>
<b>Module I: Set Theory and Matrices</b>	

Sets, Types of Sets, Basic Operations on Sets, Venn diagram, Cartesian product of two sets, Distributive law, De Morgan's Law, Matrix, Submatrix, types of matrices, symmetric, square, diagonal matrices, singular and nonsingular matrices. Addition, Subtraction, multiplication of matrices, Rank of matrix.	25
<b>Module II: Mathematical Logic</b>	
Basic Concepts, Propositions or Statements, Truth Table, Connectives and Compound Propositions, Implication, Bi-conditional of Connectives, Converse, Inverse and Contra positive of an Implication, Tautology, Logical Equivalence, Switching Circuits	20
<b>Module III: Group and Subgroup</b>	
Binary Operations, Properties of Binary Operations, Semi group, Monoid, Group, Subgroups and other Groups	20
<b>Module IV: Graph Theory</b>	
Graph, Multi Graph, Complete Graph, Bi Graph, Degree, isomorphic Graph, Euler Graph, Hamiltonian Graph, Bipartite Graph.	20
<b>Module V: Data Analysis</b>	
Data and Statistical Data, Frequency Distribution, Graphical Representation, Measure of the Central Tendency, Measure of Dispersion, Kurtosis, skewness.	15

- **Text:**
- Business Mathematics, Sancheti & Kapoor, S.Chand & Sons
  
- **References:**
- Discrete Mathematical Structure, Kolman, Busby and Ross, PHI

## **Course Name: Business Communication**

Course Objectives: This course is aimed to equip students with effective oral and written communication. In this course, students will learn Essential English grammar and English writing mechanics; Some theoretical inputs in to the process of communication, its difference between written and oral communication, and presentation skills, the process of writing, its different types and the correct format of business documents, job search creating resume participation in group discussion and interview.

### **Syllabus:**

#### **Module: I**

Essential English Grammar

#### **Module: II**

Written English communication

#### **Module III**

Concept and nature of communication

#### **Module IV**

Listening

#### **Module V**

Nonverbal communication

#### **Module VI**

Effective presentation

#### **Module VII**

Writing for the Web

#### **Module VIII**

Correspondence

**Module IX**

Reports

**Module X**

Employment communication

## **2<sup>nd</sup> Semester**

**Course Title: Data Structure Using C**

**Course Objectives:** - The aim of this course is to

- Impart in-depth knowledge of data structure and its implementation in computer programs.
- Make students understand the concepts of linear and nonlinear data structure.
- Illustrate asymptotic notations and their usage.

**Pre-requisites:** - 'C' language

**Course Learning Outcomes:**

After successful completion of this course, the student will be able to

- Apply advance C programming techniques such as pointers, dynamic memory allocation, structures to developing solutions for problems.

- Development of stack and queue data structures for solving real world problems.
- Describe and implement abstract data types such as linked list, stack, queue and tree by using ‘C ‘ for static and dynamic implementations.
- Analyze, and evaluate appropriate abstract data types and algorithms to solve problems.
- Describe and implement trees by using ‘C’ for static and dynamic implementations,
- Analyze and implement graph theory and its applications.

### Course Contents: -

	<b>Weightage (%)</b>
<b>Module I: Introduction to Data Structures</b>	<b>15</b>
Definition, Types. Algorithm design, Complexity, Time-Space Tradeoffs. Use of pointers in data structures.  Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing of Linear Arrays, Insertion And Deletion, Single Dimensional Arrays, Two Dimensional Arrays, Multidimensional Arrays, Function Associated with Arrays, Character String in C, Character String Operations, Arrays as parameters, Implementing One Dimensional Array, Sparse matrix.	
<b>Module II: Stacks and Queues</b>	<b>15</b>
Definition, Array representation of stacks, Operations Associated with Stacks- Push & Pop, Polish expressions, Conversion of infix to postfix, infix to prefix (and vice versa), Application of stacks recursion, polish expression and their compilation, conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem.  <b>Queue:</b> Definition, Representation of Queues, Operations of queues- Insert, Delete, Priority Queues, Circular Queue, Deque.	
<b>Module III : Programming with Linked Lists</b>	<b>20</b>
Introduction to Singly linked lists: Representation of linked lists in memory, Traversing, Searching, Insertion into, Deletion from linked list, Garbage collection and compaction, doubly linked list, operations on doubly linked list, circular linked list, operations on circular linked list, generalized list. Applications of Linked List-Polynomial representation using linked list and basic operation. Stack and queue implementation using linked list.	
<b>Module IV :Trees</b>	<b>20</b>

<b>Trees:</b> Basic Terminology, Binary Trees and their representation, expression evaluation, Complete Binary trees, extended binary trees, Traversing binary trees, Searching, Insertion and Deletion in binary search trees, General trees, AVL trees, Threaded trees, B trees.	
<b>Module V: Searching and Sorting Techniques</b>	<b>15</b>
Insertion Sort, Bubble sort, Selection sort, Quick sort, Merge sort, Heap sort, Partition exchange sort, Shell sort, Sorting on different keys, External sorting. Linear search, Binary search, Hashing:,Hash Functions, Collision Resolution Techniques.	
<b>Module VI: Graph and Their Applications</b>	<b>15</b>
Introduction, Graph Theory Terminology, Sequential Representation of Graph (Adjacency and Path Matrix), Warshall Algorithms, Linked Representation of Graph, Different Operations on Graphs, Traversing A Graph(DFS, BFS)., Spanning Trees-Introduction .Representation of Spanning tree, Constructing A Spanning Tree(Prim's Algorithm, Kruskal's Algorithm).	

**Pedagogy for Course Delivery:** - Subject will be taught based on lectures and practical will be conducted in blended/flipped mode. Particular emphasis will be given on practical explaining use case scenario for various algorithms. Focus will be on student's involvement while imparting the course contents.

#### Self-Work/ Professional Skill Development activities

<b>Module 1</b>	<p><b>Introduction to Data Structures</b></p> <ol style="list-style-type: none"> <li>1. What is Data Structure? What are their types and subtype? Explain each of subtype with examples in details.</li> <li>2. Define O notation of time complexity.</li> <li>3. Write a program in C++ which accepts an integer array and its size as arguments/parameter and assign the elements into two-dimension array of integers in the following format. If the array is 1 2 3 4 5 6  <pre> 1 2 3 4 5 6 1 2 3 4 5 0 </pre> </li> </ol>
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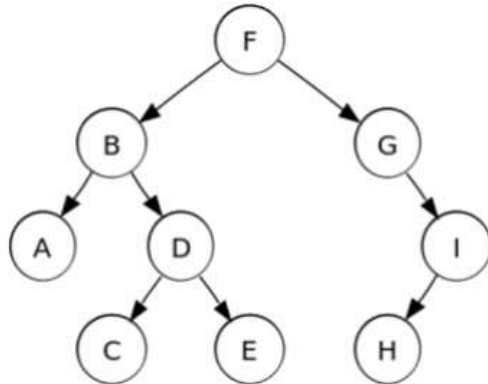


	<pre> 1 2 3 4 0 0 1 2 3 0 0 0 1 2 0 0 0 0 1 0 0 0 0 0 </pre> <p>4. Each element of an array DATA [1...10][1...10] requires 8 bytes of storage. If base address of array DATA is 2000, determine the location of DATA[4][5], when the array is stored</p> <ol style="list-style-type: none"> <li>Row-wise</li> <li>Column-wise</li> </ol> <p>5. Write a function in C++, which accepts an integer array and its size as arguments and swap the elements of every location with its following odd location.</p> <ul style="list-style-type: none"> <li>Example: If an array of nine elements initially contains the elements as 24,1,6,7,9,23,10 then the function should rearrange the array as 4,2,6,1,7,5,23,9,10.</li> </ul> <p>6. Write a program to calculate the upper triangle of a square matrix.</p> <p>7. <b>Differentiate file structure from storage structure.</b></p>
<b>Module 2</b>	<p><b>Stacks and Queues</b></p> <ol style="list-style-type: none"> <li>Evaluate the following postfix expression using a stack and show the contents of stack after execution of each operation: 120,45,20,+,25,15,-,+,*</li> <li>Discuss the various applications of stacks. Also write an algorithm to PUSH and POP an element into the Stack.</li> <li>What is difference between an array and a stack housed n an array? Why stack is called LIFO data structure? Explain how push and pop operation are implemented on a stack.</li> <li>Write a program to implement Stack using array, also show overflow and underflow in respective push and pop operations.</li> <li>Explain Push, Pop and Peep operation with algorithm.</li> <li>What is Tower of Hanoi problem in C? Write a program to implement it.</li> <li>Write a program to implement the operation of queue-Insert, Delete and explain the Priority Queues.</li> <li>Write a program for circular queues.</li> </ol>
<b>Module 3</b>	<p><b>Programming with Linked Lists</b></p> <ol style="list-style-type: none"> <li>What is the limitation of sequential data structures?</li> <li>Define sparse matrix.</li> </ol>

3. Write a program to implement Linear Linked List, showing all the operations, like creation, display, insertion, deletion and searching.
4. Write a program to implement Stack, using Linked List. Implement Push, Pop and display operations.
5. Write a program to implement Queue, using Linked List. Implement Insertion, deletion and display operations.
6. Write a program to count the number of times an item is present in a linked list.
7. Write a program to increment the data part of every node present in a linked list by 10. Display the data both before incrementation and after.
8. Write a program to implement Doubly Linked List, showing all the operations, like creation, display, insertion, deletion and searching.
9. Write a program to create a Binary Search Tree and display its contents using recursive preorder, postorder and inorder traversal.

### Trees

1. Define tree, degree of node and siblings.
2. List out type's binary tree.
3. What is the difference between full binary tree & complete binary tree?
4. Trace the binary tree of preorder traversal: PFBHGSRYTZW.
5. Create a binary tree using in-order and pre-order traversal  
 Inorder : DBHEAIFJCG  
 Preorder : ABDEHC FIJG
6. Using the following binary tree traverse it into inorder, preorder and postorder:



7. Write an algorithm to delete an element x from a binary search tree t. Discuss your method with an example.
8. Write a program to create a Binary Search Tree and display its contents using preorder, postorder and inorder traversal.

<p><b>Module 4</b></p>	<p><b>Searching and Sorting Techniques</b></p> <ol style="list-style-type: none"> <li>1. Write down complexity of all sort and in which situation those sorts should be used?</li> <li>2. Which sorting techniques is an application of recursion?</li> <li>3. Use the selection sort to put the number 3, 2, 4, 1, 5 into increasing order. Illustrate the output returned in each pass clearly. Also, write the pseudo algorithm to it.</li> <li>4. Write a program to sort the given array using MergeSort.</li> <li>5. Write a program of Graph traversal-Depth first search and Breadth first search.</li> <li>6. Trace quick sort on the list L= {11, 34,67, 78, 78, 78, 99}.What are your observations?</li> <li>7. Write the program for heap sort.</li> <li>8. What is hashing and hash function in data structure explain in detail.</li> <li>9. What is a collision resolution technique in data structure?</li> </ol>
<p><b>Module 5</b></p>	<p><b>Graph and Their Applications</b></p> <ol style="list-style-type: none"> <li>1. Write a program of Graph traversal-Depth first search and Breadth first search.</li> <li>2. Construct a Spanning Tree and calculate the minimum cost using Prim's and Kruskal's Algorithm.</li> <li>3. Explain Warshall Algorithms and write a program to implement it.</li> <li>4. What is Sequential Representation of Graph (Adjacency and Path Matrix).</li> <li>5. Explain different Operations on Graphs.</li> </ol>

**List of Experiments:**

1. Write a program to search an element using Linear Search.
2. Write a program to search an element using Binary Search.
3. Write a program to sort the given array using Bubble Sort.
4. Write a program to sort the given array using Selection Sort.
5. Write a program to sort the given array using Insertion Sort.
6. Write a program to sort the given array using QuickSort.
7. Write a program to sort the given array using MergeSort.
8. Write a program to insert a new element in the given unsorted array at k<sup>th</sup> position.
9. Write a program to delete an element from given sorted array.

10. Write a program to merge to given sorted arrays.
11. Write a program to implement Stack using array, also show overflow and underflow in respective push and pop operations.
12. Write a program to implement Queue using array, which shows insertion and deletion operations.
13. Write a program to implement Circular Queue using array, which shows insertion and deletion operations.
14. Write a program to implement Linear Linked List, showing all the operations, like creation, display, insertion, deletion and searching.
15. Write a program to implement Stack, using Linked List. Implement Push, Pop and display operations.
16. Write a program to implement Queue, using Linked List. Implement Insertion, deletion and display operations.
17. Write a program to count the number of times an item is present in a linked list.
18. Write a program to increment the data part of every node present in a linked list by 10. Display the data both before incrimination and after.
19. Write a program to implement Doubly Linked List, showing all the operations, like creation, display, insertion, deletion and searching.
20. Write a program to create a Binary Search Tree and display its contents using recursive preorder, postorder and inorder traversal.
21. Write a program to implement deletion of a node in binary search tree.
22. Write a program to implement Binary tree and display the contents using non-recursive preorder, postorder and inorder traversal techniques.
23. Write a program to sort the given array using HeapSort.
24. Write a program of Graph traversal-Depth first search and Breadth first search.
25. Write a program to implement Prim's algorithm
26. Write a program to implement Kruskal algorithm.

***Text:-***

- Yashwant Kanetkar,"Data Structure using C", BPB Publication, 5<sup>th</sup> Edition ,2011
- A.Tannenbaum,Y. Lanhgsam and A.J. Augenstein ," Data Structures Using C And C++ ",Prentice Hall of India,2<sup>nd</sup> Edition,2009.
- Jean-Paul Tremblay, P.G Sorenson, "An Introduction to Data Structures with applications", Mcgraw-Hill ,2nd Edition ,1984.

***References:-***

- Robert L Kruse, "Data Structure and Program Design in C", Prentice Hall (1991).
- Noel Kalicharan ,"Data Structure in C" ,Ist Edition Create space publisher, 2008.
- Mark Allen Weiss,"Data Structure and algorithm Analysis in C",2<sup>nd</sup> Edition AddisonWesley,1996.
- E. Balagurusamy, "Problem Solving through C language", TMH publication, Fourth Edition, 2008.
- R.S Salaria ,"Data Structures & Algorithms using C",Khanna Publication,4<sup>th</sup> Edition,2009
- E.Horowitz and S.Sahni,"Fundamentals of Data Structures in C ",2<sup>nd</sup> Edition, Universities Press,2008.

## **Course Title: Environmental Studies**

### Course Objectives:

- The goal of this course is to provide students with the scientific background needed to understand how the Earth works and how we, as human beings, fit into that. At the end of the course, it is
- expected that students will be able to identify and analyze environmental problems as well as the risks associated with these problems and understand what it is to be a steward in the environment, studying how to live their lives in a more sustainable manner.

### Course Contents/Syllabus:

#### Module I : Multidisciplinary nature of environmental studies

Introduction, definition and importance of environmental studies, need for public awareness, sensitisation and participation

#### Module II : Natural Resources

Types of natural resources, natural resource conservation, Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles. 2. Land resources: Land as a resource, land degradation, man induced landslides, Land resources: soil erosion and desertification. 3. Natural Resources: Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. 4. Natural Resources: Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. 5. Natural Resources: Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. 6. Natural Resources: Food resources: World food problems, changes caused by agriculture and overgrazing, Food resources effects of modern agriculture, fertilizerpesticide problems, water logging, salinity, case studies. 7. Natural Resources: Energy resources: Growing energy needs, Energy resources renewable and non-renewable energy sources, Energy resources use of alternate energy sources, case studies. 8. Role of individual in conservation of natural resources 9. Equitable use of resources for sustainable lifestyles.

#### Module III : Ecosystems

1. Concept of an ecosystem, 2.Types of ecosystem, 3.Structure and function of an ecosystem, Producers, consumers and decomposers. 4.Energy flow in the ecosystem, Food chains, food webs and ecological pyramids. 5.Ecological succession. 6. Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem and Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

#### Module IV : Environmental Pollution

Definition Cause, effects and control measures of :- a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards Solid waste Management : Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management : floods, earthquake, cyclone and landslides

#### Module V : Social Issues and the Environment

Environment From Unsustainable to Sustainable development Urban problems related to energy Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns. Case Studies Environmental ethics : Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Case Studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act Wildlife Protection Act Forest Conservation Act Issues involved in enforcement of environmental legislation. Public awareness.

#### Module VI: Human Population and the Environment

Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health.

Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.

#### Module VII: Field Work

Visit to a local area to document environmental assets-river/forest/grassland/ hill/mountain. - Visit to a local polluted site Urban/Rural/Industrial/Agricultural. - Study of common plants, insects, birds. - Study of simple ecosystems-pond, river, hill slopes, etc.

#### Module VIII: Biodiversity

Introduction - Definition: genetic, species and ecosystem diversity 2. Biogeographical classification of India 3. Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values 4. Biodiversity at global, national and local levels, India as a mega-diversity nation 5. Hot-spots of biodiversity, 6. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts 7. Endangered and endemic species of India 8. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity 9. Biological Diversity Act, 2002

#### Student Learning Outcomes:

- Student can recognize the environmental problem associated with development
- Apply the gained knowledge for the environmental conservation and its sustainability
- Demonstrate an integrative approach to deal with environmental issues with a focus on sustainable environmental management.
- Develop an ability to integrate the disciplines related to environmental concerns.
- Formulate the critical thinking skills for environmental protection

#### Text & References:

- Gauba Dhawan and Bisht Environmental Studies, Challenges & Solutions A quick Compendium.
- Somvanshi and Dhupper, Fundamentals of Environmental Studies.
- Kaushik and Kaushik, Fundamentals of Environmental Studies.
- Asthana and Asthana, A textbook of Environmental Studies.

**Course Title: INDIVIDUAL EXCELLENCE AND SOCIAL DYNAMICS**

**Credit Units: 3**

**Course Level: UG**

**Course Objectives:**

- To understand attitudes and its relevance with personality
- To relate Emotional Competency with Power of Motivation
- To explain of Values, Ethics & Morality among students
- To discuss cultural and social dynamics

**Pre-requisites: ----**

**Course Contents/Syllabus:**

	<b>Weightage (%)</b>
<b>Module I: Understanding Self for Effectiveness</b>	
<b>Descriptors/Topics</b> <ul style="list-style-type: none"><li>• Understanding Personality</li><li>• Role of Nature and Nurture in Personality Developme</li><li>• TEA Model of Self</li><li>• Component of Self</li><li>• Real Self, Role Self, Ideal Self</li><li>• Self-Awareness</li><li>• Techniques of Self Awareness – Johari Window and SWOT Analysis of Self</li><li>• Big 5 factor</li><li>• Meaning and nature of attitude</li><li>• Components and Formation of attitude</li></ul>	<b>20%</b>

<ul style="list-style-type: none"> <li>• Importance and relevance of attitude</li> <li>• Attitudinal Change</li> <li>• Prejudice, Discrimination, Stereotype</li> <li>• Building Positive Attitude</li> </ul>	
<b>Module II: Motivation and Emotional Intelligence</b>	
<b>Descriptors/Topics</b> <ul style="list-style-type: none"> <li>• Understanding Emotions</li> <li>• Types of Emotions</li> <li>• Function of Emotions</li> <li>• Positive emotions and Personal development</li> <li>• Creating healthy organizational climate</li> <li>• Emotional Intelligence – Meaning, components, Importance and Relevance</li> <li>• Managing Emotions</li> <li>• Motivation; Meaning, Types of Motivation, Components of Motivation</li> <li>• Source of Motivation</li> </ul>	<b>20%</b>
<b>Module III: Social and Behavioral Issues</b>	
<b>Descriptors/Topics</b> <ul style="list-style-type: none"> <li>• Social issues in Community</li> <li>• Healthy management of Social Issues:</li> <li>• Social and Psychological Stigma</li> <li>• Strategies to overcome Social Stigma</li> <li>• Behavioural Problems</li> <li>• Rumors; Social Media, Electronic Media</li> <li>• Nature of Socialization</li> <li>• Types of Socialization</li> <li>• Agents of Socialization and their Contribution</li> <li>• Social Inhibition and Social facilitation</li> </ul>	<b>15%</b>
<b>Module IV: Managing Diversity for Peace and Harmony</b>	



<p><b>Descriptors/Topics</b></p> <ul style="list-style-type: none"> <li>• Individual Differences</li> <li>• Understanding Diversity</li> <li>• Barriers and Challenges in Managing Diversity</li> <li>• Managing Diversity in Organisation</li> <li>• Tolerance</li> <li>• Harmony</li> <li>• Pro-Social Behaviour</li> <li>• Social Change</li> <li>• Sense of pride and standings up for one’s right</li> <li>• Integrity and accountability</li> <li>• Fundamental duties for a good Citizen</li> </ul>	<p><b>15%</b></p>
<p><b>Module V: Values and Ethics for Personal and Professional Development</b></p>	
<p><b>Descriptors/Topics</b></p> <ul style="list-style-type: none"> <li>▪ Personal values-Empathy, honesty, courage, commitment</li> <li>▪ Core Values</li> <li>▪ Values Clarification &amp; Acceptance</li> <li>▪ Nurturing Good values</li> <li>▪ Professional Values-Work ethics, respect for others</li> <li>▪ Its role in personality development</li> <li>▪ Moral Dilemma’s</li> <li>▪ Value Prioritization</li> <li>▪ Learning based on project work on Scriptures like- Ramayana, Mahabharata, Bible, Quran, Gita etc.</li> </ul>	<p><b>15%</b></p>
<p><b>Module VI: Human Interface and Organizational Justice</b></p>	
<p><b>Descriptors/Topics</b></p> <ul style="list-style-type: none"> <li>▪ Types of Judgment (Factual Aesthetic, Moral)</li> <li>▪ Domains in study of Ethics (Applied, Normative &amp; Meta Ethics)</li> <li>▪ Ethics in Technological Era</li> <li>▪ Meaning, Types of Organizational Justice,</li> <li>▪ Implications of Organizational Justice</li> </ul>	<p><b>15%</b></p>

**Course Learning Outcomes:**

The student will be able to:

- Relate attitudes and its relevance with personality
- Practice emotional Competency with power of motivation
- Apply values, ethics & morality in daily practices
- Demonstrate behavioral skills in social and cultural dynamics

**Pedagogy for Course Delivery:** Lectures, PPT Presentation, Activities, Psychometric testing, Group Discussion, Role Plays, Situational Analysis, Project etc.

**Professional Skills Development Activity:**

**PSDA 1:** The students will project the skills acquired while steering through the course content in the form of learning journal.

**PSDA 2:** The students will be given real life situation for reflection of behavioural Skills and developing solutions. They will be evaluated on analytical skills and applicability of the solution.

**PSDA 3:** The students will make a minor project to reflect how behavioural skills and their technical skills make a perfect blend for achieving success.

## **Course Name: Software Engineering and Modelling**

### **Course Objective:**

The Objective of this course is to

- To describe how a given software implementation will affect its surroundings.
- To address the requirements and planning of an Information System.
- To acquire knowledge about design and development of various software process models and Information system tools.
- To apply standard coding practice in developing of software project.
- To expose the students to a variety of topics such as software testing methods, costing techniques.
- To know about planning and management of software projects as per industry standard.

### **Pre-requisites:**

NIL

**Course Contents/Syllabus:**

	<b>Weightage (%)</b>
<b>Module 1: Introduction to Software Engineering.</b>	
<ul style="list-style-type: none"><li>• What and Why Software Engineering,</li><li>• Software Crisis–Problem and Causes.</li><li>• Responsibility of Software Engineering,</li><li>• Fundamental Qualities of a Software Product,</li><li>• Kinds of Software Life-Cycle Models and Case Study</li></ul>	<b>15</b>
<b>Module II Software Requirement Engineering</b>	
<ul style="list-style-type: none"><li>• Traditional Methods for Requirement Determination.</li><li>• Modern Methods for Requirement Determination.</li><li>• Process Modeling using DFD</li><li>• Data Modeling using ERD.</li><li>• Requirement documentation;</li><li>• Case Study</li></ul>	<b>15</b>
<b>Module III Coding</b>	
<ul style="list-style-type: none"><li>• Programming Practices,</li><li>• Top down Approach &amp; Bottom up Approach,</li><li>• Structure Programming,</li><li>• Information hiding,</li><li>• Paired Programming</li></ul>	<b>10</b>
<b>Module IV: Software Design</b>	
<ul style="list-style-type: none"><li>• Software Design Process and Design Objectives</li><li>• Structured Design Methodologies.</li><li>• Modules Coupling and Cohesion,</li><li>• Types of Coupling and Cohesion</li><li>• Structured Chart,</li><li>• Qualities of Good Software Design,</li></ul>	<b>20</b>
<b>Module V: Software Testing</b>	

<ul style="list-style-type: none"> <li>• Introduction to Software Testing</li> <li>• Level of Testing</li> <li>• Characteristics of software testing,</li> <li>• Black-Box Testing and White-Box Testing,</li> <li>• Alpha, Beta and Gamma testing</li> </ul>	<b>20</b>
<b>Module VI: Software Project Planning and Management</b>	
<ul style="list-style-type: none"> <li>• Software Project Planning,</li> <li>• Software Metrics,</li> <li>• Cost and Size Metrics- FP &amp; COCOMO.</li> <li>• Configuration Management,</li> <li>• Software Maintenance and Types of Maintenance</li> </ul>	<b>20</b>

### LAB EXERCISE

To test programming skills & case study for a static website

To test aspects of online marketing, payment mechanisms and try to Redefine SRS of previously made projects.

Derive FP using Size-Oriented metrics

Derive LOC based estimation for size-oriented metrics

DFD and ERD diagram

Class Diagram in UML

Use Case Diagram in UML

State Diagram in UML

Object Diagram in UML

Activity Diagram in UML

Sequence Diagram in UML

Collaboration Diagram in UML

Component Diagram in UML

## Deployment Diagram in UML

### **Student Learning Outcomes:**

After completion of the course, The student will be able to:

- Apply standard coding practice in developing of software project
- Review the principles and procedures of software planning and development of software project.
- Describe and Employ the concept of Software Life Cycle Model and Quality Concepts in various Software project.
- Demonstrate the ability to perform software testing for different types of software application.

### **Text & References:**

#### **Text Books:**

- An Integrated Approach to Software Engineering, Pankaj Jalote, 2015
- Software Engineering Concepts, Richard Fairley.2016.
- K. K. Aggarwal and Yogesh Singh, “Software Engineering”, New Age International, 3rd Ed., 20017.

#### **Reference Books:**

- Software Engineering, A Practitioner’s Approach – Roger S. Pressman.2015

### **Course Title: OPERATING SYSTEM CONCEPTS**

#### **Course Objectives:**

The course objective is to

- Provide the basic knowledge of the concepts involved in designing and working of an operating system
- Understand how it acts as a resource manager of the system as a whole.
- Describe how CPU management takes place through multiprocessing and switching between various processes.
- Discuss various issues such as Memory conflicts and how these conflicts are resolved by an operating system

#### **Prerequisites:**

NIL

#### **Course Learning Outcomes:**

The student will be able to:

- Explain the objectives and functions of modern operating systems.
- Describe the logical structure of, and facilities provided by, a modern operating system.
- Analyze the tradeoffs inherent in operating system design.
- Demonstrate practical experience of mechanisms for handling situations of deadlock among processes.
- Categorize different ways of implementing virtual memory.

<b>Module I Introduction</b>	<b>Weightage(%)</b>
Introduction to Operating System and its need; Operating System Services; Classifications: Batch Operating System; Multiprogramming Operating System; Time Sharing Operating System; Real Time Systems, Multiprocessor Systems, Distributed Systems.	20
<b>Module II Processes Management</b>	
Process Concept; States of Process; Process State transitions , Process Control Block ,Operation on processes;Context switching; Interprocess Communication; Process Scheduling; CPU Scheduler and Basic Concepts; Scheduling Criteria; CPU Scheduling Algorithms: FCFS, SJF, Round Robin & Queue Algorithms; Deadlocks: Deadlock Characterization; Deadlock Prevention; Deadlock Avoidance; Deadlock Recovery	20
<b>Module III Memory Management</b>	
Introduction to memory management and its significance; logical vs physical address space; Contiguous allocation: Single partition allocation and multiple partition allocation; Fragmentation; Memory Management Techniques: Paging, Segmentation, Virtual Memory, Demand Paging; Page Replacement algorithms: First In First Out algorithm, Least Recently Used Algorithm, Optimal Algorithm.	20
<b>Module IV File and Device Management</b>	
Types of Files; File Access Methods ; File Allocation Methods: Contiguous, Linked and Index Allocation; I/O Devices; Device Controllers; Device Drivers; Directory Structure: Single Level, Tree Structured, Acyclic Graph and General Graph Directory, File Protection	20
<b>Module V Security and Protection</b>	
Security Policies and Mechanism; Protection and Access Control: Access Matrix Model of Protection, Access Hierarchies, Access List, Capabilities	20

**Text:**

:

- Silberschatz Galvin Gagne, Operating Systems Concepts, Wiley Publication, Nine Edition, 2012.
- A S Tanenbaum, Modern Operating Systems, Prentice Hall of India New Delhi, Fourth Edition, 2015.

***References:***

- Maurice J. Bauch , Design of UNIX Operating System, Prentice Hall of India, Third Edition, 2007
- SibsankarHaldar Operating Systems,Pearson Publications, First Edition, 2010
- Garry Nutt, Operating Systems, Pearson Publications, Third edition, 2004
- Andrew S. Tanenbaum, Modern Operating Systems, 2nd Edition; GOAL Series, 2004.
- Evi Nemeth, Garth Snyder, *The UNIX System Administration Handbook*, Prentice Hall, First Edition, 2014
- Iain D. Craig , virtual machines, First Edition, Springer, 2005

**Any Other Reading/Study Materials:**

NPTEL Lecture Series: <https://nptel.ac.in/courses/106/108/106108101/>



**Course Title: Green  
Computing**

**Course Objectives:** To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment, skill in energy saving practices in their use of hardware, examine technology tools that can reduce paper waste and carbon footprint by user, and to understand how to minimize equipment disposal requirements

**Pre-requisites:** Basics Sciences

**Course Contents/Syllabus:**

**Module I FUNDAMENTALS**

Descriptors/Topics Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

**Module II GREEN ASSETS AND MODELING**

Descriptors/Topics Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

**Module III GRID FRAMEWORK**

Descriptors/Topics: Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

**Module IV GREEN COMPLIANCE**

Descriptors/Topics

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

**Module V CASE STUDIES**

**Text & References:**

**TEXT BOOKS:**

1. Bhuvan Unhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2009.
2. Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August 2009.

**REFERENCES:**

1. Alin Gales, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for the Journey”, Shoff/IBM rebook, 2011.
2. John Lamb, “The Greening of IT”, Pearson Education, 2009.

3. Jason Harris, "Green Computing and Green IT- Best Practices on regulations & industry", Lulu.com, 2008.
4. Carl speshocky, "Empowering Green Initiatives with IT", John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), "Green computing: Large Scale energy efficiency", CRC Press, 2012.

# 3<sup>rd</sup> Semester

## Course Title: Computational Statistics

### Course Objectives:

After studying the concept of random variables in probability theory, the knowledge of Statistical distributions as well as the parameters determining them are of paramount significance. It gives the idea, how the total probability is distributed among the possible values of random variables. The main objective of the course is to provide the detailed knowledge of the characterization of all the useful discrete, absolutely continuous and singular distributions. Interrelations of various Statistical Models producing different families require further investigations. With the exploration of the concepts the students will be able to formulate the mathematical/statistical models for real data set arising in various fields. Also characterize a property which is possessed by a distribution and that distribution alone.

### Prerequisites:

NIL

### Student Learning Outcomes:

#### The student will be able to:

- Formulate solutions using different charts and graphs.
- Distinguish between probability models appropriate to different chance events
- Appraise problems using probability.
- Develop the solution of the problems based on probability space and limit theorems.
- Apply solution of the problems based on Correlation coefficient and Regression coefficient.

Course Contents / Syllabus:		
4	<b>Module I:</b>	<b>20% Weightage</b>
	Concept of statistical population, Attributes and variables (discrete and Continuous). Different types of scales – nominal, ordinal, ratio and interval. Primary data – designing a questionnaire and schedule, collection of primary data, checking their consistency. Secondary data. scrutiny of data for internal consistency and detection of errors of recording. Presentation of data :	

	classification, tabulation, diagrammatic & graphical representation of grouped data. Frequency distributions, cumulative frequency distributions and their graphical representations, histogram, frequency polygon and ogives. Stem and Leaf plot. Box Plot.	
<b>5</b>	<b>Module II:</b>	<b>20% Weightage</b>
	Measure of central tendency and dispersion, merits and demerits of these measures. Moments and factorial moments. Shephard's correction for moments. Skewness and Kurtosis and their Measures. Measures based on quartiles. Bivariate data, Method of least squares for curve fitting.	
<b>6</b>	<b>Module III:</b>	<b>30% Weightage</b>
	Correlation and regression, rank Correlation (Spearman's and Kendall's measure), Intra-class correlation, correlation ratio. Partial and Multiple Correlation & Multiple Regression for Trivariate data.	
<b>7</b>	<b>Module IV:</b>	<b>30% Weightage</b>
	consistency. Association of attributes, Independence, Measure of association for 2x2 table. Chi-square, Karl Pearson's and Tschuprow's coefficient of association. Contingency tables with ordered categories.	
<b>8</b>	<b>Pedagogy for Course Delivery:</b> The class will be taught using theory and practical methods using software in a separate Lab sessions. In addition to numerical applications, the real life problems and situations will be assigned to the students and they are encouraged to get a feasible solution that could deliver meaningful and acceptable solutions by the end users. The focus will be given to incorporate probability and related measures to develop a risk model for various applications.	

**Text & References:**

1. Goon, Gupta & Dasgupta: Fundamentals of statistics. Vol. I. The world press Private Ltd., Calcutta.
2. Yule, G.U. and Kendall, M.G.: An Introduction to the theory of statistics. Charles Griffin & Company Ltd.

## Course Title: Network Basics

### Course Objectives:

- This course is aimed to provide a fundamental understanding of Computer Networking, Operating System, Connecting to the networks, network addressing, network services and Wireless technologies etc.
- After the completion of the course you will understand the core concepts around which computer networks revolve.

**Pre-requisites:** Basic knowledge of computers

### Course Contents/Syllabus:

	Weightage (%)
<b>Module I Exploring the Network</b>	5
Introduction, Communicating in a Network-Centric World, The Network as a Platform, Converged Networks, LANs, WANs, and the Internet, The Expanding Network, Network Architectures.	
<b>Module II Configuring a Network Operating System</b>	10
Configuring a Network Operating System, IOS Bootcamp, Limiting Access to Device Configurations, Address Schemes.	
<b>Module III Network Protocols and Communications</b>	10
Introduction, Network Protocols and Standards, Reference Models, Using Requests for Comments, Moving Data in the Network.	
<b>Module IV Application Layer and Transport Layer</b>	15
Introduction, Application Layer Protocols, How Application Protocols Interact with End-User Applications, Well-Known Application Layer Protocols and Services, Transport Layer, Transport Layer Protocols, Introducing TCP and UDP, TCP Communication, UDP Communication.	
<b>Module V Network Layer, IP Addressing and Subnetting</b>	25
Network Layer Protocols, Characteristics of the IP Protocol, IPv6 Packet, Routing, Routers, Configuring a Cisco Router, IPv4 Network Addresses, Types of IPv4 Addresses, IPv6 Network Addresses, Types of IPv6 Addresses, Subnetting IP Networks, Subnetting an IPv4 Network, Addressing Schemes, Design Considerations for IPv6, Subnetting an IPv6 Network.	
<b>Module VI Network Access and Ethernet Technology</b>	25

Data Link Layer, Layer 2 Frame Structure, Media Access Control, Topologies, WAN Topologies, Physical Layer, Network Media, Ethernet, Ethernet Protocol, Address Resolution Protocol, LAN Switches.	
<b>Module VII It's a Network</b>	10
Introduction, Create and Grow, Devices in a Small Network, Growing to Larger Networks, Keeping the Network Safe, Basic Network Performance, Managing IOS Configuration Files.	

**Course Learning Outcomes:** After completion of this course students should be able to

- Set up a personal computer system including operating system, interface card and peripheral devices.
- Plan and install a home and small business network and connect to the internet. Verify and troubleshoot network and internet connectivity. Configure basic IP services via GUI interface.
- Recognize and mitigate security threats to the home network.
- Configure and verify basic internet application.
- Configure and verify basic router and switches.
- Troubleshooting of basic network problems.

### List of Experiments:

- Lab1 : Researching Network Collaboration Tools
- Lab2 : Researching Converged Network Services
- Lab3 : Packet Tracer - Network Representation Instructions
- Lab4 : Packet Tracer - Navigating the IOS Instructions
- Lab5 : Establishing a Console Session with Tera Term
- Lab6: Configuring Initial Switch Settings Instructions
- Lab7 : Building a Simple Network
- Lab8: Implementing Basic Connectivity Instructions
- Lab9: Configuring a Switch Management Address
- Lab10: Researching Networking Standards
- Lab11 : Investigating the TCP/IP and OSI Models in Action Instructions
- Lab12: Using Wireshark to View Network Traffic
- Lab13 : Observing DNS Resolution
- Lab14: Exploring FTP
- Lab15 : Using Wireshark to Observe the TCP 3-Way Handshake
- Lab16 : Using Wireshark to Examine a UDP DNS Capture
- Lab17 Viewing Host Routing Tables
- Lab18 : Configure Initial Router Settings Instructions
- Lab19: Connect a Router to a LAN Instructions
- Lab20 : Identifying IPv4 Addresses

- Lab21 : Configuring IPv6 Addresses on Network Devices
- Lab22 : Troubleshooting IPv4 and IPv6 Addressing Instructions Lab
- 23: Implementing a Subnetted IPv6 Addressing Scheme Instructions
- Lab24 : Connecting a Wired and Wireless LAN Instructions
- Lab25 : Configure Layer 3 Switches Instructions
- Lab26 : Managing Device Configuration Files Using TFTP, Flash, and USB

### **Text Reading:**

- Network Basics companion guide by Cisco Networking Academy, Cisco Press, Edition 1, December 2013
- Mark Dye , Rick McDonald , Antoon Ruffi “Network Fundamentals, CCNA Exploration Companion Guide”, Cisco Press; Edition 1 December 2011

### **References:**

- Behrouz Forouzan., “Data Communication and Networking” McGraw-Hill Higher Education; 4 edition,2006
- William Stallings “ Data and Computer Communication” Prentice Hall; 10 edition, 2013
- Andrew S. Tanenbaum “ Computer Networks” Prentice Hall; 5 edition ,2010

### **Web References:**

- <https://cisco.netacad.com/>
- <http://10.0.2.19/ccna4.html>

## Course Title: INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

### Course Objectives:

The objectives of this course is to:

- To expose the students to the fundamentals & basic concepts in Data Base Management Systems.
- To discusses architecture of Database Systems with concept of relational model & ER model.
- To explain techniques for database design, Normalization and database recovery and protection.

### Pre-requisites:

Basic Knowledge of Programming Language

### Course Contents/Syllabus:

	Weightage (%)
<b>Module I Introduction to DBMS</b>	<b>20%</b>
<b>Descriptors/Topics</b> Definition of DBMS, Data Independence, DBMS Architecture, Levels, Database Administrator, File System Approach Vs DBMS Approach, Advantages of Using a DBMS, Data Models , Schemas, and Instances.	
<b>Module II Relational Database &amp; ER Model</b>	<b>20%</b>
<b>Descriptors/Topics</b> Relational System, Codd's Rule, Relational Model, Tables and Views, Entity, Types of Entity, Weak Entity Attributes , Entity sets , Entity – Relationship Diagrams, case study.	
<b>Module III Relational Model Objects</b>	<b>20%</b>
<b>Descriptors/Topics</b> Domains and Relations, Relational Data Integrity ; Primary Key, Candidate Key , Foreign Key and their rules; Relational operators, Relational Algebra, Relational Calculus, SQL Language, Data definition, Data retrieval and update operations.	
<b>Module IV Database Design</b>	<b>20%</b>
<b>Descriptors/Topics</b> Definition Of Functional Dependencies, Process Of Normalization, First Normal Form, Second Normal Form, Third Normal Form. Boycee Codd Normal Form, Fourth Normal Form, Fifth Normal Form, case study.	
<b>Module V Data Recovery &amp; Protection</b>	<b>20%</b>
<b>Descriptors/Topics</b> Recovery-Transaction recovery, System recovery, Media Recovery, Concurrency Control Techniques: Locking, Dead Lock, Introduction to Serializability, Security.	

### Course Learning Outcomes:



The student will be able to

- Reproduce good knowledge and understanding of the architecture and functioning of DBMS.
- Apply the ideas and practices of good database design using appropriate software.
- Identify the track of database technology and their implication so as to manage and plan database system developments.
  - Produce normalized relations with the use of various normalization techniques.
    - Apply the concurrency techniques for consistent data.

#### List of Self-Work activities:

<b>Activity 1</b>	Self-Work activities can be conducted by dividing the class into group of 3-4 students and same will be evaluated by board of faculty members along with the group report. Some of the suggested activities are: 1 Case study on Banking system 2. Case study on Automation system of marketing company 3. Case study on Healthcare system 4. Case study on Normalization 5. Case study on Airline company
<b>Activity 2</b>	Development of ER Diagram:  1. A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications. A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with on editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject. 2. A General Hospital consists of a number of specialized wards (such as Maternity, Paediatrics, Oncology, etc). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. 3. A database is to be designed for a Car Rental Co. (CRC). The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore the data about garages to be kept in the database includes garage names, addressees,

	<p>range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly the cash inflow coming from all sources - car hire, car sales, insurance claims - must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special credit card facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by credit card. All major credit cards are accepted. Personal details (such as name, address, telephone number, driving licence, number) about each customer are kept in the database.</p> <p>4. A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA(Hons) MSc, etc) within the framework of the modular system. The college provides a number of modules, each being characterised by its code, title, credit value, module leader, teaching staff and the department they come from. A module is co-ordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: some modules require pre-requisites modules and some degree programmes have compulsory modules. The database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance (i.e. modules taken and examination results).</p>
<b>Activity 3</b>	Implementation and description of SQL Functions: Date, Numeric, Character, Aggregate &etc.
<b>Activity 4</b>	Implementation of database query in the form of relational algebra and relational calculus

### Lab/ Practicals details:

#### List of Experiments:

<p>1) Create a table "PRODUCTS" with the below mentioned structure:</p> <p>Product ID NUMBER(11)  Supplier ID NUMBER(11)  Category ID NUMBER(11)  Quantity Per Unit VARCHAR2(20)  Unit Price NUMBER(11)  Units In Stock NUMBER(11)  Units On Order NUMBER(11)  Product ID should be the Primary Key.</p> <p>2) Consider the following tables:</p> <p>WORKS(Pname,Cname,Salary)  LIVES(Pname,Street,City)  LOCATED_IN(Cname,City)  MANAGER(Pname,Mgername)</p>	
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Where Pname=Person name, Cname= Company name and Mgrname = Manager name.

Write the SQL for the following:

- a) List the names of the people who work for the company Wipro along with the cities they live in.
- b) Find the people who work for the company “Infosys” with a salary more than Rs. 50000/-. List the names of the people , along with the street and city addresses.
- c) Find the names of the persons who live and work in the same city.
- d) Find the names of the persons who did not work for “Infosys”.
- e) Find the persons whose salaries are more than that of all of the “Oracle” employees.
- f) Find the names of the companies that are located in every city where the company “Infosys” is located.

3) Create table EMP and DEPT with the below mentioned structure

Structure for EMP table

EmpID NUMBER(4)

DeptID VARCHAR2(10)

EmpName CHAR(10)

Job CHAR(10)

HireDate DATE

Salary NUMBER(7, 2)

Commission NUMBER (7, 2)

Structure for DEPT table

DeptId VARCHAR2(10)

Deptname VARCHAR2(20)

No\_of\_Faculties NUMBER(2)

In table EMP : EmpID should be the Primary Key and DeptID should be the foreign key.

In table DEPT : DeptId should be the primary key.

4) INSERT the following values in the EMP table:

- a) 1001,SET\_01,Harrey,SE,01-Jan-2009,15000,3
- b) 1002,SET\_02, Ron, SSE,15-Feb-1998,20000,4
- c) 1003,SEM\_05, Peter, Manager,15-April-1999,40000,5
- d) 1002,SED\_07, Jolie,Assistant Manager,15-Dec-1998,50000,5
- e) 1008,SET\_08, Santy, SSE,15-Feb-2000,20000,4

f) 1008,SED\_10, San, SE,10-Feb-2009,22000,5

5) Considering the above table i.e EMP write the queries for the following:

- a) Find out the number of employees having “manager” as job.
- b) Display only the jobs with maximum salary greater than or equal to 3000
- c) Find all those employees whose job does not start with ‘M’.
- d) Find the names of the employees whose name starts with ‘S’.
- e) Find the names of the employees who are Managers and their date of joining is after “02-Jan-2006”.
- f) For describing the structure of the EMP table and DEPT table.
- g) For getting the average salary of the employees from EMP table.
- h) For displaying the current date and give the column a name “DATE”.
- i) For converting the name of the employee into uppercase where the employee name is “Santy”
- j) Create a sequence with name SEQ\_EMP , which will generate numbers from 1 to 99 in ascending order with an interval of 1. The sequence must start from 1 after generating the number 99.
- k) Displaying the names of the employees who have an a and an e in their names.

6. Considering the table DEPT in question 3, find the total number of departments.

7. Alter the EMP table for the changing the width of the field EmpID from 4 to 10.

8. .Alter the DEPT table for changing the width of the field No\_of\_Faculties from 2 to 4.

9. Delete all the records from the EMP table where the EmpName starts with “S”,

10. Insert some values in the PRODUCTS table created in Question 1 and then DROP the table PRODUCTS.

11. Update the EMP table for the following values:

- a. Increase the salary of all the employees by 10% where the job is SE and SSE.
- b. Change the hiredate of the employee “Harry” to 01-Feb-2009.
- c. Update the salary of the employees to an increase of 15% where deptid is SED\_07.

12. Alter the table EMP for the following:

- a. Add one more field in the table i.e DOB DATE
  - b. Drop the column named Commission from the EMP table.
13. Write a query to select all the records from the EMP table.
14. Write a query to select all the records from the DEPT table.
15. Write a query to select the distinct deptid from EMP table.
16. Write a query to find the name and salary of the employee from EMP table where the salary is maximum.
17. Create a view named v\_EMP on the table EMP,DEPT by selecting the following fields  
Emp ID, Dept ID, Emp Name, Job  
Where the EMP.Dept ID = DEPT. DeptId.
18. Create a synonym S\_EMP on the table EMP.  
Basic features, Block Structure of a PL/SQL Programs, Control Structures, Exception Handling, Cursor, Procedure, function and Triggers, Internet features of Oracle, Overviews of SQLJ
19. Write a PL/SQL program for:  
a. Printing the Fibonacci series from 1 to 50.  
b. Printing the smallest number among any three numbers.  
c. Printing the table of any specific number entered.
20. Create a trigger named "Client\_Master" which keeps track of records deleted or updated when such operations are carried out. Records in this table are inserted into table "Audit" when database trigger fires due to an update or delete statement fired on this table "Client".  
Table: Client  
Column name Data type Size  
Client\_no Varchar2 6  
Name Varchar2 20  
Address Varchar2 30  
Balance\_Due Number 10,2

Write a sql query to drop the table EMP, can we drop a table with data in it.

**Text Reading:**

- Elmasri & Navathe,” Fundamental of Database Systems”, Pearson Education, Seventh Edition, 2016
- Korth & Sudarshan,” Database System Concepts”,TMH, Sixth Edition, 2010
- C.J.Date,” An Introduction to Database System”, Pearson Education, Eighth Edition, 2009

**References:**

- Bipin C Desai,” Introduction to Database Systems”, Galgotia publications, Revised Edition, 2010
- Kevin Loney & Geroge Koch ,“Oracle 9i :The Complete Reference”, TMH Edition 2002
- Ivan Bayross,” SQL,PL/SQL The Programming Language Of Oracle”, BPB Publications, Third Revised Edition, 2009.

**Course Title: UNIX OPERATING SYSTEM AND SHELL PROGRAMMING**

**Course Objectives :**

- The Objective of this course is to expose the students to the fundamentals and the concepts of Unix Operating System.
- This course will prepare the students to work on UNIX ENVIRONMENT as a technical user or system administrator of a powerful, fast growing, multitasking, open operating system which is currently used on all types of computers from micros to mainframes.
- This course introduces students to the fundamentals of the UNIX/Linux operating system and shell programming. It provides an overview of the history of UNIX/Linux and an explanation of operating systems. The course covers in detail basic commands, the vi editor ,the file structure, the shell environment and shell scripts.

**Pre-requisites:**

Concepts of Operating System

**Course Contents/Syllabus:**

	<b>Weightage (%)</b>
<b>Module I : INTRODUCTION</b>	<b>15</b>
Introduction to Operating System , History of Unix ,UNIX Family, Unix System Layered and Detailed Architecture: Concept of Files in UNIX, Absolute Path and Relative Path , UNIX file system structure, Types of shells (Bourne, BASH, KORN,C), Process and	

Process States , Inode, Introduction of basic system calls	
<b>Module II : UNIX COMMANDS</b>	<b>30</b>
Telnet connect: Login, password, shell and commands, logout, current working directory, referring to home directories, Commands to move around by path concept, creating new directories, creating files –touch , cat ; copying files; moving files, Deleting files and directories; looking at files: cat, more, pg, less , head , tail; Cal, banner, file, wc, sort, cut, grep ,cmp, comm., diff ;Calculator: expr , bc ;Getting online help; manual pages ; listing commands , meta characters ,Wildcards; hidden files; Standard input and output; redirecting input and output; filter; pipes; file permissions; user and group; Interpreting file permissions; Permission Dependencies; Changing permissions, Setting Permissions. Managing file links; hard links; symbolic links; jobs and process: process ID; foreground	

and background jobs; suspend and interrupt a process; killing jobs; changing password, exit.	
<b>Module III : VI EDITOR</b>	<b>15</b>
Command mode, insert mode and last line mode; command to delete character, insert line; deleting text, command for moving the cursor; including other files; running shell commands; getting vi help; search and replace commands; changing and deleting text, Change word, Change line, Delete current line, Delete n lines, Delete remainder of Lines; copying and moving; Saving and Exiting.	
<b>Module IV : SHELL PROGRAMMING</b>	<b>30</b>
Shell as an interpreter; pattern matching; ; redirection; pipes; command substitution; shell variables, environment variables , Keywords, Assignment Statements, read , echo ,Shell scripts and execution methods, Setting positional parameters (set command), Shift , metacharacters , arithmetic operators, logical and relational operators, Test Command: Numerical Test, File Test and String Test ; Control Flow through if, case ; Loops ;while, until , for	
<b>Module V : SYSTEM ADMINISTRATION</b>	<b>10</b>
Adding and Removing Users, Starting up and Shutting down the System, Disk Management, File System Mounting and Unmounting, Monitoring System Usage, Ensuring System Security	

### **Course Learning Outcomes:**

**Upon completion of this course, the students should be able to do the following:**

- Explain the logical structure of UNIX operating system
- Maintain UNIX directories and manipulate data using pipe and filters
- Demonstrate use of all UNIX commands
- Categorize role of UNIX system administrator

### **List of Experiments:**

1. Write a Shell Script that takes a search string and filename from the terminal & displays the results.
2. Write a Shell Script that takes pattern and filename as command line arguments and displays the results appropriately i.e. pattern found/pattern not found.
3. Write a Shell Script that accepts only three arguments from the command line. The first argument is the pattern string, the second argument is the filename in which the pattern is to be searched and the third argument is the filename in which the result is to be stored.
4. Write a Shell Script that accepts a filename as a command line argument and finds out if its a regular file or a directory. If its a regular file, then



performs various tests to see if it is readable, writeable, executable etc.

5. Write a Shell Script which creates the following menu and prompts for choice from user and runs the chosen command.

Today's date

Process of user

List of files

Quit to UNIX

6. Write a Shell Script that computes the factorial of a given number.

7. Write a Shell Script that works like a calendar reminding the user of certain things depending on the day of the week.

8. Write a Shell Script that changes the extension of a group of files from txt to doc

9. Write a Shell Script that accepts both filename and a set of patterns as positional parameters to a script.

10. Write a Shell Script which will redirect the output of the date command without the time into a file.

11. Write a Shell Script (using while loop) to execute endlessly (until terminated by user) a loop which displays contents of current directory, disk space status, sleep for 30 seconds and display the users currently logged in on the screen.

12. Write a Shell Script that receives two filenames as arguments. It should check whether content of the two files is same or not. If they are same, second file should be deleted.

13. If a number is input through the keyboard, WASS to calculate sum of its digits.

14. Write a Shell Script that performs a count-down either from 10 (default) or from the value that is entered by the user.

15. Write a Shell Script which takes a command line argument of Kms and by default converts that number into meters. Also provide options to convert km to dm and km to cm.

16. Write a Shell Script using for loop, which displays the message "Welcome to the UNIX System"

17. Write a Shell Script to change the filename of all files in a directory from lower-case to upper-case.

18. Write a Shell Script that examines each file in the current directory. Files whose names end in **old** are moved to a directory named **old files** and files whose names end in **.c** are moved to directory named **programs**.

19. Write a shell script to give the result of the student. Take marks of the five subjects , student name, roll no , percentage and show a message whether a student gets division as per the following rules:

70% and above ---- distinction

60%-70% -----first division

40%-59% -----second

division Less than

40% ----- fail

20. Write a shell script which reports names and sizes of all files in a directory (directory would be supplied as an argument to the shell script) whose size is exceeding 1000 bytes. The filenames should be printed in descending order of their sizes. The total number of such files should also be reported.

21. WASS for renaming each file in the directory such that it will have the current shell PID as an extension. The shell script should ensure that the directories do not get renamed.

22. WAP to calculate and print the first *m* Fibonacci numbers.

23. WASS that will receive any number of filenames as arguments. The shell script should check whether such files already exist. If they do, then it

should be reported. The files that do not exist should be created in a sub-directory called **mydir**. The shell script should first check whether the sub-directory **mydir** exists in the current directory. If it doesn't exist, then it should be created. If **mydir** already exists, then it should be reported along with the number of files that are currently present in **mydir**.

24. A shell script receives even number of filenames. Suppose four filenames are supplied, then the first file should get copied into second file, the third file should get copied into fourth and so on. If odd number of filenames is supplied then no copying should take place and an error message should be displayed.
25. WASS to identify all zero-byte files in the current directory and delete them. Before proceeding with deletion, the shell script should get a confirmation from the user.
26. WASS to compute the **GCD** and **LCM** of two numbers.
27. Two numbers are entered through the keyboard. WAP to find the value of one number raised to the power of another.
28. WASS that prompts the user for the password. The user has maximum of 3 attempts. If the user enters the correct password, the message "Correct Password" is displayed else the message "Wrong Password".
29. WASS that repeatedly asks the user repeatedly for the "Name of the Institution" until the user gives the correct answer.
30. WAP to generate all combinations of 1, 2 and 3 using **for loop**.

#### **Text Books :**

1. UNIX AND SHELL PROGRAMMING , Yashwant P.Kanetkar , BPB Publication , 2002

#### **Reference Books :**

2. "Unix: Concepts and Application", Sumitabha Das, TMH, Second Edition, 1998
3. "Linux Programming by Examples: The Fundamentals", Arnold Robbins, Pearson Education, First Edition, 2004
4. "Design of the Unix operating System", Maurice J. Bach ,PHI, First Edition, 1986
5. Unix Shell Programming, by Stephen G. Kochan and Patrick Wood , Pearson Education ,3rd edition , 2007
6. Introduction to UNIX , David I. Schwartz , Pearson Education , Second Edition , 2009
7. UNIX SHELLS by Example, Ellie Quigley , Prentice Hall, Fourth Edition, 2008

## Course Title: PYTHON PROGRAMMING

**Course Objectives:** This course aims at

- Provide in-depth knowledge of developing and debugging Python Programs.
- Illustrate and manipulate core data structures like Lists, Dictionaries, Tuples, and Strings.
- Understand the concept of files and exception handling.

**Pre-requisites:** Experience using a web browser and email.

### Course Contents/Syllabus:

	Weightage (%)
<b>Module I: Introduction</b>	<b>15</b>
<b>Basic concepts:</b> Functional Programming, OOPS and Data Structures <b>Getting Started:</b> Running Code in the Interactive Shell, Input, Processing and Output, Editing, Saving and Running a Script, Working of Python. <b>Variables, Expressions and Statements:</b> Values and Data Types, Variables, Keywords, String Literals, Escape Sequences, Operators and Operands, Expressions and Statements, Interactive mode and Script mode, Order of Operations, Comments	
<b>Module II: Conditional Statements and Loops</b>	<b>15</b>
Modulus Operator, Boolean Expressions, Logical Operators, Conditional Execution “if statement”, Alternative Execution “else clause”, Chained Conditionals “elif clause”, Nested Conditionals, while statement, For loop, Break and Continue Statement	
<b>Module III: Functions and Recursion</b>	<b>25</b>
Function Calls, Type Conversion Functions, Math Functions, Composition, Adding new functions, Parameters and 25 Arguments, Stack Diagrams, Importing modules with “from”, Recursion, Stack Diagram for Recursive Functions, Infinite Recursion <b>String Functions:</b> Traversal, Comparison, Searching, Counting, Pre-defined String Functions, In Operator	
<b>Module IV: Lists, Dictionaries and Tuples</b>	<b>25</b>
Lists: List as a Sequence, Traversing a list, List Operations, List Slices, List Methods, Map, filter and Reduce, Deleting Elements, Lists and Strings, Objects and Values, Aliasing, List Arguments Dictionaries: Dictionary as a set of counters, Looping and Dictionaries, Reverse Look Up, Dictionaries and Lists, Memos, Global Variables, Long Integers Tuples: Tuple Assignment, Tuples as return values, Variable Length argument tuples, Lists and Tuples, Dictionaries and Tuples, Comparing Tuples, Sequences of sequences	
<b>Module V: Files</b>	<b>20</b>

Text files and their Formats, Reading from a file, Writing to a file, Accessing and Manipulating Files and Directories on the Disk, Format Operator, Filenames and paths Exception Handling: Errors, Exceptions, Handling Exceptions, Raising Exceptions, Try. Finally, The with Statement, Catching Exceptions, Databases, Pickling, Pipes	
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### Course Learning Outcomes:

After completion of this course, student will be able to:

- Apply basic Python programs.
- Analyze basic Python decisions and iterations.
- Create custom functions and call built-in Python functions.
- Analyze data structures of Python.
- Create exceptions and document code.

### Lab/Practical details:

#### List of Experiments:

1. Start the Python interpreter and type `help('print')` to get information about the print statement.
2. If you run a 10-kilometer race in 43 minutes 30 seconds, calculate your average time per mile and your average speed in miles per hour using Python Calculator. (Hint: there are 1.61 kilometers in a mile).
3. Write a function to calculate the square of first n natural numbers.
4. Write a function that draws a grid like the following:

```
+ - - - + - - - +  
|       |       |  
|       |       |  
|       |       |  
|       |       |  
+ - - - + - - - +  
|       |       |  
|       |       |  
|       |       |  
+ - - - + - - - +
```

5. Write a function that takes four parameters—a, b, c and n—and then checks to see if Fermat's theorem,  $a^n + b^n = c^n$ , holds. If n is greater than 2 and it

turns out to be true then the program should print, “Holy smokes, Fermat was wrong!” Otherwise the program should print, “No, that doesn’t work.”

6. Write a function that takes a string argument and returns true if it is a palindrome and False otherwise.
7. A number, a, is a power of b if it is divisible by b and a/b is a power of b. Write a function that takes parameters a and b and returns True if a is a power of b.
8. Write a recursive function to calculate the factorial of a given number.
9. Write a function that takes a string as a parameter. Calculate the length of a string without using len function. Print the length concatenated with the string and aligned towards the extreme right of the output screen.
10. ROT13 is a weak form of encryption that involves “rotating” each letter in a word by 13 places. To rotate a letter means to shift it through the alphabet, wrapping around to the beginning if necessary, so 'A' shifted by 3 is 'D' and 'Z' shifted by 1 is 'A'. Write a function that takes a string and an integer as parameters, and then returns a new string that contains the letters from the original string “rotated” by the given amount. Use the built-in functions ord, which converts a character to a numeric code, and chr, which converts numeric codes to characters.
11. Write a function that takes a nested list of integers and add up the elements from all of the nested lists.
12. Write a function called middle that takes a list and returns a new list that contains all but the first and last elements. So middle ([1, 2, 3, 4]) should return [2, 3].
13. Write a program to print the keys of the dictionary and their values in an alphabetical order.
14. Write a function that takes any number of arguments and returns their sum.
15. Write a program that reads words.txt and prints only the words with more than 20characters (not counting white space).

## **Textbooks and References:**

- Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705.
- Python Crash Course: A Hands-On, Project-Based Introduction to Programming (2nd Edition) Author: Eric Matthes.
- Head-First Python: A Brain-Friendly Guide (2nd Edition)
- Learn Python the Hard Way: 3rd Edition.
- Python Programming: An Introduction to Computer Science (3rd Edition)

## Course Title: IT Project Management

### Course Objectives:

1. The course presents a new management framework uniquely suited to the complexities of modern software development.
2. The course provides a clear and proactive discussion of the economic, metrics and management strategies needed to plan and execute a software project successfully.
3. This course also covers all the qualitative and quantitative aspects of project management with a practical treatment (case studies) of many managerial issues.
4. Knowledge of Project Risk Management
5. Knowledge of Quality Assurance related to Project implementation

**Pre-requisites:** Knowledge of Software Engineering

### Course Contents/Syllabus:

	Weightage (%)
<b>Module I : Introduction to Project Management</b>	
<b>Descriptors/Topics</b> <ul style="list-style-type: none"><li>• Definition &amp; objective of Project Management</li><li>• Characteristics of Projects</li><li>• Stages of Project Management</li><li>• Project Planning Process</li><li>• Establishing project organization</li><li>• Discuss the Success and Failures of Project</li></ul>	
<b>Module II Work Definition</b>	
<b>Descriptors/Topics</b> <ul style="list-style-type: none"><li>• Defining work context</li><li>• Time Estimation method</li><li>• Project cost estimation &amp; budgeting</li><li>• Project Risk Management</li></ul>	
<b>Module III : Project Planning</b>	

<p><b>Descriptors/Topics</b></p> <ul style="list-style-type: none"> <li>• Project Scheduling &amp; Planning Tools</li> <li>• WBS</li> <li>• LRC</li> <li>• Gantt chart</li> <li>• CPM/PERT Networks</li> <li>• Risk management plan</li> <li>• HRM plan</li> <li>• Procurement management system</li> <li>• Communication management system</li> </ul>	
<p><b>Module IV Project Implementation</b></p>	
<p><b>Descriptors/Topics</b></p> <ul style="list-style-type: none"> <li>• Project Monitoring &amp; Control with PERT/Cost,</li> <li>• Computer Applications in Project Management,</li> <li>• Contract Management,</li> <li>• Project Procurement Management,</li> <li>• Quality Assurance related to Project implementation</li> </ul>	
<p><b>Module V Project Monitoring &amp; Control</b></p>	
<p><b>Descriptors/Topics</b></p> <ul style="list-style-type: none"> <li>• Level of Responsibility for Control- Business &amp; Product Quality Controls,</li> <li>• Integrated change control during the life of the project,</li> <li>• Performance reporting, Deviation from specification,</li> <li>• Errors &amp; Quality Control</li> </ul>	

**Course Knowledge Outcomes:**

- Develop the ability to manage a project including planning, scheduling and risk.
- Identify the proper contents of a software requirements specification document.
- Categorize formal software metrics for software development.
- To analyze the most important aspects of software project management that is planning, which can be performed effectively in many different contexts using a project plan.

- Recognize issues in a realistic project scenario
- Knowledge to Manage IT Projects which is very useful in future as IT Professionals
- Develop a project proposal

**Text Reading:**

1. **Launching New Ventures: An Entrepreneurial Approach, 5th Edition, Kathleen R. Allen University of Southern California, ISBN-13: 9780547014562**
2. **Entrepreneurship: creating and managing new ventures, Bruce Lloyd, Pergamon Press, ISBN 0080371086**
3. **Start Run & Grow: A Successful Small Business, CCH, CCH Tax and accounting ,ISBN 0808012010**
4. **Managing New Ventures: Concepts and Cases in Entrepreneurship, By Anjan Raichaudhur, PHI, ISBN 978-81-203-4156-2**
5. **Technology Ventures: From Idea to Enterprise, Thomas H. Byers, Richard C. Dorf, Andrew Nelson, Science Engineering & Math;**

**Course Title:** Fundamental of Cloud Computing & Enterprise

**Course Objectives:** After finishing this course student will be able to:

- 1) Concepts and infrastructure of cloud computing and its business applications.
- 2) Critically appraise the opportunities and challenges of information management in complex business environment.
- 3) To use current techniques, skills, and tools necessary for Cloud Applications.
- 4) To understand the role and responsibilities of professional field, how to deal with ethical, legal, security and social issues and responsibilities related to cloud computing.
- 5) To gain expertise in implementation and development of cloud enabled business application.

**Pre-requisites:** None

**Course Learning Outcomes:**

1. Outcome 1: (Scientific foundation) When faced with a technical problem the student should be able to use applied scientific knowledge
  - a. to identify and implement relevant principles of mathematics and computer science.
  - b. to identify and implement relevant principles of physics and chemistry
  - c. to identify and implement relevant principles of engineering science
2. Outcome 2: (Tools) an ability to use the relevant tools necessary for engineering practice.
3. Outcome 3: Describe the cloud infrastructure components and cloud service creation processes.



4. Outcome 4: Implementing the configuration and management of cloud services.
5. Outcome 5: (Technical design) the technical ability to design a prescribed engineering sub-system

**Course Contents/Syllabus:**

	<b>Weightage (%)</b>
<b>Module I: Introduction</b>	<b>20</b>
Defining the cloud for the Enterprise: Database as a service, Governance/Management as a service, Testing as a service, Storage as a service , Cloud service development, Cloud Computing Challenges Layers of Cloud Computing, types of cloud computing, Cloud Computing Features, Cloud Computing Security requirements, pros and cons, benefits	
<b>Module II: Cloud Computing For Everyone</b>	<b>25</b>
Centralizing email communications, cloud computing for community Collaborating on Schedules, Collaborating on Grocery Lists, Collaborating on To-Do Lists Collaborating on Contact Lists, Collaborating on schedules, collaborating on group projects and events, cloud computing for corporation, mapping ,schedules managing projects, Collaborating on Marketing Materials, Collaborating on Expense Reports, Collaborating on Budgets, Collaborating on Financial Statements, Presenting on the Road, Accessing Documents on the Road.	
<b>Module III: Brining Governance to the clouds</b>	<b>15</b>
People and processes, Governance for the clouds, Creating the Governance model: Define Polices, design Polices, Implement policies, Governance technology.	
<b>Module IV: Working from your Services to Clouds and Cloud Services</b>	<b>25</b>
<b>Descriptors/Topics Descriptors/Topics</b> Defining Meta Services and Service, Creating the service directory, Collaborating on calendars, Schedules and task management, exploring on line scheduling and planning, collaborating on event management, collaborating on contact management, collaborating on project management, collaborating on word processing, spreadsheets, and databases.	
<b>Module V: Outside Cloud Storing and Sharing</b>	<b>15</b>
Evaluating on line file storage ,Evaluating web conference tools ,Evaluating web mail services, Evaluating instant messaging, creating groups on social networks, Evaluating on line groupware, collaborating via blogs and wikis , Understanding cloud storage, exploring on line book marking services, exploring on line photo editing applications, exploring photo sharing communities, controlling it with web based desktops.	

**Text & References:**

1. Michael Miller, “Cloud Computing”, Pearson Education, New Delhi, 2009.

2. David S. Linthicum, "Cloud computing and SOA Convergence in your Enterprise.
3. Greg Schulz 2011, Cloud and Virtual Data Storage Networking, Auerbach Publications [ISBN: 978-1439851739]
4. EMC, Information Storage and Management [ISBN: 978-0470294215]
5. Klaus Schmidt, High Availability and Disaster Recovery [ISBN: 978-3540244608]

**Course Title: Digital Marketing**

#	Course Title
1	<p><b>Course Objectives:</b></p> <ul style="list-style-type: none"> <li>• This course is aim to produce graduates with a broad range of digital marketing, in addition to an in-depth understanding of how digital marketing is revolutionizing the current industry. The focus of the course is on how to make students more effective in how they conduct business in the digital age. This requires a fundamental understanding of the technologies and platforms that form the backbone of electronic commerce.</li> </ul>
2	<p><b>Prerequisites: Basic knowledge of E-Commerce</b>            Knowledge of E-commerce.</p>
3	<p>Course Learning Outcomes:            After completion of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Learn the basics of digital marketing and the importance of the offer</li> <li>• Learn through doing how to use new media such as mobile, search and social networking</li> <li>• Learn the measurement techniques used in evaluating digital marketing efforts.</li> <li>• Understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy</li> <li>• Understand the major digital marketing channels - online advertising: Digital display,</li> </ul>

	<p>video, mobile, search engine, and social media</p> <ul style="list-style-type: none"> <li>• Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan</li> <li>• Explore the latest digital ad technologies</li> </ul>
<b>4</b>	<p><b>Module I: Introduction to Digital Marketing</b></p> <ul style="list-style-type: none"> <li>• What is Digital Marketing? Types of Digital Marketing; The 7 C's of Digital Marketing; The Digital Revolution in Media Industries...and Who's Next?; Digital media Vs Traditional media; Digital Marketing Planning.</li> </ul>
<b>5</b>	<p><b>Module II: Search Engine Optimisation &amp; Search Marketing (PPC)</b></p> <ul style="list-style-type: none"> <li>• Search Engine Optimisation - Site Supports, Sitemaps, XML Sitemap, Webmaster Tools, Website Engagement, User Experience, User Engagement, Site Speed, 404 errors , <b>SEO Tools</b></li> <li>• Search Marketing (PPC)-Quality score explained, conversion tracking, Understanding CPA Issues, Ad positioning strategy Bidding approaches</li> </ul>
<b>6</b>	<p><b>Module III: Digital Display Marketing</b></p> <ul style="list-style-type: none"> <li>• How to find suitable websites, researching publishers and websites, Google Display Planner tool, publisher and website resources, match audience with publisher</li> </ul>
<b>7</b>	<p><b>Module IV: Email Marketing, Social Media Marketing and Mobile Marketing</b></p> <ul style="list-style-type: none"> <li>• Email Marketing - Section 4 - When to Deliver, Email Reports and Analytics</li> <li>• Social Media Marketing - Google+, Circles, Google+ Hangouts, Google+ Communities, +1 Button Google+ Definition, Google+ Chat, Google+ Business Pages, Google+ Plugins, <b>Facebook Pages, Business Advertising using Facebook, Google Analytics</b></li> <li>• Mobile Marketing - mobile search analytics, in-app analytics, mobile site analytics, flurry, distimo, google, analytics dashboard, mCommerce, voice input, geo-location, privacy, data protection, copyrights, information sources, mobile events.</li> </ul>
<b>8</b>	<p><b>Module V: Analytics and Strategy &amp; Planning</b></p> <ul style="list-style-type: none"> <li>• Analytics - PPC conversion rate?, PPC Geo Locations, PPC Ecommerce report, What PPC phrases are working?, PPC phrases assisting conversions, PPC Analysis</li> <li>• Strategy &amp; Planning</li> </ul>

### **Text & References:**

- Audience: Marketing in the Age of Subscribers, Fans and Followers [Kindle Edition] by Jeffrey K. Rohrs.
- Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation Paperback – Import, 3 Jun 2014 by Damian Ryan
- The Art of Social Media “Power Tips for Power Users” by Guy Kawasaki and Peg Fitzpatrick

### **Any other Study Material:**

- <http://digitalmarketinginstitute.com/subject-matter-experts/barry-adams>
  - <http://digitalmarketinginstitute.com/topics/introduction-to-digital-marketing>
  - <http://digitalmarketinginstitute.com/courses/pay-per-click-marketing-google-adwords>
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# 5<sup>th</sup> Semester

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## Course Title: Introduction to Artificial Intelligence

**Course Objectives:** The primary objective of this course is to provide an introduction to the basic principles, techniques, and applications of Artificial Intelligence. The emphasis of the course is on teaching the fundamentals and not on providing a mastery of specific commercially available software tools or programming environments.

Upon successful completion of the course, students will have an understanding of the basic areas of artificial intelligence search, knowledge representation, learning and their applications in design and implementation of intelligent agents for a variety of tasks in analysis, design, and problem-solving. Aim of this course is to know about Lisp and Prolog and use of these languages in AI. Graduate students are expected to develop some familiarity with current research problems and research methods in AI by working on a research or design project

### Pre-requisites:

### Course Contents/Syllabus:

	Weightage (%)
<b>Module I Introduction to AI and Problem Representation:</b>	25%
<b>Descriptors/Topics</b> : Introduction: Artificial Intelligence (AI) and its importance, AI Problems (tic tac toe problem, water jug problems), Application area of AI. Problem  Representations: State space representation, problem-reduction representation, production system, characteristics and types of production system	
<b>Module II Heuristic Search Techniques</b>	25%
<b>Descriptors/Topics</b>  Heuristic Search Techniques :AI and search process, brute force search, depth-first search, breadth-first search, time and space complexities, heuristics search, hill climbing, best first search, A* algorithm and beam search, AO search, constraint satisfaction.	
<b>Module III Game Playing</b>	25%
<b>Descriptors/Topics</b>  . Game Playing: AI and game playing, plausible move generator, static evaluation move generator, game playing	

strategies,problems in game playing.	
<b>Module IV Logic and Knowledge Representation</b>	<b>25%</b>
<b>Descriptors/Topics</b> Knowledge Representation and Structured Knowledge: Associative networks, frame structures, conceptual dependencies and scripts  Logic: Propositional logic: syntax and semantics, First Order Predicate Logic (FOPL): Syntax and semantics, conversion to clausal form, inference rules, unification, and the resolution principles	

### Course Learning Outcomes:

After completion of this course, the student will be able to

Describe human intelligence and AI

Explain how intelligent system works.

Understand Propositional logic

Apply Knowledge representation and semantic in Knowledge representation.

Develop some familiarity with current research problems and research methods in AI.

### Text Reading:

- i. Elaine Rich, Kevin Knight, Artificial Intelligence TMH (Any Edition).
- ii. Max Barber, Logic Programming with Prolog, Springer, 2013

### References:

- iii. Dan W. Patterson, Introduction to AI and Expert System, PHI
- iv. V S Janakiraman, K Sarukesi, P Gopalakrishan, Foundations of Artificial Intelligence and Expert Systems, Macmillan India Ltd
- v.

### Additional Reading:

- i. Introduction to Artificial Intelligence by Wolfgang Ertel and Nathanael T. Black ,springer ,2017
- ii. V S Janakiraman, K Sarukesi, P Gopalakrishan, Foundations of Artificial Intelligence and Expert Systems, Macmillan India Ltd.

### Any other Study Material:

- iii. [https://www.tutorialspoint.com/artificial\\_intelligence](https://www.tutorialspoint.com/artificial_intelligence)
- iv. [www.nptel.ac.in](http://www.nptel.ac.in)

- v. [https://swayam.gov.in/nd1\\_noc20\\_cs42/preview](https://swayam.gov.in/nd1_noc20_cs42/preview)

Course Title: INTERNET OF THINGS

**Course Objectives:**

- Aim of this course is to discuss and explain about the basics of the Internet and Internet of Things.
- Some of the major topics which are included in this course are overview, applications, potential & challenges, and architecture of Internet of Things with Privacy and Ethical issues.
- This course will examine and discuss IoT technology and market specific topics, relevant case studies of IoT.

**Pre-requisites: Basics of Computer Networks**

**Course Learning Outcome (CLO)**

Student will be able to

- Analyze in a concise manner how the general Internet as well as Internet of Things works.
- Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
- Evaluate different protocols and standards associated with IoT.
- Apply knowledge of IoT to find out different application areas of IoT.
- Investigate different security and privacy challenges associated with IoT

**Course Contents/Syllabus:**

	<b>Weightage (%)</b>
<b>Module 1: Introduction</b>	<b>20%</b>
IoT definitions: overview, applications, potential & challenges, and architecture, The IoT paradigm - Smart objects, Related Technologies, Ubiquitous Computing, Pervasive Computing, Ambience Intelligence. <b>PDSA-1</b>	

<b>Module 2: Internet in general and Internet of Things</b>	<b>20%</b>
Layers, protocols, packets, services, performance parameters of a packet network as well as applications such as web, Peer-to-peer, sensor networks, and multimedia. <b>PDSA-II</b>	
<b>Module 3: Technologies behind the Internet of Things</b>	<b>25%</b>
Roaming and handoffs, mobile IP, and ad hoc and infrastructure less networks, RFID + NFC, Wireless networks + WSN, RTLS + GPS, Agents + Multiagent Systems, IPv6. <b>PDSA-III</b>	
<b>Module 4: IoT Examples</b>	<b>20%</b>
6LoWPAN: Incorporating IEEE 802.15.4 into the IP architecture, Internet Protocol for Smart Objects (IPSO) Alliance, Case studies, e.g. sensor body-area-network and control of a smart home. <b>PDSA-IV</b>	
<b>Module 5: Social and Ethical Issues</b>	<b>15%</b>
IoT security vulnerabilities and attacks, and mitigation controls, health, safety, privacy, and economic impacts of IoT, Industrial IoT Applications, Case Studies. <b>PDSA-V</b>	

#### **Pedagogy for Course Delivery:**

The class will be taught using theory and case based method and self-work in blended mode. In addition to assigning the case studies, the course instructor will demonstrate and explain about applications of Internet of Things. Flipped based teaching and learning methods will also be used.

#### **List of Professional Skill Development Activities (PSDA):**

- 1- Main Challenges associated with Internet of Things (IoT).**
- 2 - Elements of the Internet of Things.**
- 3- Discuss IPv6, 6LoWPAN standard and RFCs related to this standard.**



**4- Impacts of Internet of Things (IoT) on the Infrastructure of Smart Cities, Agriculture, Health, E-Governance and Garbage and Waste Management.**

**5- Privacy and Security Issues in case of Internet of Things (IoT).**

**Text & References:**

**Text:**

- Behrouz Forouzan ,Data Communications and Networking ; Edition 5; 2012, Tata McGraw-Hill
- A Hands-on-Approach by Vijay Madiseti , Arshdeep Bahga, Paperback: 446 pages Publisher: VPT; 1 edition (August 9, 2014)

**References:**

- <https://www.cisco.com/web/about/ac79/docs/innov/IoE.pdf>
- <http://www.ipso-alliance.org/wp-content/media/6lowpan.pdf>

**Course Title: INTRODUCTION TO ENTERPRISE RESOURCE PLANNING**

**Course Objectives:**

The course provides students with:

1. The basic concepts of ERP systems for manufacturing or service companies, and the differences among ( Material Requirement Planning) MRP, MRP II, and ERP systems;
2. Thinking in ERP systems: the principles of ERP systems, their major components, and the relationships among these components;
3. in-depth knowledge of major ERP components, including material requirements planning, master production scheduling, and capacity requirements planning;
4. Knowledge of typical ERP systems, and the advantages and limitations of implementing ERP systems.
5. Knowledge of SCM, BPR

**Pre-requisites: Nil**

**Course Contents/Syllabus:**

	<b>Weightage (%)</b>
<b>Module I Introduction to Enterprise Resource Planning</b>	<b>20%</b>
<b>Descriptors/Topics</b> Introduction of the term Business Process Reengineering(BPR) ,BPR Methodology, Current BPR Tools ,Introduction to material requirement planning (MRP), Definition of Enterprise Resource Planning (ERP); Evolution of ERP; Characteristics, Features, Components and needs of ERP; ERP Vendors; Benefits & Limitations of ERP Packages	
<b>Module II Enterprise Modeling and Integration of ERP</b>	<b>20%</b>
<b>Descriptors/Topics</b> Need to focus on Enterprise Integration/ERP; Information mapping; Role of common shared Enterprise database; System Integration, Logical vs. Physical System Integration, Benefits & limitations of System Integration, ERP's Role in Logical and Physical Integration	
<b>Module III ERP Architecture and Implementation Methodology of ERP</b>	<b>20%</b>
<b>Descriptors/Topics</b> Generic Model of ERP system; Core Modules functionality; Types of ERP architecture, Client Server Architecture, Web-based Architecture, Service Oriented Architecture (SOA) ; Difficulty in selecting ERP, Approach to ERP selection, Request for Proposal approach, Proof-of-Concept approach; General Implementation Methodology of ERP, Vanilla Implementation; Evaluation Criteria of ERP packages; Project Implementation Team Structure	
<b>Module IV Supply Chain Management and ERP</b>	<b>20%</b>
<b>Descriptors/Topics</b> Definition of Supply Chain Management (SCM); Stevens Model of Supply Chain Management; Aims of SCM; SCM Key Drivers; Key Issues, Benefits of SCM; ERP Vs SCM, Key SCM Vendors.	
<b>Module V</b>	<b>20%</b>
<b>Descriptors/Topics</b> Introduction to SAP; SAP architecture, Scalability, SAP R/3 System and mySAP; Integrated SAP Model; A Comparative assessment of ERP Packages	

**Course Learning Outcomes:**

Upon completion of the subject, students will be able to :

- Know basic business functional areas and explain how they are relate

- Classify different processes of the organization and relationship among all processes.
- examine systematically the planning mechanisms in an enterprise, and identify all components in an ERP system and the relationships among the components;
- comprehend the importance of Integrating the processes by formulating Business Process Re-engineering(BPR) for successful Enterprise functioning and growth.

### **Text Reading:**

1. Enterprise Systems For Management, Luvai F. Motiwalla, Jeff Thompson, Pearson Education., 2nd Ed., 2011.
2. Enterprise Resource Planning, Ravi Shankar, S.Jaiswal, Galgotia Publication Pvt. Ltd., 1st Ed., 1999.
3. Enterprise Resource Planning – Concepts and Practices by Vinod Kumar Garg & N K Venkatakrishna, PHI
4. Textbook of Enterprise Resource Planning by Mahadeo Jaiswal & Ganesh Vanapalli, Macmillan, 1/e 20

### **References:**

1. CRM at the speed of Light : Social CRM strategies, tools and techniques for engaging your customers : 4<sup>th</sup> edition by Paul Greenberg , McGraw Hill ,2009
2. Supply Chain Management Casebook : The Comprehensive Coverage and Best Practices in SCM , by Chuck Munson , Pearson FT Press 2013
3. Definitive Guide to Supply Chain Best Practices, The Comprehensive Lessons and Cases in Effective SCM , by Robert Frankel , Pearson FT Press , 2014
4. Enterprise Resource Planning by Mary Sumner , Prentice Hall , 2005
5. Supply Management, David Burt, McGraw Hill Publications, 8th Ed., 2010

### **Additional Reading:**

1. [www.sap.com](http://www.sap.com)
2. [www.oracle.com](http://www.oracle.com)
3. [www.microsoftdynamic.com](http://www.microsoftdynamic.com)
4. [www.ssaglobal.com](http://www.ssaglobal.com)
5. [www.epicor.com](http://www.epicor.com)

**Any other Study Material:**

- “ The Mobile ERP Revolution” , Compare Business Products
- “ Solving Real Business Issues During the ERP Selection Process” , Sage
- <http://www.erpgenie.com/publications/magazines.htm>
- Additional study materials if required and found suitable will be circulated in the form of cases from HBS, and other selected sources, relevant videos of solutions providers and from other sources as selected by the faculty

**Course Title: Data Warehousing and Mining**

**Course Objectives:** This course aims at

- The design and management of data warehouse (DW) and Data Mining Process.
- Giving insights on how the Data Warehouse collects and integrates data, leading to knowledge discovery.
- Introducing the core concepts of data warehousing and data mining, its techniques, implementation, benefits, and outcome expectations from this new technology.
- Data Mining (DM) process for extracting meaningful information from large volumes of data generated in an organization.
- Identifying industry branches which most benefit from DM.

**Pre-requisites:** Knowledge of RDBMS

**Course Contents/Syllabus:**

	<b>Weightage (%)</b>
<b>Module I Data Warehouse fundamentals</b>	<b>20</b>
Defining the cloud for the Enterprise: Database as a service, Governance/Management as a service, Testing as a service, Storage as a service, Cloud service development, Cloud Computing Challenges Layers of Cloud Computing, types of cloud computing, Cloud Computing Features, Cloud Computing Security requirements, pros and cons, benefits	
<b>Module II Principles of dimensional modeling</b>	<b>20</b>

Identifying Facts and Dimensions, Designing Fact Tables, Designing Dimension Table, Data Warehouse Schemas, OLAP Operations, Data Extraction, Cleanup & Transformation, Star, snowflake and galaxy schemas for multidimensional databases. Architecture for a warehouse, Steps for construction of Data Warehouses, Data Marts, Metadata. Different OLAP operations, OLAP Server: ROLAP, MOLAP and HOLAP	
<b>Module III Data Mining</b>	<b>20</b>
From Data warehousing to data mining, Motivation, Knowledge Discovery Process, objectives of Data Mining, the business context for DM, Process improvement, marketing and CRM, Tools of Data Mining	
<b>Module IV Data Mining Functionalities</b>	<b>20</b>
Data preparation, Data Mining Techniques: Statistical techniques, Characterization and discrimination, Association and market basket analysis, Classification and Prediction, Cluster analysis, Outlier analysis.	
<b>Module V Data Mining Applications</b>	<b>20</b>
Text Mining, Spatial Databases, Web Mining. Case studies in building business environment. , Applications in telecommunications industry, retail, target marketing, fraud protection, health care, science, ecommerce, banking and finance.	

## Course Learning Outcomes:

After completing the course, the student will be able to

1. Identify the role of data mining in the providing competitive edge in business.
2. Describe the components of Data Warehouse
3. Model the relational database required for an enterprise data warehouse
4. Extract, cleanse, consolidate, and transform heterogeneous data into a single data warehouse
5. Examine the types of data to be mined.
6. Analyze the data to generate information and knowledge that lead to informed decisions for businesses
7. Generate insightful trends using data mining techniques.
8. Select and apply proper data mining algorithms to build analytical applications

## Textbooks and References:

### Textbooks:

- Jiawei Han & Micheline Kamber, “Data Mining: Concepts & Techniques”, Morgan Kaufmann Publishers , 2002
- Paul Raj Poonia, “Fundamentals of Data Warehousing”, John Wiley & Sons, 2004.
- Sam Anahony, “Data Warehousing in the real world: A practical guide for building decision support systems”, John Wiley, 2004

**Reference Books:**

- Data Ware housing: Concepts, Techniques, Products and Applications, C.S.R. Prabhu, Prentice Hall of India, 2001.
- Sam Anahory, Dennis Murray. Data Warehousing in the Real World, Pearson, 2005.
- David Taniar , Progressive methods in Data Warehousing and Business Intelligence: Concepts and competitive analytics, Idea Group Inc, 2009.

**Course Title: FUNDAMENTALS OF E-COMMERCE****Course Objectives :**

- This course intends to describe that the scope of e-Commerce market has evolved beyond the narrow buying and selling of goods to include services of all kinds including entertainment and communications that is making e-Commerce an integral part of everyone's daily life.
- This course will help the students to recognize that today the extended scope of eCommerce provides the opportunity to substantially enhance the daily lives of all individuals. Case studies based on Internet Marketing , Mobile Commerce, On-line education , EDI , e-banking understanding will prepare the students for current and future scenario
- The course is designed to help the student use theoretical frameworks of e-Commerce Infrastructure and major trends in e- Commerce virtual world to interpret case studies and implement the learnings in real-life scenarios on day to day basis.

**Pre-requisites:** Student should be interested in surfing Internet and should have a willingness to develop the awareness and understanding of current and future market when technology is in the palm/pocket.

# Course Contents/Syllabus:

	Weightage (%)
<b>Module I</b>  <b>E-Commerce : A Revolution</b> Traditional commerce – an overview, Growth of Internet and the web, What is E-commerce? Origin and growth of e-commerce , Comparison between Traditional and Electronic commerce, advantages and Issues in electronic commerce , relation between e-Commerce and e-Business , digital convergence, Unique features of E-commerce technology: Ubiquity,Global reach, Universal standards, Richness ,Interactivity, Information Density,Personalization/customization,Social technology , Introducing Types of e-commerce , case study of traditional commerce vse-commerce	15%
<b>Module II</b>  <b>E-commerce business Models and concepts :</b> Eight key elements of a Business model: value proposition, Revenue model, Market opportunity, competitive environment, competitive advantage, market strategy, organizational development, management team ; Business –to – Consumer (B2C) Business Model :e-tailer ,Business-to –Business (B2B) business model : E-distributor, e-Procurement, introduce supply chain management (SCM) ,Consumer-to-Consumer (C2C) Business Model , case study on Peer-to-Peer(P2P) Business model, Introduction of M-Commerce business models, Government –to – Citizenmodel.	25%
<b>Module III</b>  <b>E-Commerce Infrastructure framework :</b>  Ecommerce framework, Terms related to Internet Technology : Internet protocols, DNS, URLs, Client/Server computing , Markup languages, Web servers and clients , web browsers, search engine, Intelligent agents (Bots), online forums and chat , blogs, podcasting, Internet telephony, Video Conferencing.	30%

<p>What is Information Super highway? Components of I-Way(Information Super Highway) , Public policy issues shaping the I-Way , Internet , Intranet and Extranet. How and why wireless technology is employed? Wireless Application Protocol benefits and limitations, mobile banking , case study of mobile commerce</p> <p><b>Conceptual Framework of e-Business</b>  e-Banking : Meaning , Importance and types of e-banking services . Traditional vs e-banking ,process of e- banking, Advantages and disadvantages of e-banking, Status of e-banking in India. Case study of national and International banks  e-Trading :Meaning and importance of e-trading, traditional trading vs e-Trading, Operational aspects of e- trading, advantage of e-trading status of e-trading  Advertising and Marketing on Internet :New age of Information based marketing , On-line advertising paradigms : Active or Push based advertising, Passive or Pull based advertising , e-Cycle of Internet Marketing, Personalization, Search engine Optimization, tracking customers : log files, forms, cookies , e- CRM  On-Demand education and digital copyrights :On-line education and virtual classrooms , distance education and e-learning, , training on demand, changing roles of Institutions: universities and colleges, Publishers, Authors , technological components of education on-demand.</p>	
<p><b>Module IV</b></p>	<p><b>20%</b></p>
<p><b>E-commerce Security environment :</b>  Dimensions of E-Commerce security, security threats in the E-commerce environment: malicious code, unwanted programs, Phishing and Identity theft , Hacking and Cybervandalism , credit card fraud/theft, spoofing , spamming, Sniffing, Insider attacks, Denial of Service (DOS) and Distributes Denial of Service(dDOS) attacks  Introducing Technology solutions: Encryption, Secure Socket Layers (SSL) , Firewalls</p>	
<p><b>Module V</b></p>	<p><b>10%</b></p>
<p><b>E-Commerce PaymentSystems:</b>  Traditional payment methods, Online Credit card Transactions, Credit card E-Commerce enablers, digital wallets, digital cash, digital signatures ,electronic billing presentment and payment , Introduction to Electronic DataInterchange(EDI)</p>	



## **Course Learning Outcomes:**

***By the end of this course , student would be able to :***

- Identify the nature of e-Commerce
- Recognize the business impact and potential of e-Commerce
- Explain the technologies required to make e-Commerce viable
- Discuss the current drivers and inhibitors facing the business world in adopting and using e-Commerce
- Explain the economic consequences of e-Commerce
- Discuss the trends in e-Commerce and use of Internet for Communication, shopping and social networking

## **Text Books :**

1. **E-Commerce Essentials by Kenneth Laudon and Carol Traver ISBN-10 :0133544982 Prentice Hall,2013**
2. **Electronic Commerce from Vision to Fulfillment” , by Elias M. Awad , Pearson Education , 3rd Edition,2006**

## **References :**

1. **The Social Media Bible : Tactics, Tools and Strategies for Business Success 3<sup>rd</sup> edition by Lon Safko Publisher : Wiley,2012**
2. **Introduction to E-Commerce : 3<sup>rd</sup> Edition by Efraim Turban, David King, Judy Lang ; Publisher Prentice Hall,2010**
3. **CRM at the speed of Light : Social CRM strategies, tools and techniques for engaging your customers : 4<sup>th</sup> edition by Paul Greenberg , McGraw Hill,2009**
4. **E-Business and e-Commerce How to Program : 1<sup>st</sup> edition by Harvey M. Deitel Publisher : Prentice Hall,2000**
5. **Digital Capital : Harnessing the Power of Business Webs : 1<sup>st</sup> edition by Cheryl Kimball publisher: Entrepreneur Press,2000**

6. **E-Business Strategies for Virtual Organizations** by Janice Burn , Publisher Taylor andFrancis,2001
7. **E-Enterprise : Business Models, Architecture , and Components :1<sup>st</sup> edition** by Faisal Hoque , Publisher : Cambridge UniversityPress,2000
8. **“Frontiers of Electronic Commerce”** by Ravi Kalakota ,AndrewWhinston. , Addison Wesley , 4th Edition,2007
9. **“ From EDI to Electronic Commerce : A Business Initiative”** by Sokol ,TMH,1995

**Any other Study Material:**

- **IEEE Xplore : An E-commerce Model using Peer-to –Peer Technology and personal blog**  
author: Byeong-Thack Oh,Ho-jinPark
- **IEEE Xplore: Business Models for Mobile Commerce services” requirement , design and the Future** by UpkarVarshney ,Georgia Stateuniversity

## Course Title: Cyber and Information Security

### Course Objectives:

- To provide a broad understanding of Cyber and Information Security.
- To provide the student with basic knowledge of cybercrime dynamics, cyber law & Intellectual property issues; explore legal & policy developments for dealing fraud using Cyber space.

Pre-requisites: NIL

### Course Contents/Syllabus:

	Weightage (%)
<b>Module I Introduction</b>	
<b>Descriptors/Topics</b> <ul style="list-style-type: none"><li>• Introduction to Information, Computer and Network Security,</li><li>• Security Concepts, kinds of security breaches,</li><li>• Threats and Risks, Point of vulnerability,</li><li>• Attacks- Passive and Active, Security Services, Confidentiality, Authentication, Non-Repudiation, Integrity, Access Control, Availability,</li><li>• Model for Internetwork Security, Internet Standards and RFCs</li></ul>	<b>10%</b>
<b>Module II Cyber security</b>	
<b>Descriptors/Topics</b> <ul style="list-style-type: none"><li>• Sources of security threats, Motives, Target Assets,</li><li>• Consequence of threats, E-mail threats, Web threats, Hacking, Intruders, Insider threats</li><li>• Cyber Squatting, Cyber Stalking, Crime of deception, Content Oriented Online Crime, Malicious Software use and detection,</li><li>• Cyber Terrorism, Information warfare and surveillance, Virtual Crime, Online Frauds</li><li>• Identity Theft and Intellectual property theft, Network threats-Worms, Virus, Spam's, Ad-ware, Spy ware,</li><li>• Trojans and covert Channels, Backdoors, Bots, IP spoofing, ARP spoofing,</li></ul>	<b>20%</b>

<ul style="list-style-type: none"> <li>• Session hijacking, Sabotage, phishing, Zombie/Zombie Drone.</li> </ul>	
<b>Module III Cyber Laws</b>	
<b>Descriptors/Topics</b> <ul style="list-style-type: none"> <li>• Security Engineering: Security Threat Management, Risk Assessment,</li> <li>• Introduction to Cyber Forensics, Evaluation of crime scene &amp; evidence collection,</li> <li>• Security Policies, Risk Management, Procedure and Guidelines.</li> <li>• Cyber Laws: Advantages, cyber lawyers, Jurisdiction and Sovereignty.</li> <li>• The IT Act of India 2000</li> <li>• Intellectual property rights, Ownership &amp; Enforcement of IPR</li> <li>• Defenses for Infringement</li> <li>• Copy right objective , Transfer of copy right, practical aspect of licensing</li> <li>• Benefits, jurisdictional Issues, copy right in digital media, patents in cyber world</li> </ul>	<b>20%</b>
<b>Module IV Cryptography</b>	
<b>Descriptors/Topics</b> <ul style="list-style-type: none"> <li>• Introduction to Cryptography</li> <li>• E-Commerce Security</li> <li>• Message Authentication, Hash functions, Hashes and Message Digests</li> <li>• Number Theory for Information Security</li> <li>• Public Key Algorithms, Public-key Infrastructure, PKI Applications</li> <li>• Cryptographic Protocols, Digital Signature</li> <li>• Digital Watermarking and Steganography</li> <li>• Biometric Security</li> <li>• Encryption, Symmetric Key Encryption, Data Encryption Standard (DES), Kerberos</li> </ul>	<b>20%</b>
<b>Module V Security Risk Management</b>	
<b>Descriptors/Topics</b>	

<ul style="list-style-type: none"> <li>• Introduction to Security Risk Management, risk assessment,</li> <li>• Security Assurance Approaches: OCTAVE and COBIT approaches.</li> <li>• Security Management of IT Systems: Network security management, Firewalls, IDS and IPS configuration management.</li> <li>• Web and wireless security management.</li> <li>• Security Models, Access control models, role-based and lattice models.</li> <li>• Computer security log management, malware handling and vulnerability management programs.</li> <li>• Specifying and enforcing security policies,</li> <li>• Information security audit and principles of audit.</li> <li>• Information Security Standards and Compliance: Overview of security standards ISO 17799 Standard, Legal and Ethical issues, PCI DSS, ISO27001.</li> </ul>	<b>20%</b>
<b>Module VI Case Studies</b>	<b>10%</b>
<b>Descriptors/Topics</b> <b>Case Studies:</b> Ransomware Evolution, AI Expansion, IOT Threats, Blockchain Revolution, Serverless Apps Vulnerability etc.	

**Course Learning Outcomes:**

1. Recognize Cyber Crimes and Information Security Issues.
2. Explain existing Cyber Laws.
3. Learning various cryptographic algorithms about E-commerce.
4. Interprets Intellectual Property Rights.
5. Identify standards related to information security
6. Experimental evaluation of industry- based case study.

**Text Reading:**

- Cryptography and Information Security: V.K. Pachghare, PHI
- Cyber Laws and IT Protection: Harish Chander, PHI
- Slay, J. and Koronios, A., IT Security and Risk Management, Wiley, 2006.
- Hossein Bidgoli, Information Security, Volume 3, Threats, Vulnerabilities, Prevention, Detection, and Management, Wiley, 2006
- Mark Merkow, Information Security : Principles and Practices, 1/e, Pearson Education
- Marjie T. Britz, Computer Forensics and Cyber Crime : An Introduction, 2/e, Pearson Education

**References:**

- William Stallings, Network Security Essentials (Applications and Standards) Pearson Education.
- Ortmeier, P. J. Security Management: An Introduction, 2nd edition, Prentice Hall., 2005
- Skoudis, Ed & Zeltser, and Lenny Malware: Fighting Malicious Code. Second Ed. Prentice Hall PTR., 2004
- Skoudis, Ed & Liston, Tom, Counter Hack Reloaded, Second Edition. Prentice Hall PTR. Plano, TX , 2006
- Wall, David, Cybercrime: The Transformation of Crime in the Information Age. Polity Publishing , 2007
- Ross J Anderson, Security Engineering: A Guide to Building Dependable Distributed Systems, 2008

## Semester 6<sup>th</sup>

### **Course Title: Introduction to e-Governance**

**Course Objectives:** Electronic Governance (e-Governance) seeks to transform public service delivery and citizens' participation in government decision processes for both social and economic benefits.

- This course to familiarize the students with the concept of e-Governance.
- This course aims to provide a basic understanding of e-governance strategies and frameworks .
- This course aims to provide understanding of e-Governance Infrastructure , preparedness and readiness.
- Conceptualization of ideas and development of service delivery models for improving the quality of service to citizen.
- This course introduces National e-Governance Plan (NeGP) , Mission modes projects and Common Service Centre (CSC) - the major initiative of Government of India.
- This course aims to appraise the role of latest technologies in empowering Digital India Initiative

**Pre-requisites: NIL**

### **Course Learning Outcomes:**

**Upon completion of the subject , students will be able to :**

- Examine the need of e-Governance Projects
- Analyze advantages and disadvantages of e-government programs
- Analyze the evolution of e-Government architecture and framework
- Compare the different e-governance projects through case studies and Critique the maturity among different models
- Support various CSC initiatives
- Develop new m-governance projects to support e-Governance Citizen centric initiatives using latest emerging technologies.
- Prioritize types of e-government services

**Course Contents/Syllabus:**

	<b>Weightage (%)</b>
<b>Module I: BASICS OF E-GOVERNANCE</b>	<b>20%</b>
<ul style="list-style-type: none"><li>• e-Governance: Policies, Strategies and Frameworks</li><li>• Information Society Concepts and Principles</li><li>• Introduction to ICT and e-Governance</li><li>• Technology and Society</li><li>• The State and Governance</li><li>• Development Policies and Globalization</li><li>• Business Information Systems</li><li>• Government Process Re-engineering(GPR)</li><li>• Towards good governance through E-governance</li><li>• Introduction to e-Democracy</li><li>• Case study</li></ul>	
<b>Module II : E-GOVERNANCE ARCHITECTURE</b>	<b>20%</b>
<ul style="list-style-type: none"><li>• Planning and Implementing e-Governance</li><li>• Legal Framework of e-Governance</li><li>• Framework for Citizen engagement in e-Governance</li><li>• Business Models for Implementation of e-Governance</li><li>• Change Management and Capacity Building in e-Governance Projects</li><li>• Infrastructural preparedness :Legal , Human , Institutional , Technological</li><li>• Leadership and Strategic Planning</li><li>• Case Study</li></ul>	



<b>Module III : Introduction to National e- Governance Division (NeGD) &amp; National e-Governance Plan(NeGP)</b>	<b>30%</b>
<ul style="list-style-type: none"> <li>• Overview of National e_Governance Division</li> <li>• Overview of National e-Governance Plan (NeGP)</li> <li>• Mission Mode Projects- Central , State and Integrated</li> <li>• Digital India , Digital divide , Common Service Centres</li> <li>• e-government readiness</li> <li>• m-Governance and recent initiatives by e-Government</li> <li>• Case Studies of e-Governance initiatives in different states of India</li> </ul>	
<b>Module IV : E-GOVERNANCE TECHNOLOGIES</b>	<b>20%</b>
<ul style="list-style-type: none"> <li>• Information Management and Digital Archiving</li> <li>• Security and Privacy in a Networked World</li> <li>• Internet of Things: Smart Devices, Processes and Services</li> <li>• Latest technologies empowering Digital India Initiatives, case studies</li> <li>• Legal Aspects of Software and Database Protection</li> <li>• Technical Change and Techno-economic Paradigms</li> <li>• Case study</li> </ul>	
<b>Module V : E-Governance Portals around the Globe</b>	<b>10%</b>
<ul style="list-style-type: none"> <li>• Study of e-Governance models of different countries</li> <li>• Case Studies of e-Governance outside India</li> </ul>	

**Pedagogy for Course Delivery:** The course joins together Highly Interactive Lectures, Case studies, Quiz, interacting with e-Governance project experts in the field /through guest lectures /seminars/workshops and understudy presentations. Blended /Flipped mode of discussions form an important part of the learning experience. The readings for the course are attracted from text books , journals and new innovative ideas /articles published by experts of the e-Governance technical and administration experts.

**Text Books:**

1. E-governance for Development: A Focus on India , Shirin Madon , Palgrave Macmillan , 2009
2. eGov 2.0 Policies, Processes & Technologies ,JaiJit Bhattacharya , Tata McGraw Hill , 2012
3. E-governance: case studies, Ashok Agarwal, University Press India, 2007
4. E-government: from vision to implementation: a practical guide with case studies, Subhash C. Bhatnagar, SAGE , 2004
5. E-Governance: Concepts And Case Studies, C.S.R. Prabhu ,PHI ,2011
6. E-Government: The science of the Possible, J. Satyanarayana , PHI, 2006
7. IT-e-Governance in India Kamalesh N. Agarwala, Murli D. Tiwari , Macmillan , 2002

**References:**

1. Electronic Governance and Cross-Boundary Collaboration: Innovations and Advancing Tools ,Yu-Che Chen (Northern Illinois University, USA) and Pin-Yu Chu (National Chengchi University, Taiwan), Publisher: Information Science Reference, 2011
2. Public Information Technology and E-Governance: Managing the Virtual State by G. David Garson, Publisher: Jones & Bartlett Learning, 2006
3. Global e-Governance: Advancing e-Governance Through Innovation and Leadership , by J Tubtimhin, Publisher: IOS Press, 2009
4. Innovations In e-Government: Governors And Mayors Speak-Out ,By Erwin Blackstone, Michael Bognanno & Simon Hakim
5. E-governance: A Global Perspective on a New Paradigm , edited by Toshio Obi, Publisher: IOS Press, 2007

6. Governance and Information Technology From Electronic Government to Information Government edited by Viktor Mayer-Schönberger and David Lazer, Publisher: Massachusetts Institute of Technology, 2007

**Course Title: Block Chain Technology**

#	Course Title	Comments (if any)				
1	<p><b>Course Objectives:</b>                      Blockchain and Cryptocurrency is vastly discussed now days in all research domains to bring the decentralization. This course is to understand Blockchain and its main application cryptocurrency. Students will learn how this system works and how can they utilize and what application can be build. After successful completion of this course, students will be familiar with blockchain and cryptocurrency concepts.</p>					
2	<p><b>Pre-requisites: Networks</b></p>					
3	<p><b>Course Learning Outcomes:</b></p> <p>Upon completion of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Define different types of database management system and cryptography system.</li> <li>• Identify the advantages of block chain network and concept of consensus.</li> <li>• Explain distributed consensus.</li> <li>• Demonstrate knowledge of block chain challenges and vulnerability issues.</li> <li>• Design block chain in different application areas</li> </ul>					
4	<table border="1" style="width: 100%;"> <tr> <td style="width: 80%;"></td> <td style="text-align: center;"><b>Weightage (%)</b></td> </tr> <tr> <td><b>Module I : Introductions</b></td> <td style="text-align: center;"><b>20</b></td> </tr> </table>		<b>Weightage (%)</b>	<b>Module I : Introductions</b>	<b>20</b>	
	<b>Weightage (%)</b>					
<b>Module I : Introductions</b>	<b>20</b>					

	<p><b>Basics:</b> Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. <b>Cryptography:</b> Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.</p>		
	<p><b>Module II: Block Chain Technology</b></p> <p>Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft &amp; Hard Fork, Private and Public blockchain.</p>	20	
	<p><b>Module III : Distributed Consensus</b></p> <p>Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.</p>	20	
	<p><b>Module IV : Cryptocurrency &amp; Cryptocurrency Regulations</b></p> <p>History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin Stakeholders, Roots of Bitcoin, Legal Aspects - Cryptocurrency Exchange, Black Market and Global Economy.</p>	20	
	<p><b>Module V: Block Chain Applications</b></p> <p>Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.</p>	20	

	<p><b>Pedagogy for Course Delivery:</b>  The course will be delivered in blended/flipped mode. The class will be taught using theory and case based method. In addition to assigning the case studies, the course instructor will demonstrate and explain about applications of block chain technology. Students will be further motivated to go for certification course from swayam/NPTEL platform.</p>		

## Course Title: Introduction to Data Science

### Course Objective:

The aim of the course is to

- Introduce students to rapidly growing field and equip them with some of its basic principles and tools as well as its general mindset.
- To learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication.
- Application to solving problems.

### Prerequisites:

- Basic knowledge of algorithms and reasonable programming experience
- Basic linear algebra (solution of linear systems and eigenvalue/vector computation)

- Basic probability and statistics

**Course Learning Outcomes:**

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

- Describe what Data Science is and the skill sets needed to be a data scientist.
- Explain in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data.
- Explain the significance of exploratory data analysis (EDA) in data science.
- Describe the Data Science Process and how its components interact.
- Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modeling.
- Identify common approaches used for Feature Generation.
- Identify and explain fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine
- Create effective visualization of given data (to communicate or persuade).
- Work effectively in teams on data science projects.
- Reason around ethical and privacy issues in data science conduct and apply ethical practices.

<b>Course Contents / Syllabus: Module I: Introduction</b>	<b>(Weightage 20%)</b>
Introduction to Data Science, Big Data and Data Science, Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model, Introduction to R, Information Visualisation	
<b>Module II:</b>	<b>(Weightage 20%)</b>
Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process Basic, Machine Learning Algorithms - Linear Regression,	

- k-Nearest Neighbors (k-NN), k-means, Naive Bayes, SVM	
<b>Module III:</b>	<b>(Weightage 20%)</b>
Feature Generation (role of domain expertise) and Feature Selection algorithms: Filters; Wrappers; Decision Trees; Random Forests	
<b>Module IV:</b>	<b>(Weightage 20%)</b>
Recommendation Systems- Dimensionality Reduction , Singular Value Decomposition, Principal Component Analysis	
<b>Module V:</b>	<b>(Weightage 20%)</b>
Text mining and information retrieval, Big Data Fundamentals and Hadoop Integration with R, Introduction to Neural Networks, Data Science and Ethical Issues	

***References Books:***

- Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly. 2014.
- James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer, 2013.
- Han, J., Kamber, M., Pei, J. Data mining concepts and techniques. Morgan Kaufmann, 2011.
- Hastie, T., Tibshirani, R., Friedman, J. The Elements of Statistical Learning, 2nd edition. — Springer, 2009.
- Murphy, K. Machine Learning: A Probabilistic Perspective. - MIT Press, 2012.

- “Practical Data Science with R”. Nina Zumel, John Mount. Manning, 2014
- “Data Science for business”, F. Provost, T Fawcett, 2013

## **Course Title: Fundamentals of Human Resource Management**

- **Course Objectives:** The objective of this course is to provide students with the basic principles, issues, trends, and practices of Human Resource Management and to develop an understanding about how an organization manages its people effectively.
- **Pre-requisites:** The students should have the knowledge of basic concepts and processes of management. They should also know the various functions which are performed in an organisation.
- **Student Learning Outcomes:**
  - By the end of this course the Students will able to
    - Demonstrate the basic concepts of HRM .
    - Learn the various objective ,scope and function of HRM
    - Learn application of HRM in the organization
    - Evaluate the current issues and trends in HRM

### **Course Contents/Syllabus:**

#### **Module I Introduction to HRM**

Introduction, Concept and Functions, Evolution (PM vs. HRM), Scope and Significance of Human Resource Management, Role and Responsibilities of the Human Resource Manager and essentials of Sound HR Policies.

#### **Module II Acquisition of Human Resources**

Objectives, Policies and Process of Human Resource Planning, Job Analysis, Recruitment (process,



methods: internal, external), Selection (process, tests, interviews), Induction, Placement

### **Module III Development of Human Resources**

Training and Development (process, methods: On-the job, Off-the job), Evaluation of training and Performance Appraisal (concept, significance, process, methods- traditional and modern)

### **Module IV Maintenance of Human Resources**

Job Evaluation: concept, process, Compensation: concept, components, Designing and Administering the Wage and Salary Structure, Grievance Procedure and Handling, Discipline, Attrition and Retention

### **Module V Current Issues in HRM**

Increased concern for HRM (Sound IR, work life balance, International Human Resource Management-, Strategic Human Resource Management, Talent management, Employee engagement, Competency mapping, HR accounting-, HRIS, HR audit, , CSR

### **Text**

- VSP Rao, Human Resource Management, Excel Publications
- Shikha Kapoor , Human Resource Management (Text and Cases)Taxmann Publication Pvt Ltd
- K Aswathappa; Human Resource and Personnel Management; McGraw- Hill Companies

### **References:**

- Garry Dessler, Human Resource Management, Pearson Publications
- Edward, B Flippo, Personnel Management, Mc Graw Hill International Ed.
- VSP Rao, Human Resource Management, Excel Publications
- K Aswathappa; Human Resource and Personnel Management; McGraw- Hill Companies
- Dale Yoder, Personnel Management and Industrial Relation,
- Monappa & Sayiaddin, Personnel Management, Vikas Publishing Company
- Desimone; Human Resource Development, Thomson Learning

- Bohlander; Managing Human Resources; Thomson Learning. Ed. 13 2004