

Program - BCA (Cloud and Security)

SEMESTER I

Course Title: Basic Mathematics- I

Course Objectives:

- Aimed to solve standard topical textbook-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.

Course Contents/Syllabus:

Module I: Set Theory and Matrices

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.

Module II: Mathematical Logic

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

Module III: Group and Subgroup

Binary Operations, Properties of Binary Operations, Semi group, Monoid, Group, Subgroups and other Groups

Module IV: Graph Theory

Graph, Multi Graph, Complete Graph, Bi Graph, Degree, isomorphic Graph, Euler Graph, Hamiltonian Graph, Bipartite Graph.

Module V: Data Analysis

Data and Statistical Data, Frequency Distribution, Graphical Representation, Measure of the Central Tendency, Measure of Dispersion, Kurtosis, skewness.

Text Readings

- Business Mathematics, Sancheti & Kapoor, S.Chand & Sons

References

- Discrete Mathematical Structure, Kolman, Busby and Ross, PHI

Course Title: Business Communication

Course Objectives:

- Students will learn essential English grammar and English writing mechanics
 - Some theoretical inputs into the process of communication, its difference between written and oral communication
 - Improve 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.
- Course Contents/Syllabus:**

Module I: Essential English Grammar

Tenses, Subject-verb Agreement, Punctuation, Sentence Structure, Common Errors in English, Foreign Words

Module II: Written English Communication

Essay Writing, Precis Writing, Summarising, Paraphrasing

Module III: Concept and Nature of Communication

What is Communication, Stages of communication: Ideation, Encoding, Transmission, Decoding and Response, Channels of Communication: Downward, Upward, Horizontal and Diagonal, Communication in Organization setting: Internal and External, Barriers to Effective Communication, Guidelines to overcome communication barriers, The Listening Process, Listening with a Purpose, Barriers to Listening, Effective Listening Strategies, Defining Non-verbal communication, Functions of non-verbal communication, Gesture cluster, Acoustic Features

Module IV: Effective Presentation

Pre-Presentation Jitters, Preparation and Practice, Delivering the presentation, Qualities of a skillful presenter, Capturing and maintaining attention, Handling questions, Power-Point presentation, Netiquette, Professional profiles, Blogs, Letters, Emails, Memo, Notices

Module V: Employment Communication

Functions of report, Types of report, The report/proposal process, Organizing the report/proposal, Resume writing, Group Discussion, Qualities/Skills assessed in group discussion, Do's and Don't's in a group discussion, Effective participation in group discussion, Mock GD sessions

Text Readings

- Business Communication K. K. Sinha
- Business Communication: Theory and Application: Lesikar and Pettit
- Effective Communication: Adair, John
- Successful Communication in Business: Pryse, B. Elizabeth

Course Title: Computer and Information Technology

Course Objectives:

- 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

Course Contents/Syllabus:

Module I: Introduction to Computers

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

Module II: Introduction to Number Systems

Introduction to Number Systems – Binary, Hexadecimal, Octal, BCD; Conversion between number systems; One's Complement; Two's Complement; Boolean Algebra and Laws.

Module III: Introduction to IT

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

Module IV: Operating Systems

Operating System: Definition and use; Types of OS: Batch Processing, Multiprogramming, Multi-Tasking, Multiprocessing; Data Communication

Module V: Introduction to Programming Concepts

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 Readings

- Gill, Nasib S.: Essentials of Computer and Network Technology, Khanna Book Publishing Co., New Delhi.
- Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.
- Chhillar, Rajender S.: Application of IT in Business, Ramesh Publishers, Jaipur.
- Donald Sanders: Computers Today, McGraw-Hill Publishers.
- Davis: Introduction to Computers, McGraw-Hill Publishers.
- V. Rajaraman: Fundamental of Computers, Prentice-Hall India Ltd., New Delhi.
- Learning MS-Office2000 by R Bangia (Khanna Book Pub)
- Teach yourself MS-Office by Sandler (BPB Pub).
- 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 Title: Human Computer Interaction

Course Objectives:

- 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.

Course Contents/Syllabus:

Module I: Introduction

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.

Module II: Design and Software Process

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.

Module III: Evaluation

Goals of Evaluation, Evaluation through Experts, Evaluation through users. Choosing an Evaluation method.

Module IV: Models and Theories

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.

Module V: Research Framework

Speech Interfaces, Information Visualization, Ubiquitous Computing, Case studies.

Text Readings

- Business Mathematics, Sancheti & Kapoor, S.Chand & Sons

References

- Discrete Mathematical Structure, Kolman, Busby and Ross, PHI

Course Title: Programming in C

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

Course Contents/Syllabus:

Module I: Introduction

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.

Module II: Programming in C

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.

Module III: Fundamental Features in C

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.

Module IV: Arrays and Functions

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.

Module V: Advanced features in C

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

Text Readings

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

SEMESTER II

Course Title: Data Structures Using C [Core Courses]

Course Objectives:

- 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.

Course Contents/Syllabus:

Module I: Introduction to Data Structures

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

Module II: Stacks and Queues

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.

Queue: Definition, Representation of Queues, Operations of queues- Insert, Delete, Priority Queues, Circular Queue, Deque.

Module III: Programming with Linked Lists

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.

Module IV: Trees

Trees: 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.

Graph and Their Applications 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).

Module V: Searching and Sorting Techniques

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.

Text Readings

- Yashwant Kanetkar, "Data Structure using C", BPB Publication, 5th Edition, 2011
- A.Tannenbaum, Y. Lanhgsam and A.J. Augenstein, "Data Structures Using C And C++", Prentice Hall of India, 2nd 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", 1st Edition Create space publisher, 2008.
- Mark Allen Weiss, "Data Structure and algorithm Analysis in C", 2nd 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, 4th Edition, 2009
- E.Horowitz and S.Sahni, "Fundamentals of Data Structures in C", 2nd 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 and Natural Resources

Multidisciplinary nature of environmental studies, Introduction, definition and importance of environmental studies, need for public awareness, sensitisation and participation 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.
- Land resources: Land as a resource, land degradation, man induced landslides, Land resources: soil erosion and desertification.
- Natural Resources: Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Natural Resources: Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Natural Resources: Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Natural Resources: Food resources: World food problems, changes caused by agriculture and overgrazing, Food resources effects of modern agriculture, fertilizer pesticide problems, water logging, salinity, case studies.
- Natural Resources: Energy resources: Growing energy needs, Energy resources renewable and non-renewable energy sources, Energy resources use of alternate energy sources, case studies.
- Role of individual in conservation of natural resources
- Equitable use of resources for sustainable lifestyles.

Module II: 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 III: 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 landslide solution

Module IV: Social Issues and the Environment

Environment From Unsustainable to Sustainable development Urban problems related to energy Water conservation, rainwater 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 V: 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

Text Readings

- 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

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

Course Contents/Syllabus:

Module I: Understanding Self for Effectiveness

Understanding Personality, Role of Nature and Nurture in Personality Development, TEA Model of Self, Component of Self, Real Self, Role Self, Ideal Self, Self-Awareness, Techniques of Self Awareness – Johari Window and SWOT Analysis of Self, Big 5 factor, Meaning and nature of attitude, Components and Formation of attitude, Importance and relevance of attitude, Attitudinal Change, Prejudice, Discrimination, Stereotype, Building Positive Attitude

Module II: Motivation and Emotional Intelligence

Understanding Emotions, Types of Emotions, Function of Emotions, Positive emotions and Personal development, Creating healthy organizational climate, Emotional Intelligence – Meaning, components, Importance and Relevance, Managing Emotions, Motivation; Meaning, Types of Motivation, Components of Motivation, Source of Motivation

Module III: Social and Behavioral Issues

Social issues in Community, Healthy management of Social Issues, Social and Psychological Stigma, Strategies to overcome Social Stigma, Behavioural Problems. Rumors; Social Media, Electronic Media, Nature of Socialization, Types of Socialization, Agents of Socialization and their Contribution, Social Inhibition and Social facilitation

Module IV: Managing Diversity for Peace and Harmony

Individual Differences, Understanding Diversity, Barriers and Challenges in Managing Diversity, Managing Diversity in Organisation, Tolerance, Harmony, Pro-Social Behaviour, Social Change, Sense of pride and standings up for one's right, Integrity and accountability, Fundamental duties for a good Citizen

Module V: Values and Ethics for Personal and Professional Development and Human Interface and Organizational Justice

Personal values-Empathy, honesty, courage, commitment, Core Values, Values Clarification & Acceptance, Nurturing Good values, Professional Values-Work ethics, respect for others, Its role in personality development, Moral Dilemma's, Value Prioritization, Learning based on project work on Scriptures like- Ramayana, Mahabharata, Bible, Quran, Gita etc. Types of Judgment (Factual Aesthetic, Moral), Domains in study of Ethics (Applied, Normative & Meta Ethics), Ethics in Technological Era, Meaning, Types of Organizational Justice, Implications of Organizational Justice, Consequences of Organizational injustice.

Text Readings

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002, Harcourt College Publishers
- Dick, Mc Cann & Margerison, Charles: Team Management, 1992 Edition, viva books
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour

- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers

Course Title: Operating System Concepts

Course Objectives:

- 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

Course Contents/Syllabus:

Module I: Introduction

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.

Module II: Processes Management

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

Module III: Memory Management

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

Module IV: File and Device Management

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

Module V: Security and Protection

Security Policies and Mechanism; Protection and Access Control: Access Matrix Model of Protection, Access Hierarchies, Access List, Capabilities

Text Readings

- 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

Course Title: Software Engineering and Modeling

Course Objectives:

- 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.

Course Contents/Syllabus:

Module I: Introduction to Software Engineering.

What and Why Software Engineering, Software Crisis–Problem and Causes, Responsibility of Software Engineering, Fundamental Qualities of a Software Product, Kinds of Software Life-Cycle Models and Case Study

Module II: Software Requirement Engineering

Traditional Methods for Requirement Determination. Modern Methods for Requirement Determination. Process Modeling using DFD, Data Modeling using ERD. Requirement documentation, Case Study, Programming Practices, Top down Approach & Bottom up Approach, Structure Programming, Information hiding, Paired Programming

Module III: Software Design

Software Design Process and Design Objectives, Structured Design Methodologies. Modules Coupling and Cohesion, Types of Coupling and Cohesion, Structured Chart, Qualities of Good Software Design

Module IV: Software Design

Introduction to Software Testing, Level of Testing, Characteristics of software testing, Black-Box Testing and White-Box Testing, Alpha, Beta and Gamma testing

Module V: Software Project Planning and Management

Software Project Planning, Software Metrics, Cost and Size Metrics- FP & COCOMO. Configuration Management, Software Maintenance and Types of Maintenance

Text Readings

- 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.

References

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

SEMESTER III

Course Title: Introduction to Data Base Management Systems

Course Objectives:

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

Course Contents/Syllabus:

Module I: Introduction to DBMS

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.

Module II: Relational Database & ER Model

Relational System, Codd's Rule, Relational Model, Tables and Views, Entity, Types of Entity, Weak Entity Attributes, Entity sets, Entity – Relationship Diagrams, case study.

Module III: Relational Model Objects

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.

Module IV: Database Design

Definition of Functional Dependencies, Process of Normalization, First Normal Form, Second Normal Form, Third Normal Form. Boyce Codd Normal Form, Fourth Normal Form, Fifth Normal Form, case study.

Module V: Data Recovery & Protection

Recovery-Transaction recovery, System recovery, Media Recovery, Concurrency Control Techniques: Locking, Dead Lock, Introduction to Serializability, Security.

Text Readings

- 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: 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.

Course Contents/Syllabus:

Module I: Introduction to Computational Statistics

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

Module II: Numerical Measures in Statistics

Measure of central tendency and dispersion, merits and demerits of these measures

Module III: Skewness and Kurtosis

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

Module IV: Correlation and Regression Analysis

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

Module V: Association of Attributes

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.

Text Readings

- Goon,Gupta & Dasgupta: Fundamentals of statistics. Vol. I. The World Press Private Ltd., Calcutta.
- Yule, G.U. and Kendall, M.G.: An Introduction to the theory of statistics. Charles Griffin & Company Ltd.
- C. E. Weatherburn: Mathematical Statistics.

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

Course Contents/Syllabus:

Module I: Fundamentals

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

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

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

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 Readings

- Bhuvan Unhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, Jun
- Woody Leonhard, Katherrine Murray, "Green Home computing for dummies", August 2009.

References

- Alin Gales, Michael Schaefer, Mike Ebberts, "Green Data Center: steps for the Journey", Shoff/IBM rebook, 2011.
- John Lamb, "The Greening of IT", Pearson Education, 2009.
- Jason Harris, "Green Computing and Green IT- Best Practices on regulations & industry", Lulu.com, 2008.
- Carl speshocky, "Empowering Green Initiatives with IT", John Wiley & Sons, 2010.
- Wu Chun Feng (editor), "Green computing: Large Scale energy efficiency", CRC Press, 2012.

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.

Course Contents/Syllabus:

Module I: Exploring the Network

Introduction, Communicating in a Network-Centric World, The Network as a Platform, Converged Networks, LANs, WANs, and the Internet, The Expanding Network, Network Architectures. Configuring a Network Operating System, IOS Bootcamp, Limiting Access to Device Configurations, Address Schemes.

Module II: Network Protocols and Communication

Introduction, Network Protocols and Standards, Reference Models, Using Requests for Comments, Moving Data in the Network.

Module III: Application Layer and Transport Layer

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.

Module IV: Network Layer, IP Addressing and Subnetting

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.

Module V: Network Access and Ethernet Technology

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. Create and Grow, Devices in a Small Network, Growing to Larger Networks, Keeping the Network Safe, Basic Network Performance, Managing IOS Configuration Files.

Text Readings

- 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

Course Title: Object Oriented Programming Using Java

Course Objectives:

- The objective is to impart programming skills used in this object oriented language java.
- The students are expected to learn it enough so that they can developed program in Java and the web solutions like creating applets etc.

Course Contents/Syllabus:

Module I: OOPS and Introduction to Java

Introduction to OOPS, Object Oriented Programming: Classes and Objects, Encapsulation, Abstraction, Polymorphism, Inheritance, Introduction of Java, History of Java, How Java is different from C++, JDK Tools, Class File, Java Bytecode, JVM, identifiers, Data types, Operators. Control Statements, loop, arrays, Inheritance in Java, Multilevel hierarchy, method overriding, Abstract classes, Final classes

Module II: Package and Exception in Java

Defining, Implementing and Applying Packages, Importing Packages, Types of packages, User define package, Exception handling in Java, try, catch, throw, throws and finally, Uncaught Exceptions, Multiple catch, Java's Built-in Exception

Module III: Constructor, Wrapper, String and StringBuffer Class in Java

Constructors, Various Types of Constructor, Role of Constructors in inheritance, Introduction to Wrapper Classes, String Operations in java, Immutability, Creating and Initializing Strings using methods of String and StringBuffer Class

Module IV: Interface and Threads in Java

Interface: Defining Interfaces, Abstract Methods in Interfaces, Implementing Interfaces, Extending Interfaces, Interface References, Default Methods in Interfaces, Static Methods in Interfaces, Constants in Interfaces
Thread: Thread life cycle, Creating and implementing thread, multi-threaded programming, thread priorities, synchronization of thread, resuming and stopping Threads

Module V: Applet and Graphics Programming

Applet Class, Life cycle of applet, creating an executable applet, adding applet to HTML file, The Graphics class, Draw lines, rectangles, circles, ellipse, arcs, polygon etc. Using control loops in Applet, Introduction to AWT packages, Layout Managers

Text Readings

- JAVA The Complete Reference by PATRICK NAUGHTON & HERBERT SCHILD, TMH
- Introduction to JAVA Programming a primar, Balaguruswamy.

References

- "Introduction to JAVA Programming" Daniel/Young PHI
- Jeff Frentzen and Sobotka, "Java Script", Tata McGraw Hil

SEMESTER IV

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.

Course Contents/Syllabus:

Module I: Introduction

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

Module II: Unix Commands

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, 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.

Module III: VI Editor

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.

Module IV: Shell Programming

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

Module V: System Administration

Adding and Removing Users, Starting up and Shutting down the System, Disk Management, File System Mounting and Unmounting, Monitoring System Usage, Ensuring System Security

Text Readings

- Unix & Shell Programming, Yashwant P.Kanetkar , BPB Publication , 2002

References

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

Course Title: Python Programming

Course Objectives:

- 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

Course Contents/Syllabus:

Module I: Introduction

Basic concepts: Functional Programming, OOPS and Data Structures

Getting Started: Running Code in the Interactive Shell, Input, Processing and Output, Editing, Saving and Running a Script, Working of Python.

Variables, Expressions and Statements: 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

Module II: Conditional Statements and Loops

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

Module III: Functions and Recursion

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

String Functions: Traversal, Comparison, Searching, Counting, Pre-defined String Functions, In Operator

Module IV: Lists, Dictionaries and Tuples

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

Module V: Files

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

Text Readings

- 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: Practical Approach to Data Mining and Analytics (Specialization Course)

Course Objectives:

- Data Mining is a systematic and sequential process of identifying and discovering hidden patterns and information in a large dataset.
- Data Analysis is a superset of Data Mining, and it involves extracting, cleansing, transforming, modelling, and visualisation of data to uncover meaningful and useful information that can help in taking decisions.

Course Contents/Syllabus:

Module I: Introduction to Data Mining

Basic concepts of Data Mining, Data Mining techniques, Related technologies

Module II: Data Pre-processing

Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies

Module III: Data Mining Algorithms

Association rules, Classification, Prediction, Clustering

Module IV: Data Analytics Using Programming Tools

Data Analytics Using Programming Tools

Module V: Topics in Analytics

Association and correlation analysis - regression models, Predictive analytics, Exploratory analysis

Module VI: Case Studies

Image analytics, Text analytics

References

- Students will be provided with well curated content in the form of video lectures, live sessions, pdf's, weblinks, etc. created as per the syllabus.

Course Title: Applied Cloud Computing (Specialization Course)

Course Objectives:

- Cloud Computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user.
- The objective of the course is to learn about how the data can be distributed to the different data centres available to many users over the internet.

Course Contents/Syllabus:

Module I: Introduction to the Cloud

Evolution of information technology (IT) and business computing models; Definition of cloud computing, business drivers for the cloud; Essential characteristics; Cloud computing vs cluster computing vs grid computing; Cloud computing architecture; Service and deployment models; Benefits, risks and challenges of cloud computing

Module II: Cloud Computing Stack

Comparison with traditional computing architecture (client/server); Services provided at various levels, types of cloud services - public, private and hybrid; Role of networks in cloud computing; Service models (XaaS); Deployment models - public cloud, private cloud, hybrid cloud, community cloud

Module III: Services

Infrastructure as a service (IaaS); Platform as a service (PaaS); Software as a service (SaaS)

Module IV: Service Management in Cloud Computing

Service management - service level agreements (SLAs), billing and accounting; Service improvement and roadmap

Module V: Cloud Security

Infrastructure security; Network level security; Host level security; Application level security; Data security and storage; Jurisdictional issues - data location identity; Access management, access control trust, reputation, risk authentication in cloud computing

Module VI: Case Studies

Kubernetes (K8s) - Amazon Web Services (AWS) Database Migration Service - cloud extract, transform, load (ETL), Amazon SageMaker - platform to build, train and deploy machine learning models quickly; Cloud-based analytic databases - Amazon Redshift, Snowflake and Google BigQuery

References

- Students will be provided with well curated content in the form of video lectures, live sessions, pdf's, weblinks, etc. created as per the syllabus.

Course Title: Information Security - Practitioner's Perspective (Specialization Course)

Course Objectives:

- Information Security is the part of information risk management which is the practice of protecting information by mitigating information risks.
- It involves preventing or at least reducing the probability of unauthorised/inappropriate access, use, disclosure, disruption, deletion/destruction, corruption, modification, inspection, recording or devaluation of information.

Course Contents/Syllabus:

Module I: Introduction to Basic Security Services

Computer security concepts; Confidentiality and integrity; Security architecture for open systems; Computer security trends

Module II: Anatomy of an Attack

Network mapping using ICMP (internet control message protocol) queries; TCP (transmission control protocol) pings; TCP (transmission control protocol) and UDP (user datagram protocol) port scanning; FTP (file transfer protocol) bounce scanning; Vulnerability scanning; System and network penetration, denial-of-service - defence and response

Module III: Protocols Attacks and Defence Mechanisms

Network layer; Transport layer; Application layer

Module IV: Malicious Software

Types of malicious software (malware); Propagation - infected content, viruses, vulnerability exploit, worms and propagation social engineering - spam email, Trojans; Payload system corruption, attack agent - zombie, bots, information theft - keyloggers, phishing, spyware, stealth - backdoors, rootkits

Module V: Cryptographic Tools

Cryptographic Tools

Module VI: Topics in Security

Security auditing - security auditing architecture, security audit trail, implementing; Legal and ethical aspects - cybercrime and computer crime, intellectual property, privacy, ethical issues

References

- Students will be provided with well curated content in the form of video lectures, live sessions, pdf's, weblinks, etc. created as per the syllabus.

SEMESTER V

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

Course Contents/Syllabus:

Module I: Introduction to AI and Problem Representation

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

Module II: Heuristic Search Techniques

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

Module III: Game Playing

Game Playing: AI and game playing, plausible move generator, static evaluation move generator, game playing strategies, problems in game playing

Module IV: Logic and Knowledge Representation – Part 1

Knowledge Representation and Structured Knowledge: Associative networks, frame structures, conceptual dependencies and scripts

Module V: Logic and Knowledge Representation – Part 2

Propositional logic: syntax and semantics, First Order Predicate Logic (FOPL): Syntax and semantics, conversion to clausal form, inference rules, unification, and the resolution principles

Text Readings

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

References

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

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.

Course Contents/Syllabus:

Module I: E-Commerce: A Revolution

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 vs e-commerce.

Module II: E-commerce business Models and concepts

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 – Citizen model

Module III: E-Commerce Infrastructure framework

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.

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

Conceptual Framework of e-Business

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.

Module IV: E-commerce Security environment

Dimensions of E-Commerce security, security threats in the E-commerce environment: malicious code, unwanted programs, Phishing and Identity theft, Hacking and Cyber vandalism, credit card fraud/theft, spoofing, spamming, Sniffing, Insider attacks, Denial of Service (DOS) and Distributed Denial of Service (DDoS) attacks

Introducing Technology solutions: Encryption, Secure Socket Layers (SSL), Firewalls

Module V: E-Commerce Payment Systems

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 Data Interchange (EDI)

Textbooks:

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

References:

- The Social Media Bible: Tactics, Tools and Strategies for Business Success 3rd edition by Lon Safko Publisher: Wiley,2012
- Introduction to E-Commerce: 3rd Edition by Efraim Turban, David King, Judy Lang; Publisher Prentice Hall,2010
- CRM at the speed of Light: Social CRM strategies, tools and techniques for engaging your customers: 4th edition by Paul Greenberg, McGraw Hill,2009
- E-Business and e-Commerce How to Program: 1st edition by Harvey M. Deitel Publisher: Prentice Hall,2000
- Digital Capital: Harnessing the Power of Business Webs: 1st edition by Cheryl Kimball publisher: Entrepreneur Press, 2000
- E-Business Strategies for Virtual Organizations by Janice Burn, Publisher Taylor and Francis,2001
- E-Enterprise: Business Models, Architecture, and Components :1st edition by Faisal Hoque, Publisher: Cambridge University Press,2000
- “Frontiers of Electronic Commerce” by Ravi Kalakota, Andrew Whinston. , Addison Wesley , 4th Edition,2007
- “From EDI to Electronic Commerce: A Business Initiative” by Sokol, TMH,1995

Course Title: Professional Ethics

Course Objectives:

- Show awareness of ethical concerns across a wide range of professions
- Understand the strengths and weaknesses of various ethical assumptions and arguments
- Understand various workplace related ethical issues and strategies to address them
- Interpret personal sense of compassion and fairness in the context of your professional roles.

Course Contents/Syllabus:

Module I: Philosophy and Ethics

Introduction to ethical philosophy: definition, nature, scope, branches. Basic Theories. (Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory). Morals, values and Ethics. Moral Issues, Moral Dilemmas & Moral Autonomy. Basic Ethical Principles, Contemporary philosophy: action, ethics, and responsibility. Linking philosophy and ethics & its implications

Module II: Ethics at Workplace

Professional Ethical Codes. Workplace Rights & Responsibilities (Whistle blowing). CSR Conflicts of Interest. Managing Boundaries and Multiple Relationships (Socializing with Current or Former Clients, Making Referrals). Organizational Loyalty.

Module III: Ethical Considerations

Basics of Intellectual Property Rights. Confidentiality, Unintentional breaches of Confidentiality. Principles of Natural Justice. Working with minors. Redressal Mechanism- Organizational Complaint Procedure. Legal aspects of professional ethics.

Module IV: Global issues in different sectors

Current Scenario. Globalization of MNCs, International Trade, World Summits. Business Ethics and Corporate Governance. Environmental Ethics. Sustainable Development Goals, Corporate Wars. Ethics pertaining to discipline: Manufacturing, Marketing, technology- Ethical Hacking, Teaching Ethics, Media Ethics, Bio Ethics, Legal ethics, Business ethics, management law, journalism.

Module V: Research Ethics and Academic Integrity

Best practices in research / standards setting initiatives and guidelines: COPE, WAME, etc Academic misconducts: Falsification, Fabrication and Plagiarism (FFP).

Redundant publications: duplicate and overlapping publications, salami slicing, Selective reporting and misrepresentation of data. Violation of publications ethics, authorship, and contributor ship. Use of plagiarism software like Turnitin, Urkund and other open-source software tools, Complaints and appeals examples and fraud from India and abroad

Textbooks:

- Jayasree Suresh and B. S. Raghavan, Human Values and Professional Ethics, 3rd Edition, S. Chand Publications
- B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
- B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
- Ethics and Excuses: The Crisis in Professional Responsibility By Banks McDowell Quorum Books, 2000
- A Global Standard for Professional Ethics: Cross-Border Business Concerns By Allen, Catherine; Bunting, Robert Journal of Accountancy, Vol. 205, No. 5, May 2008
- Conflict of Interest in the Professions By Michael Davis; Andrew Stark Oxford University Press, 2001
- Working Ethics: How to Be Fair in a Culturally Complex World By Richard Rowson Jessica Kingsley, 2006
- Preferred Strategies for Learning Ethics in the Practice of a Discipline By Pettifor, Jean L.; Paquet, Stephanie Canadian Psychology, Vol. 43, No. 4, November 2002

Course Title: Practical Approach to Cyber Security (Specialization Course)

Course Objectives:

- The knowledge and implementation of cyber security has become significant today as the number of cyber-attacks has soared as evidenced by high-profile data breaches, ransomware, or distributed denial-of-service (DoS) attacks.
- This situation calls for developers and managers with skills to strengthen online systems against cyber-attacks and make systems secure. This course aims to achieve that goal by thoroughly covering the basics of common cyber-attacks, their defences and common security good practices in the real-world.

Course Contents/Syllabus:

Module I: Need for Cyber Security and Security Mindset

Need for Cyber Security and Security Mindset

Module II: Threat Modelling and Security Architecture

Threat Modelling and Security Architecture

Module III: Basics of Cryptography

Historical overview, asymmetric/symmetric ciphers, hash functions; Digital signature, certificate, transport layer security (TLS)

Module IV: Web Security: Web Attacks and Defences

How internet and web works: underlying techniques recap; SQL injection attacks and mitigation; Cross-site scripting (XSS) attacks and defences; Cross-site request forgery (CSRF) attacks and defences; Web tracking and web privacy

Module V: Network Security

Network threat model; Tools of the trade: ping, nmap, traceroute, wireshark, tcpdump; Protocol attacks: blind spoofing, SYN flooding; DDoS attacks and defences; Botnets and crimeware; VPN and firewalls.

Module VI: Authentication and Access Control

Access control models; Passwords: attacks and defences; OAuth 2.0; Multi-factor authentication; Biometrics

Module VII: Database Encryption

Encrypted file systems; Application-level encryption

Module VIII: Usable Security: Design Principles

Behavioural nudging for users; Security notifications

Module IX: Security in Practice

Security auditing; Compliance course syllabus

References:

- Students will be provided with well curated content in the form of video lectures, live sessions, pdf's, weblinks, etc. created as per the syllabus.

Course Title: Cloud Development (Specialization Course)

Course Objectives:

- Cloud computing has a big role to play in the serverless information technology paradigm.
- The primary objective of the course is to understand how cloud development is essential in every organization and how different sectors are trying to enable their products as cloud enabled.
- This course will discuss different application development in cloud. The solutions can be in core system level or in application level

Course Contents/Syllabus:

Module I: Introduction to Cloud Computing

Evolution, History, NIST model, Cloud service providers; Properties, Characteristics, Open Standards

Module II: Compute Solution

About the compute solution and properties, requirement; Strategy for development, where and how to develop

Module III: Storage & Database Solution

Concept about storage and database, requirement; Strategy for development, where and how to develop

Module IV: Security Solution

Why security is important, types of security solution; Strategy for development, threats, where and how to develop

Module V: Network & IoT Solution

Basic network concept, IoT requirements; Strategy for development, where and how to develop

Module VI: AI & ML solution

Basic AI & ML concept, use of AI & ML different technology; Strategy for development, where and how to develop

Module VII: Application Solution: Healthcare

Requirements of cloud in Healthcare; How to and where to develop the cloud healthcare solution

References:

- Students will be provided with well curated content in the form of video lectures, live sessions, pdf's, weblinks, etc. created as per the syllabus.

SEMESTER VI

Course Title: Major Project

Course Title: Advanced Cyber Security (Specialization Course)

Course Objectives:

- The Advanced Cyber Security - An Application Approach course deals with Cyber Security from an information security management perspective

Course Contents/Syllabus:

Module I: Application Security

Importance of application security; Open Web Application Security Project (OWASP) top 10 web application vulnerabilities; Secure Software Development Life Cycle (SSDLC)

Module II: Data and Endpoint Security

Data security, data security controls; Endpoint security, host/endpoint security

Module III: Identity and Access Management (IAM)

Authorization, authentication; Access control, access control models; Privilege levels, IAM lifecycle, identity and access management process and activities

Module IV: Phases of a Cyber Attack

Reconnaissance: adversary identifies and selects a target; Weaponize: adversary packages an exploit into a payload designed to execute on the targeted computer/network; Deliver: adversary delivers the payload to the target system; Exploit: adversary code is executed on the target system; Install: adversary installs remote access software that provides a persistent presence within the target environment system; Command and control: adversary employs remote access mechanisms to establish a command and control channel with the compromised device; Act on objectives: adversary pursues intended objectives such as data exfiltration, lateral movement to other targets

Module V: Security Processes in Practice for Businesses

Key security business processes; Corporate security governance; IT strategy management; Portfolio, program, project management; Change management; Supplier (third-party management); Problem management; Knowledge management; Information security management; Business Continuity Planning (BCP); IT operations management; Overview of top 20 security controls

Module VI: Information Security Standards

Information security standards – need; ISO/IEC 27000 standard series; ISO/IEC 27001; ISO/IEC 27002; ISO/IEC 27005; ISO/IEC 27006; SP 800 standard series; SP 800 -12; Standard of Good Practice (SoGP); Control Objectives for Information and Related Technology (COBIT); BSI IT-Grundschutz baseline protection; BSI Standard 100-1; BSI Standard 100-2; BSI Standard 100-3

References:

- Students will be provided with well curated content in the form of video lectures, live sessions, pdf's, weblinks, etc. created as per the syllabus.

Course Title: Cloud Architecture (Specialization Course)

Course Objectives:

- Cloud computing has a big role to play in information technology paradigm.
- It enables IT more elastic scalability.
- Cloud provides the global enterprise to deliver its service in a more manageable way.
- For all future software and service developer, it is essential to have knowledge about the cloud architecture and development model. Also, it is required to know how big cloud players such as Amazon, Microsoft, Google etc. are building their solutions in the cloud.

Course Contents/Syllabus:

Module I: Introduction to Cloud Computing

Evolution, History, NIST model, Cloud service providers; Properties, Characteristics, Open Standards

Module II: Virtualization

Concept, Types; Impact on Cloud

Module III: Cloud Computing Stack

Comparison with traditional computing architecture, Services provided at various levels; Roles, Protocols, Service

Module IV: Service Models (XaaS) and Deployment Models

IaaS, PaaS, SaaS; Public, Private, Hybrid and Community

Module V: Cloud Design Patterns

Other PaaS services; Docker based services

Module VI: Amazon AWS

Service, Components, Global Infrastructure; Launching first EC2 instance and pricing

Module VII: Google Cloud

Service, Components, Infrastructure console; Development of Google Cloud Platform product and pricing

Module VIII: Advanced Topics

Virtual Private Cloud (VPC); Cloud Load Balancing and Auto scaling; Identity and Access Management; Cloud DNS; Caching and in-memory data store

References:

- Students will be provided with well curated content in the form of video lectures, live sessions, pdf's, weblinks, etc. created as per the syllabus

Course Title: Cryptography (Specialization Course)

Course Objectives:

- Understand different security notions and their formal definitions.
- Understand various design principles of symmetric and asymmetric cryptographic techniques

Course Contents/Syllabus:

Module I: Introduction

Introduction and basic setting, different attack models (COA, CPA, CCA etc.), Kerckhoff's law, Caesar's cipher, Substitution cipher, brute force key-search versus cryptanalytic attacks, Caesar's cipher, Substitution cipher, Product ciphers, brute force key-search versus cryptanalytic attacks. Perfect Security, Shannon's formalization, Indistinguishability-based definition of perfect security, Equivalence of different notions of perfect security, OTP, Weaknesses of perfect security

Module II: Symmetric Key Encryption

Computational security, Pseudorandomness and Stream ciphers, LFSR based stream cipher design principle, eStream project, PRF, PRP, Block ciphers, Iterated Block cipher design principle, Feistel construction, DES and its variants – 2, DES, MITM, 3 DES. (Mention linear and differential cryptanalysis) AES competition, AES design, Modes of operation of block ciphers. (Discuss various modes of operations -ECB, CBC, CFB, OFB, Counter; and their error propagation characteristics.)

Module III: Authentication and Integrity protection

Cryptographic hash functions, their security properties, design principle of MD Construction (mention MD4, MD4, SHA-0/1, SHA2 - and their current status, Mention SHA3 competition and Keccak), Message authentication code, Order of encryption and authentication, CBC MAC and its weaknesses, CMAC and HMAC Lightweight block ciphers, Format Preserving Encryption (NIST SP for FPE), AEAD schemes, (their application in Disk encryption), CAESAR competition

Module IV: Asymmetric Key Cryptography

Key Exchange in public setting, Merkle's puzzles, Diffie-Hellman Key Exchange, Required Mathematical background: GCD, Inverting elements (in a Euclidean ring), Euler's Totient function, Euler's theorem, Chinese Remainder Theorem, RSA Encryption, Prime numbers, Primality testing. Correctness of RSA, OAEP. (Mention that the description is for textbook RSA, ElGamal Encryption, Elliptic curves, ECC, Post-quantum cryptography, NIST competition for PQC design, Digital signatures, Ring Signatures, Group signatures, etc, Digital certificates and PKI, certificate expiration and revocation, how PKI is implemented in practice

Module V: Applications and real-life usage

Blockchains (and how cryptographic primitives are used to ensure immutability, and prevention of double spending), Quadratic reciprocity, Coin Tossing on a telephone, Secure Multi-party computation. Zero-knowledge proofs, their applications in blockchains, Implementation pitfalls, real-life failures while not using Cryptography properly

References:

Students will be provided with well curated content in the form of video lectures, live sessions, pdf's, weblinks, etc. created as per the syllabus.