

## Program - MCA (MACHINE LEARNING)

### SEMESTER I

#### Course Title: Graph Theory and Combinatorics (CSIT743)

##### **Course Objectives:**

- The objective of the course is to explain basic concepts in combinatorial graph theory.
- Define how graphs serve as models for many standard problems.
- Discuss the concept of graph, tree, Euler graph, cut set and Combinatorics.
- See the applications of graphs in science, business and industry.

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

##### **Module I: Introduction to Graph Theory**

Basic Terminology, Walks, Paths, Circuits, Connectedness, Handshaking Lemma, Isomorphism, Sub Graphs, Reach Ability, Union and Interaction of Graphs.

##### **Module II: Graph Theory**

Euler Graph, Shortest Path Problem, Hamiltonian Graph, Traveling Salesman Problem, Bipartite Graphs

##### **Module III: Trees**

Introduction to Trees, Rooted Trees, Path Length in Rooted Trees, Spanning Trees, Fundamental Circuits, Spanning Trees of a Weighted Graph, Cut Sets and Cut Vertices, Fundamental Cut Set, Minimum Spanning Tree

##### **Module IV: Directed Graph**

Directed Graphs and Connectedness, Directed Trees, Network Flows, Max Flow-Mincut Theorem, Matrix Representation of a Graph, Planar Graphs: Combinational and Geometric Duals, Kuratowski's Graphs, Detection of Planarity, Thickness and Crossing.

##### **Module V: Combinatorics**

Partitions, Counting Functions, Number of Partitions into Odd or Unequal Parts. Necklaces, Euler's Function, Set of Symmetries, Enumeration in the Odd and Even Cases.

##### **Text Readings**

- C.L. Liu, Elements of Discrete Mathematics, Tata McGraw Hill, 2nd Edition, 2000.
- N. Deo, Graph Theory with Applications to Engineering and Computer Science, PHI publication, 3rd edition, 2009

##### **References**

- Harikishan, Shivraj Pundir and Sandeep Kumar, Discrete Mathematics, Pragati Publication, 7th Edition, 2010.
- Colmun, Busby and Ross, Discrete Mathematical Structure, PHI Publication, 6th Edition, 2009

## **Course Title: Advanced Database Management Systems (IT601)**

### **Course Objectives:**

- To provide a strong foundation in advanced database concepts from an industry perspective.
- To covers advanced data modeling concepts like OOD Modeling and ORD Modeling
- To learn query processing and transaction management concepts for object-relational database, Parallel database and distributed database

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

#### **Module I: Query Processing**

Basic concepts of query processing; Converting SQL queries into Relational Algebra; Basic Algorithms for executing query operations; Query tree and query graph; Heuristic optimization of query tree, functional dependencies, normal forms

#### **Module II: Object Oriented and Extended Relational Database Technologies**

Overview of Object oriented database; OO Concepts; Architecture of ORDBMS and OODBMS; OOD Modeling, ORD Modeling, Specialization, Generalization, Aggregation and Associations, Object Query Language; Object Relational Concepts

#### **Module III: Parallel and Distributed Database**

Introduction; Design of Parallel databases, Parallel Query Evaluation; Distributed Databases Principles; Architectures; Design; Implementation; Fragmentation; Transparencies in Distributed Databases; Transaction control in Distributed Database; Query Processing in Distributed Database

#### **Module IV: Databases on the Web and Semi Structured Data**

Web Interfaces to the Web, Overview of XML; Structure of XML Data, Document Schema, Querying XML data; Storage of XML data, XML applications; Semi structured data model, Implementation issues, Indexes for text data.

#### **Module V: Advance Transactions and Emerging trends**

Multilevel Transactions, Long-lived transactions (Saga); Data warehousing and Data Mining; Active Database; Spatial Database; Deductive Database, Multimedia Database

### **Text Reading**

- Fundamental of Database Systems, Elmasri&Navathe, Pearson Education, 2010
- Database System Concepts; Korth&Sudarshan, TMH.2011
- Database Illuminated, Catherine Ricarso, Second Edition, Jones & Bartlett Learning.2013
- Database Management System, S K Sinha, Second Edition, Pearson Publication 2011

### **References**

- Data Base Management System, Leon & Leon, Vikas Publications ,2010
- Introduction to Database Systems, Bipin C Desai, Galgotia, 2012

## **Course Title: Core Java (CSIT751)**

### **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: Introduction to Java**

Introduction of Java, History of Java, 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, Command line arguments

#### **Module II: Java with Object Orientated Features**

Introduction to oops, Classes and Objects, Encapsulation, Abstraction, Polymorphism, Inheritance, A Closer look at Methods and Classes, constructors, types of constructors, method overloading; Inheritance, Single Inheritance, Multilevel hierarchy; Method overriding; Constructors, Various Types of Constructor, Role of Constructors in inheritance, Abstract classes; final; static; super; Garbage Collection.

#### **Module III: Exception Handling Interface and Thread in Java**

Exception handling in Java, try, catch, throw, throws and finally, Uncaught Exceptions, creating and using user defined exception Multiple catch, Java's Built-in Exception 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 IV: Java Packages and GUI**

Defining, Implementing and applying Packages, Importing Packages, Types of packages, User define package, Introduction to lang Package classes; Introduction to IO package – input streams, output streams, Sample programs on I/O files; string handling 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

#### **Module V: Event Driven Programming and Database Programming using JDBC**

AWT- Introduction to AWT, Event handling Mechanism, Event Model, Event Classes, Sources of Events, Event Listener Interfaces, working with Windows, AWT Controls; Layout Manager; Introduction to swing classes and controls; Advantages of swings over AWT; Basics, networking classes and interfaces, using java.net package, doing TCP/IP and Datagram Programming; JDBC Architecture, Connection interface, Java database connectivity, introduction to package java.sql.\*, working with SQL statements

### **Text Readings**

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

### **References**

1. "Introduction to JAVA Programming" Daniel/Young PHI
2. Jeff Frentzen and Sobotka, "Java Script", Tata McGraw Hill

## **Course Title: Advanced Software Engineering Principles (IT612)**

### **Course Objectives:**

- To provide an advanced understanding and knowledge of the software engineering techniques, techniques to collect software requirements from client and CASE tools.
- To understand the importance of these case tools in software development.

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

#### **Module I: Life Cycle Models**

Waterfall Model, Prototyping Models, Incremental Development, Spiral Model, Rapid Application Development, Component Model, Agile Software Development, Selection of appropriate development process

#### **Module II: Formal Methods**

Basic concepts, Mathematical Preliminaries, Mathematical notations for Formal Specification, Formal Specification Languages, Z-Notations, Ten commandments of formal methods, Formal Methods- The Road Ahead

#### **Module III: Component-Based Software Engineering**

**Component-Based Software Engineering**, Engineering of Component-based Systems, CBSE Process, Domain Engineering, Component-based Development, Classifying and Retrieving Components, Economics of CBSE

**Cleanroom Software Engineering**, The Cleanroom Approach, Functional Specification, Cleanroom Design, Cleanroom Testing

#### **Module IV: Client/Server Software Engineering**

**Client/Server Software Engineering**, The Structure of Client/Server Systems, Software Engineering for Client Server Systems, Analysis Modeling Issues, Design for Client Server Systems, Testing Issues.

**Web Engineering**, The Attributes of Web-based Applications, WebE Process, Framework for WebE, Formulating/Analyzing Web-based Systems, Design for Web-based Applications, Testing Web-based Applications, Management Issues.

**Service Oriented Software Engineering**, Services as Reusable Components, Service Engineering, Software Development with Services

#### **Module V: Reengineering and CASE**

**Reengineering**, Business Process Reengineering, Software Reengineering, Reverse Reengineering, Restructuring, Forward Reengineering, Economics of Reengineering

**Computer-Aided Software Engineering**, Introduction, Building Blocks for CASE, Taxonomy of CASE Tools, Integrated CASE Environments, Integration Architecture, CASE Repository, Case Study of Tools like TCS Robot

### **Text Readings**

- Roger S. Pressman, Software Engineering a Practitioners Approach, McGraw-Hill (2008).
- J. Bowan, Formal Specification and Documentation using Z - A Case Study Approach, International Thomson Computer Press (2003).
- Antoni Diller, Z., An Introduction to Formal Methods (second edition), Wiley, 2<sup>nd</sup> edition (1994).

## References

- M. Dyer, The Cleanroom Approach to Quality Software Development, Wiley (1992).
- Prowell, S., Trammell, C.J. and Poore, J.H, Cleanroom Software Engineering: Technology and Process, Addison-Wesley, Massachusetts (1999).
- Allen, Frost, Yourdon, Component-Based Development for Enterprise Systems: Applying the Select Perspectives, Cambridge University Press (1998).
- Zantinge and Adriaans, Managing Client/Server, Addison-Wesley (1996).

## **Course Title: Professional Communication**

### **Course Objectives:**

- This course aims to equip students with effective oral and written communication.
- Students will learn the difference between oral and written communication, and speaking in multicultural context, conducting and participating in meetings, the correct format of business documents.

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

#### **Module I: Verbal and Non-verbal Communication**

Oral Communication: forms, advantages and disadvantages.

Written Communication: forms, advantages and disadvantages. Principles and Significance of Non-verbal Communication, KOPPACT: Kinesics, Oculistics, Proxemics, Paralinguistics, Artifacts, Chronemics, Tactilics

#### **Module II: Social Communication Essentials and Cross-Cultural Communication**

Small Talk. Building rapport. Informal Communication: Grapevine-water cooler-Communication, Public speaking in multi-cultural context. Culture and context. Ethnocentrism, Stereotyping, cultural relativism

#### **Module III: Meetings**

Meetings: Meaning and importance. Purpose of meeting. Steps in conducting meeting. Written documents related to meeting: Notice, agenda, minutes.

#### **Module IV: Report Writing**

Types of reports. Significance of Report. Report planning. Process of Report writing. Visual Aids in Report

#### **Module V: Employment Communication**

Cover letter, Resume, Participating in a group discussion, Preparation for Interview, Appearing in Interview

### **Text Readings**

- Keyton. Joann. Communication and Organizational Culture. Sage Communications
- Krizan, Merrier, Logan and Williams. Effective Business Communication, New Delhi: Cengage, 2011

## SEMESTER II

### Course Title: Research Methodology (CSIT745)

#### **Course Objectives:**

- The students will be able to recognize the steps involved in doing research work.
- The students will be able to collect data using various media and using the best possible sample available. The students would learn to propose their Hypothesis and build models for the problem.
- The students would be able to correctly document their findings in the form of a report.

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

##### **Module I: Introduction**

Research - Types, Research process and steps, Hypothesis, Research Proposal and aspects.

Research Design- Need, Problem Definition, Variables, Research Design concepts, Literature survey and review, Research design process, Errors in research.

Research Modeling- Types of models, model building and stages, Data consideration and testing, Heuristic and simulation modeling.

##### **Module II: Sampling**

Sampling and data collection-- Techniques of sampling, Random, Stratified, Systematic, Multistage-sampling, Primary and secondary sources of data. Design of questionnaire.

##### **Module III: Data Collection and Experiments**

Design of Experiments- Objectives, strategies, Factorial experimental design, designing engineering experiments, basic principles-replication, randomization, blocking, guidelines for design of experiments.

##### **Module IV: Models and Hypothesis**

Single factor experiment- Hypothesis testing, analysis of Variance component (ANOVA) for fixed effect model; Total, treatment and error of squares, Degrees of freedom, Confidence interval; ANOVA for random effect model, estimation of variance components, Model adequacy checking.

##### **Module V: Report Writing**

Structure and components of Scientific Reports, Types of Report, Technical Reports and Thesis; Different steps in the preparation – Layout, structure and Language of typical reports; Illustrations and tables, Bibliography, Referencing and foot notes. Oral presentation- Planning, Preparation and Practice, Making presentation, Use of visual aids, Importance of Effective, Communication. Conventions and strategies of Authentication, Citation, Preparing Research papers for journals, Seminars and Conferences, Design of paper using TEMPLATE, Calculations of Impact factor of a journal, citation Index, ISBN & ISSN, Preparation of Project Proposal - Title, Abstract, Introduction – Rationale, Objectives, Methodology, Time frame and work plan, Budget and Justification, References.

#### **Text Readings**

- Design and Analysis of Experiments – Douglas C. Montgomery, Wiley India, 8th Edition, 2012.
- Research Methodology – Methods and Techniques – C.R. Kothari, New Age International, New Delhi, 2004.
- Practical Research: Planning Design – Paul D. Leddy, London, 1980.

## Course Title: Data Structures and Algorithm Design (CSE601)

### Course Objectives:

- The objective of this course module is to describe the utilization of formal ADT representations, especially those on lists, sets, trees and graphs; time and space analysis of recursive and non-recursive algorithms, including graph and sorting algorithms.
- To learn techniques for designing algorithms using appropriate data structures, prove correctness and analyze their running times.

### Course Contents/Syllabus:

#### Module I: Overview of Data Structures

**Overview of Data Structures:** Stacks, Queues, linked lists, doubly linked lists, Applications. Analysis and Efficiency of algorithms, Asymptotic Notations, Time complexity of an algorithm, Analyzing Recursive Programs using various strategies. **Divide and Conquer Paradigm:** Divide and conquer recurrence equations and their solutions, Review of various sorting techniques and its time complexity.

#### Module II: Advanced Data Structure & Algorithms

**Trees:** Basic terminology & its applications, Binary Trees, Binary Search Trees, Red-Black Trees, AVL Trees and B Trees, spanning trees: Prim's and Kruskal's algorithm. **Graphs:** Terminology, representations, traversals. **Basic graph algorithms:** Depth first search and Breadth first Search and its analysis, single source and all-pair shortest path problem.

#### Module III: Dynamic Programming

Comparison between Dynamic and Greedy Approach to solve a problem. **Dynamic Programming:** Matrix Chain Multiplication, Longest Common subsequence and 0/1 Knapsack Problem. **Greedy Programming:** Activity Selection Problem, Huffman Codes and fractional Knapsack Problem.

#### Module IV: String Matching and Approximation Algorithms

**String Matching Algorithms:** Naïve, Rabin Karp and Knuth Morris and Pratt paradigm. **Approximation Algorithms:** Vertex-Cover algorithm and Set Covering Problem

#### Module V: Theory of NP-Completeness

**NP-Completeness:** Polynomial Time, NP-completeness proofs and problems, NP-Hard and SAT problems.

### Text Readings

- Thomas H. Cormen, Charles E. Leiserson, and Ronald L. Rivest, "Introduction to Algorithms", MIT press and McGraw Hill, 2001.
- Udi Manber, "Introduction to Algorithms: A Creative Approach", Addison Wesley, 1989.
- Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures" Galgotia book source, New Delhi, 1983.

### References

- Ellis Horowitz, Sartaj Sahni, "Fundamentals of Algorithms" Galgotia book source, New Delhi, 1986.
- Jean Paul Tremblay and Paul G. Soresson, "An introduction to Data structures with applications" McGraw Hill International editions.
- Seymour Lipschutz, "Theory and problems of Data structures", McGraw Hill International editions. (Schaum's outline series).
- Aho, Hopcroft Ullman, "The design and analysis of computer algorithms" Addison Wesley publishing company. Robert L Cruse: "Data Structures and Program Design" (Prentice Hall India ,3rd Edition 1999)
- Reema Thareja, "Data Structures using C", Oxford Higher Education, New Delhi, 2011.



## **Course Title: Network Security and Cryptography (CSIT654)**

### **Course Objectives:**

- To provide conceptual understanding of network security issues, challenges and mechanisms.
- To develop basic skills of secure network architecture and explain the theory behind the security of different cryptographic algorithms.
- To describe common network vulnerabilities and attacks, defense mechanisms against network attacks, and cryptographic protection mechanisms.
- To explore the requirements of real-time communication security and issues related to the security of web services.

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

#### **Module I: Introduction to Network Security**

Introduction to Security Attacks, Services and Mechanism, Classical encryption techniques, Substitution Ciphers and Transposition ciphers, Cryptanalysis, Steganography, Stream and Block ciphers, A Brief Overview of Hardware Security

#### **Module II: Secret Key Cryptography**

Modern Block Ciphers: Block Ciphers Principles, Shannon's Theory of Confusion and Diffusion, Fiestal Structure, Data Encryption Standard (DES), Strength of DES, Idea of Differential Cryptanalysis, Block Cipher Modes of Operations, Triple DES

#### **Module III: Public Key Cryptography**

Advanced Encryption Standard (AES) encryption and decryption, Fermat's and Euler's theorem, Chinese Remainder theorem, Principals of Public Key Crypto Systems, RSA algorithm, Security of RSA algorithm

#### **Module IV: Authentication Standards & Key Management**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, Hash Functions, Secure Hash Algorithm (SHA), Message Digest, Digital Signatures: Digital Signatures, Digital Signature Standards (DSS), proof of Digital Signature Algorithm

#### **Module V: Web Security**

Authentication Applications: Kerberos, Overview of Access Control List (ACL), Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME. IP Security: Architecture, Authentication Header, Encapsulating Security Payloads, Key Management, Introduction to Secure Socket Layer, Secure electronic, transaction (SET) System Security

System Security: Introductory Idea of Intrusion, Intrusion Detection Techniques, Viruses and Worms, Firewalls, Design Principles of Firewalls, IT Acts and Cyber Laws (Global Standards), Virtual Private Network, Recent attacks on networks (Packet Analyzer, Buffer Overflow and Port Scanning), Blockchain Technology, Preventing Privacy and Piracy on Internet, Cyber Forensic and Its Applications , Brief Overview of Cyber Forensic, Cyber Forensic Processes, Cyber Forensic Applications and Cyber Forensic Tools, Digital Evidence, Investigating Windows and Unix Systems, E-mail Tracing.

## **Text Readings**

- CompTIA Security+ Study Guide: Sy0-401 (Paperback) by Emmett Dulaney, Chuck Easttom, Sixth Edition, May 2014
- W. Stallings, "Networks Security Essentials: Application & Standards", 5th Edition, Prentice Hall Publication, 2013
- W. Stallings, "Cryptography and Network Security: Principles and Practice", International Edition, Pearson Education, 2013.
- Behrouz A. Frouzan, "Cryptography and Network Security", Tata McGraw Hill Education, 2007
- Guide to Computer Forensics and Investigations, by Nelson, Phillips, Enfinger, Steuart, 2nd ed, ISBN 0-619-21706-5, 2005
- Bruce Schneier, "Applied Cryptography", Second Edition, John Wiley & Sons Publication, 1996
- Bernard Menezes, "Network Security and Cryptography", Cengage Learning Publication, 2010
- Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill Education, 2003
- SENSS 300-206: Implementing Cisco Edge Network Security Solutions, Cisco Certified Network Professional Security (CCNP Security) Certification Book, Cisco Press, 2016

## **References**

- [http://www.cnss.gov/Assets/pdf/cnssi\\_4009.pdf](http://www.cnss.gov/Assets/pdf/cnssi_4009.pdf)
- [http://en.wikipedia.org/wiki/Network\\_security](http://en.wikipedia.org/wiki/Network_security)

## **Course Title: Cognitive Analytics & Social Skills for Professionals (VAC)**

### **Course Objectives:**

- To understand the Cognitive Analytics and Social Cognition
- To apply emotional intelligence in decision making
- To develop leadership skills for effective management
- To practice resilience during uncertainty

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

#### **Module I: Cognitive Analytics and Social Cognition**

Understanding the self-preliminaries, Models of Understanding Self- T-E-A Model, Johari Window, PE Scale, Meaning and Importance of Self Esteem, Self-Efficacy, Self-Respect, Behavioural Communication- Assertive Skills, Technology adoption, Social Media Etiquettes, Creativity (ICEDIP Model), Visualization, Problem sensitivity, Problem Solving (Six Thinking Hats), Cognitive Flexibility, Cognitive Errors, Introduction to Social Cognition, Attribution Processes (Perceptual Errors), Social Inference, Stereotyping, Prejudice, Accepting Criticism.

#### **Module II: Attitudes & Emotional Intelligence**

Understanding Attitudes , Characteristics of Attitude (valence, multiplicity, relation to needs, centrality, pervasiveness, invisible, acquired), Components of Attitudes (Affective, Cognitive, Behavioural), What are Emotions, Healthy and Unhealthy expression of emotions, Relevance of EI at workplace, Emotional Intelligence and Competence, Components of Interpersonal & Intrapersonal Intelligence, Relevance of EI at workplace

#### **Module III: Leadership and Managing Excellence**

Team Design Features, Life Cycle of a Teams, Types and Development of Team Building, Issues in Team Performance , Types of leaders, Leadership styles in organizations, Situational Leadership , Strategic Leadership and Change Management- Mentoring, Building Trust, Building a Culture of Inclusion, Sociometry (Sociometry Criteria, Applications of Sociometry, Construction of sociogram), Personal Branding, Time Management, Work Life Integration, Relationship Management (Personal & Professional)

#### **Module IV: Conflict Resolution and Negotiation**

Meaning, nature, sources, stages & types of conflicts, Factors affecting conflict, Impact of Conflict, Ethical Dilemmas in Conflict, Conflict Resolution Strategies, Comparison of conflict management styles, Matching conflict management approach with group conditions, Third Party Intervention- Mediation, mediation process, function of the mediator, preconditions for mediation, Intercultural communication and conflict resolution, Negotiation -Types, purpose, stages, Four pillars of negotiation, Strategies, Persuasion, Behaviour and conduct during negotiation, closing the negotiation

#### **Module V: Values & Ethics**

Meaning & its type, Difference between values and Ethics, Relationship between Values and Ethics, Significance of moral values, Practical Applications of Values & Ethics, Significance of moral values, Moral Icons, Its role in personality development , Character building-“New Self-awareness”, Personal values-Empathy, honesty, courage, commitment, Core Values -Respect, Responsibility, Integrity, Care, & Harmony, **Resilience and Agility in Uncertainty**, Overview of Resilience , Locus of control, Paradox of choice, Overcoming negative thinking- ABC technique (Adversity, believes and consequences), Personality & cognitive variables that promote resilience, Role of family and social networks, Models, Symptoms and consequences of stress, Strategies for stress management, Agility in VUCA environment, Resilience and agility for higher performance

## Text Readings

- Towers, Marc: Self Esteem, 1st Edition 1997, American Media
- Pedler Mike, Burgoyne John, Boydell Tom, A Manager's Guide to Self-Development: Second edition, McGraw-Hill Book company.
- Khera Shiv: You Can Win, 1st Edition, 1999, Macmillan.
- Singh, Dalip, 2002, Emotional Intelligence at work; First Edition, Sage Publications.
- Goleman, Daniel: Working with E.I., 1998 Edition, Bantam Books.
- Vangelist L. Anita, Mark N. Knapp, Inter Personal Communication and Human Relationships: Third Edition, Allyn and Bacon
- Julia T. Wood. Interpersonal Communication everyday encounter
- Simons, Christine, Naylor, Belinda: Effective Communication for Managers, 1997 1st Edition Cassel
- Harvard Business School, Effective Communication: United States of America
- Foster John, Effective Writing Skills: Volume-7, First Edition 2000, Institute of Public Relations (IPR)
- 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
- Raman, A.T. (2003) Knowledge Management: A Resource Book. Excel Books, Delhi.
- Kamalavijayan, D. (2005). Information and Knowledge Management, Macmillan India Ltd. Delhi
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002, Harcourt College Publishers
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- Dick, Mc Cann & Margerison, Charles: Team Management, 1992 Edition, viva books
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company

## **Course Title: Artificial Intelligence for Real World Application (Specialization Course)**

### **Course Objectives:**

Artificial Intelligence (AI) is an area of Computer Science that emphasises on the creation of intelligent machines which work and react like humans.

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

#### **Module I: Introduction to Artificial Intelligence (AI)**

History of AI, Tools to be used for AI programming and its overview, What is cognitive science and the problem of perception, Applications of A

#### **Module II: Search & Reasoning**

Intelligent agents, uninformed search, Search Techniques 1 - search space, state space search, Search Techniques 2 - heuristic search, and pattern-directed search, Planning, control strategies and implementation, constraint satisfaction, Problem solving by heuristic search, A\* algorithm, AO\* algorithm, Adversarial search, game playing Proposition and first-order logic, Rule-based systems, semantic net, conceptual graph, inference and deduction, Resolution refutation, answer extraction, Reasoning under uncertainty - probabilistic reasoning, belief networks

#### **Module III: Machine Learning & Deep Learning**

Basic concepts, Linear models, perceptron, Introduction to supervised learning and k-nearest neighbours (KNN), decision trees, Advanced models - support vector machine (SVM), ensemble classifiers, Introduction to unsupervised learning and clustering methods. Introduction to neural networks, Backpropagation, Training neural nets using keras, Regularization, batch normalization, dropout, Introduction to convolutional neural networks (CNN), Introduction to natural language processing (NLP) and toolkits

#### **Module IV: Time Series Analysis**

Introduction to time series, Stationary time series, Smoothing time series, Autocorrelation functions, Autoregressive integrated moving average (ARIMA) models, Signal transformations, Deep learning and time series analysis

#### **Module V: Tensor Flow**

Introduction to TensorFlow, Convolutional neural networks with TensorFlow, Using TensorFlow for implementing regression and clustering methods

### **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: Machine Learning for Real World Application Applications (Specialization Course)**

### **Course Objectives:**

- Machine Learning is an application of Artificial Intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed.
- Machine Learning focusses on the development of computer programs that can access data and learn from it.

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

#### **Module I: Basics of Statistics**

Linear algebra, Mathematical statistics

#### **Module II: Basics of Machine Learning**

Introduction, Supervised learning, Unsupervised learning, Reinforcement learning

#### **Module III: Machine Learning Methodology (CRISP DM)**

Data understanding, Data preparation, Exploratory data analysis

#### **Module IV: Key Concepts in Machine Learning**

Data sample, Model selection, Regression algorithms, Model validation, Model deployment, Imbalance in data

#### **Module V: Machine Learning Algorithms with Real-Life Use Cases**

Unsupervised algorithms, Classification algorithms

### **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 III

### Course Title: Cloud Infrastructure and Services (CSIT802)

#### **Course Objectives:**

- To give students the skills and knowledge to understand how Cloud Computing Architecture can enable transformation, business development and agility in an organization.
- To understand Concepts and infrastructure of cloud computing and its business applications.
- 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.

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

##### **Module I: Cloud Computing Fundamental**

Cloud Computing Fundamental: Cloud computing definition, Characteristics of Cloud computing as per NSIT, private, public and hybrid cloud. Cloud types; Iaas, Paas, SaaS. Benefits and challenges of cloud computing; public vs private clouds, role of virtualization in enabling the cloud, Steps involved in transitioning from Classic data center to Cloud computing environment; Business Agility: Benefits and challenges to cloud architecture. Application, availability, performance, security and disaster recovery; next generation Cloud Application.

##### **Module II: Cloud Application**

Cloud Application: Technologies and the processes required when deploying web services. Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages.

##### **Module III: Cloud Services Management**

Cloud Services Management: Reliability, availability and security of services deployed from cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud-based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g. Amazon, Microsoft and Google, Salesforces.com, Ubuntu and Redhat).

##### **Module IV: Case Study: Application Development**

Application Development: Service creation environments to develop cloud-based applications. Development environments for service development; Amazon, Azure, Google App.

##### **Module V: Cloud Security and Migration to Cloud**

Security concerns and counter measures in Cloud environment, Governance, Risk, and Compliance aspects in Cloud, Cloud security best practices, Cloud models suitable for different categories of users, Considerations for choosing applications suitable for Cloud, Different phases to adopt the Cloud.

Best Practice Cloud IT Model: Analyze of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO).

## **Text Reading**

- Kumar Saurabh, Cloud Computing: Insights Into New-Era Infrastructure, Wiley India Pvt Ltd, (2011), ISBN: 8126528834
- Anthony T. Velte, Cloud Computing: A Practical Approach, Tata McGraw Hill Education Private Limited, (2009), ISBN: 0070683514
- Halper Fern, Kaufman Marcia, Bloor Robin, Hurwit Judith, Cloud Computing For Dummies , Wiley India Pvt Ltd, (2009 ) ISBN: 8126524871

## **References**

- Gautam Shroff: Enterprise Cloud Computing Technology Architecture Applications [ISBN: 978-0521137355]
- Toby velte, Anthony Velte, Robert Elsenpeter; Cloud computing, A practical Approach [ISBN: 0071626948]
- Dimitris N. Chorafas, Cloud Computing Strategies [ISBN: 1439834539]



## **Course Title: Unix / Linux Programming (CSIT803)**

### **Course Objectives:**

- This course provides the students with the skills to use the UNIX and LINUX operating system.
- This course aims to introduce basic commands for editing and manipulating files, managing processes and interacting with the Bourne/Bourne Again Shell.
- The course also teaches the participant how to use the programming constructs of the shell language to write scripts that may be used to simplify or automate tasks. This course creates understanding of various editors and file creations, data manipulation and reports using vi, sed and awk
- This course will prepare the students to work on UNIX/LINUX 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.

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

#### **Module I: Introduction**

Introduction to Operating System, History of GNU, Unix and LINUX, UNIX Family, Unix System Layered and Detailed Architecture, Features of UNIX/LINUX , Concept of Files in UNIX, Absolute Path and Relative Path , UNIX /LINUX file system structure, Types of shells (Bourne, BASH, KORN,C), Process and Process States, Inode, Two User Interfaces – Character User Interface(CUI) and Graphic User Interface (GUI) , LINUX booting Process , X Window System, LINUX Graphical environment, LINUX Desktop environment –GNOME and KDE.

#### **Module II: Processes**

Process state and transitions, the context of a process, Process System processes; running jobs in background, Job control; foreground and background jobs; suspend and interrupt a process; Back grounding and killing jobs; stopping and restarting jobs; scheduling jobs using batch and at command.

#### **Module III: Unix/Linux Commands**

Telnet connect through Login Account , password, logout ,Internal and External Commands, shell , 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; Filters and Pipes , looking at files : cat, more, pg, less , head , tail; Cal, banner, file, wc, sort, cut, grep, cmp, comm., diff, uniq; 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.

#### **Module IV: VI Editor and Shell Programming**

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; 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: sed AND awk**

Syntax for sed , regular expressions, Addressing: sed commands , Modify a File with sed , metacharacters, Inserting / Deleting/Printing Text/Lines , Substitution , Multiple edits, reading from file and writing to file, quit command Introduction to sed scripting ;

Syntax for awk , working of awk, Input from files, Input from commands, Formatting output-print and printf function , concept of record and field in awk . 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 AND SHELL PROGRAMMING, Yashwant P. Kanetkar, BPB Publication , 2002
- The Complete Reference Linux, Richard. L Peterson, Tata Mc Graw Hill, 2003, Fifth Edition.

## **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
- “Linux Administration- A beginners Guide”, Steve Shah and Wale Soyinka, Tata Mc Graw Hill, Fourth Edition ,2005

**Course Title: Quantitative Aptitude - Employability and Skill Enhancement – (DE)**

**Course Objectives:**

The course aims to increase employability skills

**Course Contents/Syllabus:**

**Module I: Algebra**

Indices, Surds, Logarithms – Introduction and Application, Types of Equations – Linear and Quadratic, Roots of Quadratic Equations, Methods to solve Quadratic Equations, Simultaneous Equations - Methods to solve (two or three unknowns), Inequalities with graphs

**Module II: Data Arrangement**

Arithmetic and Geometric Progressions – Definition, finding term, Sum till term, arithmetic and geometric means, Applications in real life, Permutation and Combination – Introduction and Applications

**Module III: Relations and functions, Limit and Continuity**

Sets – Definition, Forms of writing sets, Types of sets, Relations and Functions – Definition, Types of functions, Limit of a function – Definition and Methods to solve, Continuous and Discontinuous functions

**Module IV: Data Analysis**

Data – Definition, Frequency distribution, Graphical representation, Histogram, Frequency polygon, Frequency curve and Ogive, Measures of central tendency, Measures of Dispersion, Skewness and Kurtosis

**Module V: Forecasting Techniques**

Correlation Analysis – Introduction, methods to find correlation coefficient, Regression Analysis – Linear regression, Method of least square

## **Course Title: Deep Learning & Neural Network (Specialization Course)**

### **Course Objectives:**

- The primary objective of the course is to teach the basic and advanced concepts of deep learning and neural networks supported by industry relevant business case studies.
- The course uses Python as the programming environment. Datasets required for the case studies can be obtained from the internet.

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

#### **Module I: Preliminaries**

Introduction, Machine learning

#### **Module II: Basic of Neural Networks**

Artificial neural networks, Popular networks, Popular tools, Case studies, The human brain.

#### **Module III: Deep Neural Networks – 1**

Introduction to Deep Learning (DL), Convolutional Neural Networks (CNN), Modern CNN architectures, Image classification using CNN

#### **Module IV: Deep Neural Networks – 2**

Recurrent Neural Networks (RNN) & LSTM, Word vector representations, Sentiment analysis, Sentence classification, Application in Natural Language Processing (NLP)

#### **Module V: Emerging Trends**

Attention mechanisms and memory networks, Embeddings from LASER.

### **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: Social Media & Text Analytics (Specialization Course)**

### **Course Objectives:**

- Social Media and Text Analytics is a course that aims to provide a fundamental training on modern text processing technologies such as topic modelling and clustering and its real-world application.
- The course maintains a perfect balance of theory and practical examples with real-life problems and data.

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

#### **Module I: Introduction to Course**

Introduction to information retrieval, Inverted indices and Boolean queries, Processing unstructured and semi-structured data. Example queries using Apache Solr

#### **Module II: Text Processing**

##### **Text Processing - I**

Text encoding, tokenization, lemmatization and stop words, Proximity and phrase queries, Positional indices, Examples using common Python libraries, Index compression, lexicon compressing and posting list compression, Gap encoding, gamma codes, Zipf's law

##### **Text Processing - II**

Query expansion, Query processing fundamentals, Automatic thesaurus generation, Spelling correction and synonyms, N-gram, Edit distance, Practical experiments with query expansion

#### **Module III: Text Analytics**

Text classification techniques, Topic model fundamentals, Document-term matrix, Latent Dirichlet Allocation (LDA), Latent Semantic Indexing (LSI), Other topic modelling algorithms, Practical aspects of topic model tuning

#### **Module IV: Social Media Data Processing**

Social media data basics, Classification of social data, Modelling of social data, How to collect data - with case studies; Social media as big data, Database for modelling

#### **Module V: Social Media Analytics**

Fact finding from social data, Sentiment and opinion analysis, Sampling data using database, Sample case study with publicly available data, Python tools for text classification, Summary of the course

### **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 IV**

**Course Title: Major Project**