M. Tech.(CSE) Programme Structure

Second Semester				
Sl. No.	**Course Code**	**Course Title**	**L-T-P**	**Credit**
1	CSM201	**Program Core - III** Advance Algorithms	3-0-0	3
2	CSM202	**Program Core - IV** AI and Machine Learning	3-0-0	3
3	CSM231 CSM232 CSM233	**Program Elective - III** Data Visualization/ Big Data Analytics/ Data Warehouse and Data Mining	3-0-0	3
4	CSM241 CSM242 CSM243	**Program Elective - IV** Data Security and Access Control/ Web Analytics / Knowledge Discovery	3-0-0	3
5	CSM205	Audit Course	2-0-0	0
6	CSM206	**Laboratory - III** (Based on cores)	0-0-2	2
7	CSM207	**Laboratory - IV** (Based on Electives)	0-0-2	2
8	CSM208	Seminar and Technical Writing	2-0-0	2
Total Credits				18

***Students be encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break.**

Audit course 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

CSM201	Advanced Algorithms (3-0-0)	3 Credits

Pre-Requisites: UG level course in Algorithm Design and Analysis

Course Objective:

1. Introduce students to the advanced methods of designing and analyzing algorithms.
2. The student should be able to choose appropriate algorithms and use it for a specific problem.
3. To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
4. Students should be able to understand different classes of problems concerning their computation difficulties.
5. To introduce the students to recent developments in the area of algorithmic design.

Unit – I : **(6 Hours)**

Sorting: Review of various sorting algorithms, topological sorting

Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

Unit – II : **(8 Hours)**

Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST.

Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

Unit – III : **(9 Hours)**

Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

Unit – IV : **(10 Hours)**

Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.

Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.

Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm

Unit – V : **(10 Hours)**

Linear Programming: Geometry of the feasibility region and Simplex algorithm

NP-completeness: Examples, proof of NP-hardness and NP-completeness.

One or more of the following topics based on time and interest

Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm

Unit – VI : **(5 Hours)**

Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

Course Outcomes:

After completion of course, students would be able to:

1. Analyze the complexity/performance of different algorithms.
2. Determine the appropriate data structure for solving a particular set of problems.
3. Categorize the different problems in various classes according to their complexity.
4. Students should have an insight of recent activities in the field of the advanced data structure.

References:

1. "Introduction to Algorithms" byCormen, Leiserson, Rivest, Stein.
2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.
3. "Algorithm Design" by Kleinberg and Tardos.

CSM202	AI and Machine Learning (3-0-0)	3 Credits

Course Objective:

1. To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.
2. To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
3. Explore supervised and unsupervised learning paradigms of machine learning.
4. To explore Deep learning technique and various feature extraction strategies.

Unit – I : **(10 Hours)**

Supervised Learning (Regression/Classification)

Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive BayesLinear models: Linear Regression, Logistic Regression, Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods

Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

Unit – II : **(7 Hours)**

Unsupervised Learning

Clustering: K-means/Kernel K-means; **Dimensionality Reduction:** PCA and kernel PCA Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models)

Unit – III : **(6 Hours)**

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

Unit – IV : **(9 Hours)**

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

Unit – V : **(9 Hours)**

Scalable Machine Learning (Online and Distributed Learning)

A selection from some other advanced topics, e.g., Semi-supervised Learning,
Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference

Unit – VI : **(5 Hours)**

Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

Course Outcomes:

After completion of course, students would be able to:

1. Extract features that can be used for a particular machine learning approach in various IOT applications.
2. To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
3. To mathematically analyse various machine learning approaches and paradigms.

References:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

CSM231	Data Visualization (3-0-0)	3 Credits

Pre-Requisites: Computer Graphics, Image Processing

Course Objective:

1. familiarize students with the basic and advanced techniques of information visualization and scientific visualization,
2. to learn key techniques of the visualization process
3. a detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques

Unit – I : **(8 Hours)**

Introduction of visual perception, visual representation of data, Gestalt principles, information overloads.

Unit – II : **(8 Hours)**

Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

Unit – III : **(10 Hours)**

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

Unit – IV : **(11 Hours)**

Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

Unit – V : **(7 Hours)**

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations

Unit – VI : **(4 Hours)**

Recent trends in various perception techniques, various visualization techniques, data structures used in data visualization.

Course Outcomes

On completion of the course the student should be able to

1. familiar with the design process to develop visualization methods and visualization systems, and methods for their evaluation.
2. preparation and processing of data, visual mapping and the visualization
3. have an understanding of large-scale abstract data,

References:

1. WARD, GRINSTEIN, KEIM,.Interactive Data Visualization: Foundations, Techniques, and Applications. Natick : A K Peters, Ltd.
2. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.

CSM232	Big Data Analytics (3-0-0)	3 Credits

Pre-Requisites: Data Structure, Computer Architecture and Organization

Course Objective:

1. Understand big data for business intelligence. Learn business case studies for big data analytics.
2. Understand nosql big data management. Perform map-reduce analytics using Hadoop and related tools

Unit – I : **(8 Hours)**

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

Unit – II : **(8 Hours)**

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.

Unit – III : **(9 Hours)**

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures

Unit – IV : **(10 Hours)**

MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats

Unit – V : **(7 Hours)**

Hbase, data model and implementations, Hbase clients, Hbase examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration.

Unit – VI : **(6 Hours)**

Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.

Course Outcomes:

After completion of course, students would be:

1. Describe big data and use cases from selected business domains
2. Explain NoSQL big data management
3. Install, configure, and run Hadoop and HDFS
4. Perform map-reduce analytics using Hadoop
5. Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

References:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging
2. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
3. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of
4. Polyglot Persistence", Addison-Wesley Professional, 2012.
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
6. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
7. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
8. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
9. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.

CSM233	Data Warehouse and Data Mining (3-0-0)	3 Credits

Pre-Requisites: Databases, Probability

Course objective:

The objective of this course is to introduce data warehousing and mining techniques. Application of data mining in web mining, pattern matching and cluster analysis is included to aware students of broad data mining areas.

Unit – I : **(7 Hours)**

Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods;

Unit – II : **(8 Hours)**

Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns,

Unit – III : **(8 Hours)**

Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis;

Unit – IV : **(11 Hours)**

Mining Data Streams, Methodologies for stream data processing and stream data systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis;

Unit – V : **(9 Hours)**

Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining.

Unit – VI : **(5 Hours)**

Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis.

Course Outcome:

After completion of course, students would be:

1. Study of different sequential pattern algorithms
2. Study the technique to extract patterns from time series data and it application in real world.
3. Can extend the Graph mining algorithms to Web mining
4. Help in identifying the computing framework for Big Data

References:

1. Jiawei Han and M Kamber, Data Mining Concepts and Techniques,, Second Edition, Elsevier Publication, 2011.
2. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.
3. G Dong and J Pei, Sequence Data Mining, Springer, 2007.

CSM241	Data Security and Access Control (3-0-0)	3 Credits

Pre-Requisites: Database Management

Course Objective:
The objective of the course is to provide fundamentals of database security. Various access control techniques mechanisms were introduced along with application areas of access control techniques.

Unit – I : **(9 Hours)**
Introduction to Access Control, Purpose and fundamentals of access control, brief history, Policies of Access Control, Models of Access Control, and Mechanisms, Discretionary Access Control (DAC), Non- Discretionary Access Control, Mandatory Access Control (MAC). Capabilities and Limitations of Access Control Mechanisms: Access Control List (ACL) and Limitations, Capability List and Limitations.

Unit – II : **(8 Hours)**
Role-Based Access Control (RBAC) and Limitations, Core RBAC, Hierarchical RBAC, Statically Constrained RBAC, Dynamically Constrained RBAC, Limitations of RBAC. Comparing RBAC to DAC and MAC Access control policy.

Unit – III : **(10 Hours)**
Biba'sintrigity model, Clark-Wilson model, Domain type enforcement model, mapping the enterprise view to the system view, Role hierarchies- inheritance schemes, hierarchy structures and inheritance forms, using SoD in real system Temporal Constraints in RBAC, MAC AND DAC.
Integrating RBAC with enterprise IT infrastructures: RBAC for WFMSs, RBAC for UNIX and JAVA environments Case study: Multi line Insurance Company

Unit – IV : **(10 Hours)**
Smart Card based Information Security, Smart card operating system fundamentals, design and implantation principles, memory organization, smart card files, file management, atomic operation, smart card data transmission ATR, PPS Security techniques- user identification, smart card security, quality assurance and testing, smart card life cycle-5 phases, smart card terminals.

Unit – V : **(7 Hours)**
Recent trends in Database security and access control mechanisms. Case study of Role-Based Access Control (RBAC) systems.

Unit – VI : **(4 Hours)**
Recent Trends related to data security management, vulnerabilities in different DBMS.

Course Outcomes:
After completion of course, students would be:

1. In this course, the students will be enabled to understand and implement classical models and algorithms
2. They will learn how to analyse the data, identify the problems, and choose the relevant models and algorithms to apply.
3. They will further be able to assess the strengths and weaknesses of various access control models and to analyse their behaviour.

References:

1. Role Based Access Control: David F. Ferraiolo, D. Richard Kuhn, RamaswamyChandramouli.
2. http://www.smartcard.co.uk/tutorials/sct-itsc.pdf : Smart Card Tutorial.

CSM242	Web Analytics (3-0-0)	3 Credits

Course Objective
The course explores use of social network analysis to understand growing connectivity and complexity in the world ranging from small groups to WWW.

Unit – I : **(10 Hours)**
Introduction – Social network and Web data and methods, Graph and Matrices, Basic measures for individuals and networks, Information Visualization

Unit – II : **(8 Hours)**
Web Analytics tools: Click Stream Analysis, A/B testing, Online Surveys

Unit – III : **(9 Hours)**
Web Search and Retrieval: Search Engine Optimization, Web Crawling and indexing, Ranking Algorithms, Web traffic models

Unit – IV : **(12 Hours)**
Making Connection: Link Analysis, Random Graphs and Network evolution, Social Connects: Affiliation and identity

Unit – V : **(9 Hours)**
Connection: Connection Search, Collapse, Robustness Social involvements and diffusion of innovation

Course Outcomes
After completion of course, students would be:

- Become familiar with core research communities, publications, focused on web and social media analytics and research questions engaged in

References:

1. Hansen, Derek, Ben Sheiderman, Marc Smith. 2011. Analyzing Social Media Networks with NodeXL: Insights from a Connected World. Morgan Kaufmann, 304.
2. Avinash Kaushik. 2009. Web Analytics 2.0: The Art of Online Accountability.
3. Easley, D. & Kleinberg, J. (2010). Networks, Crowds, and Markets: Reasoning About a Highly Connected World. New York: Cambridge University Press. http://www.cs.cornell.edu/home/kleinber/networks-book/
4. Wasserman, S. & Faust, K. (1994). Social network analysis: Methods and applications. New York: Cambridge University Press. Monge, P. R. & Contractor, N. S. (2003). Theories of communication networks. New York: Oxford University Press.

CSM243	Knowledge Discovery (3-0-0)	3 Credits

Pre-Requisites: Data structures, Basic Statistics

Course Objective: Conduct case studies on real data mining examples

Unit – I : **(7 Hours)**

Introduction KDD and Data Mining - Data Mining and Machine Learning, Machine Learning and Statistics, Generalization as Search,Data Mining and Ethics

Unit – II : **(10 Hours)**

Knowledge Representation - Decision Tables, Decision Trees, Classification Rules, Association Rules, Rules involving Relations, Trees for Numeric Predictions, Neural Networks, Clusters

Unit – III : **(9 Hours)**

Decision Trees - Divide and Conquer, Calculating Information, Entropy, Pruning, Estimating Error Rates, The C4.5 Algorithm

Evaluation of Learned Results- Training and Testing, Predicting Performance, Cross-Validation

Unit – IV : **(8 Hours)**

Classification Rules - Inferring Rudimentary Rules, Covering Algorithms for Rule Construction, Probability Measure for Rule Evaluation, Association Rules, Item Sets, Rule Efficiency

Unit – V : **(7 Hours)**

Numeric Predictions - Linear Models for Classification and Numeric Predictions,

Numeric Predictions with Regression Trees, Evaluating Numeric Predictions

Unit – VI : **(7 Hours)**

Artificial Neural Networks – Perceptrons, Multilayer Networks, The Backpropagation Algorithm

Clustering - Iterative Distance-based Clustering, Incremental Clustering, The EM Algorithm

Course Outcome:

After completion of course, students would be:

1. Able to have knowledge of various knowledge representation methods.

References:

1. Data mining and knowledge discovery handbook by Maimon, oded(et al.)
2. Data Cleansing : A Prelude to knowledge Discovery

CSM205	Audit Course (2-0-0)	0 Credits

The lists of subjects for Audit Courses are listed at the end.

CSM206	Laboratory – III (0-0-4) (Based on Core Subject)	2 Credits

The concerned instructor will define the experiment list in sync with the theory subject.

CSM207	Laboratory – IV (0-0-4) (Based on Electives / Core)	2 Credits

The concerned instructor will define the experiment list in sync with the theory subject.

CSM208	Seminar and Technical Writing (2-0-0)	2 Credits

Audit Courses 1 & 2: English for Research Paper Writing

Course objectives:

Students will be able to:

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Unit – I : **(4 Hours)**

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit – II : **(4 Hours)**

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

Unit – III : **(4 Hours)**

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit – IV : **(4 Hours)**

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Unit – V : **(4 Hours)**

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

Unit – VI : **(4 Hours)**

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

Audit Courses 1 & 2: Disaster Management

Course Objectives: -

Students will be able to:

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Unit – I : (4 Hours)

Introduction: Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Unit – II : (4 Hours)

Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Unit – III : (4 Hours)

Disaster Prone Areas In India: Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides and Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Unit – IV : (4 Hours)

Disaster Preparedness And Management : Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data rom Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

Unit – V : (4 Hours)

Risk Assessment: Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Unit – VI : **(4 Hours)**

Disaster Mitigation: Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Suggested readings:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep &Deep Publication Pvt. Ltd., New Delhi.

Audit Courses 1 & 2: Sanskrit for Technical Knowledge

Course Objectives:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects
4. enhancing the memory power
5. The engineering scholars equipped with Sanskrit will be able to explore the
6. huge knowledge from ancient literature

Unit – I : **(8 Hours)**

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences.

Unit – II : **(8 Hours)**

Order, Introduction of roots, Technical information about Sanskrit Literature.

Unit – III : **(8 Hours)**

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics.

Course Outcome:

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

Suggested reading

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Audit Courses 1 & 2: Value Education

Course Objectives:

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Unit – I : **(4 Hours)**

- Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.

Unit – II : **(6 Hours)**

- Moral and non- moral valuation. Standards and principles.
- Value judgements
- Importance of cultivation of values.
- Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.
- Honesty, Humanity. Power of faith, National Unity.
- Patriotism.Love for nature,Discipline

Unit – III : **(6 Hours)**

- Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline.
- Punctuality, Love and Kindness.
- Avoid fault Thinking.
- Free from anger, Dignity of labour.
- Universal brotherhood and religious tolerance.
- True friendship.
- Happiness Vs suffering, love for truth.
- Aware of self-destructive habits.
- Association and Cooperation.
- Doing best for saving nature

Unit – IV : **(6 Hours)**

- Character and Competence –Holy books vs Blind faith.
- Self-management and Good health.
- Science of reincarnation.
- Equality, Nonviolence,Humility, Role of Women.
- All religions and same message.
- Mind your Mind, Self-control.
- Honesty, Studying effectively

Course outcomes:
Students will be able to:

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

Suggested reading

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

Audit Courses 1 & 2: Constitution of India

Course Objectives:
Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Unit – I : **(4 Hours)**
History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working)

Unit – II : **(4 Hours)**
Philosophy of the Indian Constitution: Preamble Salient Features

Unit – III : **(4 Hours)**
Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Unit – IV : **(4 Hours)**
Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit – V : **(4 Hours)**
Local Administration: District's Administration head: Role and Importance,

Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation.
Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit – VI : **(4 Hours)**

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

Suggested reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Audit Courses 1 & 2: Pedagogy Studies

Course Objectives:

Students will be able to:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

Unit – I : **(4 Hours)**

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education.
Conceptual framework, Research questions. Overview of methodology and Searching.

Unit – II : **(2 Hours)**

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit – III : **(4 Hours)**

Evidence on the effectiveness of pedagogical practices. Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Unit – IV : **(4 Hours)**

Professional development: alignment with classroom practices and follow-up support Peer support, Support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes

Unit – V : **(2 Hours)**

Research gaps and future directions: Research design, Contexts. Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Suggested Reading:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Audit Courses 1 & 2: Stress Management by Yoga

Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Unit – I : **(8 Hours)**

Definitions of Eight parts of yog. (Ashtanga)

Unit – II : **(8 Hours)**

Yam and Niyam.

Do`s and Don't's in life.

(i) Ahinsa, satya, astheya, bramhacharya and aparigraha

(ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit – III : **(8 Hours)**

Asan and Pranayam

(i) Various yog poses and their benefits for mind & body

(ii) Regularization of breathing techniques and its effects-Types of pranayam

Suggested Reading:

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency.