M. Tech.(CSE) Programme Structure

First Semester				
Sl. No	**Course Code**	**Course Title**	**L-T-P**	**Credit**
1	CSM101	**Program Core - I** Advanced Data Structures	3-0-0	3
2	CSM102	**Program Core - II** Soft Computing	3-0-0	3
3	CSM111 CSM112 CSM113	**Program Elective - I** Data Science/ Distributed Systems/ Data Preparation and Analysis	3-0-0	3
4	CSM121 CSM122 CSM123	**Program Elective - II** Recommender System/ Pattern Recognition / Data Storage Technologies and Networks	3-0-0	3
5	CSM105	Research Methodology and IPR	2-0-0	2
6	CSM106	Audit Course	2-0-0	0
7	CSM107	**Laboratory - I** (Advanced Data Structures)	0-0-4	2
8	CSM108	**Laboratory - II** (Based on Electives / Core)	0-0-4	2
Total Credits				18

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.

CSM101	Advanced Data Structures (3-0-0)	3 Credits

Pre-Requisites: UG level course in Data Structures

Course Objective:

1. The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
2. Students should be able to understand the necessary mathematical abstraction to solve problems.
3. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
4. Student should be able to come up with analysis of efficiency and proofs of correctness.

Unit – I : **(7 Hours)**

Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.

Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Unit – II : **(5 Hours)**

Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

Unit – III : **(9 Hours)**

Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

Unit – IV : **(12 Hours)**

Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer- Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.

Unit - V: **(10 Hours)**

Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.

Unit - VI: **(5 Hours)**

Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem

Course Outcome:
After completion of course, students would be able to:

1. Understand the implementation of symbol table using hashing techniques.
2. Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
3. Develop algorithms for text processing applications.
4. Identify suitable data structures and develop algorithms for computational geometry problems.

References:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.

CSM102	Soft Computing (3-0-0)	3 Credits

Pre-Requisites: Basic knowledge of mathematics

Course Objective:

1. To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
2. To implement soft computing based solutions for real-world problems.
3. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
4. To provide students hand-on experience on MATLAB to implement various strategies.

Unit – I : **(7 Hours)**

Introduction To Soft Computing And Neural Networks: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

Unit – II : **(8 Hours)**

Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

Unit – III : **(10 Hours)**

Neural Networks: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial
Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

Unit – IV : **(5 Hours)**

Genetic Algorithms: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.

Unit - V: **(13 Hours)**

Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

Unit - VI: **(5 Hours)**

Recent Trands in deep learning, various classifiers, neural networks and genetic algorithm. Implementation of recently proposed soft computing techniques.

Course Outcome:

After completion of course, students would be able to:

1. Identify and describe soft computing techniques and their roles in building intelligent machines
2. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
3. Apply genetic algorithms to combinatorial optimization problems.
4. Evaluate and compare solutions by various soft computing approaches for a given problem.

References:

1. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing®, Prentice Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications®, Prentice Hall, 1995.
3. MATLAB Toolkit Manual

CSM111	Data Science (3-0-0)	3 Credits

Course Objective:

1. Provide you with the knowledge and expertise to become a proficient data scientist.
2. Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;
3. Produce Python code to statistically analyse a dataset;
4. Critically evaluate data visualisations based on their design and use for communicating stories from data;

Unit – I : **(6 Hours)**

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

Unit – II : **(7 Hours)**

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources.

Unit – III : **(10 Hours)**

Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

Unit – IV : **(11 Hours)**

Data visualisation: Introduction, Types of data visualisation, Data for visualisation: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

Unit – V: **(7 Hours)**

Applications of Data Science, Technologies for visualisation, Bokeh (Python)

Unit – VI : **(7 Hours)**

Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

Course Outcome:

On completion of the course the student should be able to

1. Explain how data is collected, managed and stored for data science;
2. Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists;
3. Implement data collection and management scripts using MongoDB

References:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.

CSM112	Distributed Systems (3-0-0)	3 Credits

Course Objective:

To introduce the fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment, and to provide insight into related research problems.

Unit – I : Introduction **(8 Hours)**

Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts

Distributed Database Management System Architecture Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues

Unit – II : Distributed Database Design **(11 Hours)**

Alternative design strategies; Distributed design issues; Fragmentation; Data allocation

Semantics Data Control

View management; Data security; Semantic Integrity Control

Query Processing Issues

Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data

Unit – III : Distributed Query Optimization **(11 Hours)**

Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms

Transaction Management

The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models

Concurrency Control

Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management.

Unit – IV : Reliability **(8 Hours)**

Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols

Unit – V : Parallel Database Systems **(6 Hours)**

Parallel architectures; parallel query processing and optimization; load balancing

Unit – VI : Advanced Topics **(4 Hours)**

Mobile Databases, Distributed Object Management, Multi-databases

Course Outcome:

On completion of the course the student should be able to

1. Design trends in distributed systems.
2. Apply network virtualization.
3. Apply remote method invocation and objects.

References:

1. Principles of Distributed Database Systems, M.T. Ozsu and P. Valduriez, Prentice-Hall, 1991.
2. Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley, 1992.

CSM113	Data Preparation and Analysis (3-0-0)	3 Credits

Course Objective:
To prepare the data for analysis and develop meaningful Data Visualizations

Unit – I : Data Gathering and Preparation **(9 Hours)**
Data formats, parsing and transformation, Scalability and real-time issues

Unit – II : Data Cleaning **(11 Hours)**
Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation

Unit – III : Exploratory Analysis **(13 Hours)**
Descriptive and comparative statistics, Clustering and association, Hypothesis generation

Unit – IV : Visualization **(15 Hours)**
Designing visualizations, Time series, Geolocated data, Correlations and connections, Hierarchies and networks, interactivity

Course Outcome:
On completion of the course the student should be able to
1. Able to extract the data for performing the Analysis.

References:
1. Making sense of Data : A practical Guide to Exploratory Data Analysis and Data Mining, by Glenn J. Myatt.

CSM121	Recommender System (3-0-0)	3 Credits

Course Objective:
1. To learn techniques for making recommendations, including non-personalized, content-based, and collaborative filtering
2. To automate a variety of choice-making strategies with the goal of providing affordable, personal, and high-quality recommendations

Unit – I : Introduction **(9 Hours)**
Overview of Information Retrieval, Retrieval Models, Search and Filtering Techniques: Relevance Feedback, User Profiles, Recommender system functions, Matrix operations, covariance matrices, Understanding ratings,
Applications of recommendation systems, Issues with recommender system.

Unit – II : Content-based Filtering (8 Hours)

High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, pre-processing and feature extraction, Obtaining item features from tags, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

Unit – III : Collaborative Filtering (9 Hours)

User-based recommendation, Item-based recommendation, Model based approaches, Matrix factorization, Attacks on collaborative recommender systems.

Unit – IV : Hybrid Approaches (8 Hours)

Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade
Meta-level, Limitations of hybridization strategies.

Unit – V : Evaluating Recommender System (6 Hours)

Introduction, General properties of evaluation research, Evaluation designs: Accuracy, Coverage, confidence, novelty, diversity, scalability, serendipity, Evaluation on historical datasets, Offline evaluations.

Unit – VI : Types of Recommender Systems (8 Hours)

Recommender systems in personalized web search, knowledge-based recommender system, Social tagging recommender systems, Trust-centric recommendations, Group recommender systems.

Course Outcome:

After completion of course, students would be able to:

1. Design recommendation system for a particular application domain.
2. Evaluate recommender systems on the basis of metrics such as accuracy, rank accuracy, diversity, product coverage, and serendipity

References:

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
2. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer (2016), 1st ed.
3. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed.
4. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.

CSM122	Pattern Recognition (3-0-0)	3 Credits

Course Objective:

1. To study the concept of a pattern and the basic approach to the development of pattern recognition and machine intelligence algorithms basic methods of feature extraction.
2. To understand supervised learning techniques such as LSM, Decision Tree, SVM, RBFN, HMM. Performance Analysis, ROC curve.
3. To learn unsupervised learning methods Graph Clustering, Clustering of High Dimensional Data-Subspace.
4. To understanding of frequency domain features and their performance analysis.

Unit – I : **(12 Hours)**

Introduction: Feature representation, extraction and Pattern Representation. Learning and adaptation: Concept of Supervised, Unsupervised Classification, Reinforcement learning. Application Areas.

Feature Selection: Data Pre-processing, Data Normalization, Outlier Removal, Missing Data, Class Separability Measures, Feature-Subset Selection, Bayesian Information Criterion.

Unit – II: **(10 Hours)**

Supervised Learning: Perceptron Algorithm, Least-Squares Methods, Multilayer Perceptron's, Decision Trees, Support Vector Machines, Radial Basis Function Networks, Combinations of Classifiers. Hidden Markov Models (HMM)-evaluation, decoding and learning

Unit – III: **(8 Hours)**

Bayes Decision Theory: Discriminant Functions and Services, the Normal Distribution, Bayesian Classification, Estimating Probability Density Functions, Nearest Neighbour Rules, Bayesian Networks. Performance Analysis, ROC Curves

Unit – IV: **(8 Hours)**

Unsupervised Classification: Sequential Algorithms, Hierarchical Clustering, Partition Based Clustering: k-Medoid Algorithms, DB-Scan Clustering, FCM Clustering. Spectral Clustering.

Unit – V: **(10 Hours)**

Feature Generation: Principal Component Analysis, The Singular Value Decomposition, Independent Component Analysis, Discrete Fourier Transform, Hadamard Transform, Haar Transform. Dynamic Time Warping in Speech Recognition, Measures Based on Correlations.

Course Outcome:
After completion of course, students would be able to:

1. Student will understand the concept of a patterns and development of pattern recognition and machine intelligence algorithms.
2. Student will learn about supervised learning techniques, LSM, Decision Tree, SVM, RBFN, HMM, Performance Analysis.
3. Student will learn the unsupervised learning methods Graph Clustering, Clustering of High Dimensional Data-Subspace.
4. Student will understand about the frequency domain features and their performance analysis.

References:

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2nd Edition, 2016.
2. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006
3. Theodoridis, S. and K. Koutroumbas, Pattern recognition. 4th Edition. 2009, San Diego,CA: Academic Press.

CSM123	Data Storage Technologies and Networks (3-0-0)	3 Credits

Pre-Requisites:
Basic knowledge of Computer Architecture, Operating Systems, and Computer Networking is required.

Course Objective:
To provide learners with a basic understanding of Enterprise Data Storage and Management Technologies

Unit – I : **(8 Hours)**
Storage Media and Technologies – Magnetic, Optical and Semiconductor Media, Techniques for read/write Operations, Issues and Limitations.

Unit – II : **(9 Hours)**
Usage and Access – Positioning in the Memory Hierarchy, Hardware and Software Design for Access, Performance issues.

Unit – III : **(7 Hours)**
Large Storages – Hard Disks, Networked Attached Storage, Scalability issues,

Unit – IV : **(9 Hours)**

Storage Architecture - Storage Partitioning, Storage System Design, Caching, Legacy Systems.

Unit – V : **(10 Hours)**

Storage Area Networks – Hardware and Software Components, Storage Clusters/Grids. Storage QoS–Performance, Reliability, and Security issues.

Unit – VI : **(5 Hours)**

Recent Trends related to Copy data management, Erasure coding, and Software-defined storage appliances.

Course Outcome:

After completion of course, students would be:

1. Learn Storage System Architecture
2. Overview of Virtualization Technologies, Storage Area Network

References:

1. The Complete Guide to Data Storage Technologies for Network-centric ComputingPaperback– Import, Mar 1998 by Computer Technology Research Corporation
2. Data Storage Networking: Real World Skills for the CompTIA Storage by Nigel Poulton

CSM105	Research Methodology & Intellectual Property Rights (2-0-0)	2 Credits

Module I:

Introduction to RM: Meaning and significance of research. Importance of scientific research in decision making. Types of research and research process. Identification of research problem and formulation of hypothesis. Research Designs.

Module II:

Measurement and Data Collection. Primary data, Secondary data, Design of questionnaire ; Sampling fundamentals and sample designs. Measurement and Scaling Techniques.

Module III:

Data Analysis : Hypothesis testing; Z-test, t-test, F-test, Chi-square test. Analysis of Variance, Non-parametric Test – Sign Test, Run test, Krushall – Wallis test.

Report Writing and Presentation: Research Report, Types and significance, Structure of research report, Ethical issues in research, Presentation of report.

Module-IV

Introduction to Intellectual property: Introduction, types of intellectual property, importance of intellectual property rights.

Trade Marks: Purpose and function of trade marks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration

Module -V:

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade screte litigation.

TEXT BOOKS & REFERENCES:

1. Research Methodology, C.R.Kothari
2. Research Methodology, Chawla and Sondhi, Vikas
3. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
4. Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, Tata Mc Graw Hill Publishing Company Ltd.

CSM106	Audit Course (2-0-0)	0 Credits

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

CSM107	Laboratory – I (0-0-4) (Advanced Data Structures)	2 Credits

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

CSM108	Laboratory – II (0-0-4) (Based on Electives / Core)	2 Credits

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

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.