RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF ENGINEERING (B.Tech.) DEGREE COURSE
SEMESTER: FIFTH (C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Software Engineering & Project Management **Subject code:** BTECH_CSEDS-501T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs(Theory)	3	-	3	30	70	100

Course Objectives:

1	To understand general idea of software engineering
2	To develop skills to design various software process models
3	To develop skills required for software testing and various risk strategies

Course Outcome:

At the end of this course students are able to:

CO1	Acquire Knowledge of software engineering methods, practices, process models and application.
CO2	understand measure, metrics and indicators and learn various Modeling Approach
CO3	Analyze and extract requirements for product and translate these into a documented design using different modeling techniques.
CO4	To learn software testing methods and types, And to understand debugging concept with various testing methods.
CO5	To understand project management, and to know software risks and principles of quality management, further the concept of reengineering and reverse engineering.

Unit 1	Basics: Introduction to Software Engineering, Software Myths, Software Engineering- A Layered Technology. Software Process Models: The Waterfall Model, Evolutionary Process Models, Specialized Process Models, Agile Process Models **7Hrs**
Unit 2	System Engineering: Hierarchy, Business Process Engineering, Product Engineering, System Modeling, Requirements Engineering: Requirements Analysis, Analysis Modeling Approaches, Data Modeling, Object-Oriented Analysis, Scenario-Based Modeling, Flow-Oriented Modeling, Class-based Modeling. **7Hrs**
Unit 3	Design Engineering Concepts, Design Model, Pattern-Based Software Design, Architectural Design, Cohesion, Coupling, User interface analysis and Design **7Hrs**
Unit 4	Unit Testing, Integration Testing, Validation Testing, System Testing, Art of Debugging, Software Testing Fundamentals, Black-Box Testing, White-Box Testing, Metrics for Source Code **7Hrs**
Unit 5	Risk Management: Risk strategies, Software risks, Risk identification, Risk refinement, RMMM Quality Management: Software Quality Assurance, Software Reviews, Formal Technical Review, Software Reliability, Change Management: Software Configuration Management, SCM Process, Reengineering: Software reengineering, Reverse Engineering, Restructuring, Forward Engineering. **8Hrs**

Text Books-

1. Software Engineering-A Practitioner's Approach (Sixth Edition) by Roger Pressman (TMH)
2. Software Engineering (Ninth Edition)-Ian Summerville (Pearson)
3. Software Engineering for students (4th Edition)- Douglas Bell(Pearson)

Reference Books:

1. Schaum's Outline of Theory and Problems of Software Engineering by David Gustafson (TMH)
2. Software Engineering (Third Edition) by K. K. Aggarwal and Yogesh Singh (New age International Publishers)
3. Software Engineering, Theory and Practice(4th Edition)- Pfleeger, Atlee(Pearson)

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SEMESTER: FIFTH (C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Artificial Intelligence **Subject code:** BTECH_CSEDS-502T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs(Theory)	3	-	3	30	70	100

Course Objectives:

1	To understand general idea of Artificial Intelligence
2	To understand various Knowledge Representation
3	To develop skills required for ES and life cycle of ES

Course Outcome:

At the end of this course students are able to:

CO1	Acquire Knowledge of Applications of AI, Production systems, Real world problem.
CO2	To understand uniform search strategies like BFS, DFS and problem reduction.
CO3	Analyze the Issues in knowledge representation and resolution method in propositional logic.
CO4	To learn Structural Knowledge Representation and Transition networks
CO5	To understand the Knowledge acquisition methods, knowledge engineering process and expert system.

Unit 1	History and Application of AI, the Turing Test approach, AI Problems and AI Techniques, Defining problem as state space representation, Production system, Problem characteristics, monotonic and non-monotonic production systems, Solving problems by searching-Toy problems, Real-World problems. **7Hrs**
Unit 2	Uniformed Search Strategies: Breadth-first search, Depth-first search, Comparing uniformed search techniques. Informed search strategies: Generate-and-test, Hill climbing, best-first search, problem reduction, constraint satisfaction, Mean-ends analysis **7Hrs**
Unit 3	Knowledge Representation: Issues in knowledge representation, Approaches to knowledge representation, introduction to ontology Logic and Inferences: Formal logic, history of logic and knowledge, propositional logic, resolution method in propositional logic **7Hrs**
Unit 4	Structural Knowledge Representation: Frames, scripts, predicate logic, semantic network, example of knowledge representation schemes, Truth maintenance system. Transition networks: RTN, ATN. Basic techniques of NLP, application of NLP **7Hrs**
Unit 5	Expert system: Knowledge acquisition methods, knowledge engineering process, goals in knowledge system development, basic architecture of expert system, problem domain versus knowledge domain, Development of ES and life cycle of ES. Advantages of expert system, structure of Rule based expert system, characteristics of conventional system and expert system. **8Hrs**

Text Books:

1. Artificial Intelligence (Third Edition) McGraw-Hill Elaine Rich, Kevin Knight.
2. A First course in Artificial Intelligence (McGraw-Hill) Deepak Khemani.
3. Artificial Intelligence A modern approach (Second Edition) Pearson, Stuart Russell, and Peter Norvig.

Reference Books:

1. Fuzzy Logic with Engineering application (Third edition) Timothy J.Rose.

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SEMESTER: FIFTH (C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Language Processor **Subject code:** BTECH_CSEDS-503T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs(Theory)	3	1	4	30	70	100

Course Objectives:

1	To understand general idea of Language Processor
2	To understand various Processors i.e., assembler, loader, Syntax analyzer and code generation
3	To develop skills required to optimize code and also to generate code in Processors

Course Outcome:

At the end of this course students are able to:

CO1	Acquire Knowledge of Language Processors.
CO2	To understand analyzers like lexical and syntax analyzer in LP.
CO3	Analyze the Run time system to know storage organization.
CO4	To learn issues and design on intermediate code generation.
CO5	To understand the flow graph and register allocation and assignment and code generation.

Unit 1	**Introduction to Language Processing**: Language Processing Activities, Fundamentals of Language Processing, Fundamentals of Language Specifications Language Processors: **Macro Processors** - Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities in 'C', **Assemblers** - Elements of Assembly Language Programming, Assembly Scheme, single pass Assembler, Detailed Design of two pass assembler, **Loader and Linkers** - Relocation of Linking Concept, Design of Linker, Linker for MS DOS, Linking for overlays, Design of absolute loaders, Design of direct linking loaders. **8 Hrs**
Unit 2	**Lexical Analyzer**: Lexical Analysis, Specification of tokens, Recognition of tokens, Regular Expression, Finite automata, NFA , Lex Implementation. **Syntax Analyzer** : Syntax analysis, Types of Grammar, CFG, CFL, PDA & Turing Machine , Top down parsing , Bottom up parsing , YACC. **7 Hrs**
Unit 3	**Semantic Analyzer**: Syntax directed Translation, L- attributed and S-attributed definitions with their implementation, Type checking. **Run Time System:** storage organization, activation tree , activation record, parameter passing. **7 Hrs**
Unit 4	**Intermediate Code Generation**: Run-Time Environment: issues and design, Intermediate Languages, Implementation of Three Address Code. **Code Optimization**: Optimization of basic blocks, Loops in flow graphs, Global data flow analysis, Code generation. **7 Hrs**
Unit 5	**Code Generation**: Issues in the Design of a Code Generator , The Target Machine, Run-Time Storage Management, Basic Blocks and Flow Graphs, Next-Use Information, A Simple Code Generator, Register Allocation and Assignment ,The DAG Representation of Basic Blocks , Peephole Optimization, Generating Code from DAGs , Dynamic Programming Code-Generation Algorithm. **7 Hrs**

Text Books:

1. Programming Language Processors by David A. Watt
2. Introduction to Assembly Language Programming: For Pentium and RISC Processors (springer) by Sivarama P. Dandamudi
3. Assembly Language for x86 Processors, Global Edition (pearson) by Kip Irvine

Reference Books:

Assembly Language for x86 Processors, (pearson) by Kip R. Irvine

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SEMESTER: FIFTH (C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Soft computing **Subject code:** BTECH_CSEDS-504.1T

Elective-I

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs(Theory)	3	-	3	30	70	100

Course Objectives:

1	To introduce the concepts in Soft Computing such as Artificial Neural Networks
2	To understand Fuzzy logic-based systems.
3	To develop skills required to understand genetic algorithm-based systems and their hybrids

Course Outcome:

At the end of this course students are able to:

CO1	Learn soft computing techniques and their applications
CO2	Analyze various neural network architectures.
CO3	Define the fuzzy systems.
CO4	Understand the genetic algorithm concepts and their applications.
CO5	Identify and select a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution.

Unit 1	Introduction to Soft Computing Artificial neural networks - biological neurons, Basic models of artificial neural networks – Connections, Learning, Activation Functions, McCulloch and Pitts Neuron, Hebb network. **8 Hrs**
Unit 2	Perceptron networks – Learning rule – Training and testing algorithm, Adaptive Linear Neuron, Back propagation Network – Architecture, Training algorithm **7 Hrs**
Unit 3	Fuzzy logic - fuzzy sets - properties - operations on fuzzy sets, fuzzy relations - operations on fuzzy relations. Fuzzy membership functions, fuzzification, Methods of membership value assignments – intuition – inference – rank ordering, Lambda – cuts for fuzzy sets, Defuzzification methods **7 Hrs**
Unit 4	Truth values and Tables in Fuzzy Logic, Fuzzy propositions, Formation of fuzzy rules - Decomposition of rules – Aggregation of rules, Fuzzy Inference Systems - Mamdani and Sugeno types, Neuro-fuzzy hybrid systems – characteristics – classification **7 Hrs**
Unit 5	Introduction to genetic algorithm, operators in genetic algorithm - coding - selection - cross over – mutation, Stopping condition for genetic algorithm flow, Genetic-neuro hybrid systems, Genetic Fuzzy rule based system **7 Hrs**

Text Books

1. S. N. Sivanandam and S. N.Deepa, Principles of soft computing – John Wiley & Sons, 2007.
2. Timothy J. Ross, Fuzzy Logic with engineering applications , John Wiley & Sons, 2016.

Reference Books:

1. N. K. Sinha and M. M. Gupta, Soft Computing & Intelligent Systems: Theory & Applications-Academic Press /Elsevier. 2009.
2. Driankov D., Hellendoorn H. and Reinfrank M., An Introduction to Fuzzy ControlNarosa Pub., 2001.

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BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Digital Image Processing **Subject code:** BTECH_CSEDS-504.2T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs(Theory)	3	-	3	30	70	100

Course Objectives:

1	To introduce the concepts in Soft Computing such as Artificial Neural Networks
2	To understand Fuzzy logic-based systems.
3	To develop skills required to understand genetic algorithm-based systems and their hybrids

Course Outcome:

At the end of this course students are able to:

CO1	Learn soft computing techniques and their applications
CO2	Analyze various neural network architectures.
CO3	Define the fuzzy systems.
CO4	Understand the genetic algorithm concepts and their applications.
CO5	Identify and select a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution.

Unit 1	Digital Image Fundamentals: A simple image model, Sampling and Quantization, Imaging Geometry, Digital Geometry, Image Acquisition Systems, Different types of digital images. Bilevel Image Processing: Basic concepts of digital distances, distance transform, medial axis transform, component labeling, thinning, morphological processing, extension to grey scale morphology. **8Hrs**
Unit 2	Binarization and Segmentation of Grey level images: Histogram of grey level images, Optimal thresholding using Bayesian classification, multilevel thresholding, Segmentation of grey level images, Water shade algorithm for segmenting grey level image. **7Hrs**
Unit 3	Binarization and Segmentation of Grey level images: Histogram of grey level images, Optimal thresholding using Bayesian classification, multilevel thresholding, Segmentation of grey level images, Water shade algorithm for segmenting grey level image. **7Hrs**
Unit 4	Detection of edges and lines in 2D images: First order and second order edge operators, multi-scale edge detection, Canny's edge detection algorithm, Hough transform for detecting lines and curves, edge linking. Images Enhancement: Point processing, Spatial Filtering, Frequency domain filtering, multi-spectral image enhancement, image restoration. **7Hrs**
Unit 5	Color Image Processing: Color Representation, Laws of color matching, chromaticity diagram, color enhancement, color image segmentation, color edge detection, color demosaicing. Image compression: Lossy and lossless compression schemes, prediction based compression schemes, vector quantization, sub-band encoding schemes, JPEG compression standard, Fractal compression scheme, Wavelet compression scheme. **7Hrs**

Text Books

1. Fundamentals of Digital Image Processing Paperback by Sanjay Sharma
2. Digital Image Processing 3rd Edition by Woods (Author), Gonzalez (Author)

Reference Books:

1. Gonzalez and Woods, Digital Image Processing, Prentice-Hall.
2. Software Engineering (Third Edition) by K. K. Aggarwal and Yogesh Singh (New age International Publishers)
3. Software Engineering, Theory and Practice(4th Edition)- Pfleeger, Atlee(Pearson)

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BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Elective-I Health Informatics **Subject code:** BTECH_CSEDS-504.3T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs(Theory)	3	-	3	30	70	100

Course Objectives:

1	Introduction to health informatics, knowledge to advance individual health, health care.
2	To learn the application of informatics skills and knowledge to health-related problems.
3	To application activities will include simple data analysis and visualization of clinical data,

Course Outcome:

At the end of this course students are able to:

CO1	Develop knowledge about problems and challenges that health informatics addresses
CO2	Demonstrate basic skills and knowledge in health informatics for application in future health-related careers
CO3	Perform visualization and simple analysis of a data set to assess difficulty of predicting cardiovascular risk in a synthetic patient dataset
CO4	Apply communication skills through an interview with an informatics professional and development of a written summary
CO5	Analyze ethical and diversity issues in health informatics

Unit 1	Introduce the research and practice of the field in the context of the problems that motivate its work. Describe the data, information, and knowledge environment of health informatics, from cells and genes to people to health systems **7Hrs**
Unit 2	**Electronic Health Records** : Describe and demonstrate the electronic health record (EHR) and its derivatives, and the functions for which it is used, including clinical decision support and re-use of clinical data. **Electronic Health Records** : Describe and demonstrate the electronic health record (EHR) and its derivatives, and the functions for which it is used, including clinical decision support and re-use of clinical data **8Hrs**
Unit 3	**Bioinformatics**: Find and apply informatics in genomics and other aspects of molecular biology Informatics **Information Retrieval** : Discuss the discovery and dissemination of health-related knowledge and demonstrate the ability to retrieve and appraise it **7Hrs**
Unit 4	**Data Science, Analytics, and Visualization**: Apply analytical and visualization skills to data sets Informatics **Applications in Public Health**: Describe the applications of informatics to public health **7Hrs**
Unit 5	**Ethical Issues in Health Informatics**: Discuss the ethical challenges for the use of data and information in health-related areas. **Careers in Health Informatics** : Describe the career and training options for work in health informatics **7Hrs**

Text Books:

1. Hoyt, RE and Yoshihashi, A, Eds. (2014). Health Informatics: Practical Guide for Healthcare.
2. Information Technology Professionals, Sixth Edition. Pensacola, FL, Lulu.com.

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SEMESTER: FIFTH (C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Software Engineering & Project Management-Lab **Subject code:** BTECH_CSEDS-505P

Load	Practical	Credits	College Assessment Marks	University Evaluation	Total Marks
2Hrs(Practical)	2	1	25	25	50

Course Objectives

1	To understand general idea of software engineering
2	To develop skills to understand creation of object and interaction between them
3	To develop skills required for creation of various UML models

Course Outcome:

At the end of this course students are able to:

CO1	Learn the concept of requirement gathering & to learn the development of use case model
CO2	Understanding the object creation and the interaction between various objects & their collaboration
CO3	Understanding various states of objects & different component views
CO4	Learning the development of various UML models & understanding complete design phase.

List of Practical:-

1. To find the requirement specification (both functional and nonfunctional) of a given Problem.
2. To Develop DFD model (level-0, level-1 DFD and Data dictionary) of the project.
3. To Develop Structured design for the DFD model developed
4. To Develop UML Use case model for a problem
5. To Develop sequence diagram
6. To Develop Class diagram
7. To Draw activity diagram in UML.
8. To Draw the Entity relationship diagram of a project.
9. To Develop state transition diagram
10. Draw Object Diagram for ATM System

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SEMESTER: FIFTH (C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Artificial Intelligence-Lab **Subject code:** BTECH_CSEDS-506P

Load	Practical	Credits	College Assessment Marks	University Evaluation	Total Marks
2Hrs(Practical)	2	1	25	25	50

Course Objectives

1	To understand general idea of Artificial Intelligence
2	To develop skills to understand creation of object and interaction between them
3	To develop skills required for creation of various puzzle problem

Course Outcome:

At the end of this course students are able to:

CO1	Acquire Knowledge of Applications of AI, Production systems, Real world problem.
CO2	To understand uniform search strategies like BFS, DFS and problem reduction.
CO3	Analyze the Issues in knowledge representation and resolution method in propositional logic.
CO4	To learn Structural Knowledge Representation and Transition networks
CO5	To understand the Knowledge acquisition methods, knowledge engineering process and expert system.

List of Practical:-

1. Write a program that list four addresses in a label form, each address should list a name, one-line address, city, state & pin-code.
2. Write a program for diagnosis the childhood diseases.
3. Write a program to demonstrate the effective use of Cut and Fail.
4. Write a program to find roots of quadratic equation. (consider all possible cases)
5. Write a program to find minimum & maximum from give Numbers.
6. Write a program to solve Water-Jug Problem.
7. Write a program to find factorial of given number.
8. Write a program to input user name and password from user and repeatedly asking if any one of them is wrong.
9. Write a program to implement Tower of Hanoi Problem
10. Write a program for traveling salesman problem

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BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Language processor-Lab **Subject code:** BTECH_CSEDS-507P

Load	Practical	Credits	College Assessment Marks	University Evaluation	Total Marks
2Hrs(Practical)	2	1	25	25	50

Course Objectives

1	To introduce the major concept areas of language translation and compiler design.
2	To extend the knowledge of parser by parsing LL parser and LR parser.
3	To provide practical programming skills necessary for constructing a compiler.

Course Outcome:

At the end of this course students are able to:

CO1	To Understand fundamentals of compiler.
CO2	Apply the knowledge of patterns, tokens & regular expressions for solving a problem
CO3	To design & conduct experiments for symbol table in compiler
CO4	To design & conduct experiments for parser in compiler.
CO5	To acquire the knowledge of modern compiler & its features.

List of Practical:-

1. Introduction to 'c' compiler.
2. Write a program to eliminate white spaces from a input file using arrays.
3. Write a program to identify keywords from a input file.
4. Write a program to find whether the string is identifier or not.
5. Write a program for implementing symbol table
6. Write a program to find first() function from a given grammar.
7. Write a program to find follow() function from a given grammar.
8. Write a program to implement directed acyclic graph (dag).
9. To study the lex.
10. To study the yacc.

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SEMESTER: FIFTH (C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Effective Technical Communication **Subject code:** BTECH_CSEDS-508T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
2Hrs(Theory)	2	-	2	15	35	50

Course Objectives:

1	To Understand the knowledge of technical communication
2	To learn the technical writing reports
3	To develop skill to acquire technical communication skill

Course Outcome:

At the end of this course students are able to:

CO1	To understand the nature and objective of Technical Communication relevant for the work place as Engineers
CO2	Utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.
CO3	To enhance confidence in face of diverse audience.
CO4	Create a vast know-how of the application of the learning to promote their technical competence.
CO5	It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics.

Unit 1	Technical Writing: Report writing Technical proposal Technical description Business letters(sales, order, complaint, adjustment, inquiry, recommendation, appreciation, apology, acknowledgement, cover letter) Agenda of meeting, Minutes of meeting Resume writing **7 Hrs**
Unit 2	Technical Communication: Public speaking Group discussion Presentation strategies Interview skills Negotiation skills Critical and Creative thinking in communication **7 Hrs**
Unit 3	Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear: Confident speaking; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections. **8 Hrs**
Unit 4	Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means. **7 Hrs**

Text Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
3. Practical Communication: Process and Practice by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2014, Delhi.

Reference Books:

1. Skills for Effective Business Communication by Michael Murphy, Harward University, U.S.
2. Business Communication for Managers by Payal Mehra, Pearson Publication, Delhi.

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BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Essence of Indian Knowledge Tradition (Audit Course)
Subject Code: BTECH_CSEDS-510A

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3 Hrs (Theory)	3	NIL	NIL	50	NIL	NIL

Unit 1	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge **8 Hrs**
Unit 2	Protection of traditional knowledge:The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK. **7 Hrs**
Unit 3	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. **7 Hrs**
Unit 4	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge **7 Hrs**
Unit 5	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK **7 Hrs**

Text Book:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

Reference Books:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.