CS-VII

B. TECH. VII SEMESTER COMPUTER SCIENCE & ENGG.							
COURSE CONTENTS (BTech SCHEME)							
CS7301	Fundamentals of Machine Learning	L	T	P	C	Max. Marks	Min. Marks
Duration	3 Hours	2	1	2	4	70	22

Course Descriptions:

This course provides a concise introduction to the fundamental concepts in machine learning and popular machine learning algorithms. We will look at classic supervised and unsupervised learning methods. The supervised learning algorithms includes linear regression, logistic regression, k-nearest neighbour, an introduction to Bayesian learning and the naïve Bayes algorithm, support vector machines and neural networks. The unsupervised methods cover the various types of clustering methods and the basic clustering algorithms. Feature reduction methods PCA and SVD will be covered and Reinforcement learning with Markov decision process (MDP) and Bellman equations will also be discussed. The course will be accompanied by hands-on problem solving with programming in Python and some tutorial sessions.

Course Objectives:

- To understand various key paradigms for machine learning approaches
- To familiarize with the mathematical and statistical techniques used in machine learning.
- To understand and differentiate among various machine learning techniques.
- Provide technical details about various recent algorithms and software platforms related to Machine Learning.

Syllabus:

Unit-1

Machine learning basics and Motivations, Supervised and Unsupervised Learning, Classifying with k-Nearest Neighbor classifier, Support vector machine classifier, Naive Bayes classifier.

Unit-2

Introduction to Artificial Neural Network: forward propagation, cost functions, error back propagation, training by gradient descent. Predicting numeric values: Introduction to regression, Linear Regression, Logistic regression, Tree-based regression, Bias /Variance tradeoff.

Unit-3

Clustering: Desired Features of Cluster Analysis, Cluster Analysis Methods:- Partitional Methods, Hierarchical Methods, Density-Based Methods. Quality and Validity of Cluster Analysis Methods. Association analysis with Apriori algorithm, efficiently finding frequent itemsets with FP-growth.

Unit-4

Dimensionality reduction: Feature extraction - Principal component analysis, Singular value decomposition. Feature selection – feature ranking and subset selection, filter, wrapper and embedded methods.

Unit-5

Reinforcement learning: Markov decision process (MDP), Bellman equations, Value iteration and policy iteration, Linear quadratic regulation, Linear Quadratic Gaussian, Q-learning, Value function approximation.

Course Outcomes:

After the completion of this course, students are expected to have the ability to:

- To formulate a machine learning problem
- Select an appropriate pattern analysis tool for analyzing data in a given feature space.
- Apply pattern recognition and machine learning techniques such as classification and feature selection to practical applications and detect patterns in the data.
- Design and program efficient algorithms related to recent machine learning techniques, train models, conduct experiments, and develop real-world ML-based applications and products.

TEXT BOOKS:

1. Tom Mitchell, Machine Learning, McGraw-Hill 1997
2. E. Alpaydin, Introduction to Machine Learning, MIT Press 2nd Edition, 2009
3. P. Harrington, Machine learning in action, Manning Pub. Co Edition 2012
4. C. M. Bishop, Pattern recognition and Machine Learning, Springer 2006

REFERENCE BOOKS:

1. Tan, Introduction to Data Mining, Pearson Pub. 2nd Edition 2006
2. Duda, Hart and Stock, Pattern Classification, Wiley 2nd Edition 2000
3. Carl G. Looney, Pattern Recognition using Neural Networks, Oxford 1997

B.TECH. VII SEMESTER COMPUTER SCIENCE &ENGG.							
COURSE CONTENTS (UEC SCHEME)							
CS7302	Software Architecture	L	T	P	C	Max. Marks	Min. Marks
Duration	5 Hours	2	1		3	70	22

Course Description:
Software development requires both an understanding of software design principles and a broader understanding of software architectures that provide a framework for design. The course explores the role of design in the software life cycle, including different approaches to design, design trade-offs, and the use of design patterns in modelling object-oriented solutions. It also focuses on important aspects of system architecture, including the division of functions among system modules, synchronization, asynchronous and synchronous messaging, interfaces, and the representation of shared information

Course Objective

- To learn middleware architecture design principles.
- To understand requirements traceability and how to insure the system meets cross-cutting end-to-end software architectural properties.
- To identify and compose design patterns.

Syllabus

Unit I:

Introduction: The Architectural Concept, Architectural Patterns, Reference Models and Reference, Importance of Software Architecture, Architectural Structures and Views, UML Component Diagram, UML Package Diagram, UML Deployment Diagram, UML Activity Diagram.

Unit-II:

Architectural Quality Attributes: Introduction to Quality Attributes, Need of quality attributes, Understanding quality attributes, architecture and quality attributes. Achieving Quality, Tactics, Relationship of Tactics to Architectural Patterns.

Unit-III:

Architectural Styles: Data flow styles, Call-return styles, Shared Information styles, Event styles, Case studies for each style. Architectural styles, Pipes and filters, Data abstraction and object-oriented organization, Event based, implicit invocation, Layered systems, Repositories, Other familiar architectures, Heterogeneous Architectures

Unit-IV:

Software Architecture analysis and design: requirements for architecture and the life-cycle view of architecture design and analysis methods, architecture-based economic analysis: Cost Benefit Analysis Method (CBAM), Architecture Trade-off Analysis Method (ATAM). Active Reviews for Intermediate Design (ARID), Attribute Driven Design method (ADD), Domain – specific Software architecture.

Unit V:

Documenting the architecture: Guidelines and practices, documenting the Views using UML, Pros and cons of using visual languages, Need for formal languages, Architectural Description Languages, ACME, Designing and documentation, Case studies

Course Outcomes:

- Describe Software architecture for various software systems.
- Recognize and derive Quality attributes for software architectures.

- Demonstrate the use of different architectural styles and frameworks.
- Demonstrate documentation for architectural patterns.
- Use implementation techniques of Software architecture for effective software development

References Books:

1. Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Second Edition, Pearson, ISBN 978-81-775-8996-2. 2. Raghavan, Compiler Design, TMH Pub.
2. Dikel, David, D. Kane, and J. Wilson, "Software Architecture: Organizational Principles and Practices", Prentic -Hall.
3. Albin, S. "The Art of Software Architecture", Indiana: Wiley, 2003.
4. Humphery Watts, "Managing the Software Process", Addision Wesley, 1989.(Revised).

Elective-I

CS-7311

B.TECH. VII Semester **COMPUTER SCIENCE & Engg.**							
COURSE CONTENTS (UEC SCHEME)							
CS731X	**Big Data Analytics**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Duration	3 Hours	2	1	2	4	70	22

Course Description:
This course covers the introduction to advance topics of big data analytics. This course focuses on concepts of big data platform, distributed file system, framework and predictive analytics and their visualization.

Course Objective

- Understand the Big Data Platform and its Use cases
- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS
- Understand Map Reduce Jobs
- Provide hands on Hadoop Eco System
- Apply analytics on Structured, Unstructured Data.
- Exposure to Data Analytics with R.

Syllabus:
UNIT-1

Introduction to big data : Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting.

UNIT-2

Mining data streams : Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.

UNIT-3

Hadoop: History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop - Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-

Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features , Hadoop environment.

UNIT-4

Frameworks: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams.

UNIT-5

Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.

Course Outcomes:

The students will be able to:

- Identify Big Data and its Business Implications.
- List the components of Hadoop and Hadoop Eco-System
- Access and Process Data on Distributed File System
- Manage Job Execution in Hadoop Environment
- Develop Big Data Solutions using Hadoop Eco System
- Analyze Infosphere BigInsights Big Data Recommendations.
- Apply Machine Learning Techniques using R.

References:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
4. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
6. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007.
7. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
8. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", 2 nd Edition, Elsevier, Reprinted 2008.
9. Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets, "Intelligent Data Mining", Springer, 2007.

EC - 7321 OEL-II

B.Tech. VII Semester **COMPUTER SCIENCE &Engg.**							
COURSE CONTENTS (UEC SCHEME)							
EC731X	**Cyber Forensic and Laws**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Duration	3 Hours	2	1	0	3	70	22

Course Description:
The course is intended to teach the students fundamental concepts in the area of Cyber Forensics Laws. This course will provide in depth knowledge and a critical understanding of Cyber Forensics from different viewpoints, Cyber Crime, Cyber Laws and Application in different domain.

Course Objective

- Understand basic concepts and application of Cyber Forensics.
- To provide a computer systems perspective on the converging areas of Cyber Forensics.
- To learn basic concepts and application of Cyber Crime.
- To cover topics of cyber Laws.

Syllabus

Unit I:

Cyber Forensics Fundamentals: Introduction to Cyber Forensics, Cyber Forensics and Digital evidences, Internet Fraud, Challenges in Cyber Forensics, Deleted File Recovery, Data Recovery Tools.

Unit-II:

Overview of Cyber Forensics: Validating Forensics Data, Data Hiding Techniques, Introduction of Network Forensics, Cell Phone and Mobile Devices Forensics, Search and Seizure of computers, Recovery Deleted evidences .Concept of online frauds, Perception of Cyber Criminals, Hackers, Overview of Insurgents and extremist group, Cyber Terrorism, Virtual crime

Unit-III:

Introduction of Cyber Crime: Classification of Cyber Crimes, Cyber Crime and Criminal justice, Concept of Cyber fraud and Cheating, Harassments and Email abuse, E-mail Spoofing, Spamming, Tools and Methods in Cyber Crime, Method of Phishing, Phishing Techniques.

Unit-IV:

Cyber Forensics Investigation: Introduction to Cyber Forensic Investigation, Investigation Tools, Digital Evidence Collection, Handling Preliminary Investigations, and Conducting Disk based Analysis, Investigations information hiding scrutinizing Email, Tracing Internet Access.

Unit V

Cyber Laws: Introduction to IT Laws and Cyber Crimes, IPR, Concept of Jurisdiction, Indian Context of Jurisdiction and IT Act, International Law and Jurisdiction issues in Cyber Laws.

Course Outcomes:

- Understands basics of Cyber Forensics.
- Understands Concept of Cyber Crime.
- Understands various Cyber Laws.
- Understands Cyber fraud and methods of Cyber Crime.