INFORMATION TECHNOLOGY DEPARTMENT

IT78511: ADVANCED ALGORITHMS

HOURS PER WEEK			CREDITS			MAXIMUM MARKS				
						THEORY		PRACTICAL		TOTAL MARKS
T	P	Tu	T	P	Tu	CW	END SEM	SW	END SEM	
3	-	-	3	-	-	30	70	-	-	100

PER-REQUISITES:

COURSE OUTCOMES: The student should be able to

1. Analyze running times of algorithms using asymptotic analysis (time and space complexity).

2. Understand various data structures and apply them for designing algorithms.

3. Describe & Apply the divide & conquer, dynamic programming, greedy method and explain when an algorithmic design situation calls for it.

4. Optimize the solution with respect to time complexity & memory usage

5. Define various classes of algorithms and explain the significance of NP completeness.

COURSE CONTENTS:

THEORY:

UNIT 1: Introduction to algorithms: Review of ADT, RAM Model, algorithm design, performance analysis: time and space complexity, functions and their growth rates, recurrence relations, recursion tree method, masters theorem. Elementary and advanced data structures, selected sorting techniques.

UNIT 2: Divide and conquer approach: merge sort, quick sort, the maximum-sub array problem, Strassen's algorithm for matrix multiplication, searching minimum and maximum elements.

UNIT 3: Dynamic programming: Rod cutting problem, matrix-chain multiplication, elements of dynamic programming, longest common sub-sequence, optimal binary search trees.

UNIT 4: Greedy Algorithms: Elements of the greedy strategy, graph algorithms, an activity-selection problem, Huffman codes. Amortized Analysis: Aggregate analysis, the accounting method, the potential method, dynamic tables.

UNIT 5: Greedy Algorithms: Elements of the greedy strategy, graph algorithms, an activity-selection problem, Huffman codes. Amortized Analysis: Aggregate analysis, the accounting method, the potential method, dynamic tables.

ASSESSMENT: Mid-term test, Assignment, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:

1. T.H. Coreman, C.E. Leiserson and R.L. Rivest, "Introduction to Algorithms", Prentice Hall of India.

2. Jon Kleinberg, Eva Tardos, "Algorithm Design", Pearson Education, LPE.

REFERENCE BOOKS:

1. Aho, Hopcroft, Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education, Asia, 2002.

2. Elliz Horowitz, SartajSahni, "Computer Algorithms", Pearson Education.

3. Saara Base, "Computer Algorithms: Introduction to Design and Analysis", PE, 2/e, 1988.

4. G.Brassard and P. Brately, "Algorithmic: Theory and Practice", Prentice Hall of India. 1988.

Research Journals

1. ACM Journal on Algorithms and Computation Theory.

2. ACM Journal of Experimental Algorithms.

3. IEEE/ACM Journal on Algorithmics..

INFORMATION TECHNOLOGY DEPARTMENT

IT78512: SOFT COMPUTING

HOURS PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
3	-	-	3	-	-	30	70	-	-	100

COURSE OBJECTIVES:

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

COURSE OUTCOMES: After completion of course, students will 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.

COURSE CONTENTS:

THEORY:

UNIT 1: Introduction to Soft Computing and Neural Networks: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics.

UNIT 2: 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 3: 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 4: Genetic Algorithms: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.

UNIT 5: Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic. Recent Trands in deep learning, various classifiers, neural networks and genetic algorithm. Implementation of recently proposed soft computing techniques

ASSESMENT:

TEXT BOOKS RECOMMENDED:

- S. Rajasekran, G.A. Vijayalaxmi Pai "Neural Network, Fuzzy Logic and Genatic Algorithm".
- Bert Kosko "Neural Networks and Fuzzy Systems" PHI Pub.

REFERENCE BOOKS:

- Martin T. Hagan, Howard B. Demuth, Mark Beale "Neural Network Design, VPH Pub.
- Keeman "Learning & soft computing", Pearson
- Philip d. W asserman "Neural Computing", Van Nastrand Reinhold pub.

INFORMATION TECHNOLOGY DEPARTMENT

IT 78711: BIG DATA ANALYTICS

HOURS PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
3	-	-	3	-	-	30	70	-	-	100

Course Outcomes

1. Students will be able to understand the concept and challenges of Big data.
2. Students will be able to demonstrate knowledge of big data analytics.
3. Students will be able to develop Big Data Solutions using Hadoop Eco System
4. Students will be able to gain hands-on experience on large-scale analytics tools.
5. Students will be able to understand MongoDB and Cassandra and its query languages.

COURSE CONTENTS:

Unit1: Introduction to Big data, Big data characteristics, Types of big data, Traditional versus Big data, Evolution of Big data, challenges with Big Data, Technologies available for Big Data, Infrastructure for Big data, Use of Data Analytics, Desired properties of Big Data system.

Unit2: Introduction to Hadoop, Core Hadoop components, Hadoop Eco system, Hive Physical Architecture, Hadoop limitations, RDBMS Versus Hadoop, Hadoop Distributed File system, Processing Data with Hadoop, Managing Resources and Application with Hadoop YARN.

Unit3: Introduction to Hive Hive Architecture, Hive Data types, Hive Hive Query Language, Introduction to Pig, Anatomy of Pig, Pig on Hadoop, Use Case for Pig, ETL Processing, Data types in Pig running Pig, Execution model of Pig, Operators, Eval function,Data types of Pig.

Unit4: Introduction to NoSQL, NoSQL Business Drivers, NoSQL Data architectural patterns, Variations of NOSQL architectural patterns using NoSQL to Manage Big Data.

Unit5: Introduction to MongoDB, Terms used in RDBMS and MongoDB, Data Types and Query Language of MongoDB, Introduction of Cassandra, features of Cassandra, Cassandra query Language and its data type, CRUD operations, Introduction Applications of social Network mining.

TEXT BOOKS RECOMMENDED:

1. Radha Shankarmani, M. Vijaylakshmi, " Big Data Analytics", Wiley, Second edition
2. Seema Acharya, Subhashini Chellappan, " Big Data and Analytics", Wiley, First edition

REFERENCE BOOKS:

1. Kai Hwang, Geoffrey C., Fox. Jack, J. Dongarra, “Distributed and Cloud Computing”, Elsevier, First edition
2. Michael Minelli, Michele Chambers, Ambiga Dhiraj, “Big Data Big Analytics”, Wiley

INFORMATION TECHNOLOGY DEPARTMENT

IT78761: MACHINE LEARNING

HOURS PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
3	-	-	3	-	-	30	70	-	-	100

PRE-REQUISITE: BASIC KNOWLEDGE OF MATHEMATICS

COURSE OUTCOMES: After completion of course, students will be able to:

1. Develop an appreciation for what is involved in learning models from data.
2. Understand a wide variety of learning algorithms.
3. Understand how to evaluate models generated from data.
4. Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

COURSE CONTENTS:

THEORY:

UNIT 1: **Dimensionality Reduction :** Introduction, Subset Selection, Principal Components Analysis,Factor Analysis, Linear Discriminant Analysis

Parametric Methods : Introduction, Maximum Likelihood Estimation, Evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification : Regression, Tuning Model Complexity: Bias/Variance Dilemma, Model Selection Procedures

Nonparametric Methods : Introduction , Nonparametric Density Estimation, Nonparametric Classification

UNIT 2: **Classification :** Introduction, Decision tree, Linear Discrimination, Gradient Descent, Linear and Logistic Regression, VC-dimension, Neural Networks, support vector machines (SVM) and kernel methods, ,Gibbs Algorithm, Graphical Models, Bayes Optimal Classifier,EM Algorithm, Maximum Likelihood method.Ensemble methods: Bagging, random forests, boosting; **Clustering :** Introduction, Mixture Densities, k-Means, k-Medoids, Expectation-Maximization Algorithm, Hierarchical Clustering, Density Based Clustering, Spectral Clustering.

UNIT 3: The Perceptron, Training a Perceptron, Learning Boolean Functions, Multilayer Perceptrons, Backpropagation Algorithm, Training Procedures, Tuning the Network Size, introduction to deep neaural network and Convolution Neaural network.

UNIT 4: **text analysis and its applications** : basic techniques in natural language processing, including tokenziation, part-of-speech tagging, Bag of words, N-grams, chunking, syntax parsing and named entity recognition. Tf-idf. Vector space models. Text categorization, Text clustering , Topic modeling Probabilistic Latent Semantic Indexing (pLSI) and Latent Dirichlet Allocation (LDA), Document summarization Sentiment analysis.

UNIT 5: **Hidden Markov Models :** Introduction, Discrete Markov Processes, Hidden Markov Models, Three Basic Problems of HMMs, Evaluation Problem, Finding the State Sequence, Learning Model, Parameters Continuous Observations, The HMM with Input, Model Selection in HMM. **Reinforcement Learning** : Introduction, Single State Case: K-Armed Bandit ,Elements of Reinforcement Learning, Model-Based Learning, Temporal Difference Learning.

ASSESSMENT: Mid-term test, Assignment, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (INDIAN EDITION), 2013.
2. Foundations of Machine Learning by M. Mohri, A. Rostamizadeh, and A. Tahwalkar. Published by MIT Press, 2012.
3. Machine Learning: A Probabilistic Perpective by Kevin Murphy. Published by MIT Press 2012.

REFERENCE BOOKS:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective (MLAPP), MIT Press, 2012
2. Christopher Bishop, Pattern Recognition and Machine Learning (PRML), Springer, 2007.

INFORMATION TECHNOLOGY DEPARTMENT

IT78781 : INTERNET OF THINGS

HOURS PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
3	-	-	3	-	-	30	70	-	-	100

Course objectives:

1.To assess the vision and introduction of IoT.

2.To Understand IoT Market perspective.

3.To Implement Data and Knowledge Management and use of Devices in IoT Technology.

4.To Understand State of the Art -IoT Architecture.

5.To classify Real World IoT Design Constraints, Industrial Automation in IoT.

Course Content

UNIT 1: **Introduction to IoT**
Definition, Characteristics of IoT,History of IoT,About objects/things in IoT ,IOT Conceptual framework,Physical Design of IoT ,Logical Design of IoT,IoT Enabling Technologies, IoT Levels & Deployment Templates,Domain Specific IoTs,Impact of IoT on Society.

UNIT 2: **IoT Architecture**
M2M high -level ETSI architecture,IETF architecture for IoT, OGC architecture, SDN (Software Define Networking) and NFV(Network Function Virtualization) for IoT, Data Storage in IoT, IoT Cloud Based Services, Sensor Cloud, Fog Computing.

UNIT 3: IoT Protocol and Wireless Network
Sensor Network ,IoT System Management with NETCONF-YANG,Basics of Wireless networking,Web communication Protocols for connected devices,Unified Data Standard Protocols: IEEE 802.15.4, BACNet Protocol, Modbus ,Zigbee Architecture,Network Layer- 6LowPAN,COAP, Message Communication Protocols for connected devices, SOAP, REST,HTTP Restful and Web Sockets, Internet Connectivity Principles : Internet Connectivity , Internet Based Communication, IP Addressing IoT, Media Access Control.

UNIT 4: Building IoT with IoT Platform

IoT Design Methodology : Specification -Requirement, Process Model. Introduction to Arduino Programming , Integration of sensors and Actuators with Arduino, Introduction to Python Programming , Introduction to Raspberry Pi Board, Programming Raspberry Pi with Python , Other IoT Platform.

UNIT 5: Case Studies

Agriculture, Healthcare, Activity Monitoring,Smart City Street lighting control and Monitoring,Open issue and Challenges.

Course Outcomes:

CO1: Interpret the vision of IoT from a global context.
CO2: Determine the Market perspective of IoT.
CO3: Compare and Contrast the use of Devices, Gateways and Data Management in IoT.
CO4: Implement state of the art architecture in IoT.
CO5: Illustrate the application of IoT in Industrial Automation and identify Real World Design Constraints.

Text Books

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach.
2. Rajkamal "Internet of Things: Tata McGraw Hill Publication.
3. Shriram K Vasudevan,Abhishek S Nagarajan "Internet of Things " Wiley Publication.

Reference Books