RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

CSE-Artificial Intelligence and Machine Learning/ Artificial Intelligence and Machine Learning, VIII-Semester
AL 802(A) Block Chain Technologies

Course Objectives:
The objective of this course is to provide conceptual understanding of how block chain technology can be used to innovate and improve business processes. The course covers the technological underpinning of block Chain operations in both theoretical and practical implementation of solutions using block Chain technology.

Unit I Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block ina Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, UnderstandingCryptocurrency to Block chain, Permissioned Model of Block chain, Overview of Securityaspects of Block chain; Basic Crypto Primitives: Cryptographic Hash Function, Properties of ahash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic
cryptocurrency

Unit II Understanding Block chain with Crypto currency: Bitcoin and Block chain: Creation ofcoins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction inBitcoin Network, Block Mining, Block propagation and block relay.Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in aBitcoin network, Proof of Work (PoW) – basic introduction, HashCashPoW, Bitcoin PoW,Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

Unit III Understanding Block chain for Enterprises: Permissioned Block chain: Permissionedmodel and use cases, Design issues for Permissioned block chains, Execute contracts, Statemachine replication, Overview of Consensus models for permissioned block chain- Distributedconsensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem,Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT overAsynchronous systems.

Unit IV Enterprise application of Block chain: Cross border payments, Know Your Customer(KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade –Trade Finance Network, Supply Chain Financing, and Identity on Block chain

Unit V Block chain application development: Hyperledger Fabric- Architecture, Identities andPolicies, Membership and Access Control, Channels, Transaction Validation, Writing smartcontract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Rippleand Corda.

References:
1. Melanie Swan, "Block Chain: Blueprint for a New Economy", O'Reilly, 2015
2. Josh Thompsons, "Block Chain: The Block Chain for Beginners- Guide to Block chain
Technology and Leveraging Block Chain Programming"
3. Daniel Drescher, "Block Chain Basics", Apress; 1stedition, 2017
4. Anshul Kaushik, "Block Chain and Crypto Currencies", Khanna Publishing House, Delhi.
5.Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and
Smart Contracts Explained", Packt Publishing
6. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts
for Ethereum and Block Chain", Packt Publishing
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman
Ramakrishna, "Hands-On Block Chain with Hyperledger: Building Decentralized Applications
with Hyperledger Fabric and Composer", Import, 2018

Course Outcomes:
After the completion of this course, the students will be able to:
1. Understand block chain technology
2. Acquire knowledge of crytocurrencies

3. Develop block chain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks
4. Build and deploy block chain application for on premise and cloud based architecture
5. Integrate ideas from various domains and implement them using block chain technology in different perspe

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AL802 (B) High Performance computing

Unit 1 Introduction to modern processors-: General Purpose cache based architecture-performance metric and bench marks, Moors Law, pipelining, super clarity, SIMD. MemoryHierarchies, Multi core processors, Multi threaded processors, Vector processors- Designprinciple , Max performance estimates, programming for vector architecture. BasicOptimizations for serial codes:- Scalar profiling, common sense optimizations, Simplemeasures and their impacts, role of compilers, C++ optimizations.

Unit II Data access optimizations: balance analysis and light speed estimates, storage order,Algorithm classifications and assess optimizations, case studies for data accessoptimizations. Parrall Computers: Shared memory computers, Distributed memorycomputers, hybrid systems, Network computers.

Unit III Basics of parallel computing: data and functional parallelism, parallel scalability- laws,metrics, factors, efficiency and load imbalance. Shared memory parallel programming withOpen MP: Parallel execution, data scoping, work sharing using loops, synchronization,Reductions, loop scheduling and Tasking.

Unit IV Efficient Open MP Programming: Program profiling, Performance pitfalls, improving theimpact of open MP work sharing constructs, determining overheads for short loops,Serilisation and false sharing.

Unit V Distributed Memory parallel programming with MPI: Message passing, Message and pointto point communication, collective communication, non blocking point-to-pointcommunication, virtual topologies. Efficient MPI Programming: MPI performance tools,communication parameters, impact of synchronizations sterilizations and contentions,reductions in communication overhead.

Text Books :
1. George Hager and Gerhard Wellein , " Introduction to high performance Computing for scientists and engineers", CRC Press
2. Charles Severance, Kevin Dowd, "High Performance Computing", 2nd Edition, O'Reilly

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CSE-Artificial Intelligence and Machine Learning/ Artificial Intelligence and Machine Learning, VIII-Semester

AL802 (C) Big Data Analytics

Course Outcomes:

1. Students should be able to understand the concept and challenges of Big data.

2. Students should be able to demonstrate knowledge of big data analytics.

3. Students should be able to develop Big Data Solutions using Hadoop Eco System

4. Students should be able to gain hands-on experience on large-scale analytics tools.

5. Students should be able to analyse the social network graphs.

Course Content

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 HadoopYARN, Map Reduce programming.

Unit3: Introduction to Hive Hive Architecture, Hive Data types, 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, functions,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, Introduction to Mango DB.

Unit5: Mining social Network Graphs: Introduction Applications of social Network mining, Social Networks as a Graph, Types of social Networks, Clustering of social Graphs Direct Discovery of communities in a social graph, Introduction to recommender system.

Text Books:

1. RadhaShankarmani, M. Vijaylakshmi, " Big Data Analytics", Wiley, Secondedition

2. Seema Acharya, SubhashiniChellappan, " Big Data and Analytics", Wiley,

Firstedition

Reference Books:

1. 1.KaiHwang,Geoffrey C., Fox. Jack, J. Dongarra, "Distributed and Cloud

Computing", Elsevier, Firstedition

2. Michael Minelli, Michele Chambers, AmbigaDhiraj, "Big Data Big

Analytics",Wileyfor old question papers visit http://www.rgpvonlin

CSE-Artificial Intelligence and Machine Learning/ Artificial Intelligence and Machine Learning, VIII-Semester

AL802(D) Quantum Computing

COURSE OBJECTIVES:

Course Objectives: The objective of this course is to impart necessary knowledge to the learner so that he/she can develop and implement algorithm and write programs using these algorithm

Unit I Motivation for studying Quantum Computing , Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.), Origin of Quantum Computing Overview of major concepts in Quantum Computing: Qubits and multi-qubits states, Braket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement

Unit II Math Foundation for Quantum Computing: Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors

Unit III Building Blocks for Quantum Program: Architecture of a Quantum Computing platform, Details of q-bit system of information representation: Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perceptive e.g. Bell State, Operation on qubits: Measuring and transforming using gates. Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc.

Unit IV Programming model for a Quantum Computing Program: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits. Basic techniques exploited by quantum algorithms, Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks

Unit V Major Algorithms: Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch - Jozsa Algorithm OSS Toolkits for implementing Quantum program: IBM quantum experience, Microsoft Q, RigettiPyQuil (QPU/QVM)

References:

1. Michael A. Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press.

2. David McMahon, "Quantum Computing Explained", Wiley Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand major concepts in Quantum Computing

2. Explain the working of a Quantum Computing program, its architecture and program model

3. Develop quantum logic gate circuits

4. Develop quantum algorithm 5. Program quantum algorithm on major toolkits