

New Scheme Based On AICTE Flexible Curricula

Information Technology, VIII- semester

Open Elective IT 803 (A) Blockchain Technology

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 in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Cryptocurrency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain; Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash 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 of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.
Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, HashCash PoW, 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: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous 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 and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and 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; 1st edition, 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 cryptocurrencies
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 perspectives

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

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Open Elective IT 803 (B) Human Computer Interaction

Course Objectives:

To provide the basic knowledge on the levels of interaction, design models, techniques and validations focusing on the different aspects of human-computer interface and interactions

Unit I HCI Foundations:

Input–output channels, Human memory, Thinking: reasoning and problem solving, Emotion, Individual differences, Psychology and the design of interactive systems, Text entry devices, Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction, Physical controls, sensors and special devices, Paper: printing and scanning

Unit II Designing Interaction:

Overview of Interaction Design Models, Discovery - Framework, Collection - Observation, Elicitation, Interpretation - Task Analysis, Storyboarding, Use Cases, Primary Stakeholder Profiles, Project Management Document

Unit III Interaction Design Models:

Model Human Processor - Working Memory, Long-Term Memory, Processor Timing, Keyboard Level Model - Operators, Encoding Methods, Heuristics for M Operator Placement, What the Keyboard Level Model Does Not Model, Application of the Keyboard Level Model, GOMS - CMN-GOMS Analysis, Modeling Structure, State Transition Networks - Three-State Model, Glimpse Model, Physical Models, Fitts' Law

Unit IV Guidelines in HCI:

Shneiderman's eight golden rules, Norman's Seven principles, Norman's model of interaction, Nielsen's ten heuristics, Heuristic evaluation, contextual evaluation, Cognitive walk-through

Collaboration and Communication:

Face-to-face Communication, Conversation, Text-based Communication, Group working, Dialog design notations, Diagrammatic notations, Textual dialog notations, Dialog semantics, Dialog analysis and design

Unit V Human Factors and Security:

Groupware, Meeting and decision support systems, Shared applications and artifacts, Frameworks for groupware Implementing synchronous groupware, Mixed, Augmented and Virtual Reality

Validation: Validations - Usability testing, Interface Testing, User Acceptance Testing

References:

1. A Dix, Janet Finlay, G D Abowd, R Beale., Human-Computer Interaction, 3rd Edition, Pearson Publishers, 2008
2. Shneiderman, Plaisant, Cohen and Jacobs, Designing the User Interface: Strategies for Effective Human Computer Interaction, 5th Edition, Pearson Publishers, 2010.
3. Hans-Jorg Bullinger,” Human-Computer Interaction”, Lawrence Erlbaum Associates, Publishers
4. Jakob Nielsen,” Advances in Human-computer Interaction”, Ablex Publishing Corporation

5. Thomas S. Huang, "Real-Time Vision for Human-Computer Interaction", Springer
6. Preece et al, Human-Computer Interaction, Addison-Wesley, 1994

Course Outcomes:

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

1. Enumerate the basic concepts of human, computer interactions
2. Create the processes of human computer interaction life cycle
3. Analyze and design the various interaction design models
4. Apply the interface design standards/guidelines for evaluating the developed interactions
5. Apply product usability evaluations and testing methods

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Open Elective IT 803 (C) Printing and Design

Course Objectives:

To impart knowledge and skills related to 3D printing technologies, selection of material and equipment and develop a product using this technique in Industry 4.0 environment

Unit I 3D Printing (Additive Manufacturing):

Introduction, Process, Classification, Advantages, Additive V/s Conventional Manufacturing processes, Applications.

CAD for Additive Manufacturing: CAD Data formats, Data translation, Data loss, STL format.

Unit II Additive Manufacturing Techniques:

Stereo- Lithography, LOM, FDM, SLS, SLM, Binder Jet technology.

Process, Process parameter, Process Selection for various applications.

Additive Manufacturing Application Domains: Aerospace, Electronics, Health Care, Defence, Automotive, Construction, Food Processing, Machine Tools

Unit III Materials:

Polymers, Metals, Non-Metals, Ceramics

Various forms of raw material- Liquid, Solid, Wire, Powder; Powder Preparation and their desired properties, Polymers and their properties, Support Materials.

Unit IV Additive Manufacturing Equipment:

Process Equipment- Design and process parameters, Governing Bonding Mechanism, Common faults and troubleshooting, Process Design

Unit V Post Processing:

Post Processing Requirement and Techniques. Product Quality: Inspection and testing, Defects and their causes

References:

1. Ian Gibson, David W. Rosen and Brent Stucker, “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer, 2010.
2. Andreas Gebhardt, “Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing”, Hanser Publisher, 2011.
3. Khanna Editorial, “3D Printing and Design”, Khanna Publishing House, Delhi.
4. CK Chua, Kah Fai Leong, “3D Printing and Rapid Prototyping- Principles and Applications”, World Scientific, 2017.
5. J.D. Majumdar and I. Manna, “Laser-Assisted Fabrication of Materials”, Springer Series in Material Science, 2013.
6. L. Lu, J. Fuh and Y.S. Wong, “Laser-Induced Materials and Processes for Rapid Prototyping”, Kulwer Academic Press, 2001.

7. Zhiqiang Fan And Frank Liou, “Numerical Modelling of the Additive Manufacturing (AM) Processes of Titanium Alloy”, InTech, 2012.

Course Outcomes:

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

1. Develop CAD models for 3D printing.
2. Import and Export CAD data and generate .stl file.
3. Select a specific material for the given application.
4. Select a 3D printing process for an application.
5. Produce a product using 3D Printing or Additive Manufacturing (AM).

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Open Elective IT 803 (D) Parallel Computing

Course Objectives:

To develop an understanding of the fundamental principles and engineering trade-offs involved in designing modern parallel computers and to develop programming skills to effectively implement parallel architecture

Unit I Introduction: The need for parallelism, Forms of parallelism (SISD, SIMD, MISD, MIMD), Moore's Law and Multi-cores, Fundamentals of Parallel Computers, Communication architecture, Message passing architecture, Data parallel architecture, Dataflow architecture, Systolic architecture, Performance Issues

Unit II Large Cache Design: Shared vs. Private Caches, Centralized vs. Distributed Shared Caches, Snooping-based cache coherence protocol, directory-based cache coherence protocol, Uniform Cache Access, Non-Uniform Cache Access, D-NUCA, S-NUCA, Inclusion, Exclusion, Difference between transaction and transactional memory, STM, HTM

Unit III Graphics Processing Unit: GPUs as Parallel Computers, Architecture of a modern GPU, Evolution of Graphics Pipelines, GPGPUs, Scalable GPUs, Architectural characteristics of Future Systems, Implication of Technology and Architecture for users, Vector addition, Applications of GPU

Unit IV Introduction to Parallel Programming: Strategies, Mechanism, Performance theory, Parallel Programming Patterns: Nesting pattern, Parallel Control Pattern, Parallel Data Management, Map: Scaled Vector, Mandelbrot, Collative: Reduce, Fusing Map and Reduce, Scan, Fusing Map and Scan, Data Recognition: Gather, Scatter, Pack, Stencil and Recurrence, Fork-Join, Pipeline

Unit V Parallel Programming Languages: Distributed Memory Programming with MPI: trapezoidal rule in MPI, I/O handling, MPI derived datatype, Collective Communication, Shared Memory Programming with Pthreads: Conditional Variables, read-write locks, Cache handling, Shared memory programming with Open MP: Parallel for directives, scheduling loops, Thread Safety, CUDA: Parallel programming in CUDA C, Thread management, Constant memory and Event, Graphics Interoperability, Atomics, Streams

References:

1. D. E. Culler, J. P. Singh, and A. Gupta, "Parallel Computer Architecture", MorganKaufmann, 2004
2. Rajeev Balasubramonian, Norman P. Jouppi, and Naveen Muralimanohar, "Multi-Core Cache Hierarchies", Morgan & Claypool Publishers, 2011

3. Peter and Pach Eco, "An Introduction to Parallel Programming", Elsevier, 2011
4. James R. Larus and Ravi Rajwar, "Transactional Memory", Morgan & Claypool Publishers, 2007
5. David B. Kirk, Wen-mei W. Hwu, "Programming Massively Parallel Processors: A Hands-on Approach", 2010
6. Barbara Chapman, F. Desprez, Gerhard R. Joubert, Alain Lichnewsky, Frans Peters "Parallel Computing: From Multicores and GPU's to Petascale", 2010
7. Michael McCool, James Reinders, Arch Robison, "Structured Parallel Programming: Patterns for Efficient Computation", 2012
8. Jason Sanders, Edward Kandrot, "CUDA by Example: An Introduction to GeneralPurpose GPU Programming", 2011

Course Outcomes:

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

1. To develop an understanding of various basic concepts associated with parallel computing environments
2. Understand, appreciate and apply parallel and distributed algorithms in problem solving
3. Acquire skills to measure the performance of parallel and distributed programs
4. Design parallel programs to enhance machine performance in parallel hardware environment
5. Design and implement parallel programs in modern environments such as CUDA, OpenMP, etc