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

AL801 Business Intelligence

OBJECTIVES:
The student should be made to:
Be exposed with the basic rudiments of business intelligence system
understand the modeling aspects behind Business Intelligence
understand of the business intelligence life cycle and the techniques used in it
Be exposed with different data analysis tools and techniques

UNIT I BUSINESS INTELLIGENCE
Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.

UNIT II KNOWLEDGE DELIVERY
The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

UNIT III EFFICIENCY
Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis

UNIT IV BUSINESS INTELLIGENCE APPLICATIONS
Marketing models – Logistic and Production models – Case studies.

UNIT V FUTURE OF BUSINESS INTELLIGENCE
Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.

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TEXT BOOK:
1. Efraim Turban, Ramesh Sharda, Dursun Delen, “Decision Support and Business Intelligence Systems”, 9 th Edition, Pearson 2013.

REFERENCES:2. Larissa T. Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making”, Addison Wesley, 2003.
3. Carlo Vercellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, Wiley Publications, 2009.
4. David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Manager‟s Guide”, Second Edition, 2012.
5. Cindi Howson, “Successful Business Intelligence: Secrets to Making BI a Killer App”, McGraw- Hill, 2007.
6. Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, “The Data Warehouse Lifecycle Toolkit”, Wiley Publication Inc.,2007

PRACTICAL: Different problems to be framed to enable students to understand the concept learnt and get hands-on on various tools and software related to the subject. Such assignments are to be framed for ten to twelve lab sessions

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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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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

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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

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AL 803(A) Introduction to IOT

Course Objective:
The objective of this course is to provide an understanding of the technologies and the standards relating to the Internet of Things and to develop skills on IoT technical planning.

Unit I IoT definition, Characteristics, IoT conceptual and architectural framework, Components of IoT ecosystems, Physical and logical design of IoT, IoT enablers, Modern day IoT applications, M2M communications, IoT vs M2M, IoT vs WoT, IoT reference architecture, IoT Network configurations, IoT LAN, IoT WAN, IoT Node, IoT Gateway, IoT Proxy, Review of Basic Microcontrollers and interfacing.

Unit II Define Sensor, Basic components and challenges of a sensor node, Sensor features, Sensor resolution; Sensor classes: Analog, Digital, Scalar, Vector Sensors; Sensor Types, bias, drift, Hysteresis error, quantization error; Actuator; Actuator types: Hydraulic, Pneumatic, electrical, thermal/magnetic, mechanical actuators, soft actuators

Unit III Basics of IoT Networking, IoT Components, Functional components of IoT, IoT service oriented architecture, IoT challenges, 6LowPAN, IEEE 802.15.4, ZigBee and its types, RFID Features, RFID working principle and applications, NFC (Near Field communication), Bluetooth, Wireless Sensor Networks and its Applications

Unit IV MQTT, MQTT methods and components, MQTT communication, topics and applications, SMQTT, CoAP, CoAP message types, CoAP Request-Response model, XMPP, AMQP features and components, AMQP frame types

Unit V IoT Platforms, Arduino, Raspberry Pi Board, Other IoT Platforms; Data Analytics for IoT, Cloud for IoT, Cloud storage models & communication APIs, Attacks in IoT system, vulnerability analysis in IoT, IoT case studies: Smart Home, Smart framing etc.

References:

1. Vijay Madisetti, Arshdeep Bahga, "Ïnternet of Things, A Hands on Approach", University Press
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
4. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
5. Adrian McEwen, "Designing the Internet of Things", Wiley
6. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
7. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media

Course Outcomes:
After the completion of this course, the students will be able to:
1. Understand Internet of Things and its hardware and software components
2. Interface I/O devices, sensors & communication modules
3. Analyze data from various sources in real-time and take necessary actions in an intelligent fashion
4. Remotely monitor data and control devices
5. Develop real life IoT based Projects

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Open Elective – AL 803(B) Bio Informatics

Objective:
The course has been designed to be an entry level in Bioinformatics. It is introductory in nature and will provide an overview of the concepts and practices in Bioinformatics. The course structure has been designed such that students will acquire skills required to become Assistant Programmer/Technical Assistant
in Bioinformatics. It would also help students to acquire a good foundation to take up further studies.
Course Outcomes: After Completing the course student should be able to:
1. To get introduced to the basic concepts of Bioinformatics and its significance in Biological data analysis.
2. Describe the history, scope and importance of Bioinformatics and role of internet in Bioinformatics.
3. Explain about the methods to characterize and manage the different types of Biological data.
4. Classify different types of Biological Databases.
5. Introduction to the basics of sequence alignment and analysis.

Unit-I
Introduction: Introduction to bioinformatics, objectives of bioinformatics, Basic chemistry of nucleic acids, structure of DNA & RNA, Genes, structure of bacterial chromosome, cloning methodology, Data maintenance and Integrity Tasks.

Unit-II
Bioinformatics Databases & Image Processing: Types of databases, Nucleotide sequence databases, Protein sequence databases, Protein structure databases, Normalization, Data cleaning and transformation, Protein folding, protein function, protein purification and characterization, Introduction to Java clients, CORBA, Using MYSQL, Feature Extraction.

Unit-III
Sequence Alignment and database searching: Introduction to sequence analysis, Models for sequence analysis, Methods of optimal alignment, Tools for sequence alignment, Dynamics Programming, Heuristic Methods, Multiple sequences Alignment

Unit-IV
Gene Finding and Expression: Cracking the Genome, Biological decoder ring, finding genes through mathematics & learning, Genes prediction tools, Gene Mapping, Application of Mapping, Modes of Gene Expression data, mining the Gene Expression Data.

Unit V
Proteomics & Problem solving in Bioinformatics: Proteome analysis, tools for proteome analysis, Genetic networks, Network properties and analysis, complete pathway simulation: E-cell, Genomic analysis for DNA & Protein sequences , Strategies and options for similarity search , flowcharts for protein structure prediction
Recommended Books:
1. Gopal & Jones, BIOINFORMATICS with fundamentals of Genomics &Proteomics ,TMH Pub
2. Rastogi , Bioinformatics –Concepts , skills & Applications , CBS Pub
3. Claverie , Bioinformatics , Wiley pub
4. Stekel ,MicrarrayBioInformatics , Cambridg

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Open Elective –AL 803(c) Managing Innovation and Entrepreneurship

COURSE OBJECTIVE

The aim of the course is to motivate students to innovate in business. In the first place, to achieve this goal, students will be introduced to the basic terminology, typology of innovations and historical context for better comprehension. Also issues of innovation management will be introduced. Students will become familiar with the impact of innovation, innovative processes and aspects that affect it, including applicable methods and innovation management techniques. Course contents:

UNIT-1

Innovation, the basic definition and classification: The relationship of innovation and entrepreneurship, creation of competitive advantage based on innovation. Innovative models, Product, process, organizational and marketing innovation and their role in business development.

UNIT-II

Sources of innovation (push, pull, analogies), transfer of technology. Creative methods and approaches used in innovation management. Approaches to management of the innovation process (agile management, Six Thinking Hats, NUF test).

UNIT-III

Project approach to innovation management, method Stage Gate, its essence, adaptation of access to selected business models. In-house business development of the innovation process in the company. Open Innovation as a modern concept, the limits of this method and its benefits for business development.

UNIT-IV

Innovations aimed at humans, role of co-creation in the innovation process. The strategy of innovation process, types and selection of appropriate strategies.

UNIT-V

Measurement and evaluation of the benefits of innovation for business (financial and non- financial metrics, their combination and choice). Barriers to innovation in business, innovation failure and its causes, post-audits of innovative projects. Organization and facilitation of an innovation workshop.

REFERENCE BOOKS

1. CLARK, T. – OSTERWALDER, A. – PIGNEUR, Y. Business model generation: a handbook for visionaries, game changers, and challengers. Wiley Publications
2. BESSANT, J R. – TIDD, J. Managing innovation: integrating technological, market and organizational change. Wiley Publications

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Open Elective –AL 804(D) Human Computer Interaction

Unit I: Introduction, Human Computer Interaction (HCI) concepts and definitions, Nature of interaction human and Machine, interaction design, understanding and conceptualizing interaction, understanding users, interfaces and interactions, data gathering.

Unit II: Introduction to User Centered System Design (UCSD), Natural computing, user centered system design, core concepts, interactive design and its strength and weakness, types of user model, user model and evaluation, Heuristic evaluation.

Unit III: Psychological user models. Black box models of human performance, including perception, motor control, memory and problem-solving. Quantitative analysis of performance. Human processor, keystroke level model, and GOMS descriptions of user performance.

Unit IV: Modeling of system understanding. Mental models and metaphor, use of design prototypes, controlled experiments. Cognitive walkthrough. Evaluation from the perspective of a novice learning to use the system.

Unit V: Task analysis and design. Contextual and qualitative studies, use-case driven design. Research techniques. Cognitive dimensions of notations, CSCW, ubiquitous computing, new interaction techniques, programmability.

References:-

1. Alan Dix, Janet E. Finlay, “Human-Computer interaction”, Pearson Education.
2. Olsen, “Human-Computer Interaction”, Cengage Learning.
3. Preece, J. Sharp, H. & Rogers, “Interaction design: beyond human-computer interaction Y. Wiley.
4. Smith Atakan Serengal, “Human-Computer Interaction”, Cengage Learning