DEPARTMENT OF INFORMATION TECHNOLOGY

IV B.Tech

R21 SYLLABUS

VIGNANA BHARATHI INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF INFORMATION TECHNOLOGY
B.Tech-R21 COURSE STRUCTURE

IV B.Tech I Semester

S. No	Course Code	Course Title	Category	L	T	P	C
1	21IT4111	Blockchain Technology	PC	3	1	-	4
2	21CS4111	Data Warehousing and Data Mining	PC	3	-	-	3
3	**Open Elective-III**		OE	3	-	-	3
4	**Professional Elective-III**		PE	3	-	-	3
	21IT4171	Distributed Systems					
	21IT4172	Scripting Languages					
	21IT4173	Big Data Technologies					
	21IT4174	Ethical Hacking					
5	**Professional Elective-IV**		PE	3	-	-	3
	21IT4175	Artificial intelligence					
	21CS4176	Adhoc and Sensor Networks					
	21IT4176	Computer Vision					
	21IT4177	Virtual Reality					
6	21IT4151	Blockchain Technology Lab	PC	-	-	3	1
7	21IT4152	Data warehousing and Data Mining Lab	PC	-	-	3	1.5
8	21IT4181	Mini Project	PW	-	-	4	2
Total				15	1	10	20.5

IV B.Tech II Semester

S. No	Course Code	Course Title	Category	L	T	P	C
1	21MB4212	Fundamentals of Management and Organizational Behavior	HS	3	-	-	3
2	**Professional Elective-V**		PE	3	-	-	3
	21IT4271	Deep Learning					
	21IT4272	Software Defined Networks					
	21IT4273	Bio Informatics					
	21DS4271	Human Computer Interaction					
3	**Professional Elective-VI**		PE	3	-	-	3
	21IT4274	Design Patterns					
	21CS4276	Natural Language Processing					
	21IT4276	Information Retrieval Systems					
	21IT4275	High Performance Computing					
4	21IT4281	Major Project	PW	-	-	20	10
Total				**9**	**-**	**20**	**19**

VIGNANA BHARATHI INSTITUTE OF TECHNOLGY
(AUTONOMOUS)
B.Tech (IT) – R21 SYLLABUS

R21 B.Tech
2021-2022
IV Year-I Semester

21IT4111: BLOCKCHAIN TECHNOLOGY

IV B. Tech I Sem. **L T P C**
3 1 - 4

Pre-requisites:
- Knowledge in Security and Applied Cryptography.
- Knowledge in Distributed Databases.

Course Objectives:
- Impart strong technical understanding of Blockchain technologies.
- Gain knowledge about applications of cryptography in Blockchain.
- Learn about the concepts of various implementations of Blockchain technology such as Bit coin, Ethereum and Hyper ledger.
- Understand the modern currencies and their market usage.
- Introduce application areas, current practices and research activity.

Course Outcomes: After the completion of the course student should be able to
- Learn fundamentals of Blockchain techniques.
- Analyze various consensus problems.
- Adapt Bitcoin technology to improve usage.
- Make use of Ethereum frameworks to write smart contract.
- Interpret Blockchain technology in real time applications.

UNIT I
Introduction: What is Blockchain, The history of block chain, Benefits and limitations of Blockchain, Distributed systems, Decentralization using block chain, CAP theorem and block chain, Crowd funding.

UNIT II
Cryptography in Blockchain: Cryptocurrency, How a Cryptocurrency works, cryptographic primitives, Asymmetric cryptography, public and private keys, line interface, Bitcoin improvement proposals (BIPs) , Consensus Algorithms, Digital Identity verification, Blockchain Neutrality, Digital art.

UNIT III
Bitcoin:- The Bitcoin network, Wallets and its types, Bitcoin payments, Bitcoin investment and buying and selling bitcoins, Bitcoin installation, Bitcoin programming and the command line interface, Bitcoin improvement proposals (BIPs).
Blockchain Science: Grid coin, Folding coin, Blockchain Genomics

UNIT IV
Ethereum:- Ethereum Virtual Machine (EVM),Wallets for Ethereum, Solidity, Smart Contracts, Some Attacks on Smart Contracts, The Ethereum network, Applications developed on Ethereum , Scalability and security issues.

UNIT V

Issues in Blockchain: - Technical challenges, Business model challenges, Government Regulations, Zero Knowledge proofs and protocols in Blockchain.

Hyper ledger:- Hyper ledger as a protocol, Fabric, Hyper ledger Fabric, Saw tooth Lake, Corda Architecture.

Text Books:

1. Blockchain Blue print for Economy by Melanie Swan.

2. I. Bashir, Mastering Block chain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd revised edition. Birmingham: Packt Publishing, 2018.

References:

1. Vigna, Paul, and Michael J. Casey. The Truth Machine: The Block chain and the Future of Everything. Picador, 2019.

2. Gerard, David. Attack of the 50 foot block chain: Bitcoin, block chain, Ethereum & smart contracts. David Gerard, 2017.

3**.** Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang, "An Overview of Block chain Technology: Architecture, Consensus, and Future Trends," in 2017 IEEE International Congress on Big Data (Big Data Congress), 2017, pp.557–564.

21CS4111: DATA WAREHOUSING AND DATA MINING

B.Tech. IV Year I Sem. **L T P C**
3 - - 3

Prerequisites:

- Database Management Systems.

Course Objectives:

- Understand data warehouse concepts, architecture, business analysis and tools.
- Understand various data pre-processing and data visualization techniques
- Understand various algorithms for finding hidden and interesting patterns in data
- Apply various classification and clustering techniques using tools.
- To make use of cluster Analysis.

Course Outcomes: Upon completion of the course, the students will be able to

- Demonstrate data mart to perform business analysis with OLAP tools.
- Analyze suitable pre-processing techniques for data analysis
- Apply association rule mining techniques for data analysis & find frequent patterns
- Apply and Analyze various classification techniques for data analysis
- Apply and Analyze various suitable clustering techniques for data analysis

UNIT-I

Data Warehousing, Business Analysis and On-Line Analytical Processing (OLAP) : Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) –Typical OLAP Operations, OLAP and OLTP.

UNIT-II

Data Mining Introduction: Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Functionalities – Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures. - Architecture of a Typical Data Mining Systems- Classification of Data Mining Systems.

UNIT-III

Frequent Pattern Analysis: Mining Frequent Patterns, Associations and Correlations, Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT-IV

Classification: Issues Regarding Classification and Prediction, Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation –

Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy.

UNIT-V

Clustering: Cluster analysis- Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods- Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods –Outlier analysis-outlier detection methods.

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber, ―Data Mining Concepts and Techniques‖, Third Edition, Elsevier, 2012.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First impression, 2014.
3. H.Dunham,"Data Mining: Introductory and Advanced Topics" Pearson Education.
4. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems, Pearson Education.

REFERENCE BOOKS:

1. Alex Berson and Stephen Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.
2. K.P. Soman, Shyam Diwakar and V. Ajay, ―Insight into Data Mining Theory and Practice‖, Eastern Economy Edition, Prentice Hall of India, 2006
3. Ian H.Witten and Eibe Frank, ―Data Mining: Practical Machine Learning Tools and Techniques‖, Elsevier, Second Edition.
4. Mallach, "Data Warehousing System", McGraw –Hill.

21IT4171: DISTRIBUTED SYSTEMS
(Professional Elective-III)

IV B. Tech I Sem. **L T P C**
3 - - 3

Prerequisites:

- A course on "Operating Systems".
- A course on "Computer Organization & Architecture".

Course Objectives:

- Understand the basic concepts of Distributed system and sharing of resources in a distributed manner.
- Familiarize the basics of Distributed systems.
- Demonstrate the concepts of IPC, group communication and RPC.
- Describe the theoretical concepts, namely, virtual time, agreement and consensus protocols.
- Understand the concepts of Transaction in Distributed Environment, Concurrency control, Deadlocks and Error recovery.

Course Outcomes: After the completion of the course student should be able to

- Characterize the Distributed Systems.
- Know the support of Operating System like Operating system architecture, Protection, Communication and Invocation and architecture of file service.
- Understand peer to peer systems and applications with case studies.
- Understand Transactions and Concurrency control.
- Understand Security issues like Transactions with replicated data.

UNIT - I

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models - Introduction, Architectural and Fundamental models, Networking and Internetworking, Inter - process Communication, Distributed objects and Remote Invocation - Introduction, Communication between distributed objects, RPC, Events and notifications, Case study - Java RMI.

UNIT - II

Operating System Support - Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems - Introduction, File Service architecture.

UNIT - III

Peer to Peer Systems - Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies - Squirrel, OceanStore.

Time and Global States - Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement - Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT - IV

Transactions and Concurrency control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering.

Distributed Transactions- Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT - V

Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, and Consistency models.

TEXT BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, 4th Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/ CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS:

1. Distributed Systems - Principles and Paradigms, A.S. Tannenbaum and M.V. Steen, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

21IT4172: SCRIPTING LANGUAGES
(Professional Elective-III)

IV B. Tech I Sem. **L T P C**
3 - - 3

Prerequisites:

- A course on "Computer Programming and Data Structures"
- A course on "Object Oriented Programming Concepts"

Course Objectives: This course will enable students to

- Learn the basics of Ruby
- Understand the embedding Ruby to other languages
- Learn the language PERL
- To gain in-depth knowledge of programming features of Perl.
- To Learn TCL and Tk.

Course Outcomes: After the completion of the course student will be able to

- Develop Ruby programs and CGI scripts
- To implement the design of programs by embedding Ruby to other Languages.
- To write and apply Perl scripts.
- Create internet applications using PERL.
- Write programs using TCL and Tk

UNIT - I

Introduction: Ruby, Rails, The structure and Execution of Ruby Programs, Package Management with RUBY GEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and web services.

Ruby Tk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

UNIT - II

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter

UNIT - III

Introduction to PERL and Scripting: Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT - IV

Advanced PERL : Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT – V

TCL: TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

Tk: Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron,Wiley Publications.
2. Ruby Progamming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Progammers guide by Dabve Thomas Second edition

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

21IT4173: BIG DATA TECHNOLOGIES
(Professional Elective-III)

IV B.Tech I Sem. **L T P C**
3 - - 3

Prerequisites:

- A knowledge on Database Management Systems.

Course Objectives:

- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyse the big data using intelligent techniques.
- To introduce programming tools HIVE and SQOOP in Hadoop ecosystem.
- To manage job execution in Hadoop Environment.
- To develop Big Data Solutions using Hadoop Eco System, sqoop, Spark.

Course Outcomes:

- Illustrate the basic concepts of big data.
- Gain knowledge on Hadoop Eco System.
- Understand concepts like Loading, Querying and Importing data in Hive.
- Learn to extract data from Hadoop and export it to external structured data stores.
- Learn to process the data using Spark.

UNIT I

Introduction to big data: Introduction to Big Data Platform, what is big data, Evolution of data, 5v's of big data, big data benefits, big data challenges, different kinds of data, big data sources, big data tools, stages in big data processing, and job roles in big data.

UNIT II

Introduction to Hadoop: Hadoop, History of Hadoop, Hadoop Ecosystem, Hadoop 1.x architecture and its disadvantages, Hadoop 2.x architecture, Core components of Hadoop-HDFS, Map Reduce, YARN, fundamentals of HBase and ZooKeeper.

UNIT III

Hive: Hive introduction, Hive architecture, data flow in Hive, data types in Hive, Hive tables, Hive partitions and bucketing, HiveQL, Querying Data in Hive, Hive services

UNIT IV

Introduction to Sqoop: Sqoop import, sqoop-import-All –Tables, Sqoop-Export, Sqoop-job, Sqoop incremental append, Sqoop incremental last modified.

UNIT V

Spark Introduction-Spark Components, Spark Architecture, Spark RDD-Parallelize read text file, Read csv, create RDD, Spark SQL-Data frame-create data frame, where and filter functions with column, renamed, drop ,distinct, groupby, join functions.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, Fourth Edition, 2015.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012

References:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data: The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
3. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ", VPT, 2016.

21IT4174: Ethical Hacking
(Professional Elective - III)

IV B.Tech I Semester **L T P C**
3 - - 3

Prerequisites:
- A course on "Operating Systems"
- A course on "Computer Networks"
- A course on "Network Security and Cryptography"

Course Objectives:
- Explore ethical hacking basics, cryptography Aspects of security
- Enhance the technical foundation of planning and cracking in ethical hacking
- Investigate how to attack a computer system, evaluation of computer security for hacking
- Explore scanning, enumeration and exploitation
- Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system.

Course Outcomes:
- outline the phases of ethical hacking framework and security issues
- Plan and execute controlled attacks to safeguard the business
- Identify security gaps and prepare for an ethical hack
- Use enumeration and Exploitation techniques
- Adapt best practices for Deliverable and Integration for security

UNIT I

Introduction: Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration

Information Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture

Information Security Program: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

UNIT II

The Business Perspective: Business Objectives, Security Policy, Previous Test Results, **Business Challenges Planning for a Controlled Attack:** Inherent Limitations, Imposed Limitations, timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

UNIT III

Preparing for a Hack: Technical Preparation, Managing the Engagement

Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance

UNIT IV

Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase

Exploitation: Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

UNIT V

Deliverable: The Deliverable, The Document, Overall Structure, Aligning Findings, Presentation

Integration: Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion.

Text Books:

1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press.

References:

1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning
2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning

21IT4175: ARTIFICIAL INTELLIGENCE
(Professional Elective-IV)

IV B.Tech I Sem **L T P C**
3 - - 3

Prerequisites:
- Discrete mathematics, basic probability theory and Statistics.
- Knowledge of any programming language and data structures.

Course Objectives:
- To provide introduction to the problem-solving techniques
- To have an understanding of topics such as heuristic search, blind search, minimax search etc. that play an important role in AI programs
- To familiarize with the knowledge representation techniques used in AI.
- To give exposure to learning methods used in Artificial Intelligence.
- To have a basic understanding of some of the more advanced topics of AI such as the Fuzzy Logic and knowledge processing in expert systems.

Course Outcomes:
- Formulate an efficient problem space for a problem expressed in natural language.
- Identify and trace the different search algorithms.
- Ability to possess the skill for representing knowledge using the appropriate technique for a given problem.
- Summarize different learning methods used in AI.
- Summarize the significance of Fuzzy Logic and expert systems in AI.

UNIT I
Introduction to AI: History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications.
Problems, Problem Spaces and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs.

UNIT II
Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search).
Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning.

UNIT III
Knowledge Representation: Issues in Knowledge Representation, Representing Simple Facts in Predicate Logic, Representing Instance and ISA Relations, Computable Functions and Predicates, Resolution, Natural Deduction.

Representing Knowledge Using Rules: Procedural Vs Declarative Knowledge, Logic Programming, Forward Vs Backward Reasoning, Matching, Control Knowledge

UNIT IV

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT V

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

Fuzzy Sets: Concept of a Fuzzy number- Operations on Fuzzy Sets – Typical Membership Functions – Discrete Fuzzy Set

TEXT BOOKS:

1. Elaine Rich, Kevin Knight, Shivashankar B Nair, Tata McGraw Hill - Artificial Intelligence, 3rd Edition, 2004.
2. Stuart Russell – Peter Narang, Pearson Education Asia - Artificial Intelligence - A modern approach.

REFERENCE BOOKS:

1. George F Luger - Artificial Intelligence, Pearson Education Asia Allen B. Downey – (Think Python) Python for software design- How to think like a computer scientist, Cambridge University press, 2009.

21CS4176: ADHOC AND SENSOR NETWORKS
(Professional Elective – IV)

IV B.Tech I Sem **L T P C**
3 - - 3

Pre-requisites:

- A course on "Computer Networks"
- A course on "Mobile Computing"

Course Objectives:

- To understand the basic WSN Technology and supporting protocols.
- To understand the MAC protocols and address physical layer can errors.
- To understand the security of sensor networks
- To understand the applications of ad hoc and sensor networks
- To Understand the transport layer and security issues possible in Ad hoc and Sensor networks

Course Outcomes: After the completion of the course student should be able to

- Identify the major issues, fundamentals and applications associated with ad hoc/sensor networks.
- Explore current ad-hoc/sensor technologies by researching key areas such as algorithms, protocols, hardware, and applications.
- Gain Knowledge on different networking environments like Broadcasting, Multicasting and Geocasting.
- Apply the knowledge to identify appropriate physical and MAC layer protocols.
- Understand the transport layer and security issues possible in Ad Hoc and sensor networks.

UNIT I

Introduction to Ad Hoc Networks: - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs. Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology - based routing algorithms-Proactive: DSDV, Reactive DSR, AODV, Hybrid: ZRP, Position - based routing algorithms-Location Services- DREAM, Quorum -based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT II

Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability - based Methods, Area - based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree - based: AMRIS, MAODV; Mesh - based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

UNIT III

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented - GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad Hoc.

UNIT IV

Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT V

Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

Text Books:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

References:

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.
2. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley, 2007.

21IT4176: COMPUTER VISION
(Professional Elective – IV)

IV B.Tech I Sem **L T P C**
3 - - 3

Prerequisite:

- **Programming and Mathematics course.**

Course Objectives:

- Recognize and describe both the theoretical and practical aspects of computing with images. Connect issues from Computer Vision to Human Vision.
- Describe the foundation of image formation and image analysis. Understand the basics of 2D and 3D Computer Vision.
- Become familiar with the major technical approaches involved in computer vision. Describe various methods used for registration, alignment, and matching in images.
- Get an exposure to advanced concepts leading to object categorization and segmentation in images.
- Build computer vision applications.

Course Outcomes: After the completion of the course student should be able to

- Implement fundamental image processing techniques required for computer vision.
- Understand Image formation process.
- Extract features from Images and do analysis of Images.
- Generate 3D model from images and to develop applications using computer vision techniques.
- Understand video processing, motion computation and 3D vision and geometry.

UNIT I

Introduction: Image Processing, Computer Vision and Computer Graphics, What is Computer Vision - Low - level, Mid-level, High-level.

Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality

UNIT II

Image Formation Models: Monocular imaging system, Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc., Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading, Construction of 3D model from image.

Image Processing and Feature Extraction: Image preprocessing, Image representations (continuous and discrete), Edge detection.

UNIT III

Motion Estimation: Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.

Shape Representation and Segmentation: Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multi resolution analysis.

UNIT IV

Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition. Image Understanding: Pattern recognition methods, HMM, GMM and EM.

UNIT V

Applications: Photo album - Face detection – Face recognition - Eigen faces - Active appearance and 3D shape models of faces Application: Surveillance - foreground-background separation - particle filters - Chamfer matching, tracking, and occlusion - combining views from multiple cameras - human gait analysis Application: In-vehicle vision system: locating roadway - road markings - identifying road signs - locating pedestrians.

Text Books:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.
3. Multiple View Geometry in Computer Vision Second Edition, Richard Hartley and Andrew Zisserman, Cambridge University Press, March 2004.

References:

1. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley Longman, Inc., 1992. Wiley Dreamtech.
2. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs, 1982. Java Script, D. Flanagan, O'Reilly, SPD.
3. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010.
4. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.
5. Image Processing, Analysis, and Machine Vision. Sonka, Hlavac, and Boyle. Thomson.

21IT4177: VIRTUAL REALITY
(Professional Elective-IV)

IV B.Tech I Sem **L T P C**
3 - - 3

Prerequisites:
- A knowledge on computer graphics, digital logic design.
- Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction

Course Objectives: The course should enable the students to
- Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction.
- Design a virtual environment and compelling virtual reality experience.
- Comprehend and analyze the fundamental issues of virtual reality.
- Study about Virtual Hardware and Software.
- Develop Virtual Reality applications.

Course Outcomes: The student will be able to
- Apply the fundamental concepts relating to Virtual Reality such as presence, immersion, and Engagement
- Illustrate critique academic research papers relating to Virtual Reality
- Differentiate group of peers from a variety of disciplines on a team project.
- Communicate and present individual and group project work.
- Demonstrate competence with several modern Virtual Reality technologies such as Google Cardboard, Google Sketch Up, Unity, the Oculus Rift and the HTC Vive.

UNIT I
Virtual Reality And Virtual Environments: The historical development of VR: Scientific landmarks Computer Graphics, Real-time computer graphics, Flight simulation, Virtual environments, Requirements for VR, benefits of Virtual reality, Hardware Technologies For 3d User **Interfaces:** Visual Displays Auditory Displays, Haptic Displays, Choosing Output Devices for 3D User Interfaces.

UNIT II
3D User Interface Input Hardware: Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home - Brewed Input Devices, Choosing Input Devices for 3D Interfaces.

UNIT III
Software technologies: Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market.

UNIT IV

3D Interaction Techniques: 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation, Design Guidelines - 3D Travel Tasks, Travel Techniques, Design Guidelines - Theoretical Foundations of Wayfinding, User Centered Wayfinding Support, Environment Centered Wayfinding Support, Evaluating Wayfinding Aids, Design Guidelines - System Control, Classification, Graphical Menus, Voice Commands, Gestural Commands, Tools, Multimodal System Control Techniques, Design Guidelines,

Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry .

Designing and developing 3D user interfaces: Strategies for Designing and Developing Guidelines and Evaluation.

Virtual reality applications: Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.

UNIT V

Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

Text Books:

1. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.
2. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.
3. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice",Addison Wesley, USA, 2005.
4. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and Virtual Worlds", 2005.

References:

1. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.
2. John Vince, "Virtual Reality Systems", Addison Wesley, 1995.
3. Howard Rheingold, "Virtual Reality: The Revolutionary Technology and how it Promises to Transform Society", Simon and Schuster, 1991.
4. William R Sherman and Alan B Craig, "Understanding Virtual Reality: Interface, Application and Design (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
5. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

21IT4151: BLOCKCHAIN TECHNOLOGY LAB

IV B.Tech I Sem **L T P C**
- - 3 1

Prerequisite(s):

- Cryptography and Network Security
- Advanced Data Structures Lab
- Programming for Problem Solving Lab

Course Objectives:

Develop ability to

- Understand block chain technology
- Learn to develop block chain based solutions and write smart contracts
- Understand on-premise and cloud based architectures for block chain applications
- Learn to integrate ideas from various domains and implement them using block chain technology in different perspectives.
- Understand framework implementation with a modular architecture.

Course Outcomes (COs):

At the end of the course, student would be able to

- Describe block chain technology.
- Develop block chain based solutions and write smart contract using Hyperledger fabric and Ethereum frameworks.
- Build and deploy block chain application for on premise and cloud based architecture.
- Integrate ideas from various domains and implement them using block chain technology in different perspectives.
- Implementation of framework intended as a foundation for developing applications or solutions with a modular architecture.

LIST OF EXPERIMENTS:

1. Install and understand Docker container, Node.js, Java and Hyper ledger Fabric, Ethereum and perform necessary software installation on local machine
2. Create and deploy a smart contract using test network and initialize the channel
3. Creating Blockchain using Python, mining new blocks, and displaying the whole Blockchain
4. Build A Simple Cryptocurrency Blockchain In Node.js
5. Creating Smart Contract using Solidity and Remix IDE.
6. Interact with a block chain network. Execute transactions and requests against a block chain network by creating an app to test the network and its rules.
7. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Block chain Starter Plan. Use Hyperledger Fabric to invoke chaincode while storing results and data in the starter plan.
8. Write a program to create and deploy an ERC20 token

Text Books:

- Blockchain Blue print for Economy by Melanie Swan.
- Bashir, Mastering Block chain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd revised edition. Birmingham: Packt Publishing, 2018.

References:

- Vigna, Paul, and Michael J. Casey. The Truth Machine: The Block chain and the Future of Everything. Picador, 2019.
- Gerard, David. Attack of the 50 foot block chain: Bitcoin, block chain, Ethereum & smart contracts. David Gerard, 2017.
- Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang, "An Overview of Block chain Technology:

21IT4152: DATA WAREHOUSING AND DATA MINING LAB

IV B.Tech I Sem **L T P C**
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Course Objectives:

- Learn how to build a data warehouse and query it (using open source tools like Pentaho Data Integration Tool, Pentaho Business Analytics).
- Learn to perform data mining tasks using a data mining toolkit (such as open source WEKA).
- Understand the data sets and data preprocessing.
- Demonstrate the working of algorithms for data mining tasks such association rule mining, classification, clustering and regression.
- Exercise the data mining techniques with varied input values for different parameters.
- To obtain Practical Experience Working with all real data sets.

Course Outcomes:

- Ability to understand the various kinds of tools.
- Find the unseen pattern in large volume of historical data that helps to manage an organization efficiently.
- Demonstrate the working of algorithms for data mining tasks such association rule mining, classification, clustering and regression in large data sets.
- Ability to apply mining techniques for realistic data.
- Emphasize hands-on experience working with all real data sets

LIST OF EXPERIMENTS:

1. A. Build Data Warehouse
i. Identify source tables and populate sample data.
ii. Design multi-dimensional data models namely Star, Snowflake and Fact
iii.Constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, manufacturing, Automobiles, sales etc).
iv. Write ETL scripts and implement using data warehouse tools.
v. Perform Various OLAP operations such slice, dice, roll up, drill up and pivot
vi. Explore visualization features of the tool for analysis like identifying trends etc.

B.Installation of WEKA Tool - Explore WEKA Data Mining/Machine Learning Toolkit
i.Understand the features of WEKA tool kit such as Explorer, Knowledge flow interface, Experimenter, command-line interface.
ii.Navigate the options available in the WEKA(ex. select attributes panel, preprocess panel, classify panel, cluster panel, associate panel and visualize)

2. Listing applications for mining
3. Creating new Arff File
4. Conversion of various data files
5. Pre-Processes Techniques on Data Set
6. Pre-process a given dataset based on Handling Missing Values
7. Training the given dataset for an application-classification

8. Testing the given dataset for an application-classification
9. Generating accurate models-classification
10. Data Pre-Processing – Data Filters
11. Feature selection-classification
12. Web Mining-Clustering Techniques
13. Text Mining-Association Analysis.

Text Books:

1. Data Mining – Concepts and Techniques - Jiawei Han & Micheline Kamber Harcourt India.
2. Data Mining Techniques – Arun K pujari, Universities Press.

References:

1. Data Mining Introductory and advanced topics –Margaret H Dunham, Pearson Education.
2. Data Mining Techniques – Arun K Pujari, University Press.
3. Data Warehousing in the Real World – Sam Anahory & Dennis Murray. Pearson Edn Asia.
4. Data Warehousing Fundamentals – Paul raj Ponnaiah Wiley Student Edition.
5. The Data Warehouse Life cycle Tool kit – Ralph Kimball Wiley Student Edition.

21IT4181: Mini Project

IV B.Tech I Sem

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IV YEAR – II SEM

21MB4212: FUNDAMENTALS OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR

IV B.Tech II Sem. **L T P C**
3 - - 3

Course Objective:

- To understand the fundamentals of management, history and evolution of management theories
- To analyze various dimensions of organizational planning and organizing.
- To understand the functions of staffing, Directing and controlling.
- To understand the fundamental concepts of Organizational Behaviour.
- To analyze and evaluate the various dimensions of Cognitive process and Stress related issues in Organizational Behaviour.

Course Outcomes: After the completion of the course, student should be able to

- Understand the fundamentals of management and contribution of management thinkers.
- Analyze the relevance and importance of planning and organizing.
- Understand the importance of organizing, types of organizational structures and various function of human resource management
- Understand fundamental concepts of organizational behaviour
- Analyze and evaluate the various dimensions of cognitive process and stress related issues in organizational behaviour.

UNIT- I

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management.

Approaches- Classical Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT – II

Planning and Organizing: General Framework for Planning - Planning Process, Types of Plans, Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization.

UNIT- III

Staffing: Functions of HRM.

Leadership: Leadership Styles; Leadership theories.

Motivation - Types of Motivation; Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X, Theory Y and Theory Z.

Communication: Types of communication, Importance, Communication Process and communication Barriers.
Controlling: Process of controlling, Types of Control

UNIT- IV
Introduction to OB - Definition, Nature and Scope –Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organizational Behaviour. Cognitive Processes-I : Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization -Social perception – Attribution Theories.

UNIT- V
Cognitive Processes-II: Personality and Attitudes - Personality as a continuum – Meaning of personality - Johari Window and Transactional Analysis - Nature and Dimension of Attitudes- Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intra-individual conflict - strategies to cope with stress and conflict.

TEXT BOOKS:

1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009
3. Principles and Practice of Management, L. M. Prasad, S. Chand, 2019, New Delhi.
4. Robbins, P. Stephen, Timothy A. Judge: Organisational Behaviour, 12/e, PHI/Pearson, NewDelhi, 2009.

REFERENCES:

1. Newstrom W. John & Davis Keith, Organisational Behaviour-- Human Behaviour at Work, 12/e,TMH, New Delhi, 2009.
2. Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2009.

21IT4271: DEEP LEARNING
(Professional Elective-V)

IV B.Tech II Sem. **L T P C**
3 - - 3

Prerequisite(s):
- Artificial Intelligence

Course Objectives: Develop ability to
- Understand various learning models.
- Learn feed forward neural networks for learning
- Learn to use auto encoders and regularization
- Understand Convolution Neural Networks for learning
- Understand Recurrent Neural Networks for learning

Course Outcomes (COs)
- Analyze various learning models.
- Use feed forward neural networks for learning
- Highlight the importance of auto encoders and regularization
- Apply Convolution Neural Networks for learning
- Apply Recurrent Neural Networks for learning

UNIT I
Introduction- Historical Trends in Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptron, Perceptron Learning Algorithm. Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feed forward Neural Networks, Representation Power of Feed forward Neural Networks.

UNIT II
Feed Forward Neural Networks: - Back propagation, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMS Prop, Adam, Eigenvalues and Eigenvectors, Eigenvalue Decomposition, Basis Principal Component Analysis and its interpretations, Singular Value Decomposition.

UNIT III
Auto encoders:- Relation to PCA, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Contractive auto encoders, Regularization: Bias Variance Tradeoff, L2 regularization, early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Greedy Layer wise Pre-training, Better activation functions, better weight initialization methods, Batch Normalization.

UNIT IV
Convolutional Neural Network: - The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Innitely Strong Prior, Variants of the Basic Convolution

Function, Structured Outputs, Data Types, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Back propagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks.

UNIT V

Recurrent Neural Networks-Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs, Encoder Decoder Models, Attention Mechanism, Attention over images.

Text Books:

1. Good fellow. I., Bengio.Y. and Courville.A., " Deep Learning", MITPress, 2016.

References:

1. Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018.
2. Navin Kumar Manaswi, "Deep Learning with Applications Using Python", A press, 2018.
3. John D Kelleher "Deep Learning" (The MIT Press Essential Knowledge series) The MIT Press,2019.
4. Daniel Graupe "Deep Learning Neural Networks: Design and Case Studies", World Scientific Publishing Co Pte Ltd, 2016.
5, Rajiv Chopra "Deep Learning", Khanna Book Publishing ,2018.

21IT4272 -SOFTWARE DEFINED NETWORKS
(Professional Elective-V)

IV B.Tech II Sem. **L T P C**
3 - - 3

Course Objectives:

- Understand the concepts of Software Defined Networks.
- Apply various SDN Principles with different Architectures.
- Apply concepts of Virtualization, Framework solutions on Data Centers.
- Analyses a given scenario and implement Social Defined Networks.
- To Comprehend the concepts behind network virtualization.

Course Outcomes:

- Recognize the fundamentals and characteristics of Software Defined Networks.
- Understand the basics of Software Defined Networks Operations and Data flow.
- Discriminate different Software Defined Network Operations and Data Flow.
- Analyze alternative definitions of Software Defined Networks.
- Apply different Software Defined Network Operations in real world problem.

Unit I

Introduction: History of Software Defined Networking (SDN), Modern Data Center, Traditional Switch Architecture, Why SDN, Evolution of SDN, How SDN Works, Centralized and Distributed Control and Date Planes.

Unit II

Open Flow & SDN Controllers: Open Flow Specification, Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor, Based Overlays, SDN via Opening up the Device, SDN Controllers, General Concept.

Unit III

Data Centers: Multitenant and Virtualized Multitenant Data Center, SDN Solutions for the Data Center Network, VLANs, EVPN, VxLAN.

Unit IV

SDN Programming: Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs.
Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications.

Unit V

SDN: Juniper SDN Framework, IETF SDN Framework, Open Daylight Controller, Floodlight Controller, Bandwidth Calendaring, Data Center Orchestration.

Text Books

1. Paul Goransson and Chuck Black, ―Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.

2. Thomas D. Nadeau, Ken Gray, ―SDN: Software Defined Networks, O'Reilly Media, 2013.
3. William Stallings, "Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud", Pearson Education, 1st Edition, 2015.

References:

1. Siamak Azodolmolky, ―Software Defined Networking with Open Flow, Packet Publishing, 2013.
2. Vivek Tiwari, ―SDN and Open Flow for Beginners‖, Amazon Digital Services, Inc., 2013.
3. Fei Hu, Editor, ―Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

E-Resources & Other Digital Material:

1. https://www.coursera.org/learn/sdn.
2. https://www.udemy.com/course/sdn-openflow-nfv-introduction.
3. https://www.coursera.org/learn/network-virtual.

21IT4273: BIOINFORMATICS
(Professional Elective – V)

IV B.Tech II Sem. **L T P C**
3 - - 3

Prerequisite:
- Scripting Languages, XML, DBMS

Course Objectives:
- Introduce Bioinformatics and Elementary commands.
- Introduce PAM, BLOSUM database: BLAST and FASTA.
- Introduce Primary database Information.
- Introduce Phylogenetic analysis and tree building.
- Introduce Biochemical KEGG, EXGESCY, BRENDA, ERGO**.**

Course Outcomes: After the completion of the course student should be able to
- Gain knowledge on Bioinformatics and Elementary commands.
- Gain knowledge on PAM, BLOSUM database: BLAST and FASTA.
- Learn Phylogenetic analysis and tree building.
- Gain knowledge on Biological databases.
- Gain knowledge Biochemical database.

UNIT I
Introduction to Bioinformatics: Scope of Bioinformatics, Elementary Commands and Protocols, ftp, telnet, HTTP, Primer on Information theory.
Special topics in Bioinformatics: DNA mapping and sequencing, map alignment. Large scale sequencing methods, shortgun and Sanger method, cDNA sequencing Genome mapping, map assembly, Comparative sequence analysis.

UNIT II
Sequencing Alignment and Dynamic Programming: - Local Alignment, Global alignment, pairwise and multiple sequence alignments, Concept of gap penalty and e-value, Alignment algorithms.
Dynamic programming in sequence alignment: Needleman - Wunsch Algorithm and Smith Waterman Algorithm, Aminoacid Substitution matrices (PAM, BLOSUM). Sequence similarity search with database, BLAST and FASTA.

UNIT - III
Primary database Information: Introduction to Biological databases, organization and management of databases, searching and retrieval of information from World Wide Web, Structure databases PDB (Protein Data Bank), Molecular Modeling databases (MMDB), Primary databases NCBL, EMBL, DDBJ.
Secondary database: Introduction to Biological databases, organization and management of databases Swissport, PIR, KEGG.

UNIT IV

Phylogenetic Analysis and Tree Building: Introduction to phylogenetics, Methods of phylogenetic analysis, role of multiple sequence alignment algorithms in phylogenetic analysis, Automated tools for phylogenetic analysis, Construction of phylogenetic tree.

UNIT V

Biochemical database: Introduction to Biological databases, organization and management of databases, KEGG, EXGESCY, BRENDA, ERGO.

Introduction to Homology: Introduction to Homology, Levels of protein structure, homology modeling of proteins (Sequence to structure) Cn3D, rasMol and SPDbv in homology modeling -case study.

Text Books:

1. S. C. Rastogi, N. Mendiratta, "Bioinformatics Methods and Applications", CBS publications, 2004.
2. James D. Tisdall, "Beginning Perl for Bioinformatics" O'Reilly media, 1st Edition, 2001.

Reference Books:

1.D.R. Westhead, J.H. Parish, "Bioinformatics" Viva books private limited, New Delhi (2003).
2. Att Wood, "Bioinformatics" Pearson Education, 2004.
3. Bryan Bergeron, M.D, "Bioinformatics Computing" Pearson Education, 2003.

21DS4271: HUMAN COMPUTER INTERACTION

(Professional Elective –V)

B.Tech. IV Year II Sem.

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COURSE OBJECTIVES:

1. To understand the design principles of developing a Human Computer Interface.

2. To learn tools and devices required for designing a good interface

3. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Value based living in a natural way.

4. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

5. To help the students appreciate the essential complementarity between VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

COURSE OUTCOMES:

1.Acquire knowledge on principles and components of HCI.

2: Analyze product usability evaluations and testing methods

3: Design an effective user interface for software application using the building tools and techniques

4: Ability to develop appropriate technologies and management patterns to create harmony in professional and personal life.

5: It ensures students sustained happiness through identifying the essentials of human values and skills.

Develop ability to

1. Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.
2. Recognize how a computer system may be modified to include human diversity
3. Be aware of mobile HCI.
4. Learn the guidelines for user interface

UNIT - I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT - II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen

Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT- III

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT- IV

HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction.

UNIT- V

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

TEXT BOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech. Units 1, 2, 3
2. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education Units 4, 5

REFERENCE BOOKS:

1. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
3. User Interface Design, Soren Lauesen, Pearson Education.
4. Human –Computer Interaction, D. R. Olsen, Cengage Learning.
5. Human –Computer Interaction, Smith - Atakan, Cengage Learning.

21IT4274 : DESIGN PATTERNS
(Professional Elective – VI)

IV B.Tech II Sem. **L T PC**
3 - - 3

Prerequisite:
- Object Oriented Programming through Java.

Course Objectives:
- Understand the basic concepts of Design patterns.
- Understand the various Design patterns.
- Understand the importance of design patterns for development of a reusable product.
- Apply the suitable design patterns to refine the basic design for given context.
- Relate the Creational, Structural and Behavioral Design Patterns.

Course Outcomes: After the completion of the course student should be able to
- Appreciate the basic concepts of design patterns and able to know how to select and use the design patterns.
- Identify the design pattern in the existing code and use of creational patterns.
- Apply and use the structural patterns.
- Identify and use the behavioral patterns.
- Find and catalog patterns in the object-oriented software.

UNIT I
Introduction: What Is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT II
A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary What to Expect from Design Patterns.

UNIT III
Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT IV
Structural Patterns: Adapter, Bridge and Composite, Decorator, façade, Flyweight, Proxy.

UNIT V
Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

Text Books:

1. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, Addison-Wesley, 1995.
2. Java™ Design Patterns: A Tutorial, James W. Cooper, Addison Wesley, 2000.

Reference Books:

1. Patterns in Java: A catalog of reusable Design Patterns Illustrated with UML, Mark Grand, Volume 1, Wiley DreamTech.
2. Patterns in Java, Mark Grand, Volume 2, Wiley DreamTech, 2008.
3. Java Enterprise Design Patterns, Mark Grand, Wiley DreamTech, 2006.

21CS4276: NATURAL LANGUAGE PROCESSING

(Professional Elective - VI)

IV B.Tech II Sem. **L T P C**

3 - - 3

Prerequisites:

- Data structures, finite automata and probability theory

Course Objectives:

- Solve the problems and solutions of NLP
- Solve the relation to linguistics and statistics.
- Importance of Representation of Syntactic Structure. And Parsing Algorithms
- To introduce Semantic Interpretation.
- Make use of Multilingual and Cross lingual Language Modeling.

Course Outcomes: Upon completion of the course, the students will be able to

- Understand linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Apply manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Design, implement, and analyze NLP algorithms
- Design different language modeling Techniques.

UNIT – I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models.

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, and Performances of the Approaches.

UNIT - II

Syntax Analysis: Parsing Natural Language, Tree banks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT - III

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT - IV

Predicate-Argument Structure:Meaning Representation Systems, Software.

UNIT - V

Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling.

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory toPractice– Daniel M. Bikel and Imed Zitouni, Pearson Publication.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S.Tiwary

REFERENCE BOOKS:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.

21IT4276: INFORMATION RETRIEVAL SYSTEMS
(Professional Elective - VI)

IV B.Tech II Sem **L T P C**

3 - - 3

Course Objectives:

- To learn the important concepts and algorithms in IRS.
- To learn genesis and diversity of information retrieval situations for text and hyper media.
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.
- To understand the performance of information retrieval using advanced techniques such as classification, clustering, and filtering
- To understand various Text Search Algorithms and Multimedia Information Retrieval

Course Outcomes:

- Understand IR principles to locate relevant information in large collections of data
- Understand information extraction using indexing, and various data structure algorithms.
- Design different document clustering algorithms and understand automatic indexing.
- Use various search algorithms and perform information visualization.
- Analyze the ways to design an Information Retrieval System for web search tasks.

UNIT I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities.

UNIT II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

UNIT IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the Internet and Hypertext.

UNIT V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval,Web search basics. Web crawling and indexes.

Text Books:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

Reference Books:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

21IT4275: HIGH PERFORMANCE COMPUTING
(Professional Elective – VI)

IV B.Tech II Sem. **L T P C**
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Prerequisites:

- Computer networks.
- Distributed System.

Course Objectives:

- Knowledge on parallel programming paradigms.
- To understand the HPC platforms with particular reference to Cluster system.
- Analyze the performance of HPC applications.
- To Understand SPMD Programming.
- Knowledge on Partitioning applications for heterogeneous resources.

Course Outcomes: Upon completion of the course, the students will be able to

- Understand the role of HPC in science and engineering.
- Apply HPC platforms and parallel programming models.
- Analyze and assess the performance of HPC applications and their supporting hardware.
- Apply administration, scheduling, code portability and data management in an HPC environment, with particular reference to Grid Computing.
- Analyze the suitability of different HPC solutions to common problems found in Computational Science.

UNIT-I

Introduction: Characteristics and requirements, Review of Computational Complexity, Performance: metrics and measurements, Granularity and Partitioning, Locality: temporal/spatial/stream/kernel, Basic methods for parallel programming, Real-world case studies (drawn from multi scale, multi-discipline applications).

UNIT -II

High-End Computer Systems: Memory Hierarchies, Multi-core Processors: Homogeneous and Heterogeneous, Shared-memory Symmetric Multiprocessors, Vector Computers, Distributed Memory Computers, Supercomputers and Peta scale Systems, Application Accelerators / Reconfigurable Computing, Novel computers: Stream, multithreaded, and purpose-built.

UNIT -III

Parallel Algorithms: Parallel models: ideal and real frameworks, Basic Techniques: Balanced Trees, Pointer Jumping, Divide and Conquer, Partitioning, Regular Algorithms: Matrix operations and Linear Algebra, Irregular Algorithms: Lists, Trees, Graphs, Randomi.

UNIT -IV

Parallel Programming: Revealing concurrency in applications, Task and Functional Parallelism,

Task Scheduling, Synchronization Methods, Parallel Primitives (collective operations), SPMD Programming (threads, OpenMP, MPI), I/O and File Systems, Parallel Matlabs (Parallel Matlab, Star-P, Matlab MPI), Partitioning Global Address Space (PGAS) languages (UPC, Titanium, Global Arrays

UNIT -V

Performance: Measuring performance, Identifying performance bottlenecks, restructuring applications for deep memory hierarchies, Partitioning applications for heterogeneous resources, using existing libraries, tools, and frameworks.

TEXT BOOK:

1. Contemporary High Performance Computing by Jeffrey S. Vetter ,Released November 2017, Publisher(s): Chapman and Hall/CRC , ISBN: 9781466568358.

REFERENCE BOOK:

1. High Performance Computing by Charles Severance & Kevin Dowd, Copyright Year: 2010 , Last Update: 2021 ,Publisher: OpenStax CNX.

21IT4281: Major Project

IV B.Tech II Sem

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