

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Information Technology, VIII-Semester

IT- 8001 – Information Security

Branch : Information Technology, VIII Semester

Course: Information Security

Unit I: Basic of Cryptography, secret key cryptography, Types of attack, Substitution ciphers, Transposition ciphers, block ciphers and steam ciphers, Confusion and Diffusion, Data encryption standard, round function, modes of operation, cryptanalysis, brute force attack, Security Goals (Confidentiality, Integrity, Availability).

Unit II: Public key Cryptography, Modulo arithmetic, Greatest common divisor, Euclidean algorithm, RSA algorithm, hash function, attack on collision resistance, Diffie hellman key exchange, Digital signature standard, elliptic curve cryptography.

Unit III: Authentication: One way Authentication, password based, certificate based, Mutual Authentication ,shared secret based, Asymmetric based, Authentication and key agreement, centralized Authentication, eavesdropping, Kerberos, IP security overview:- security association & Encapsulating security payload ,tunnel and transfer modes, internet key exchange protocol, Secure Socket Layer(SSL), Transport Layer Security (TLS).

Unit IV: Software vulnerabilities: Phishing Attacks, buffer overflow vulnerability, Format String attack, Cross Site Scripting, SQL injection Attacks, Email security:- Security services of E-mail ,Establishing keys, Privacy ,Authentication of the source, Message integrity ,Non-Repudiation, Viruses, Worms, Malware.

Unit V: Web Issue: Introduction, Uniform Resource Locator/uniform resource identify, HTTP, Cookies, Web security problem, Penetration Testing, Firewalls:- functionality, Policies and Access Control, Packet filters, Application level gateway, Encrypted tunnel, Security architecture, Introduction to intrusion detection system.

References:-

William Stalling, “ Cryptography and Network security”, Pearson.

Atul Kahate, “ Cryptography and Network Security”, TMH.

Bernard Menezes, “ Network Security and Cryptography”, CENGAGE Learning.

Charlie Kaufman, “ Network Security”, PHI.

Forouzan, “Cryptography & Network Security”, TMH

Randy Weaver, “ Network Infrastructure Security”, Cengage Learning.

List of Experiment:-

- Study of Network Security fundamentals - Ethical Hacking, Social Engineering practices.
- System threat attacks - Denial of Services.
- Sniffing and Spoofing.
- Web Based Password Capturing.
- Virus and Trojans.
- Anti-Intrusion Technique – Honey pot.
- Symmetric Encryption Scheme – RC4.
- Block Cipher – S-DES, 3-DES.
- Asymmetric Encryption Scheme – RSA.
- IP based Authentication.

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Credit Based Grading System

Information Technology, VIII-Semester

IT- 8002 – Soft Computing

Branch : Information Technology, VIII Semester

Course: Soft Computing

Unit I: Introduction to Neural Network: Concept, biological neural network, evolution of artificial neural network, McCulloch-Pitts neuron models, Learning (Supervise & Unsupervise) and activation function, Models of ANN-Feed forward network and feed back network, Learning Rules-Hebbian, Delta, Perceptron Learning and Windrow-Hoff, winner take all.

Unit II: Supervised Learning: Perceptron learning,- Single layer/multilayer, linear Separability, Adaline, Madaline, Back propagation network, RBFN. Application of Neural network in forecasting, data compression and image compression.

Unit III: Unsupervised learning: Kohonen SOM (Theory, Architecture, Flow Chart, Training Algorithm) Counter Propagation (Theory, Full Counter Propagation NET and Forward only counter propagation net), ART (Theory, ART1, ART2). Application of Neural networks in pattern and face recognition, intrusion detection, robotic vision.

Unit IV: Fuzzy Set: Basic Definition and Terminology, Set-theoretic Operations, Member Function, Formulation and Parameterization, Fuzzy rules and fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy if-then Rules, Fuzzy Inference Systems. Hybrid system including neuro fuzzy hybrid, neuro genetic hybrid and fuzzy genetic hybrid, fuzzy logic controlled GA. Application of Fuzzy logic in solving engineering problems.

Unit V: Genetic Algorithm: Introduction to GA, Simple Genetic Algorithm, terminology and operators of GA (individual, gene, fitness, population, data structure, encoding, selection, crossover, mutation, convergence criteria). Reasons for working of GA and Schema theorem, GA optimization problems including JSP (Job shop scheduling problem), TSP (Travelling salesman problem), Network design routing, timetabling problem.

References:-

S.N. Shivnandam, "Principle of soft computing", Wiley.

S. Rajshekaran and G.A.V. Pai, "Neural Network, Fuzzy logic And Genetic Algorithm", PHI.

Jack M. Zurada, "Introduction to Artificial Neural Network System" JAico Publication.

Pearson Prentice. Hall, 2nd Edition..Simon Haykins, "Neural Network- A Comprehensive Foudation"

Timothy J.Ross, "Fuzzy logic with Engineering Applications", McGraw-Hills 1.

- Randy L. Haupt

Sue Ellen Haupt Practical Genetic Algorithms, John Wiley & Sons, Second Edition

List of Experiment:-

- Form a perceptron net for basic logic gates with binary input and output.
- Using Adaline net, generate XOR function with bipolar inputs and targets.
- Calculation of new weights for a Back propagation network, given the values of input pattern, output pattern, target output, learning rate and activation function.
- Construction of Radial Basis Function Network.
- Use of Hebb rule to store vector in auto associative neural net.
- Use of ART algorithm to cluster vectors.
- Design fuzzy inference system for a given problem.

- Maximize the function $y = 3x^2 + 2$ for some given values of x using Genetic algorithm.
- Implement Travelling salesman problem using Genetic Algorithm.
- Optimisation of problem like Job shop scheduling using Genetic algorithm.

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Credit Based Grading System

Information Technology, VIII-Semester

Elective –V IT-8003(1): Digital Image Processing

Branch : Information Technology, VIII Semester

Course: Digital Image Processing

Unit I: Image representation, fundamental steps in image processing, image model. Sampling & quantization. Neighbors of a pixel, connectivity and distance measures. Basic transformations and perspective transformations. Two dimensional Fourier transform, Discrete Fourier transform and their properties. Fast Fourier transform, Walsh Transform, Hadamard transform and Discrete Cosine transform.

Unit II: Image Enhancement: Intensity transformations, histogram processing, Image subtraction, image averaging, Spatial filtering-smoothing and sharpening filters, frequency domain filtering methods-low pass filtering, high pass filtering, median filtering.

Unit III: Image compression: Redundancy and its types. Image compression model, variable length coding, bit plane coding, constant area coding, run length coding, lossless and lossy predictive coding, transform coding.

Unit IV: Image restoration and Segmentation: Degradation model, effect of diagonalisation on degradation, algebraic approach. Detection of discontinuities by point, line and edge detection. Edge linking, graph theoretic techniques, thresholding techniques, region oriented segmentation.

Unit V: Representation & Description: Chain codes, polygonal approximations, signatures, boundary segments, skeleton, boundary descriptors, shape descriptors regional descriptors, image morphology-dilation, erosion, opening, closing, thickening, thinning, skeleton, pruning,, hit or miss transform.

References:-

- R.C Gonzalez & Richard E Wood, "Digital Image Processing" ,Addison Wesley Publishing
- Anil K Jain, "Fundamentals of Digital image processing". PHI.
- Sonka, Hlavac, Boyle, "Digital image processing and computer vision", Cengage learning, India Edition.
- B Chanda, D. Dutta Majumder, "Digital image Processing and Analysis", PHI.

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Credit Based Grading System

Information Technology, VIII-Semester

Elective –V IT-8003(2): Data Science

Branch : Information Technology, VIII Semester

Course: Data Science

Unit-I Introduction, Grasping the Fundamentals of Big Data, The Evolution of Data Management, Defining Big Data, Building a Successful Big Data Management Architecture, Beginning with capture, organize, integrate, analyze, and act, Setting the architectural foundation, Performance matters, Big Data Types, Defining Structured Data, sources of big structured data, role of relational databases in big data, Defining Unstructured Data, sources of unstructured data, Integrating data types into a big data environment

Unit-II Statistics- Population, Sample, Sampled data, Sample space, Random sample, Sampling distribution, Variable, Variation, Frequency, Random variable, Uniform random variable, Exponential random variable, Mean, Median, Range, Mode, Variance, Standard deviation, Correlation, Linear Correlation, Correlation and Causality, Regression, Linear Regression, Linear Regression with Nonlinear Substitution, Classification, Classification Criteria, Naive Bayes Classifier, Support Vector Machine

Unit-III Introduction Data Analytics, Drivers for analytics, Core Components of analytical data architecture, Data warehouse architecture, column oriented database, Parallel vs. distributed processing, Shared nothing data architecture and Massive parallel processing, Elastic scalability, Data loading patterns, Data Analytics lifecycle: Discovery, Data Preparation, Model Planning, Model Building, Communicating results and findings, Methods: K means clustering, Association rules.

Unit-IV Data Science Tools- Cluster Architecture vs Traditional Architecture, Hadoop, Hadoop vs. Distributed databases, The building blocks of Hadoop, Hadoop datatypes, Hadoop software stack, Deployment of Hadoop in data center, Hadoop infrastructure, HDFS concepts, Blocks, Name nodes and Data nodes, Overview of HBase, Hive, Cassandra and Hypertable, Sqoop.

Unit-V Introduction to R, Data Manipulation and Statistical Analysis with R, Basics, Simple manipulations, Numbers and vectors, Input/Output, Arrays and Matrices, Loops and conditional execution, functions, Data Structures, Data transformations, Strings and dates, Graphics.

References:

1. Judith Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, Wiley Big Data For Dummies, 3
2. Runkler, Thomas A., Springer Vieweg Data Analytics, Models and Algorithms for Intelligent Data Analysis
3. Vignesh Prajapati Big Data Analytics with R and Hadoop, Packt Publication,

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Credit Based Grading System

Information Technology, VIII-Semester

Elective –V IT-8003(3): Information Theory and Coding

Branch : Information Technology, VIII Semester

Course: Information Theory and Coding

Unit I : Information – Entropy, Information rate, classification of codes, Source coding theorem, Shannon-Fano coding, Huffman coding, - Joint and conditional entropies, Mutual information - Discrete memory less channels – BSC, BEC – Channel capacity, Shannon limit

Unit II : Error Control Coding-Definitions and Principles: Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder - CRC ,Convolution codes – code tree trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding

Unit III : Source Coding: TEXT, AUDIO and SPEECH:- Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm , Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MPEG Audio layers I,II,III, Dolby AC3 ,Speech: Channel Vocoder, Linear Predictive Coding

Unit IV: Source Coding:IMAGE AND VIDEO: Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard

Unit V Compression techniques- Principles,Text Compression – Static Huffman Coding – Dynamic Huffman Coding – Arithmetic Coding – Image Compression – Graphics Interchange Format , Digitized Documents Introduction To JPEG Standards.

Reference Books:

- 1 .R Bose, "Information Theory, Coding and Cryptography", TMH
- 2 Herbert Taub and Donald Scihiling , "Principles of Communication Systems", McGraw Hill Publication
- 3 . R P Singh and S D Sapre "Communication systems", TMH
4. Fred Halsall, "Multimedia Communications, Applications Networks Protocols And Standards", Pearson Education,

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Credit Based Grading System

Information Technology, VIII-Semester

Elective –VI IT-8004(1): Data Mining & Warehousing

Branch : Information Technology, VIII Semester

Course: Data Mining and Warehousing

Unit I: Data Warehousing: Need for data warehousing , Basic elements of data warehousing, Data Mart, Data Warehouse Architecture, extract and load Process, Clean and Transform data, Star ,Snowflake and Galaxy Schemas for Multidimensional databases, Fact and dimension data, Partitioning Strategy-Horizontal and Vertical Partitioning.

Unit II: Data Warehouse and OLAP technology, Multidimensional data models and different OLAP Operations, OLAP Server: ROLAP, MOLAP, Data Warehouse implementation, Efficient Computation of Data Cubes, Processing of OLAP queries, Indexing data.

Unit III: Data Mining: Data Preprocessing ,Data Integration and Transformation, Data Reduction, Discretizaion and Concept Hierarchy Generation , Basics of data mining, Data mining techniques, KDP (Knowledge Discovery Process), Application and Challenges of Data Mining, Introduction of Web Structure Mining, Web Usage Mining, Spatial Mining, Text Mining, Security Issue, Privacy Issue, Ethical Issue.

Unit IV: Mining Association Rules in Large Databases: Association Rule Mining, Single-Dimensional Boolean Association Rules, Multi-Level Association Rule, Apriori Algorithm, Fp-Growth Algorithm, Time series mining association rules, latest trends in association rules mining.

Unit V: Classification and Clustering Distance Measures, Types of Clustering, K-Means Algorithm, Decision Tree Induction, Bayesian Classification, Association Rule Based, Other Classification Methods, Prediction, Classifier Accuracy, Categorization of methods, Partitioning methods, Outlier Analysis.

References:-

- Arun k Pujari “Data Mining Technique” University Press
- Han,Kamber, “Data Mining Concepts & Techniques”, M.Kaufman.
- P.Ponnian, “Data Warehousing Fundamentals”, John Wiley.
- M.H.Dunham, “Data Mining Introductory & Advanced Topics”, Pearson Education.
- Ralph Kimball, “The Data Warehouse Lifecycle Tool Kit”, John Wiley.
- E.G. Mallach , “The Decision Support & Data Warehouse Systems”, TMH

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Credit Based Grading System

Information Technology, VIII-Semester

Elective –VI IT-8004(2): Internet of Things

Branch : Information Technology, VIII Semester

Course: Internet of Things

Unit I: Internet of Things (IoT): Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples .
Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability

Unit II: Hardware for IoT: Sensors, digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology.
Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, Raspberry pi, Beagle Bone, Intel Galileo

Unit III: IoT PROTOCOLS : IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks, Zigbee – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

Unit IV: Security : Understanding the risks, Modes of attack - Denial of Service Guessing the credentials , Getting access to stored credentials, Man in the middle , Sniffing network communication , Port scanning and web crawling ,Search features and wildcards ,Breaking ciphers , Tools for achieving security - Virtual Private Networks , X.509 certificates and encryption , Authentication of identities , Usernames and passwords , Using message brokers and provisioning servers ,Centralization versus decentralization

Unit V: IoT Applications :Home Automation- Smart Appliances , Smoke/ Gas Detection, Cities – Smart Parking ,Smart Lighting , Smart Road , Health and Lifestyle- Health and fitness monitoring, Retail- Smart Payments.

Case Studies:

Smart city streetlights:- control and monitoring

References:

- 1.Raj Kamal “Internet of Things”, McGraw-Hill, 1st Edition, 2016
- 2.Olivier Hersent,David Boswarthick, Omar Elloumi “The Internet of Things key applications and protocols”, Wiley
3. Peter Waher, “Learning Internet of Things”, Packt publishing
- 4 Arshdeep Bahga, Vijay Madisetti, “Internet of Things (A hands on approach)” University Press (India)

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Information Technology, VIII-Semester

Elective –VI IT-8004(3): Unix & Shell Programming

Branch : Information Technology, VIII Semester

Course: Unix & Shell Programming

UNIT-I: General Overview of the System: System structure, user perspective, O/S services assumption about Hardware The Kernel and buffer cache architecture of Unix O/S, System concepts, Kernel data Structure, System administration, Buffer headers, Structure of the buffer pool, Scenarios for retrieval of the buffer, Reading and writing disk block, Advantage and disadvantage of buffer cache.

UNIT-II: Internal Representation of Files: Inodes, Structure of regular, Directories conversions of a path name to an inode, Super block, Inode assignment to a new file, Allocation of disk blocks, Open read write file and record close, File creation, Operation of special files change directory and change root, change owner and change mode. STAT and FSTAT, PIPES mounting and unmounting files system, Link Unlink.

UNIT-III: Structures of Processes and process control: Process states and transitions layout of system memory, the context of a process, manipulation of process address space, Sleep process creation/termination. The user Id of a process, changing the size of a process. Killing process with signals, job control, scheduling commands: AT and BATCH, TIME, CORN.

UNIT-IV: Introduction to shell scripts: shell Bourne shell, C shell, Unix commands, permissions, editors, grep family, shell variables, scripts, metacharacters and environment, if and case statements, for while and until loops. Shell programming.

UNIT-V: Introduction of Awk and perl Programming: Awk pattern scanning , BEGIN and END patterns, Awk arithmetic and variables, and operators, functions, perl; the chop() function, variable and operators. Networking tools: Resolving IP addressing, TELNET, FTP, Socket programming, introduction of Linux structure.

References

- Sumitabha Das "Unix concepts and Applications".Tata McGraw Hill,
- Y.Kanetkar "Unix shell programming", BPB Pub
- .B.W. Kernighan & R. Pike, "The UNIX Programming Environment", PHI Learning
- S.Prata " Advanced UNIX: A Programming's Guide", BPB Publications, New Delhi.
- M.J. Bach "Design of UNIX O.S. ", PHI Learning
- Beck "Linux Kernel", Pearson Education, Asia.

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Information Technology, VIII-Semester

IT-8005 – Project-II

Branch : Information Technology, VIII Semester

Course: Project-II

In VIII semester student completes implementation of major project for which literature survey and partial implementation is done by him/her in VII sem. Student is required to submit a Major Project Report for the same.

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Information Technology, VIII-Semester

IT-8006 – Lab (Elective – VI)

Branch : Information Technology, VIII Semester

Course: Departmental Choice (Internal Assessment)

Student will be given lab work or small project to be completed based on choice of Elective VI subject .

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Information Technology, VIII-Semester

IT-8007 – Group Discussion (Internal Assessment)

Branch : Information Technology, VIII Semester

Course: Group Discussion (Internal Assessment)

Students will be assigned different subjects related to technology ,social issues ,environmental ,business & Economy ,Current affairs from time to time and in sub groups .They are required to prepare for and against the motion for the allotted topic for group discussion.

Group discussion helps students to not only reach the subject but also enchases their debating skills, confidence ,presentation skills and mutual appreciation .It also helps them to confidently face such group discussion during placements and in social life.