LINUX PROGRAMMING

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To develop the skills necessary for systems programming.
2. To model asynchronous event handling.
3. To establish efficient communication between two asynchronous processes.
4. To design various client & server communication models.

UNIT I - Korn Shell Programming, Text Processing Utilities and Files
Basic Script Concepts, Expressions, Decisions: Making Selections, Repetition, Special Parameters and Variables, Changing Positional Parameters, Argument Validation, Control Structures and select. Text Processing Utilities – grep, make utility.
Files: Files concept, File System Structure, I-nodes, File Attributes, File types, kernel support for files, file descriptors, low level file Access- File structure related system calls (File APIs), Directory file APIs.

UNIT II – Process and Signals
Process: Process concept, Kernel support for process, process attributes, process control - process creation, waiting for a process, process termination, zombie process, orphan process APIs.
Signals: Introduction to signals, Signal generation and handling, Kernel support for signal, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, and abort and sleep functions.

UNIT III - IPC, Message Queues, Semaphores and Shared Memory
IPC: Introduction to IPC, Pipes, FIFOs. Message Queues - Kernel support for messages, Unix System V APIs for messages, client/server example. Semaphores - Kernel support for semaphores, Unix System V APIs for semaphores. Shared Memory - Kernel support for shared memory, Unix system V APIs for shared memory, semaphore and shared memory example.

UNIT IV – Socket Programming
Sockets: Introduction to Sockets, Socket Addresses, Socket system calls for connection oriented protocol and connectionless protocol, example, client/server programs.

UNIT V – Multithreaded Programming and Advanced I/O
Multithreaded Programming: Differences between threads and processes, Thread structure and uses, Threads and Lightweight Processes, POSIX Thread APIs, Creating Threads, Thread Attributes, Thread Synchronization with semaphores and with Mutexes, Example programs.
Advanced I/O: Introduction, Non-Blocking I/O, Record Locking, I/O Multiplexing, select and pselect functions, Poll Function, Asynchronous I/O, POSIX Asynchronous I/O readv and writev functions, readn and writen-functions, Memory-Mapped I/O.

Course Outcomes: At the end of the course, the student should be able to

CO 1	:	Make use of well-defined Korn shell utilities and develop menu driven Text processing Application.
CO 2	:	Appreciate process abstraction and asynchronous event handling using signals.
CO 3	:	Implement IPC Mechanisms, Messages Queues and synchronize the access patterns as a shared memory.
CO4	:	Design concurrent server programs based on various design alternatives.
CO5	:	Implement multi-threaded based server and I/O Multiplexing mechanisms.

Text Books:

1. Behrouz A. Forouzan, Richard F. Gilberg, *UNIX and shell Programming*, Cengage Learning.

2. W Richard Stevens and Stephen A Rago, *Advanced Programming in the UNIX Environment*, 3rd Edition, Addison Wesley / Pearson Education Inc., 2013.
3. T.Chan, *Unix System Programming using C++*, PHI.

References:

1. W R Stevens, *Unix Network Programming*, PHI.
2. Uresh Vahalia, *Unix Internals: The New Frontiers*, Pearson Education.
3. Graham Glass and King Ables, *Unix for Programmers and Users*, 3rd Edition, Pearson Education.

DATA WAREHOUSING AND DATA MINING

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To demonstrate the value of Data mining in solving real-world problems.
2. Demonstrate Understanding of foundational concepts underlying Data mining.
3. Demonstrate Understanding of algorithms commonly used to perform various Data mining tasks.

UNIT I – Introduction to Data Mining and Data Warehouse
Fundamentals of Data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining task Primitives, Data Warehouse, Integration of a Data Mining System with a Database or a Data Warehouse System, Multidimensional Data Model, A three tier Data Warehouse Architecture, OLAP Technology for Data Mining.

UNIT II – Association Rule Mining
Data Characterization, Data Discrimination, Attribute-Oriented Induction.
Association Rule Mining: Basic Concepts, Efficient and Scalable Frequent Itemset Mining methods. Mining various kinds of Association rules, from Association Analysis to Correlation Analysis, Constraint-based Association Mining.

UNIT III - Classification and Prediction
Classification: Introduction to Classification and Prediction, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule based classification, Support Vector Machines, Associate Classification, Lazy Learners, and Other Classification Methods.
Accuracy and Error measures: Evaluating the accuracy of a classifier or a predictor, Ensemble Methods.

UNIT IV – Cluster Analysis
Introduction to Cluster Analysis, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Classical Partitioning methods: K-Means and K-Medoids, Hierarchical Method-BIRCH, Density-Based Methods: DBSCAN and DENCLUE, Grid-Based Methods: STING, Model-Based Clustering Methods-Expectation Maximization, Clustering High-Dimensional Data: PROCLUS, Outlier Analysis.

UNIT V – Time Series, Text and Web Mining
Mining Time-series data, Mining sequence patterns in Transactional Databases, Text Mining, Mining the World Wide Web, VIPS and HITS algorithms.
Applications and Trends in Data Mining: Data Mining Applications, Major issues and challenges in Data Mining, Social Impacts of Data Mining.

Course Outcomes: At the end of the course, the student should be able to

CO 1	:	Understand different data mining tasks and apply the algorithms most appropriate for addressing them.
CO 2	:	Discover and Analyze interesting patterns from different kinds of databases.
CO 3	:	Apply the techniques of classification and prediction to build and use supervised learning from datasets.
CO4	:	Apply the techniques of clustering to implement unsupervised learning systems.
CO5	:	Understand nature of time-series, web and text data to develop methodologies and application for such data analysis and mining.

Text Books:

1. Jiawei Han, Micheline Kamber and Jian Pei, *Data Mining Concepts and Techniques*, 3rd Edition, Morgan Kaufmann Publishers/Elsevier, 2011.

2. Pang Ning Tan, Michael Steinbach and Vipin Kumar, *Introduction to Data Mining,* Pearson Education, 2007.
3. Sam Anahory and Dennis Murray, *Data Warehousing in the Real World*, Pearson Edition Asia.

References:

1. Arun K Pujari, *Data Mining Techniques*, 2nd Edition, University Press.
2. K P Soman, S Diwakar and V Ajay, *Insight into Data Mining*, PHI, 2008.
3. Paulraj Ponnaiah, *Data Warehousing Fundamentals*, Wiley Student Edition.

DEEP LEARNING

(Professional Elective II)

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To know the Characteristics and principles of deep neural networks and CNN.
2. To model building through different learning techniques
3. To know the Vectorization Deep models and Feature Engineering

UNIT I - Foundations of Neural Networks and Deep Learning
Neural Networks, activation function, loss function, hyper parameters, Definition-Deep learning, Architectural Principles, Building blocks of Deep networks, RBMs, Auto encoders.

UNIT II - **Architectures of deep Networks**
Unsupervised pretrained Networks, Deep Belief Networks, Generative Adversial Networks, CNN, Architecture, Input layer, Convolutional Layers, Recurrent Neural networks, Recursive Neural Networks, Modeling CSV data with Multilayer Perceptron, Modeling Handwritten images using CNN.

UNIT III - Concepts of Tuning Deep Networks
An Intuition for Building Deep Networks, Matching Input data and Network Architectures, Relating Model Goal and Output layers, Weight Initialization, Loss Function, Learning rates and Recommendations, Optimization methods, How to use Regularization.

UNIT IV - Tuning Specific Deep Network Architectures
Common Convolutional Architectural Patterns, Configuring Convolutional Layers, Configuring Pooling Layers, Transfer Learning, Network Input Data and Input Layers, Output Layers and RNN Output Layer, Training the Network, Padding and Masking.

UNIT V - Vectorization
Introduction to vectorization, Why do we need to vectorize Data, Feature Engineering and Normalization techniques, Vectorizing Image data, Image data Representation, Working with sequential data, Working with Text in Vectorization.

Course Outcomes: At the end of the course, the student should be able to

CO 1 : Use Deep networks for solving different problems related to data visualization
CO 2 : Formalize tasks in terms of Computational Complexity via neural networks and Deep Learning architectures
CO 3 : Design deep learning models to solve data-rich tasks.
CO4 : Build datasets, tune and train deep learning models with deep learning libraries
CO5 : Understand the inner mechanisms of Deep learning neural techniques during training process and Vectorization.

Text Books:

1. Josh Patterson and Adam Gibson "*Deep Learning- A Practitioners approach*, O'reilly 2017
2. Nikhil Budum, Nicholas Locascio, *Fundamentals of Deep learning*, 2017.

References:

1. Jacek M. Zurada, *"Introduction to Artificial Neural Systems"*, Jacek M. Zurada, PWS Publishing Company, 1995.
2. Jeff Heaton, Deep Learning and Neural Networks, Heaton Research Inc., 2015.
3. Yoshua Bengio, Learning Deep Architectures for AI, Foundations and Trends in Machine Learning, Yoshua Bengio, Now Publishers, 2009

VITUAL REALITY

(Professional Elective II)

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To understand Virtual reality concepts
2. To Demonstrate understanding of the classic components of a VR system, Human Factors, Applications
3. Understanding how to do Modeling, model management, VR programming.

UNIT I - Introduction

The three I's of virtual reality, commercial VR technology and the five classic components of a VR system.
(1.1, 1.3 and 1.5 of TextBook (1))

UNIT II - Input Output Devices

Trackers, Navigation, and Gesture Interfaces – Three dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces. Graphics displays, sound displays and haptic feedback.
(2.1, 2.2 and 2.3, 3.1,3.2 & 3.3 of Text Book (1)).

UNIT III - Modeling

Geometric modeling, kinematics modeling, physical modeling, behavior modeling, model management.
(5.1, 5.2 and 5.3, 5.4 and 5.5 of Text Book (1)).

UNIT IV - Human Factors and Applications

Methodology and terminology, user performance studies, VR health and safety issues. Medical applications, military applications, robotics applications
(7.1, 7.2, 7.3, 8.1, 8.3 and 9.2 of Text Book (1)).

UNIT V - VR Programming

Introducing Java 3D, loading and manipulating external models, using a lathe to make shapes. 3D Sprites, animated 3D sprites, particle systems
(Chapters 14, 16 and 17, 18, 19 and 21 of Text Book (2))

Course Outcomes: At the end of the course, the student should be able to

CO 1 : Know the fundamentals of Virtual Reality
CO 2 : Understanding the components of VR
CO 3 : Can exhibit proficiency with Modeling, types, Model management
CO4 : Applications of VR and their Issues to be concentrated.
CO5 : Understand the Java 3D

Text Books:

1. Gregory C. Burdea and Philippe Coiffet, *Virtual Reality Technology*, John Wiley and Sons, Inc (Wiley Inter Science), Second Edition, 2006
2. Andrew Davison, *Killer Game Programming in Java*, Oreilly-SPD, 2005.

References:

1. William R.Sherman, Alan Craig, *Understanding Virtual Reality, interface, Application and Design*, Morgan Kaufmann, 2008
2. Bill Fleming, *3D Modeling and surfacing*, Elsevier (Morgan Kauffman).
3. David H.Eberly, *3D Game Engine Design*, Elsevier.
4. John Vince, *Virtual Reality Systems*, Pearson Education, 2007

SEMANTIC WEB AND SOCIAL NETWORKS

(Professional Elective II)

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To learn Web Intelligence
2. To learn Knowledge Representation for the Semantic Web
3. To learn Ontology Engineering
4. To learn Semantic Web Applications, Services and Technology
5. To learn Social Network Analysis and semantic web

UNIT I: Web Intelligence

Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

UNIT II: Knowledge Representation for the Semantic Web

Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web – Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

UNIT III: Ontology Engineering

Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

UNIT IV: Semantic Web Applications, Services and Technology

Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods.

UNIT V: Social Network Analysis and semantic web

What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

Course Outcomes: At the end of the course, the student should be able to

CO 1 : Understand the basics of Semantic Web and Social Networks.
CO 2 : Understand and knowledge representation for the semantic web.
CO 3 : Create ontology.
CO4 : Develop social-semantic applications.
CO5 : Build blogs and social networks.

Text Books:

1. Berners Lee, Godel and Turing, *Thinking on the Web*, Wiley inter science, 2008.
2. Peter Mika, *Social Networks and the Semantic Web*, Springer, 2007.

References:

1. J. Davies, R. Studer, P. Warren, *Semantic Web Technologies*, Trends and Research in Ontology Based Systems, John Wiley & Sons. 2006
2. Heiner Stuckenschmidt, Frank Van Harmelen*, Information sharing on the semantic Web*, Springer Publications. 2005 Edition.
3. T. Segaran, C. Evans, J. Taylor, *Programming the Semantic Web*, O'Reilly, SPD. 2009

DESIGN PATTERNS

(Professional Elective II)

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To make students understand the basic concepts of design patterns.
2. To understand the various Design patterns.
3. To understand the importance of design patterns for development of reusable product.

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 - **Creational Patterns**

Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns. Example Programs on Creational Patterns (Database Connection Object for Singleton Pattern, Dynamic Object creation for Factory Pattern)

UNIT III - **Structural Patterns**

Adapter, Bridge and Composite, Decorator, façade, Flyweight, Proxy. Example Programs on Structural Patterns (Payment Gateway Interface program for Façade Design Pattern, ATM Example program for Proxy Design Pattern)

UNIT IV - **Behavioral Patterns**

Chain of Responsibility, Command, Interpreter and Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns. Example program on Sorting Techniques using Strategy Pattern. Program on MVC Architecture using Observer Pattern. Amount Dispense in ATM by using Chain of Responsibility Pattern.

UNIT V - **A Case Study**

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

Course Outcomes: At the end of the course, the student should be able to

CO 1	:	Appreciate the basic concepts of design patterns and able to know how to select and use the design patterns
CO 2	:	Identify the design pattern in the existing code and use of creational patterns.
CO 3	:	Apply and use the structural patterns
CO4	:	Identify and use the behavioral patterns
CO5	:	Find and catalog patterns in the object oriented software

Text Books:

1. Gamma, E., Helm, R., Johnson, R., Vlissides, J. *Design Patterns - Elements of Reusable Object-Oriented Software*, Addison-Wesley, 1995.
2. James W.Cooper*, "Java™ Design Patterns: A Tutorial***",** Addison Wesley, 2000.

References:

1. Mark Grand, *"Patterns in java –A catalog of reusable Design Patterns Illustrated with UML",* Volume 1,Wiley DreamTech.
2. Mark Grand, *Java Enterprise Design Patterns,* Wiley DreamTech, 2006.

WEB SERVICES AND CLOUD COMPUTING

(Professional Elective II)

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. This course aims to provide conceptual understanding of Service Oriented Architecture, its implementation using Web Services - SOAP & ReST, fundamentals of Cloud Computing, it's delivery models, Virtualization, Federation, Presence and various pressing issues related to Cloud Computing such as Security and Privacy.
2. It provides a deep drill down of all the critical concepts using a variety of case studies.
3. It provides an evaluation of various pros and cons of cloud computing technology and examines it's future direction, opportunities, risks and challenges.

UNIT I - SOA and Web Services

Overview of Service Oriented Architecture – SOA concepts, Key Service Characteristics, Technical Benefits of SOA. Introduction to Web Services– The definition of web services, basic operational model of web services, basic steps of implementing web services. Core fundamentals of SOAP – SOAP Message Structure, SOAP encoding, SOAP message exchange models. Describing Web Services –Web Services life cycle, anatomy of WSDL. Introduction to Axis– Installing axis web service framework, deploying a java web service on axis.

UNIT II – ReST based Web Services

Overview of Representational State Transfer (ReST) – URIs, Statelessness, Resource Oriented Architecture, Designing read-only ReST web service, Designing read-write ReST web service, ReST Benefits and Limitations.

UNIT III - Cloud Computing

Principles of Parallel and Distributed Computing, Introduction to cloud computing, Cloud computing architecture, cloud concepts and technologies, Cloud benefits and challenges, Cloud service delivery models – Infrastructure as a Service, Platform as a Service, Software as aService, Cloud deployment models – public, private, hybrid. Case Study: Amazon cloud and its ReST web services, Google App Engine, Microsoft Azure.

UNIT IV - Virtualization

Virtualization- Characteristic features, Taxonomy, Hypervisors, Virtualization and Cloud Computing, Pros and Cons of Cloud Computing. Case Studies: Xenpara-virtualization, VMWare full virtualization.

UNIT V - Federation, Presence, Security and Privacy in the Cloud

Federation in the cloud, Presence in the cloud, Privacy and its relation to cloud based information system, Cloud security challenges, Software-as-a-Service security.

Course Outcomes: At the end of the course, the student should be able to

- CO 1 : Acquire the basic knowledge on Service Oriented Architecture and fundamentals of SOAP & WSDL in defining Web Services.
- CO 2 : Learn about ROA and ReST based Web Services.
- CO 3 : Understand the basics of Cloud Computing and explore case studies like Amazon Cloud, Google App Engine, and Micosoft Azure.
- CO 4 : Learn about Virtualization and case studies like Xen-Para Virtualization, VMWare Full Virtualization.
- CO 5 : Learn about Federation, Presence, Security and Privacy in the Cloud and also know about the challenges faced in the Cloud.

Text Books:

1. R. Nagappan, R. Skoczylas and R.P. Sriganesh, *Developing Java Web Services*, Wiley India, 2008**.**
2. Raj Kumar Buyya, James Broberg and Andrzej M Goscinski, *Cloud Computing: Principles and Paradigms*, Wiley, 2013.

References:

1. Michael P. Papazoglou, *Web Services & SOA: Principles and Technology*, 2nd Edition, Pearson, January, 2012.
2. Leonard Richardson and Sam Ruby, *ReSTful Web Services*, 1st Edition, O'Reilly, July, 2011.
3. Raj Kumar Buyya, Christian Vecchiola and S Thamarai Selvi, *Mastering Cloud Computing*, McGraw Hill, February, 2013.
4. John W. Rittinghouse, and James F. Ransome, *Cloud Computing: Implementation Management and Security*, 1st Edition, CRC Press, August, 2009.

DIGITAL IMAGE PROCESSING AND PATTERN RECOGNITION

(Professional Elective III)

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To impart adequate background knowledge about image processing and pattern recognition
2. To demonstrate knowledge and skills required for image processing and pattern recognition tools
3. To offer necessary knowledge to design and implements a prototype of an image processing and pattern recognition application.

UNIT I - FUNDAMENTAL OF DIGITAL IMAGE PROCESSING

Fundamental steps of image processing, components of an image processing of system. The image model and image acquisition, sampling and quantization, relationship between pixels, distance functions, Statistical and spatial operations, Intensity functions transformations, histogram processing, smoothing & sharpening – spatial filters. Frequency domain filters, homomorphic filtering, image filtering & restoration. Inverse and Weiner filtering, FIR Weiner filter.

UNIT II - IMAGE SEGMENTATION

Morphological and other area operations, basic morphological operations, opening and closing operations, dilation erosion, Hit or Miss transform, morphological algorithms, extension to grey scale images. Segmentation and Edge detection region operations, basic edge detection, second order detection, crack edge detection, gradient operators, compass and Laplace operators, edge linking and boundary detection, thresholding, region-based segmentation, segmentation by morphological watersheds.

UNIT III – IMAGE COMPRESSION AND SECURITY

Image compression: Types and requirements, statistical compression, spatial compression, contour coding, quantizing compression, image data compression-predictive technique, pixel coding, transfer coding theory, lossy and lossless predictive type coding, Digital Image Water marking.

UNIT IV – IMAGE REPRESENTATION AND DESCRIPTION

Representation and Description: Chain codes, Polygonal approximation, Signature Boundary Segments, Skelton's, Boundary Descriptors, Regional Descriptors, Relational Descriptors, Principal components for Description, Relational Descriptors

UNIT V - PATTERN RECOGNITION AND CLASSIFICATION

Pattern Recognition Fundamentals: Basic Concepts of pattern recognition, Fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model

Pattern classification: Pattern classification by distance function: Measures of similarity, Clustering criteria, K-Means algorithm, Pattern classification by likelihood function: Pattern classification as a Statistical decision problem, Bayes classifier for normal patterns.

Course Outcomes: At the end of the course, the student should be able to

CO 1	:	Apply pixel relationship and color model to images
CO 2	:	Outline the basics of filtering for image enhancement in the spatial and frequency domain
CO 3	:	Summarize the procedure for restoring degraded images and segmentation.
CO 4	:	Do image representation and description.
CO 5	:	Perform the classification of patterns

Text Books:

1) Rafael C. Gonzalez and Richard E. Woods, *Digital Image Processing*, Third edition, Pearson Education, 2017
2) Julus T. Tou, and Rafel C. Gonzalez, *Pattern recognition Principles*, Addision-Wesley Publishing Company.

References:

1) Anil K. Jain, *Fundamentals of digital image processing*, Prentice Hall of India, 2004
2) Richard Duda, Hart and David Strok, *Pattern classification*, John Wiley publishers.
3) S.Jayaraman, S. Esakkirajan and T.Veerakumar, *Digital Image Processing*, TMH, 2016

CYBER SECURITY

(Professional Elective III)

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. Appraise the current structure of cyber security roles across the DoD enterprise, including the roles and responsibilities of the relevant organizations.
2. Evaluate the trends and patterns that will determine the future state of cyber security

UNIT I – Digital Securities

Introduction, Types of Attacks, Digital Privacy, Online Tracking, Privacy Laws, Types of Computer Security risks (Malware, Hacking, Pharming, Phishing, Ransomware, Adware and Spyware, Trojan, Virus, Worms, WIFI Eavesdropping, Scareware, Distributed Denial-Of-Service Attack, Rootkits, Juice Jacking), Antivirus and Other Security solution, Password, Secure online browsing, Email Security, Social Engineering, Secure WIFI settings, Track yourself online, Cloud storage security, IOT security, Physical Security Threads

UNIT II - Online Anonymity

Anonymous Networks, Tor Network, I2P Network, Freenet, Darknet, Anonymous OS – Tails, Secure File Sharing, VPN, Proxy Server, Connection Leak Testing, Secure Search Engine, Web Browser Privacy Configuration, Anonymous Payment

UNIT III - Cryptography and Secure Communication

The Difference Between Encryption and Cryptography, Cryptographic Functions, Cryptographic Types, Digital Signature, The Difference Between Digital Signatures and Electronic Signatures, Cryptographic Systems Trust Models, Disk Encryption Using Open Source Tools, Multitask Encryption Tools, Attacking Cryptographic Systems, Countermeasures Against Cryptography Attacks, Securing Data in Transit, Cloud Storage Encryption, Encrypt DNS Traffic and Email Communication

UNIT IV - Cyber Crime

Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

UNIT V - Digital Forensics

Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis.

Course Outcomes: At the end of the course, the student should be able to

CO 1 : Identify security risks and take preventive steps
CO 2 : Apply the security tools and analysis of attacks in the network.
CO 3 : Exploring different security solution to counter the attacks in Internet.
CO 4 : Investigate cybercrime and collect evidences
CO 5 : Use knowledge of forensic tools and software

Text Books:

1. Nihad Hassan and Rami Hijazi, *Digital Privacy and Security Using Windows: A Practical Guide*, Apress, 2015

References:

1. Nasscom, *Digital Forensics*, DSCI, 2012.
2. Nasscom, *Cyber Crime Investigation*, DSCI, 2013.

MINING MASSIVE DATA SETS

(Professional Elective III)

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To get know the latest technologies and algorithms for mining massive data sets
2. To impart knowledge about big data processing, the purpose of map reduce in scaling data mining applications and problems inherent to handle massive data sets
3. To expose similarity and dissimilarity measures, stream data processing and machine learning models to extract knowledge from massive data sets.

UNIT I – MapReduce

Introduction to distributed file systems, Map-reduce, Algorithms using MapReduce Extension to MapReduce, Communication cost model, Complexity theory for MapReduce.

UNIT II – Similarity Measures

Finding similar items, Page rank, Matrix factorization, Shingles, Minhashing, Locality Sensitive Hashing families. Dissimilarity Measures - Distance Measures, Theory of Locality-Sensitive Functions, Methods for High Degrees of Similarity.

UNIT III – Stream Processing

Motivation, Sampling, Bloom filtering, Count-distinct using FM sketch, Estimating moments using AMS sketch. Dimensionality Reduction **-** Linear dimensionality reduction, PCA, SVD. Random projections, Johnson-Lindenstrauss lemma, JL transforms, sparse JL-transform. Random hashing, Clarkson-Woodruff algorithm.

UNIT IV – Large Scale machine learning

Machine learning model, perceptrons, support vector machines, and learning from nearest neighbor. Advertising on the web - issues in on-line advertising, on-line algorithms, and content based recommendations.

UNIT V – Mining Social Network Graphs

Introduction to social network graphs, clustering social network graphs, partitioning graphs, finding overlapping communities.

Course Outcomes: At the end of the course, the student should be able to

CO 1	:	Understand the concept data mining, Map reduce framework for Big data processing.
CO 2	:	Use the different similarity and dissimilarity measures while extracting the knowledge from massive data sets
CO 3	:	Identify algorithms for stream data analytics, and dimensionality reduction techniques
CO 4	:	Design algorithms to mine data using perceptrons, support vector machines, and also understand the concept of advertising on web
CO 5	:	Construct algorithms to extract data from social network graphs

Text Books:

1. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, *Mining of Massive Datasets*, 2nd edition, Cambridge University Press, 2014.
2. S. Boyd, N. Parikh, E. Chu, B. Peleato, and J. Eckstein, *Distributed optimization and statistical learning via the alternating direction method of multipliers*, 2011.

References:

1. Jimmy Lin and Chris Dyer. Morgan and Claypool, *Data Intensive Text Processing with MapReduce*, Morgan and Claypool publishers, 2010.
2. Tom White, *Hadoop: The definitive Guide*, 4th edition, O'reilly Press, 2015.

VISUAL PROGRAMMING USING C# AND .NET

(Professional Elective III)

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To know the elements of the .NET Framework and work effectively with Visual Studio.NET
2. To develop applications for the .NET Framework using C# and deploy C# Applications
3. Use C# debugging techniques

UNIT I – Introduction to .NET Framework and Visual Studio.NET

Introduction to .NET Framework – The .Net Framework, C# language.
Visual Studio.NET - using the Visual Studio IDE.C# Language and Syntax – Data Types, Variables, Constants, Operators, Casting, Control Structures, Conditionals, Loops, Namespaces, Preprocessor Directives, Keywords, Strings and Regular Expressions.

UNIT II – Overview of Object Oriented Programming for C#

Classes and Objects – Constructing and Initializing objects, Properties, Indexers, Methods and Constructors, Parameter Passing to Methods and Constructors, Abstraction, Encapsulation, Static fields and methods. Inheritance – Overview, Controlling accessibility, Overloading, Method Hiding. Interfaces – Overview, Using .NET provided interfaces, Writing and using your own interfaces. Polymorphism – Overview, Dynamic vs. Static Binding, Abstract Classes, Generics – Generic Features, Generic Methods, Arrays and Tuples, Delegates and Events.

UNIT III – Reflection, Web application Development

Reflection, Assemblies – Features, Structure, Types – Shared and Private, C# Collections introduction Collections, List<T>, HashSet<T>, SortedSet<T> , Stack<T> , Queue<T>, LinkedList<T> Web Application Development – Getting Started with ASP.NET 4.5.1, Building ASP.NET Website, Designing your Webpage, Working with ASP.NET Server Controls-Types.

UNIT IV – Creating consisting looking websites, Databases, LINQ

Creating consisting looking websites – Master Page, Content Page, Page Life cycle, Navigation – Navigation Controls, Routing & Redirection, Validating User Input, Processing data at server, Databases – Installation of Server 2012, Retrieving and manipulating data with SQL, LINQ – Language Integrated Query.

UNIT V – ADO.NET

ADO.NET – Overview of ADO.NET, Evolution from ADO, Concepts, Using Database Connections. Working with Stored Procedures, Data Reader, Managing Data and Relationships, Datasets – Structure, Using a Datasets, Typed Datasets, Populating the Datasets, Persisting Dataset changes. Deploying the website –Preparing for deployment, Running under IIS.

Course Outcomes: At the end of the course, the student should be able to

CO 1	:	Understand basics of .Net Framework and using Visual studio.Net.
CO 2	:	Create Object Oriented Programs using C#
CO 3	:	Work with public, private libraries and build web applications using ASP.Net
CO 4	:	Create Websites and understand the Language Integrated Query (LINQ) database.
CO 5	:	Understand terminology and providers associated with ADO.NET

Text Books:

1. Christian Nagel, Jay Glynn and Morgan Skinner, *Professional C# 5.0 and .NET 4.5.1*, John Wiley & Sons Inc., 2014
2. Imar Spaanjaars, *Beginning ASP.net 4.5.1in C# and VB*, Wrox Publication, 2014.

References:

1. John Sharp, *Microsoft Visual C# Step by Step*, O'Reilly Media, Inc., 2013.

2. Randal Root and Mary Romero Sweeney, *A Tester's Guide to .NET Programming*, Apress,2006

WIRELESS NETWORKS AND MOBILE COMPUTING

(Professional Elective III)

Instruction	:	3 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	3	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To provide an introduction to mobile and wireless computing.
2. To provide a basic understanding of how the communication networks are planned, Managed, administered and operated.
3. To understand Communication management networks, protocols, modeling, network management applications such as configuration, fault and performance management.

UNIT I - Introduction to Network Technologies and Cellular Communications:
Infrared vs. Radio Transmission, Infrastructure and Ad Hoc Networks, GSM - Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services. Mobile Computing (MC) - Introduction to MC, novel applications, limitations, and architecture, Bluetooth - User Scenarios, Physical Layer, MAC layer, Networking, Security, Link Management.

UNIT II - (Wireless) Medium Access Control
Motivation for a specialized MAC (Hidden and exposed terminals, near and far terminals), SDMA, FDMA, TDMA, CDMA, MAC protocols for GSM, Wireless LAN (IEEE802.11), collision Avoidance (MACA, MACAW) protocols.

UNIT III - Mobile IP Network Layer:
IP and Mobile IP Network layers, Packet Delivery and Handover Management, Location Management Registration, tunneling and encapsulation, Dynamic Host Configuration Protocol (DHCP).

UNIT IV - Mobile Transport Layer
Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other transport Protocols for Mobile Networks

UNIT V – Mobile Ad hoc Networks (MANETs):
Introduction, applications and challenges of a MANET, applications. Classification of Routing algorithms, algorithms such as DSR, AODV, DSDV, etc., Mobile agents and service discovery

Course Outcomes: At the end of the course, the student should be able to

- CO 1 : Apply advanced data communication methods and networking protocols for wireless and mobile environment
- CO 2 : Utilize and employ application frame works for developing mobile applications including under disconnected and weakly connected environment
- CO 3 : Select components and networks for particular application.
- CO4 : Understand issues related to client server computing with adaptation, power aware and context aware computing and MANET Protocols
- CO5 : Have a good understanding of how the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support

Text Books:

1. Ivan Stojmenovic, *Handbook of Wireless Networks and Mobile Computing*, Wiley, 2002
2. Jochen Schiller, *Mobile Communications*, 2nd Edition , Addison-Wisley, 2004

References:

1. Reza Behravanfar, *Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML*, Cambridge University Press, October 2004.
2. RajKamal, *Mobile computing*, Oxford University Press, 2007.

LINUX AND SHELL PROGRAMMING LAB

Instruction	:	2 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	1	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To make the students to learn Linux shell programming
2. To realize the operating system principles and abstractions.

LIST OF EXPERIMENTS:

1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
2. Write a shell script that deletes all lines containing a specific word in one or more files supplied as arguments to it.
3. Write a shell script that displays a list of all files in the current directory to which the user has read, write and execute permissions.
4. Write a C program to implement "ls –ls" command.
5. Write a C program which creates a child process and the parent waits for child's exit.
6. Write a C program to demonstrate the difference between the fork and vfork system calls.
7. Write a C program in which main process creates a child process and registers a signal handler to get the exit status of the child asynchronously.
8. Implement ` ls|wc -l -c –w ' command using pipe and exec functions.
9. Establish bidirectional communication between sender program and receiver program using multiple FIFO's.
10. Implement SVR based Message Queue IPC mechanism to establish asynchronous communication between two communicating processes.
11. Implement the following communication model:
    a) Process 1 creates a Message Queue resource.
    b) Process 2 enacts the server role
    c) Process 3 and 4 are clients
    d) Process 3 seeks 'isprime' service from the server by inserting the payload in the message queue
    e) Process 4 seeks 'iseven' service form the server by inserting the payload in the message queue
    f) Server retrieves the service request from the Message queue and inserts the reply
    g) Intended Client retrieves the response.
12. Implement client/server model using socket API
13. Implement a concurrent server using fork based model while avoiding the zombie state of the client.
14. Implement a concurrent server model using pthread API
15. Solve the producer consumer problem using pthread API

Course Outcomes: At the end of the course, the student should be able to

CO 1 : Develop and implement Linux shell programs
CO 2 : Write programs to implement shell commands and use IPC mechanisms for realizing scalable applications.
CO 3 : Model the process abstraction and process control.
CO4 : Implement and deploy client-server applications while utilizing relevant System calls
CO5 : Implement concurrent programs using process and thread API and establish communication among them

References:

DATA MINING LAB

Instruction	:	2 Periods / week	Continuous Internal Evaluation	:	30 Marks
Tutorial	:		Semester End Examination	:	70 Marks
Credits	:	1	Semester End Exam Duration	:	3 Hours

Course Objectives:

1. To make the students to learn and use Data Mining tools.
2. To impart skill to build Machine Learning Models using Python libraries.

List of Tasks:

1. Implement the following subtasks on the German Credit Data set.
   a) List all the categorical (or nominal) attributes and the real-valued attributes separately.
   b) Identify missing values in a given data set.
   c) Identify Null values in a given data set.
2. Implement Discretization Concept on Numerical Attribute.
3. Discuss about Filters on Supervised and Unsupervised Learning.
4. Apply Apriori Frequent Item Set Mining Algorithm on Weather nominal dataset.
   a) List the top 10 Association rules. (Check the results for different support and confidence threshold values) using Weka.
5. Apply FP-growth Frequent Item Set Mining Algorithm on Super Market dataset.
   a) List the top 10 Association rules. Check the results for different support and confidence threshold values using Weka.
6. Construct a Naïve Bayesian Classifier Model on IRIS Data set. Test the build Classification Model Using 10-fold cross validation. Comment on the performance of the Constructed Classification Model using Weka.
7. Construct a Decision Table for Rule based Classifier on Soybean Data set. Test the build Classification Model Using 10-fold cross validation. Comment on the performance of the Constructed Classification Model using Weka.
8. Construct an EM Model on Diabetes Data set. Comment on the performance of the Clustering Model using Weka.
9. Construct a Simple K-Means Model on Vote Data set. Comment on the performance of Clustering Model using Weka.
10. Construct a Naïve Bayesian Classifier Model on Vote Data set. Test the build Classification Model Using 5-fold cross validation using Python Scikit Learn.
11. Apply the Hierarchical Clustering Technique on Weather dataset and comment on the performance of the algorithm using Python Scikit Learn.
12. Create a Data Set of 30 instances characterized by four attributes (income, age, expenditure, assets) in arff format. Apply K-Means Clustering technique on the generated Data set. Compute the performance of K-Means algorithm against hierarchal Clustering algorithm using Python Scikit Learn.
13. Apply the Decision Table Rules Classification Technique on Soybean dataset and comment on the performance of the algorithm using Python Scikit Learn.
14. Construct a J48 Trees Classifier Model on Weather Numeric Data set. Test the build Classification Model Using 10-fold cross validation. Comment on the performance of the Constructed Classification Model using Python Scikit Learn.
15. Construct a EM Model on Diabetes Data set. Comment on the performance of the Clustering Model using Python Scikit Learn.
16. Construct a Cobweb Model on IRIS Data set. Comment on the performance of the Clustering Model using Python Scikit Learn.

Course Outcomes: At the end of the course, the student should be able to

CO 1 : Pre-process the dataset for data analysis and mining
CO 2 : Use WEKA tools for discovering various types of knowledge such as Association rules, Classification and clustering models.
CO 3 : Build Machine Learning Models in Python using libraries such as Scikit learn.

References: