JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
		3	0	0	3
	COMPUTER NETWORKS				

Course Objectives:
- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

Course Outcomes:
By the end of the course, the student will be able to
- Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
- Discuss different transmission media and different switching networks.
- Analyze data link layer services, functions and protocols like HDLC and PPP.
- Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
- Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

UNIT I:
Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History.
Physical Layer –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

UNIT II:
Data link layer: Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, **Elementary Data Link Layer protocols**: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.
Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.

UNIT III:
Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access:** Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA).
Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

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UNIT IV:

The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms- General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- Admission Control-Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket.

Internet Working: How networks differ- How networks can be connected- Tunnelling, internetwork routing-, Fragmentation, network layer in the internet – IP protocols-IP Version 4 protocol-IPV4 Header Format, IP addresses, Class full Addressing, CIDR, NAT-, Subnets-IP Version 6-The main IPV6 header, Transition from IPV4 to IPV6, Comparision of IPV4 & IPV6- Internet control protocols- ICMP-ARP-DHCP

UNIT V:

The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services-TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control, Congestion control in TCP.

Application Layer –- World Wide Web: HTTP, Electronic mail-Architecture- web based mail- email security- TELENET-local versus remote Logging-Domain Name System: Name Space, DNS in Internet ,- Resolution-Caching- Resource Records- DNS messages- Registrars-security of DNS Name Servers, SNMP.

Text Books:
1. Computer Networks — Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks – Behrouz A. Forouzan, Fifth Edition TMH.

References Books:
1. Data Communications and Networks- Achut S Godbole, AtulKahate
2. Computer Networks, Mayank Dave, CENGAGE

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III Year – I Semester		L	T	P	C
		3	0	0	3
	DESIGN AND ANALYSIS OF ALGORITHMS				

Course Objectives:
Upon completion of this course, students will be able to do the following:
- Ability to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes: After the completion of the course, student will be able to
- Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
- List and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method
- Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
- Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
- Demonstrate NP- Completeness theory ,lower bound theory and String Matching

UNIT I:
Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, asymptotic notation, Randomized Algorithms.

UNIT II:
Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.
The Greedy Method: The general Method, knapsack problem, minimum-cost spanning Trees, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT III:
Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, optimal Binary search trees, 0/1 knapsack, The traveling salesperson problem.

UNIT IV:
Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.

UNIT V:
NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

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Text Books:

1. Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2. Introduction to Algorithms Thomas H. Cormen, PHI Learning
3. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.

Reference Books:

1. Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications,2008.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

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III Year – I Semester		L	T	P	C
		3	0	0	3
	DATA MINING TECHNIQUES				

Course Objectives:
The main objective of the course is to
- Introduce basic concepts and techniques of data warehousing and data mining
- Examine the types of the data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

Course Outcomes:
By the end of the course student will be able to
- Illustrate the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications.
- Demonstrate on various Data Preprocessing Techniques viz. data cleaning, data integration, data transformation and data reduction and Process raw data to make it suitable for various data mining algorithms.
- Choose appropriate classification technique to perform classification, model building and evaluation.
- Make use of association rule mining techniques viz. Apriori and FP Growth algorithms and analyze on frequent itemsets generation.
- Identify and apply various clustering algorithm (with open source tools), interpret, evaluate and report the result.

UNIT I:
Data Warehousing and Online Analytical Processing: Data Warehouse: Basic concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Introduction: Why and What is data mining, What kinds of data need to be mined and patterns can be mined, Which technologies are used, Which kinds of applications are targeted.

UNIT II:
Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT III:
Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction, Visual Mining for Decision Tree Induction.

UNIT IV:
Association Analysis: Problem Definition, Frequent Item set Generation, Rule Generation: Confident Based Pruning, Rule Generation in Apriori Algorithm, Compact Representation of frequent item sets, FP-Growth Algorithm.

UNIT V:
Cluster Analysis: Overview, Basics and Importance of Cluster Analysis, Clustering techniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bi-secting K Means,

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Text Books:
1. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier,2011.
2. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson,2012.

Reference Books:
1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.
3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.
   http://onlinecourses.nptel.ac.in/noc18_cs14/preview
5. (NPTEL course by Prof.PabitraMitra)
   http://onlinecourses.nptel.ac.in/noc17_mg24/preview
6. (NPTEL course by Dr. NandanSudarshanam& Dr. BalaramanRavindran)
   http://www.saedsayad.com/data_mining_map.htm

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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
		3	0	0	3
	DevOps **(Job Oriented Course)**				

Course Objectives:
- Introduces the basic concepts of Information System.
- To understand The Management Control Framework and The Application Control Framework.

Course Outcomes: At the end of the course, student will be able to
- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility.
- Describe DevOps & DevSecOps methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools
- Acquire the knowledge of maturity model, Maturity Assessment

UNIT I: Phases of Software Development Life Cycle, Values and principles of agile software development.

UNIT II: Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

UNIT III: DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT IV: CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

UNIT V: Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:
1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security   in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
2. What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

Reference Books:
1. Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.

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III Year – I Semester		L	T	P	C
		3	0	0	3
	ARTIFICIAL INTELLIGENCE **(Professional Elective –I)**				

Course Objectives: The student will be able to
- Know the methodology of Problem solving
- Implement basic AI algorithms
- Design and carry out an empirical evolution of different algorithms on a problem formalization

Course Outcomes (COs): At the end of the course, student will be able to
- Understand the fundamental concepts in Artificial Intelligence
- Analyze the applications of search strategies and problem   reductions
- Apply the mathematical logic concepts.
- Develop the Knowledge representations in Artificial Intelligence.
- Explain the Fuzzy logic systems.

UNIT I:
Introduction to artificial intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

UNIT II:
Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem
Search Strategies: exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction

UNIT III:
Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic

UNIT IV:
Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR
Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure.

UNIT V:
Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

Text Books:
1. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

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Reference Books:

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

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III Year – I Semester		L	T	P	C
		3	0	0	3

AGILE SOFTWARE PROCESS
(Professional Elective –I)

Course Objectives:
Students shall be able to
- Comprehend an iterative, incremental development process leads to faster delivery of more useful software.
- Apply the principles and practices of extreme programming.
- Analyze the essence of agile development methods.
- Develop prototyping in the software process.

Course Outcomes:
After going through this course the student will be able to:
- Comprehend the common characteristics of an agile development process.
- Identify and contrast state of the practice agile methodologies.
- Analyze and contrast agile software development process models and plan driven process models.
- Determine software project characteristics that would be suitable for an agile process

UNIT I:
The Agile Movement - A Five Minute Primer, What is Agile Development, The Agile Methodologies Agile Values, Agile Practices, Agile Principles Agile Characteristics-The Characteristics of an Agile Project, The Development Team Project Management, The Customer, Processes and Tools The Contract, What Projects Can Benefit from Agile Development.

UNIT II:
The Agile Methodologies: Common Themes, Methodology Descriptions, Extreme Programming, Scrum, Feature Driven Development, The Crystal Methodologies, Adaptive Software Development, Dynamic Systems Development Method, Lean Software Development, Starting Monday: Investigate Further Selecting an Approach that Fits: Choosing between an Agile or Traditional Approach, Selecting the Right Agile Approach

UNIT III:
Going Agile: Is the Team Ready? Announcing the Team's Intention to Go Agile, Encountering, Addressing and Overcoming Resistance, Start with the Bare Minimum, Altering the Project Environment, Iteration Zero, Discontinue a Process Once its Served its Purpose, False Agile, Practitioners and Projects, Starting Monday: Measuring The Team's Progress.

UNIT IV:
Agile Practices: Getting Started, Agile Practices Explained, Selecting the Next Practice, Rejecting a Practice, Adopt Practices before Tools Learn Programming Practices in Pairs, Agile Practices in this Book Agile Practices Explained, Why these Practices were Chosen

UNIT V:
Testing :An Agile Approach to Testing, The Good Enough Approach Testing as the Best Defense, Sharing a Code Base with another Project Team, Sharing Common Components with another Project Team, Depending upon Code or Components Produced by Another Project Team

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Text Books:
1. Agile Software Development with Scrum, Ken Schawber, Mike Beedle, Pearson, 2015. ISBN-13: 9780132074896.
2. Integrating Agile Development In The Real World (Charles River Media Programming), Peter Schuh, , 2004, Cengage Learning, ISBN-13: 9781584503644

Reference Books:
1. Agile Testing: A Practical Guide for Testers and Agile Teams, Lisa Crispin, Janet Gregory, Publisher: Addison Wesley
2. Agile Software Development, Principles, Patterns and Practices, Alistair Cockburn, Pearson Education, 2015. ISBN-13: 9780321482754
3. Agile Software Development: The Cooperative Game, By Alistair Cockburn Publisher: Addison Wesley

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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
		3	0	0	3
	DISTRIBUTED SYSTEMS **(Professional Elective –I)**				

Course Objectives:
- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributedsystems
- To learn distributed mutual exclusion and deadlock detection algorithms
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
- To learn the characteristics of peer-to-peer and distributed shared memory systems

Course Outcomes:
At the end of the course, the students will be able to:
- Elucidate the foundations and issues of distributed systems
- Illustrate the various synchronization issues and global state for distributed systems
- Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems
- Describe the features of peer-to-peer and distributed shared memory systems

UNIT I:
Distributed Systems: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues andchallenges.
A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications.
Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

UNIT II:
Message Ordering & Snapshots: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

UNIT III:
Distributed Mutex & Deadlock: Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport's algorithm, Ricart-Agrawala algorithm, Maekawa's algorithm, Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp's classification, Algorithms forthe single resource model, the AND model and the OR model.

UNIT IV:
Recovery & Consensus: Check pointing and rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, Coordinated check pointing algorithm, Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure, free system, Agreement in synchronous systems with failures.

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UNIT V:

Peer-to-peer computing and overlay graphs: Introduction, Data indexing and overlays, Chord –Content addressable networks, Tapestry.

Distributed shared memory: Abstraction and advantages, Memory consistency models, Sharedmemory Mutual Exclusion.

Text Books:
1. Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and TimKindberg, Fifth Edition, Pearson Education, 2012.
2. Distributed computing: Principles, algorithms, and systems, Ajay Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.

Reference Books:
1. Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall ofIndia, 2007.
2. Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri,McGraw-Hill, 1994.
3. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,PearsonEducation, 2007.

e-Resources:
   1) https://nptel.ac.in/courses/106/106/106106168/

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III Year – I Semester		L	T	P	C
		3	0	0	3
	ADVANCED UNIX PROGRAMMING **(Professional Elective –I)**				

Course Objectives:
Understating the shell commands, shell programming, system calls of files and processes, signals, inter-process communication concepts and programming, TCP and UDP.

Course Outcomes: After finishing this course student will be able to:
- Gain good knowledge on Unix commands and awareness of shell programming
- Know about different system calls for files and directories
- Ability to know the working of processes and signals
- Application of client server program for IPC
- Knowledge about socket programming

UNIT I:
Introduction, Architecture of unix, Responsibilities of shell, unix file system, vi editor. **Unix commands**: Some Basic Commands, file utilities, process utilities, text processing utilities, network utilities, disk utilities, backup utilities , Security by file permissions.

UNIT II:
Shell Programming: shell variables, The Export command, The Profile File a Script Run During starting, The First Shell Script, The read command, Positional Parameters, The $? Variable , Knowing the exit Status- More about the Set Command, The Exit command, Branching Control Structures, Loop Control Structures, The Continue and Break Statement- The Expr Command, Performing Integer Arithmetic- Real Arithmetic in Shell Programs- The here Document(<<), The Sleep Command, Debugging Scripts, The Script command, The Eval command, The Exec Command, Sample programs. **Files** - Introduction, file descriptors, open, creat, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, links-soft and hard links-symlink, link, unlink.

UNIT III:
Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions. **Process Control**: process identifiers, fork function, vfork function, exit function, wait and waitpid functions, exec functions, user identification. **Signals**: signal handling using signal function, kill and raise, alarm, pause, abort and sleep functions.

UNIT IV:
IPC: introduction, pipes, FIFO's, client –server examples for pipes and FIFO's **message queues:** message queue structure in kernel, system calls of message queue, client-server example for message queue. **Semaphores:** definition, system calls of semaphores, semaphores structure in kernel, file locking using semaphores

UNIT V:
Shared memory-system calls of shared memory, semaphore structure in kernel, client server example. **Sockets:** Introduction, overview, elementary socket system calls, TCP Echo program, UDP Echo program

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Text Books:
1. Unix the ultimate guide, 3rd edition, Sumitabha Das, TMH.
2. Advanced programming in the Unix environment by W. Richard Stevens.
3. Unix network programming by W. Richard Stevens.

Reference Books:
1. Introduction to Unix and shell programming, Venkateshmurhty
2. Unix and shell programming by B.M. Harwani, OXFORD university press.

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III Year – I Semester		L	T	P	C
		0	0	3	1.5
	DATA MINING TECHNIQUES WITH R LAB				

Course Objectives:
- To understand the mathematical basics quickly and covers each and every condition of data mining in order to prepare for real-world problems.
- The various classes of algorithms will be covered to give a foundation to further apply knowledge to dive deeper into the different flavors of algorithms.
- Students should aware of packages and libraries of R and also familiar with functions used in R for visualization.
- To enable students to use R to conduct analytics on large real life datasets.
- To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R.

Course Outcomes(COs): At the end of the course, student will be able to
- Extend the functionality of R by using add-on packages
- Extract data from files and other sources and perform various data manipulation tasks on them.
- Code statistical functions in R
- Use R Graphics and Tables to visualize results of various statistical operations on data
- Apply the knowledge of R gained to data Analytics for real life applications

List of Experiments:
1. Implement all basic R commands.
2. Interact data through .csv files (Import from and export to .csv files).
3. Get and Clean data using swirl excercises.(Use 'swirl' package, library and install that topic from swirl).
4. Visualize all Statistical measures (Mean,Mode, Median, Range, Inter Quartile Range etc., using Histograms, Boxplots and Scatter Plots).
5. Create a data frame with the following structure.

EMP ID	EMP NAME	SALARY	START DATE
1	Satish	5000	01-11-2013
2	Vani	7500	05-06-2011
3	Ramesh	10000	21-09-1999
4	Praveen	9500	13-09-2005
5	Pallavi	4500	23-10-2000

   a.   Extract two column names using column name.
   b.   Extract the first two rows and then all columns.
   c.   Extract 3rd and 5th row with 2nd and 4th column.
6. Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into
   i.   0 to 1 range with min-max normalization.
   ii.   a value around 0 with z-score normalization.
7. Create a data frame with 10 observations and 3 variables and add new rows and columns to it using 'rbind' and 'cbind' function.
8. Write R program to implement linear and multiple regression on 'mtcars' dataset to estimate the value of 'mpg' variable, with best R^2 and plot the original values in 'green' and predicted values in 'red'.

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9. Write R Programs to implement k-means clustering.
10. Write R Programs to implement k-medoids clustering.
11. Write R Programs to implement density based clustering on iris dataset.
12. Write a R Program to implement decision trees using 'readingSkills' dataset.
13. Implement decision trees using 'iris' dataset using package party and 'rpart'.
14. Use a Corpus() function to create a data corpus then Build a term Matrix and Reveal word frequencies.

Reference Books:

1. www.tutorialspoint.com/r
2. www.r-tutor.com
3. R and Data Mining: Examples and Case Studies, 1st ed, Yanchang Zhao, Sprnger, 2012.
4. https://towardsdatascience.com/

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III Year – I Semester		L	T	P	C
		0	0	3	1.5
	COMPUTER NETWORKS LAB				

Course Objectives:
Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

Course Outcomes:
By the end of the course student will be able to
- Know how reliable data communication is achieved through data link layer.
- Suggest appropriate routing algorithm for the network.
- Provide internet connection to the system and its installation.
- Work on various network management tools

List of Experiments:

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as
   i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra's algorithm to compute the Shortest path through a graph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12. Write a Program to implement Broadcast tree by taking subnet of hosts.
13. Wireshark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
14. How to run Nmap scan
15. Operating System Detection using Nmap
16. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate& Throughput.

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III Year – I Semester		L	T	P	C
		0	0	4	2
	ANIMATION COURSE: ANIMATION DESIGN **(Skill Oriented Course)**				

Course Objectives:
The main objective of this course is to understand 2-D and 3-D animation using Adobe package

Course Outcomes:
At the end of the Course, Student will be able to:
- learn various tools of digital 2-D animation
- understand production pipeline to create 2-D animation.
- apply the tools to create 2D animation for films and videos
- understand different styles and treatment of content in 3D model creation
- apply tools to create effective 3D modelling texturing and lighting

List of Experiments:

1. Adobe Photoshop:
   a. Create your visiting card
   b. Create Title for any forthcoming film
2. Draw Cartoon Animation using reference
3. Creating Frame by Frame animation
4. Create a scene by using Mask layers animation
5. Adobe Illustrator:
   Packet Design(Toothpaste packet, Soap cover, any Food product)
6. Create any model of the male or female character
7. Create any Model of Cars or Bike
8. Create any Model of any animal.
9. Create any Model of any birds, fishes, and worms.
10. Create and Convert 2D objects into 3D objects
11. Create an animated 3D titling with sound
12. Create any Model some objects such as chairs, tables, fruits, utensils

List of Augmented Experiments: (Weeks 13 – Week 16)
(Any two of the following experiments can be performed)

1. Animate day and night scene of a street with the help of lighting
2. Create a human character using Character studio and animate the same
3. Create a natural outdoor or indoor scene.
4. Apply texture on various objects and characters

Reference Books:
1. Flash MX 2004, Thyagharajan Anbumani, TMH.
2. Brian Underdahl, The Complete Reference – Macromedia Flash Mx2004, 2nd edition – TMH.

Web Links:
1. https://onlinecourses.swayam2.ac.in/cec21_cs07/preview
2. https://onlinecourses.swayam2.ac.in/ugc19_cs09/preview
3. https://onlinecourses.swayam2.ac.in/ntr20_ed15/preview
4. https://youtube.com/playlist?list=PLfFk8y2fd3FjeE_CrFASNvDLBp3yF1Hwi

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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
		0	0	4	2
CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DevOps **(Skill Oriented Course)**					

Course Outcomes:
At the end of the Course, Student will be able to:
- ➢ Understand the why, what and how of DevOps adoption
- ➢ Attain literacy on Devops
- ➢ Align capabilities required in the team
- ➢ Create an automated CICD pipeline using a stack of tools

List of Exercises:

Note: There are online courses indicated in the reference links section. Learners need to go through the contents in order to perform the given exercises

Exercise 1:

Reference course name :Software engineering and Agile software development
Get an understanding of the stages in software development lifecycle, the process models, values and principles of agility and the need for agile software development. This will enable you to work in projects following an agile approach to software development.
Solve the questions given in the reference course name to gauge your understanding of the topic

Exercise 2:

Reference course name: Development & Testing with Agile: Extreme Programming
Get a working knowledge of using extreme automation through XP programming practices of test first development, refactoring and automating test case writing.
Solve the questions in the "Take test" module given in the reference course name to gauge your understanding of the topic

Exercise 3:

Module name : DevOps adoption in projects
It is important to comprehend the need to automate the software development lifecycle stages through DevOps. Gain an understanding of the capabilities required to implement DevOps, continuous integration and continuous delivery practices.
Solve the questions given in Quiz1, Quiz2, Quiz 3

Exercise 4:

Module name :Implementation of CICD with Java and open source stack
Configure the web application and Version control using Git using Git commands and version control operations.

Exercise 5:

Module Name: Implementation of CICD with Java and open source stack
Configure a static code analyzer which will perform static analysis of the web application code and identify the coding practices that are not appropriate. Configure the profiles and dashboard of the static code analysis tool.

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Exercise 6:

Module Name: Implementation of CICD with Java and open source stack
Write a build script to build the application using a build automation tool like Maven. Create a folder structure that will run the build script and invoke the various software development build stages. This script should invoke the static analysis tool and unit test cases and deploy the application to a web application server like Tomcat.

Exercise 7:

Module Name: Implementation of CICD with Java and open source stack
Configure the Jenkins tool with the required paths, path variables, users and pipeline views.

Exercise 8:

Module name: Implementation of CICD with Java and open source stack
Configure the Jenkins pipeline to call the build script jobs and configure to run it whenever there is a change made to an application in the version control system. Make a change to the background color of the landing page of the web application and check if the configured pipeline runs.

Exercise 9:

Module name: Implementation of CICD with Java and open source stack
Create a pipeline view of the Jenkins pipeline used in Exercise 8. Configure it with user defined messages.

Exercise 10 :

Module name: Implementation of CICD with Java and open source stack
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static analysis of code.

Exercise 11:

Module name :Implementation of CICD with Java and open source stack
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static unit testing.

Exercise 12:

Module name :Course end assessment
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for code coverage.

Reference Books:

1. Learning Continuous Integration with Jenkins: A beginner's guide to implementing Continuous Integration and Continuous Delivery using Jenkins - Nikhil Pathania ,Packt publication
[https://www.amazon.in/Learning-Continuous-Integration-Jenkins-Pathania/dp/1785284835]
2. Jenkins 2 – Up and Running: Evolve Your Deployment Pipeline for Next Generation Automation - Brent Laster, O'Reilly publication
[https://www.amazon.in/Jenkins-2-Running-Brent-Laster/dp/
1491979593]

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Hardware and software configuration:
1. Git [GitHub or Gitlab]
2. Sonarqube
3. Jenkins
4. JUnit
5. Eclipse
6. Tomcat server
7. Maven
8. Cobertura or JaCoCo
9. Java SDK
10. All necessary drivers and jar files for connecting the software
11. Windows machine with 16GB RAM

Web Links: (Courses mapped to Infosys Springboard platform)

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013382690411003904735_shared/overview [Software Engineering and Agile software development]

2. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_0135015781949767681046 7 [Development & Testing with Agile: Extreme Programming]

3. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01353898917192499226_shared [DevOps CICD]

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III Year – I Semester		L	T	P	C
		2	0	0	0
	EMPLOYABILITY SKILLS-I				

Course Objectives:
The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

Course Outcomes: The end of the course student will be able to
- Understand the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Understand the core competencies to succeed in professional and personal life

UNIT I:
Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.
Communication Skills: Verbal Communication; Non Verbal Communication (Body Language)

UNIT II:
Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT III:
Standard Operation Methods: Note Making, Note Taking, Minutes Preparation, Email & Letter Writing
Verbal Ability: Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies, Spotting Errors, Sentence Completion, Course of Action -Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work

UNIT IV:
Job-Oriented Skills –I: Group Discussion, Mock Group Discussions

UNIT V:
Job-Oriented Skills –II: Resume Preparation, Interview Skills, Mock Interviews

Text Books and Reference Books:
1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
4. Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

e-resources:
1.   www. Indiabix.com
2.   www.freshersworld.com

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III Year – I Semester	Minor Course	L	T	P	C
		3	0	2	4
	COMPUTER NETWORKS				

Course Objectives:
Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

Course Outcomes:
By the end of the course, the student will be able to
- Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
- Discuss different transmission media and different switching networks.
- Analyze data link layer services, functions and protocols like HDLC and PPP.
- Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
- Suggest appropriate routing algorithm for the network.
- Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

UNIT I:
Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History.
Physical Layer –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

UNIT II:
Data link layer: Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, **Elementary Data Link Layer protocols**: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.
Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.

UNIT III:
Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access:** Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA).

UNIT IV:
The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-

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General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- Admission Control-Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket.

UNIT V:

The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services-TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control, Congestion control in TCP.

List of Experiments:

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as
   i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra's algorithm to compute the Shortest path through a graph.

Text Books:
1. Computer Networks — Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks – Behrouz A. Forouzan, Fifth Edition TMH.

References Books:
1. Data Communications and Networks- Achut S Godbole, AtulKahate
2. Computer Networks, Mayank Dave, CENGAGE

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III Year – II Semester		L	T	P	C
		3	0	0	3
	MACHINE LEARNING				

Course Objectives:
- Identify problems that are amenable to solution by ANN methods, and which ML methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different ANN methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

Course Outcomes: After the completion of the course, student will be able to
- Explain the fundamental usage of the concept Machine Learning system
- Demonstrate on various regression Technique
- Analyze the Ensemble Learning Methods
- Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
- Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

Unit I:
Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.
Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit II:
Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, **Linear Models:** Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, **Binary Classification:** Multiclass/Structured outputs, MNIST, Ranking.

Unit III:
Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking.
Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

Unit IV:
Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures.
Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

Unit V:
Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

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Text Books:
1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,25th November 2020

Reference Books:
1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

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III Year – II Semester		L	T	P	C
		3	0	0	3
	BIG DATA ANALYTICS				

Course Objectives:
- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyze the big data using intelligent techniques
- To introduce programming tools PIG & HIVE in Hadoop echo system

Course Outcomes:
At the end of the course, the students will be able to
- Illustrate big data challenges in different domains including social media, transportation, finance and medicine
- Use various techniques for mining data stream
- Design and develop Hadoop
- Identify the characteristics of datasets and compare the trivial data and big data for various applications
- Explore the various search methods and visualization techniques

UNIT I:
Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

UNIT II:
Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies - Real Time Sentiment Analysis - Stock Market Predictions.

UNIT III:
Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNIT IV:
Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

UNIT V:
Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application

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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

Reference Books:
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.
4. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

Software Links:
1. Hadoop:http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html

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III Year – II Semester		L	T	P	C
		3	0	0	3
	CRYPTOGRAPHY AND NETWORK SECURITY				

Course Objectives:
The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

Course Outcomes : At the end of the course, student will be able to
- Explain different security threats and countermeasures and foundation course of cryptography mathematics.
- Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
- Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
- Design applications of hash algorithms, digital signatures and key management techniques
- Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec .

UNIT I:
Basic Principles : Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.

UNIT II:
Symmetric Encryption: Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

UNIT III:
Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

UNIT IV:
Data Integrity, Digital Signature Schemes & Key Management : Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

UNIT V:
Network Security-I: Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, **Network Security-II :** Security at the Network Layer: IPSec, System Security

Text Books:
1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. Cryptography and Network Security,4th Edition, William Stallings, (6e) Pearson,2006
3. Everyday Cryptography, 1st Edition, Keith M.Martin, Oxford,2016

Reference Books:
1. Network Security and Cryptography, 1st Edition, Bernard Meneges, Cengage Learning,2018

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III Year – II Semester		L	T	P	C
		3	0	0	3
	MOBILE COMPUTING **(Professional Elective-II)**				

Course Objectives:
- To understand the fundamentals of mobile communication
- To understand the architecture of various Wireless Communication Networks
- To understand the significance of different layers in mobile system Course Contents

Course Outcomes: Upon completion of the course, the students will be able to:
- Develop a strong grounding in the fundamentals of mobile Networks
- Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network
- Comprehend, design, and develop a lightweight network stack
- Analyze the Mobile Network Layer system working
- Explain about the WAP Model

UNIT I:
Introduction to Wireless Networks: Applications, History, Simplified Reference Model, Wireless transmission, Frequencies, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular Systems: Frequency Management and Channel Assignment, types of hand-off and their characteristics.

UNIT II:
MAC – Motivation, SDMA, FDMA, TDMA, CDMA, Telecommunication Systems, GSM: Architecture Location tracking and call setup, Mobility management, Handover, Security, GSM, SMS, International roaming for GSM, call recording functions, subscriber and service data management, DECT, TETRA, UMTS, IMT-2000.

UNIT III:
Wireless LAN: Infrared vs. Radio transmission, Infrastructure, Adhoc Network, IEEE 802.11WLAN Standards, Architecture, Services, HIPERLAN, Bluetooth Architecture & protocols.

UNIT IV:
Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, Mobile Transport Layer, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/Fast recovery, Transmission/Time-out freezing, Selective retransmission, Transaction Oriented TCP.

UNIT V:
Support for Mobility: Wireless Application Protocol: Architecture, Wireless Datagram Protocol, Wireless Transport Layer Security, Wireless Transaction Protocol, Wireless Session Protocol, Wireless Application Environment, Wireless Markup Language, WML Scripts, Wireless Telephone Application.

Text Books:
1. Jochen Schiller, "Mobile Communication", Second Edition, Pearson Education, 2008.

Reference Books:
1. William Stallings, "Wireless Communications and Networks", Second Edition, Pearson Education, 2004.
2. C. Siva Ram Murthy, B. S. Manoj, "Adhoc Wireless Networks: Architectures and Protocols", Second Edition, Pearson Education, 2008.

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III Year – II Semester		L	T	P	C
		3	0	0	3
	MEAN STACK DEVELOPMENT **(Professional Elective II)**				

Course Outcomes:

At the end of the Course, Student will be able to:

- Build static web pages using HTML 5 elements.
- Apply JavaScript to embed programming interface for web pages and also to perform Client side validations.
- Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js.
- Develop JavaScript applications using typescript and work with document database using MongoDB.
- Utilize Angular JS to design dynamic and responsive web pages.

UNIT-I:

HTML 5: Introduction to Web, Overview of Web Technologies, HTML - Introduction, HTML - Need, Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element, Sectioning Elements, Paragraph Element, Division and Span Elements, List Element, Link Element, Character Entities, HTML5 Global Attributes, Creating Table Elements, Table Elements : Colspan/ Rowspan Attributes, border, cellspacing and cellpadding attributes, Creating Form Elements, Input Elements - Attributes, Color and Date Pickers, Select and Datalist Elements, Editing Elements, Media, Iframe, Why HTML Security, HTML Injection, Clickjacking, HTML5 Attributes & Events Vulnerabilities, Local Storage Vulnerabilities, HTML5 - Cross-browser support, Best Practices For HTML Web Pages.

UNIT-II:

JavaScript: Why we need JavaScript, What is JavaScript, Environment Setup, Working with Identifiers, Type of Identifiers, Primitive and Non Primitive Data Types, Operators and Types of Operators, Types of Statements, Non - Conditional Statements, Types of Conditional Statements, If and Switch Statements, Types of Loops, Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions, Working With Classes, Creating and Inheriting Classes, In-built Events and Handlers, Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser and Document Object Model, Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods, Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API, Creating and consuming Modules.

UNIT-III:

Node.js: Why and What Node.js, How to use Node.js, Create a web server in Node.js, Node Package Manager, Modular programming in Node.js, Restarting Node Application, File Operations.

Express.js: Express Development Environment, Defining a route, Handling Routes, Route and Query Parameters, How Middleware works, Chaining of Middlewares, Types of Middlewares, Connecting to MongoDB with Mongoose, Validation Types and Defaults, Models, CRUD Operations, API Development, Why Session management, Cookies, Sessions, Why and What Security, Helmet Middleware, Using a Template Engine Middleware, Stylus CSS Preprocessor.

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UNIT-IV:
Typescript: Installing TypeScript, Basics of TypeScript, Function, Parameter Types and Return Types, Arrow Function, Function Types, Optional and Default Parameters, Rest Parameter, Creating an Interface, Duck Typing, Function Types, Extending Interfaces, Classes, Constructor, Access Modifiers, Properties and Methods, Creating and using Namespaces, Creating and using Modules, Module Formats and Loaders, Module Vs Namespace, What is Generics, What are Type Parameters, Generic Functions, Generic Constraints.

MongoDB: Introduction Module Overview, Document Database Overview, Understanding JSON, MongoDB Structure and Architecture, MongoDB Remote Management, Installing MongoDB on the local computer (Mac or Windows), Introduction to MongoDB Cloud, Create MongoDB Atlas Cluster, GUI tools Overview, Install and Configure MongoDB Compass, Introduction to the MongoDB Shell, MongoDB Shell JavaScript Engine, MongoDB Shell JavaScript Syntax, Introduction to the MongoDB Data Types, Introduction to the CRUD Operations on documents, Create and Delete Databases and Collections, Introduction to MongoDB Queries.

UNIT-V:
What is Angular, Features of Angular, Angular Application Setup, Components and Modules, Executing Angular Application, Elements of Template, Change Detection, Structural Directives - ngIf, ngFor, ngSwitch, Custom Structural Directive, Attribute Directives - ngStyle, ngClass, Custom Attribute Directive, Property Binding, Attribute Binding, Style and Event Binding, Built in Pipes, Passing Parameters to Pipes, Nested Components Basics, Passing data from Container Component to Child Component, Passing data from Child Component to ContainerComponent, Shadow DOM, Component Life Cycle, Template Driven Forms, Model Driven Forms or Reactive Forms, Custom Validators in Reactive Forms, Custom Validators in Template Driven forms, Dependency Injection, Services Basics, RxJS Observables, Server Communication using HttpClient, Communicating with different backend services using Angular HttpClient, Routing Basics, Router Links, Route Guards, Asynchronous Routing, Nested Routes.

Text Books:
1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow,O'Reilly.

Reference Books:
1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book,1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda SKatila, Cengage Learning.

Web Links:
1. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview (HTML5)

2. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview (Javascript)

3. https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview (Node.js & Express.js)

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4. https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview (Typescript)

5. https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)

6. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview (MongoDB)

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III Year – II Semester		L	T	P	C
		3	0	0	3
	DESIGN PATTERNS **(Professional Elective II)**				

Course Objectives:
- Demonstration of patterns related to object oriented design.
- Describe the design patterns that are common in software applications
- Analyze a software development problem and express it
- Design a module structure to solve a problem, and evaluate alternatives
- Implement a module so that it executes efficiently and correctly

Course Outcomes:
- Construct a design consisting of a collection of modules
- Examine well-known design patterns (such as Iterator, Observer, Factory and Visitor)
- Distinguish between different categories of design patterns
- Ability to understand and apply common design patterns to incremental /iterative development
- Identify appropriate patterns for design of given problem
- Design the software using Pattern Oriented Architectures

UNIT I:
Introduction: 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.
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.

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

UNIT III:
Structural Pattern: Adapter, Bridge, Composite, Decorator, açade, Flyweight, Proxy.

UNIT IV:
Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer.

UNIT V:
Behavioral Patterns: State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.
What to Expect from Design Patterns, a Brief History, the Pattern Community an Invitation, a Parting Thought.

Text Books:
1. "Design Patterns", Erich Gamma, Pearson Education.

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Reference Books:
1. "Head First Design patterns", Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
2. "Design Patterns in Java", Steven John Metsker & William C. Wake, Pearson education, 2006
3. "J2EE Patterns", Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
4. "Design Patterns in C#", Steven John metsker, Pearson education, 2004.
5. "Pattern Oriented Software Architecture", F.Buschmann & others, John Wiley & Sons.

e-Resources:
1. https://www.javatpoint.com/design-patterns-in-java
2. https://www.tutorialspoint.com/design_pattern/design_pattern_overview.htm

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III Year – II Semester		L	T	P	C
		3	0	0	3
	SCRIPTING LANGUAGES **(Professional Elective II)**				

Course Objectives:
From the course the student will
- Understand the concepts of scripting languages for developing web based projects
- Illustrates object oriented concepts like PHP, PYTHON, PERL
- Create database connections using PHP and build the website for the world
- Demonstrate IP address for connecting the web servers
- Analyze the internet ware application, security issues and frame works for application

Course Outcomes:
After the completion of the course, student will be able to do the following
- Ability to understand the differences between scripting languages
- Create PHP authentication Methodology for security issues
- Identify PHP encryption functions and Mcrypt Package
- Explain syntax and variables in TCL
- Able to gain some fluency programming in Ruby, JavaScript, Perl, Python, and related languages
- Master an understanding of python especially the object oriented concepts

UNIT I:
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 II:
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.
PHP Basics: PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT III:
Advanced PHP Programming: PHP and Web Forms, Files, PHP Authentication and Methodologies-Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package, Building Web sites for the World.

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

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UNIT V:

Python: Introduction to Python language, python-syntax, statements, functions, Built-in-functionsand Methods, Modules in python, Exception Handling. Integrated Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

Text Books:
1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
3. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech).

References Books:
1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Leeand B.Ware (Addison Wesley) Pearson Education. Programming Python,M.Lutz,SPD.
2. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
3. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
4. PHP and MySQL by Example, E.Quigley, Prentice Hall (Pearson).
5. Perl Power, J.P.Flynt, Cengage Learning.

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III Year – II Semester		L	T	P	C
		0	0	3	1.5
	BIG DATA ANALYTICS LAB				

Software Requirements :
1. **Hadoop**   **:** https://hadoop.apache.org/release/2.7.6.html
2. **Java**   **:** https://www.oracle.com/java/technologies/javase/javase8u211-later-archive-downloads.html
3. **Eclipse**   **:** https://www.eclipse.org/downloads/

List of Experiments:
Experiment 1: Week 1, 2:
　1. Implement the following Data structures in Java
　　a) Linked Lists b) Stacks c) Queues d) Set e) Map

Experiment 2: Week 3:
　2. (i)Perform setting up and Installing Hadoop in its three operating modes:
　　Standalone,   Pseudo distributed,   Fully distributed
　　(ii)Use web based tools to monitor your Hadoop setup.

Experiment 3: Week 4:
　3.Implement the following file management tasks in Hadoop:
- Adding files and directories
- Retrieving files
- Deleting files

　Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Experiment 4: Week 5:
　4. Run a basic Word Count MapReduce program to understand MapReduce Paradigm**.**

Experiment 5: Week 6:
　5. Write a map reduce program that mines weather data.
　Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for   analysis with Map Reduce, since it is semi structured and record-oriented.

Experiment 6: Week 7:
　6.Use MapReduce to find the shortest path between two people in a social graph.
　Hint: Use an adjacency list to model a graph, and for each node store the distance from the original node, as well as a back pointer to the original node. Use the mappers to propagate the distance to the original node, and the reducer to restore the state of the graph. Iterate until the target node has been reached.
Experiment 7: Week 8:
　7. Implement Friends-of-friends algorithm in MapReduce.
　Hint: Two MapReduce jobs are required to calculate the FoFs for each user in a social network .The first job calculates the common friends for each user, and the second job sorts the common friends by the number of connections to your friends.

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Experiment 8: Week 9:

    8.   Implement an iterative PageRank graph algorithm in MapReduce.

    Hint: PageRank can be implemented by iterating a MapReduce job until the graph has converged. The mappers are responsible for propagating node PageRank values to their adjacent nodes, and the reducers are responsible for calculating new PageRank values for each node, and for re-creating the original graph with the updated PageRank values.

Experiment 9: Week 10:

    9.   Perform an efficient semi-join in MapReduce.

    Hint: Perform a semi-join by having the mappers load a Bloom filter from the Distributed Cache, and then filter results from the actual MapReduce data source by performing membership queries against the Bloom filter to determine which data source records should be emitted to the reducers.

Experiment 10: Week 11:

    10.   Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Experiment 12: Week 12:

    11.   Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes

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III Year – II Semester		L	T	P	C
		0	0	3	1.5
	MACHINE LEARNING USING PYTHON LAB				

Course Objectives:
This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

Course Outcomes (Cos): At the end of the course, student will be able to
- Implement procedures for the machine learning algorithms
- Design and Develop Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Develop Machine Learning algorithms to solve real world problems

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

Experiment-1:
Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Experiment-2:
For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Experiment-3:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-4:
Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Experiment-5: Develop a program for Bias, Variance, Remove duplicates , Cross Validation
Experiment-6: Write a program to implement Categorical Encoding, One-hot Encoding

Experiment-7:
Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment-8:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment-9: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Experiment-10:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and

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recall for your data set.

Experiment-11: Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-12: Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Experiment-13:
Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set

Experiment-14:
Write a program to Implement Support Vector Machines and Principle Component Analysis

Experiment-15:
Write a program to Implement Principle Component Analysis

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III Year – II Semester		L	T	P	C
		0	0	3	1.5
CRYPTOGRAPHY AND NETWORK SECURITY LAB					

Course Objectives:
- To learn basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
- To understand and implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher.

Course Outcomes: At the end of the course, student will be able to
- Apply the knowledge of symmetric cryptography to implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher
- Demonstrate the different algorithms like DES, BlowFish, and Rijndael, encrypt the text "Hello world" using Blowfish Algorithm.
- Analyze and implement public key algorithms like RSA, Diffie-Hellman Key Exchange mechanism, the message digest of a text using the SHA-1 algorithm

List of Experiments:
1. Write a C program that contains a string (char pointer) with a value \Hello World'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value \Hello World'. The program should AND or and XOR each character in this string with 127 and display the result
3. Write a Java program to perform encryption and decryption using the following algorithms:
   a) Ceaser Cipher
   b) Substitution Cipher
   c) Hill Cipher
4. Write a Java program to implement the DES algorithm logic
5. Write a C/JAVA program to implement the BlowFish algorithm logic
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Using Java Cryptography, encrypt the text "Hello world" using BlowFish. Create your own key using Java key tool.
8. Write a Java program to implement RSA Algorithm
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

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III Year – II Semester		L	T	P	C
		0	0	4	2
DATA SCIENCE: NATURAL LANGUAGE PROCESSING **(Skill Oriented Course)**					

Course Outcomes:
Upon successful completion of the course, the student will be able to:
- Explore natural language processing (NLP) libraries in Python
- Learn various techniques for implementing NLP including parsing & text processing
- Understand how to use NLP for text feature engineering

Python Libraries: nltk, re,word2vec

List of Experiments :

1. Demonstrate Noise Removal for any textual data and remove regular expression pattern such as hash tag from textual data.
2. Perform lemmatization and stemming using python library nltk.
3. Demonstrate object standardization such as replace social media slangs from a text.
4. Perform part of speech tagging on any textual data.
5. Implement topic modeling using Latent Dirichlet Allocation (LDA) in python.
6. Demonstrate Term Frequency – Inverse Document Frequency (TF – IDF) using python
7. Demonstrate word embeddings using word2vec.
8. Implement Text classification using naïve bayes classifier and text blob library.
9. Apply support vector machine for text classification.
10. Convert text to vectors (using term frequency) and apply cosine similarity to provide closeness among two text.
11. Case study 1: Identify the sentiment of tweets

    In this problem, you are provided with tweet data to predict sentiment on electronic products of netizens.
12. Case study 2: Detect hate speech in tweets.

    The objective of this task is to detect hate speech in tweets. For the sake of simplicity, we say a tweet contains hate speech if it has a racist or sexist sentiment associated with it. So, the task is to classify racist or sexist tweets from other tweets.

Web References:
1. https://www.analyticsvidhya.com/blog/2017/01/ultimate-guide-to-understand-implement-natural-language-processing-codes-in-python/
2. https://datahack.analyticsvidhya.com/contest/linguipedia-codefest-natural-language-processing-1/?utm_source=ultimate-guide-to-understand-implement-natural-language-processing-codes-in-python&utm_medium=blog
3. https://www.analyticsvidhya.com/blog/2018/07/hands-on-sentiment-analysis-dataset-python/

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III Year – II Semester		L	T	P	C
		0	0	4	2
	VIDEO ANALYTICS **(Skill Oriented Course)**				

Course Outcomes:
At the end of the Course, Student will be able to:
- Illustrate the principles and techniques of digital image
- Demonstrate the image recognition and motion recognition
- Discuss the fundamentals of digital video processing
- Illustrate the motion estimation, segmentation and modeling
- Analyze video processing in applications

List of Experiments:
Note: Implement the following applications using MATLAB/Open CV/Python

1. Image enhancement application
2. Object/image recognition applications based on digital image transforms.
3. Image analysis systems for object recognition.
4. Content Based Image Retrieval
5. Image compression, Image Fusion
6. Image Steganography, Watermarking
7. Video Enhancement and Noise Reduction
8. Motion Estimation and Segmentation,
9. Motion Tracking
10. Multi-target/Multi-camera tracking
11. Action Recognition

List of Augmented Experiments: (Weeks 13 – Week 16)
(Any two of the following experiments can be performed)
1. Implement Optical character recognition,
2. Implement Image Captioning and Visual Question Answering.
3. Implement Gesture Recognition.
4. Implement Smart Surveillance and Tracking

Reference Books:
1. "Practical Image and Video Processing Using MATLAB", Oge Marques,Wiley-IEEE Press,2011.
2. "Image Engineering: Processing, Analysis and Understanding", Yu Jin Zhang, Tsinghua University Press, 2009.
3. "Object Detection and Recognition in Digital Images: Theory and Practice",   Boguslaw Cyganek ,Wiley 2013.

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III Year – II Semester		L	T	P	C
		2	0	0	0
	EMPLOYABILITY SKILLS-II				

Course Objectives:
The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

Course Outcomes: After completion of this course
- Solve various Basic Mathematics problems by following different methods
- Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
- Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
- Analyze, summarize and present information in quantitative forms including table, graphs and formulas

UNIT I:
Numerical ability l: Number system, HCF & LCM, Average, Simplification, Problems on numbers
Numerical ability II: Ratio & Proportion, Partnership, Percentages, Profit & Loss

UNIT II:
Arithmetical ability l: Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.
Arithmetical ability ll: Time & Distance, Problems on boats &Steams, Problems on Trains

UNIT III:
Arithmetical ability lll: Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock,
Logical ability: Permutations and Combination and Probability.

UNIT IV:
Mensuration: Geometry, Areas, Volumes

UNIT V:
Data interpretation: Tabulation, Bar graphs, Pie charts, line graphs

Text Books And Reference Books:
1. R. S. Aggarwal "Quantitative Aptitude", Revised ed., S Chand publication, 2017 ISBN:8121924987

E- resources:
1. https://blog.feedspot.com/aptitude_youtube_channels/
2. https://www.tutorialspoint.com/quantitative_aptitude/
3. https://www.careerbless.com/aptitude/qa/home.php

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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – II Semester	Minor Course	L	T	P	C
		3	0	2	4
	DATA STRUCTURES AND ALGORITHMS				

Course Objectives:

The objective of the course is to
- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
- Demonstrate the different data structures implementation

Course Outcomes:

After completing this course a student will be able to:
- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

UNIT I:

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II:

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation, Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III:

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues- Circular Queues, Deques, Priority Queues, Multiple Queues.

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV:

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals,

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UNIT V:
Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path

Exercise -1 (Searching)
a) Write C program that use both recursive and non recursive functions to performLinear search for a Key value in a given list.
b) Write C program that use both recursive and non recursive functions to performBinary search for a Key value in a given list.

Exercise -2 (Sorting-I)
a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -3(Sorting-II)
a) Write C program that implement radix sort, to sort a given list of integers in ascending order
b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4(Singly Linked List)
a) Write a C program that uses functions to create a singly linked list
b) Write a C program that uses functions to perform insertion, deletion operations on a singly linked list
c) Write a C program to reverse elements of a single linked list.

Exercise -5(Queue)
a) Write C program that implement Queue (its operations) using arrays.
b) Write C program that implement Queue (its operations) using linked lists

Exercise -6(Stack)
a) Write C program that implement stack (its operations) using arrays
b) Write C program that implement stack (its operations) using Linked list
c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7(Binary Tree)
Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

Exercise -8(Binary Search Tree)
a) Write a C program to Create a BST
b) Write a C program to insert a node into and delete a node from a BST.

Text Books:
1) Data Structures Using C. 2nd Edition.Reema Thareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:
1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3) Data Structures with C, Seymour Lipschutz TMH