

SEMESTER/YEAR : 7TH SEM / 4TH YEAR
COURSE CODE : 16CS402
TITLE OF THE COURSE : EMBEDDED SYSTEMS
L: T/A: P: C : 2 : 0 : 2 : 3

Course Objectives:

1. To get ability to identify, formulate and design solutions in the areas of embedded computing system
2. To understand the program design and analysis

Course Outcomes: At the end of the course students will be able to

1. Explain the purpose of embedded systems and compare microprocessors with microcontrollers
2. Design and analysis of a processor for specific Purpose
3. To Design Real Time Operating System (RTOS) Based

Module I **6Hrs**

Embedded Computing: Introduction, Complex Systems and Microprocessors, Embedded Systems Design Process, Formalism for System design Example: Model Train Controller.

Module II **9Hrs**

Instruction Sets, CPUs: Preliminaries, ARM Processor, Programming Input and Output, Supervisor mode, Exceptions, Traps, Coprocessors, Memory Systems Mechanisms, CPU Performance, CPU Power Consumption. Design Example: Data Compressor.

Module III **10Hrs**

Bus-Based Computer Systems: CPU Bus, Memory Devices, I/O devices, examples of Arduino board and Raspberry pi. Component Interfacing, Designing with Microprocessor, Development and Debugging, System-Level Performance Analysis Design Example: Alarm Clock,

Module IV

7Hrs

Program Design and Analysis: Components for embedded programs, Models of programs, Assembly, Linking and Loading, Basic Compilation Techniques, Program optimization, Program-Level performance analysis, Software performance optimization, Program-Level energy and power analysis, Analysis and optimization of program size, Program validation and testing. Design Example: Software modem.

Module V

12Hrs

Real Time Operating System (RTOS) Based Design : Basics of OS, Kernel, types of OSs, tasks, processes, Threads, Multitasking and Multiprocessing, Context switching, Scheduling Policies, Task Communication, Task Synchronization, Inter process Communication mechanisms, Evaluating OS performance, Choice of RTOS, Power Optimization. Design Example: Telephone Answering machine.

Text Book

1. Wayne Wolf: Computers as Components, Principles of Embedded Computing Systems

- Design, 2nd Edition, Elsevier, 2008.
2. J.W. Valvano, Embedded Microcomputer System: Real Time Interfacing, Brooks/Cole, 2000.

References:

1. David Simon, An Embedded Software Primer, Addison Wesley, 2000.
2. H. Kopetz, Real-time Systems, Kluwer, 1997
3. R. Gupta, Co-synthesis of Hardware and Software for Embedded Systems, Kluwer 1995.
4. Gomaa, Software Design Methods for Concurrent and Real-time Systems, Addison-Wesley, 1993.
5. Shibu K V: Introduction to Embedded Systems, Tata McGraw Hill, 2009(Chapters 10, 13)

SEMESTER/YEAR : 7TH SEM / 4TH YEAR
COURSE CODE : 16CS403
TITLE OF THE COURSE : OPTIMIZATION TECHNIQUES
L: T/A: P: C : 3 : 0: 0 : 3

COURSE OBJECTIVES:

- 1) To introduce Optimization techniques and their applications
- 2) To formulate Optimization problems and selecting techniques to solve them
- 3) To study and understand the Un-constrained and Constrained techniques

COURSE OUTCOMES:

Students will be able to

- 1) Formulate the optimization problems and use suitable algorithm to solve Linear and Non-Linear Programming
- 2) Formulate Un-constrained and constrained optimization models and solve them using appropriate techniques

MODULE 1 - Introduction to Optimization

7Hrs

Introduction: Engineering application of optimization, statement of an optimization problem with example for minimum weight and optimum cost consideration, classification of optimization problems and techniques, Single variable optimization, multi-variable optimization with equality and inequality constraints and without constraints.

MODULE 2 - Formulation of optimization problems

7Hrs

Continuous functions - Discrete functions - Unimodal functions - Convex and concave functions. Necessary and sufficient conditions for optimum of unconstrained functions- Numerical methods for unconstrained functions - One-dimensional search - Gradient-free search with fixed step size.

MODULE 3 - Linear & Non-Linear Programming

12Hrs

Linear: Introduction, standard form of the problem, Geometry, basic terminology **Techniques of linear programming: Simplex method, Revised simplex method:** Duality in linear programming, decomposition principle, post-optimality analysis.
Non-Linear: Introduction, elimination methods: various search methods- Fibonacci method and golden section method Interpolation Method-Quadratic and cubic interpolation methods, Direct root method.

MODULE 4 - Unconstrained Optimization Introduction

10Hrs

Techniques: Introduction; Standard form of the problem and basic terminology; Direct search method- Simplex method, Random search method, Univariate and pattern search method Indirect search method-Steepest Descent (Cauchy) method, Conjugate gradient method, Newtons method, **Application to engineering problems.**

MODULE 5- Constrained Optimization Introduction

10Hrs

Standard form of the problem and basic terminology; Direct method: Sequential Linear Programming; Generalized Reduced gradient method, Methods of feasible direction

Indirect method: Penalty function method Interior and exterior penalty function method, Convex programming problem, Check for convergence Application to engineering problems.

Case Study: Genetic Algorithm based Optimization, Neural network based optimization.

Text Books

1. S.S.Rao, Engineering Optimisation- Theory and Practice, New Age International. 4th Edition.
2. G. Zapfel, R. Barone and M. Bogl, Metaheuristic search concepts: A tutorial with applications to production and logistics, Springer. 2010

Reference Books

1. Gass S. I., Introduction to Linear Programming, Tata McGraw Hill.
2. Reeves C., Modern heuristic techniques for combinatorial problems, Orient Longman.
3. Goldberg, Genetic algorithms in Search, optimization and Machine Learning, Addison Wesley.
4. K. Deb, Optimization for engineering design – algorithms and examples, Prentice Hall of India.
5. Gallagher and O.C Zeinkiewicz, Optimum Structural Design Theory & Applications, John Wiley.

SEMESTER/YEAR : 7TH SEM/ 4TH YEAR
COURSE CODE : 16CS428
TITLE OF THE COURSE : DATA WAREHOUSING AND DATA MINING
L: T/A: P: C : 3 : 0 : 0 : 3

COURSE OBJECTIVES:

1. Be familiar with the concepts of data warehouse and data mining
2. Apply preprocessing statistical methods for any given raw data.
3. Be acquainted with the tools and techniques used for knowledgeDiscovery in Databases

COURSE OUTCOMES: At the end of the course students will be able to

1. Learn the concepts of database technology evolutionary path which hasled to the need for data mining and its applications
2. Explore DWH and OLAP , and devise efficient & cost effective methods for maintaining DWHs
3. Develop practical work of DM techniques and design hypotheses based onthe analysis to conceptualize a DM solution to a practical problem.

MODULE 1 - DATA WAREHOUSING:

8Hrs

Data warehousing Components -Building a Data warehouse -- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

MODULE 2 - BUSINESS ANALYSIS:

9Hrs

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.

MODULE 3 - DATA MINING:

9Hrs

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Types of Data-attributes and measurements, types of data sets, Data Quality, Data Mining Task Primitives – Integrationof a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.

MODULE 4 - CLUSTERING AND TRENDS IN DATA MINING:

9Hrs

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications

MODULE 5 - ASSOCIATION RULE MINING AND CLASSIFICATION:

10Hrs

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based AssociationMining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation –Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

TEXTBOOKS:

1. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition,Tenth Reprint,2007.
- 2.Jiawei Han and MichelineKamber, "Data Mining Concepts and Techniques", Second Edition,Elsevier,2007.

REFERENCES:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, " Introduction To Data Mining", PersonEducation,2007.
- 2.K.P. Soman, Shyam Diwakar and V. Ajay ", Insight into Data mining Theory and Practice", Easter Economy, Edition, PrenticeHallofIndia, 2006.
3. G. K. Gupta, " Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
- 4.DanielT.Larose, "Data Mining Methods and Models", Wile-Interscience, 2006.

SEMESTER/YEAR : 7TH SEM / 4TH YEAR
COURSE CODE : 16CS429
TITLE OF THE COURSE : CRYPTOGRAPHY
L: T/A: P: C : 3 : 0: 0 : 3

COURSE OBJECTIVES:

1. Understand OSI security architecture and classical encryption techniques. Acquire fundamental knowledge on the concepts of finite fields and number theory
2. To understand the various cryptographic concepts and algorithms
3. To understand the underlying mathematical structures of cryptographic algorithm
4. To get an overview of the various applications of the cryptographic algorithms and implement them in mini project.

COURSE OUTCOMES: At the end of the course students will be able to

1. Understand the theories and concepts of Cryptographic
2. Understand the Cryptographic Techniques
3. Design the Cryptographic Algorithms
4. Apply Cryptographic Algorithms in real world problems

MODULE 1 - Introduction & Number Theory

8Hrs

Services, Mechanisms and attacks-the OSI security architecture-Network security model- Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).

Finite fields and number theory: Overview of Groups, Rings, Fields-Modular arithmetic- Euclid's algorithm. Finite fields- Polynomial Arithmetic -Prime numbers, Fermat's and Euler's theorem- Testing for primality -The Chinese remainder theorem- Discrete logarithms.

MODULE 2 - Cryptographic Protocols

9Hrs

Foundations – Protocol Building Blocks - Basic Protocols - Intermediate Protocols – Advanced Protocols – Zero Knowledge Proofs - Zero-Knowledge Proofs of Identity -Blind Signatures - Identity-Based Public-Key Cryptography -Oblivious Transfer - Oblivious Signatures – Esoteric Protocols.

MODULE 3 - Cryptographic Techniques

9Hrs

Key Length - Key Management - Electronic Codebook Mode - Block Replay - Cipher Block Chaining Mode – Stream Ciphers - Self-Synchronizing Stream Ciphers - Cipher-Feedback Mode - Synchronous Stream Ciphers – Output Feedback Mode - Counter Mode - Choosing a Cipher Mode - Interleaving - Block Ciphers versus Stream Ciphers -Choosing an Algorithm - Public-Key Cryptography versus Symmetric Cryptography - Encrypting Communications Channels -Encrypting Data for Storage - Hardware Encryption versus Software Encryption - Compression, Encoding, and Encryption - Detecting Encryption – Hiding and Destroying Information.

MODULE 4 - Cryptographic Algorithms

9Hrs

Information Theory - Complexity Theory - Number Theory - Factoring - Prime Number Generation – Discrete Logarithms in a Finite Field - Data Encryption Standard (DES) – Lucifer - Madryga - NewDES - GOST – 3 Way – Crab– RC5 - Double Encryption - Triple Encryption - CDMF Key Shortening - Whitening.

MODULE 5 - Cryptographic Algorithms Design and Applications

10Hrs

Symmetric Algorithms (Pseudo-Random-Sequence Generators and Stream Ciphers – RC4 - SEAL - Cipher Design - N-Hash - MD4 - MD5 - MD2 - Secure Hash Algorithm (SHA) - One-Way Hash Functions Using Symmetric Block Algorithms)

Asymmetric Algorithms Using Public-Key Algorithms -Message Authentication Codes. RSA - Pohlig-Hellman - McEliece - Elliptic Curve Cryptosystems -Digital Signature Algorithm (DSA) - Gost Digital Signature Algorithm - Discrete Logarithm Signature Schemes – Ongchnorr - Shamir - Diffie-Hellman - Station-to-Station Protocol -Shamir's Three-Pass Protocol – IBM Secret-Key Management Protocol – Kerberos
Case study: IBM Common Cryptographic Architecture.

Text Books

1. Bruce Schneier, Applied Cryptography: Protocols, Algorithms, and Source Code in C, John Wiley & Sons, Inc, 2nd Edition, 2007.
2. William Stallings, Cryptography and Network Security, 6rd Edition, Pearson Education, 2013

Reference Books

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007.
2. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
3. Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006.
4. Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.
5. Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in PublicWorld", PHI 2002.
6. Bruce Schneier and Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
7. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.
8. AtulKahate, Cryptography and Network Security, Tata McGraw Hill, 2003.
Wenbo Mao, Modern Cryptography Theory and Practice, Pearson Education, 2004.

SEMESTER/YEAR : 8TH SEM / 4TH YEAR
COURSE CODE : 16CS436
TITLE OF THE COURSE : COMPUTER VISION
L: T/A: P: C : 3 : 0 : 0 : 3

COURSE OBJECTIVES:

1. To introduce various topics of computer vision with their applications.
2. Combining the analytics with CV which helps in various Video Analytics processing.

COURSE OUTCOMES: At the end of the course students will be able to

1. Computer Vision along with video analysis helps the students to do the video analytics in a much easier way using Stereo Vision and Structure from motion features.
2. Students will be able to do analysis on various real-time application of video analytics

MODULE 1 - Image Formation Models **8Hrs**

Introduction to Computer Vision, Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Image representations (continuous and discrete), Edge detection, Image Enhancement, Restoration, Histogram Processing.

MODULE 2- Depth estimation, views & Object Recognition **10Hrs**

Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, RANSAC, 3-D reconstruction framework; Auto-calibration. Houghtransforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, Shape priors for recognition

MODULE 3 - Motion Estimation& Analysis **8Hrs**

Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion, Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

MODULE 4- Shape Representation and Segmentation **10Hrs**

Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multi resolution analysis, Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, Texture Segmentation; Object detection.

MODULE 5 - Dynamic Vision

08Hrs

Multiview Identification: View based model, view correspondence, in identification, Generalization from multiple view.

Identifying moving faces, Biological perspectives, Computational Theories of temporal identification, identification using holistic temporal trajectories, Identification by Continuous view transformation.

Text Books

1. Computer Vision - A modern approach, by David A. Forsyth and Jean Ponce, Pearson, 2nd Edition, 2015
2. Computer Vision: Algorithms and Applications, by Richard Szeliski, Springer-Verlag London Limited 2011.
3. Dynamic Vision: From Images to Face Recognition, Imperial College Press, World Scientific Publication Co Ltd, 2000

Reference Books

1. Introductory Techniques for 3D Computer Vision, by Emanuele Trucco and Alessandro Verri, Publisher: Prentice Hall. 1998
2. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
3. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.
4. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992

SEMESTER/YEAR : 8TH SEM / 4TH YEAR
COURSE CODE : 16CS337
TITLE OF THE COURSE : PARALLEL COMPUTING
L: T/A: P: C : 3 : 0 : 0 : 3

Course Objectives

1. To understand the architectural, hardware, OS and programming aspects in High Performance Computing
2. To understand the distributed memory programming, shared memory programming, and a few parallel applications

Course Outcomes

1. Knowledge and understanding of high performance computing at various levels/layers
2. Design and implement parallel solutions to the given problems

Module 1: 8 Hrs

Introduction to Computer Systems: Processors, Memory, I/O Devices; Cost, timing, and scale (size) models. Program Execution: Process, Virtual Memory, System Calls, Dynamic Memory Allocation.

Module 2: 9 Hrs

Machine-Level View of a Program: typical RISC instruction set and execution, Pipelining. Performance issues and Techniques, Cost and Frequency Models for I/O, paging, and caching. Temporal and spatial locality.

Module 3: 10 Hrs

Typical Compiler Optimizations: Identifying program bottlenecks – profiling, tracing. Simple high-level language optimizations – locality enhancement, memory disambiguation. Choosing Appropriate Computing Platforms: benchmarking, cost-performance issues.

Module 4: 10 Hrs

Parallel Computing: Introduction to parallel Architectures and Interconnection Networks, communication latencies. Program parallelization: task partitioning and mapping, data distribution, Message passing, synchronization and deadlocks.

Module 5: 9 Hrs

Distributed memory programming using MPI/PVM. Shared memory parallel programming. Multithreading.

Text Books:

1. Dowd, K., High performance Computing, O'Reilly Series, 1993.
2. Culler, D., and Singh, J.P., Parallel Computer Architecture: A Hardware/Software Approach. Morgan Kaufmann Pub., 1999.

References

1. Gropp, W., Lusk, E., and Skjellum, A., Using MPI: Portable Parallel Programming with the Message-passing Interface, MIT Press, 1997.
2. Grama, Gupta, A., Karypis, G., Kumar, V., Introduction to Parallel Computing, Addison Wesley, 2003. ISBN:0-201-64865-2

SEMESTER/YEAR : 8TH SEM / 4TH YEAR
COURSE CODE : 16CS338
TITLE OF THE COURSE : SOCIAL NETWORKS AND ANALYTICS
L: T/A: P: C : 3 : 0 : 0 : 3

COURSE OBJECTIVES:

1. To understand the Social network concepts and its issues/challenges, various tools of Social network analysis.
2. To know about Social network APIs.
3. To know about mining and classification techniques of Social networks.

COURSE OUTCOMES: At the end of the course students will be able to

1. Understand the Social network concepts and its issues/challenges, various tools of Social network analysis.
2. Understand about Social network APIs.
3. Understand about mining and classification techniques of Social networks.

MODULE 1 - Introduction 8Hrs

Social network concepts – Development of social network and analysis - Online social networks – Social Network Data - Issues and challenges

MODULE 2 - Social Network Analysis 9Hrs

Linked-based and structural analysis - Content-based analysis - Static and dynamic analysis
Mathematical Representation of social networks

MODULE 3 - Social networking systems and API 9Hrs

Social networking systems and API - Statistical Analysis of Social Networks- Community Detection in Social Networks - Node Classification in Social Networks -Evolution in Dynamic Social Networks

MODULE 4 - Social Influence Analysis 9Hrs

Social Influence Analysis -Link Prediction in Social Networks -Data Mining in Social Media Text Mining in Social Networks - Social Tagging -Building social services

MODULE 5 - Tools for Social network analysis 9Hrs

UCINET – PAJEK– NETDRAW – StOCNET - SPlus - R – NodeXL- SIENA and RSIENA - Real-world networks (Facebook graph, Twitter networks,)
Case Studies

Text Books

1. Christina Prell, Social Network Analysis: History, Theory and Methodology, SAGE Publications Ltd, Publication Year 2011
2. Stanley Wasserman and Katherine Faust, “ Social Network Analysis: Methods and Applications”, Cambridge University Press, 1994

Reference Books

1. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, 2010
2. Carrington and Scott (eds). The SAGE Handbook on Social Network Analysis SAGE, First Edition 2011

SEMESTER	VI					
YEAR	III					
COURSE CODE	16CS475					
TITLE OF THE COURSE	INTRODUCTION OF BLOCKCHAIN AND DISTRIBUTED LEDGER					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-		-	39	3

Perquisite Courses (if any)

#	Sem/Year	Course Code	Title of the Course
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COURSE OBJECTIVES:

- Learn the underlying principles and techniques associated with block chain Technologies.
- Understand and describe how blockchain works
- Familiarize with Ethereum, smart contracts and related technologies, and solidity language.
- Understand the application of Blockchain in various domains

COURSE OUTCOMES:

CO No.	Outcomes	Blooms Taxonomy Level
CO1	Describe the basic concepts and technology used for blockchain	L2
CO2	Explore the usage of Merkle tree, cryptography and mining in Blockchain	L2
CO3	Use smart contract in real world applications.	L3
CO4	Implement Ethereum block chain contract.	L3
CO5	Apply hyper ledger platform to implement the Block chain Application	L3
CO6	Apply the learning of solidity and de-centralized apps on Ethereum.	L3

COURSE CONTENT:

MODULE 1: Introduction to Blockchain

8Hrs

Distributed systems, P2P network Architecture of Blockchain, Generic elements of a blockchain: How blockchain works, Benefits, features, and limitations of blockchain How blockchain accumulates blocks, types of blockchain, Distributed ledger, Consensus mechanisms-Proof of work, Proof of Stake, Proof of Authority, CAP theorem, Decentralization, Disintermediation, Ecosystem - Storage, Communication and Computation

MODULE 2: Cryptography and Smart Contracts

8Hrs

Symmetric cryptography (DES, AES), Asymmetric cryptography, Public and Private keys, Algorithms - RSA, Hash functions, SHA, SHA-256

Smart contracts - Benefits of Smart contracts, Solidity Programming-Types, Literals, Enums, write basic program using Solidity, Compile, verify and deploy.

MODULE 3: Ethereum Blockchain

8Hrs

The Ethereum network, Ethereum Virtual Machine Execution Environment, Opcodes and

their meaning, Structure of a Block, Genesis Block, Merkle tree, Geth, Transactions, Transaction receipts, Nonce, Gas - gasPrice, gasLimit, Ether, Mining, Wallets, Ethereum network (main net, test net), Metamask

MODULE 4: Ethereum Development

8Hrs

Infura, Web3.0 for Blockchain, Web3J -Java frontend, **Creating Blockchain network and peering**, Truffle - build contract, migrate and deploy, Ganache CLI

MODULE 5: **Hyperledger**

7Hrs

Projects under Hyperledger, Hyperledger reference architecture, Hyperledger design principles, Hyperledger Fabric, Hyperledger Sawtooth, Case study: Blockchain in IoT

TEXT BOOKS:

1. Mastering Blockchain, Third Edition, Published by Packt Publishing Ltd, Published 2020, Imran Bashir
2. Solidity Programming Essentials, First Edition, Published by Packt Publishing Ltd, April 2018
Blockchain for Dummies, Manav Gupta, IBM Limited Edition, John Wiley & Sons, Inc. 2017

SEMESTER/YEAR : 8TH SEM/ 4TH YEAR **COURSE CODE** : 16CS339
TITLE OF THE COURSE : HUMAN COMPUTER INTERFACE
L: T/A: P: C : 3 : 0 : 0 : 3

COURSE OBJECTIVES:

- Learn the foundations of Human Computer Interface
- Be familiar with the design technologies for individuals and persons with disabilities
- Be aware of mobile HCI
- Learn the guidelines for user interface.

COURSE OUTCOMES: At the end the course the students will be able to design the Human Computer Interface.

MODULE 1 - FOUNDATIONS OF HCI

6Hrs

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Historical evolution of HCI; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

MODULE 2- DESIGN & SOFTWARE PROCESS

9Hrs

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

MODULE 3 - MODELS AND THEORIES

12Hrs

Cognitive models –Socio-Organizational issues and stake holder requirements – Communication and collaboration models.

Keystroke level model (KLM), GOMS, CASE STUDIES.

Shneiderman's eight golden rules; Norman's seven principles; Norman's model of interaction; Neilsen's ten heuristics with example of use

MODULE 4- Responsive GUI Design

11 Hrs

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

MODULE 5

7 Hrs

Conversational Interfaces, IVR, Chatbot, ALEXIA, MONTANA and similar tools. Case Studies.

Text Books

1. Alan Dix, , Inc, Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction",3rd Edition, Pearson Education, 2004 (MODULE I, II & III)
2. Brian Fling, "Mobile Design and Development", First Edition ,O"Reilly Media Inc., 2009 (MODULE –IV).
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O"Reilly, 2009.(MODULE -V)

Reference Book:

1. Interaction Design, beyond Human Computer Interaction", by I Jennifer Preece, Yvonne Rogers, Helen Sharp, John Wiley & Sons

Elective Courses: UG Research Project/Product Development

1. 16CS340 UG Research Project/Product Development Foundation
2. 16CS432 UG Research Project/Product Development

Course credit: 03 for each of the above course

Introduction

16CS340 is a prerequisite for 16CS432. Apart from that, students can take this in any semester from 6th Sem onwards.

Students can register only for the foundation course or both the courses.

Course Introduction

These courses are intended to give highly motivated students the opportunity to learn how to do research and develop products by participating in an ongoing research/Product development project leading to a publication or a PoC implementation that can be pitched for funding opportunity.

Course Objectives

1. To identify key research questions within a field to carry out research in a team
2. To identify and summarize the literature review of the relevant field
3. To demonstrate relevant referencing and inculcate new skills in various aspects of academic writing
4. To demonstrate the knowledge and understanding of writing the publication/report
7. To showcase the strong evidence on the clarity of the argument, understanding of the selected domain area and presentation of its technical information
8. To detail description of the process of carrying out the independent research in written document along with results and conclusions with reference to the existing literature
9. To analyze and synthesize the new research findings

Course Outcomes

1. Draft of the Publication or Demonstration of the Proof-of-concept product, Draft of patent application

The research topic proposed by both the guide and the student team should be approved by the department chairman to proceed further. A degree of industrial input and involvement will be encouraged, and can be facilitated through existing academic-industrial collaborations or by addressing specific topics that are of interest to industrial partners.

All projects will be closely supervised by the Project Guide with ongoing feedback and guidance at all stages of the project from the conception to completion.

The following criteria will be checked by the department chairman to approve for the research proposal:

a. Department staff as course guide

1. Ability to provide research direction to the student in the chosen field of interest
2. Ability to design an appropriate research strategy and methodology to carry out the research by student
3. Ability to provide and evaluate the strong literature review document for the chosen research topic

5. Ability to train students on research paper / technical writing skills

6. Conduct reviews in regular time period and submit the evaluation to department chairman

b. Student Team

1. To be dedicated and committed to work on a new research topic by learning new technical skills
2. To have fair knowledge on what is product development or research topic
3. To have constant interaction with allocated guide by providing weekly updates
4. To be committed to complete the project and submitting the technical paper within the stipulated time framed by the university

Evaluation:

There will be CIA evaluation as well as the Semester end evaluation of the work done. It will be done by a committee of senior researchers of the Department.

The rubrics for this will be worked out shortly.

SEMESTER	IV					
YEAR	II					
COURSE CODE	20CS2406					
TITLE OF THE COURSE	FULL STACK DEVELOPMENT					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2	-	-	2	42	3

COURSE OBJECTIVES:

1. Understand the major areas and challenges of web programming..
2. To create websites using HTML5, CSS3, JavaScript
3. Front end framework for developing Interactive WebApp using ReactJS
4. Understand server-side scripting language-Node.JS
5. Latest Framework for fast API development using GraphQL

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
C01	Know the fundamentals of front end web technologies like HTML5 and CSS3.	L2
C02	Use of ReactJS a javascript library to build UI components	L3
C03	Building real world application using Node.Js,Express	L3
C04	Develop a fully functioning website and deploy on a web server.	L5

COURSE CONTENT:

MODULE 1

8 Hrs

Markup Language (HTML5), CSS3

Introduction to HTML and HTML5 - Formatting and Fonts -Commenting Code – Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – HTML Forms, Video & Audio tag

CSS3: Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; Background images, Conflict Resolution, CSS box model,CSS3 features: Box Shadow, Opacity, Rounded corners, Attribute selector

MODULE 2

9 Hrs

Client-Side Scripting: JavaScript , JSON

JavaScript Basics –Arrays- Functions - JavaScript objects – HTML DOM - DOM methods – Events-Regular Expressions , JSON

MODULE 3

9 Hrs

Node JS

Introduction to Node JS, Setup Dev Environment, Node JS Modules, Node Package Manager, File System, Debugging Node JS Application, Events, Express.JS, Database Connectivity, MVC Architecture In Node Js Applications

MODULE 4

10 Hrs

React JS

React.JS: Introducing React ,Main Principles of React, Building your first react app, Components in React, Transferring properties, Dealing with State, The Component life cycle, Virtual DOM, JSX

MODULE 5

9 Hrs

GraphQL

Introduction to GraphQL, GraphQL Vs. REST, GraphQL Vs. SQL, Your First GraphQL Query, Complex Types – Unions, Fragments, Interfaces, Graph Nodes, GraphQL with JavaScript, GraphQL with React, GraphQL Server-Exercise Problems

Text Books:

1. Robert W. Sebesta, Programming the World Wide Web ,7th Edition, Pearson Education, 2008.
2. Basarat Ali Syed - Beginning Node.js-Apress ,2014.
3. Anthony Accomazzo, Ari Lerner, Clay Allsopp, David Guttman, Tyler McGinnis, Nate Murray, FullStack React – The Complete Guide to ReactJS & Friends, Fullstack.io, 2017

References:

1. Lionel Lopez,React Quickstart Step-by-Step Guide to Learning React Javascript Library
 2. Kirupa Chinnathambi, JavaScript Absolute Beginner's Guide, 1st Edition, 2017.
 3. Robert W Sebesta, Pearson, Programming the World Wide Web, 7th Edition, 2013.
 4. Kirupa Chinnathambi, Learning React, 1 Edition, Addison-Wesley Professional
 5. Mark Pilgrim,HTML5Up and Running,O'Reilly, 1st Edition, 2012.
- <https://reacthandbook.com/>

SEMESTER/YEAR	: I SEM
COURSE CODE	: 20CSE5002
TITLE OF THE COURSE	:CLOUD COMPUTING AND APPLICATIONS
L: T/A:P: C	: 3: 0:2:4

COURSE OBJECTIVES:

1. To understand concepts of Cloud, Virtualization and limitations.
2. To understand cloud computing concepts, technologies and services.

COURSE OUTCOMES:

1. Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
2. Conceptual and sound knowledge of virtualization and different types of virtualization.
3. Acquire knowledge of cloud computing, technologies and services.
4. Explain the core issues of cloud computing such as security, privacy and interoperability.

MODULE 1

8 hrs

Introduction to Cloud Computing: Introduction- Historical Development – Cloud Computing Architecture – The Cloud Reference Model – Cloud Characteristics – Cloud Deployment Models: Public, Private, Community, Hybrid Clouds- **Cloud Delivery Models: IaaS, PaaS, SaaS – Open Source Private Cloud Software: Eucalyptus, Open Nebula, Open Stack.**

MODULE 2:

9 hrs

Virtualization: Definition, benefits, Data Center Technology – Virtualization – Characteristics of Virtualized Environments, Types of Virtualization, Para Virtualization, Hardware Assisted, Networking in virtualized environment, Virtual Machines and Access Control, Implementation Levels of Virtualization – **Tools and Mechanisms: Xen, VMWare, Microsoft Hyper-V, KVM, Virtual Box**

MODULE 3:

10 hrs

Cloud Computing Mechanism: Cloud Infrastructure Mechanism: Cloud Storage, Cloud Usage Monitor, Resource Replication – Specialized Cloud Mechanism: Load Balancer, SLA Monitor, Pay-per-use Monitor, Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi Device Broker, State Management Database – Cloud Management Mechanism: Remote Administration System, Resource Management System, SLA Management System, Billing Management System.

MODULE 4:

9 hrs

Security in the cloud: Basic Terms and Concepts – Threat Agents – Cloud Security Threats – Cloud Security Mechanism: Encryption, Hashing, Digital Signature, Public Key

Infrastructure, Identity and Access Management, Single Sign-on, Cloud Based Security Groups, Hardened Virtual Server Images.¹¹ AWS, Google Compute Engine, Azure, BeanStack, Red Hat OpenShift

MODULE 5:

9 hrs

Introduction to developing Cloud Services: Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – Microsoft Azure - IBM Clouds.

TEXT BOOKS

1. D. Marshall, W. A. Reynolds, and D. Mc Corry, Advanced Server Virtualization, Aurbech Publications, 2006.
2. John Rittinghouse & James Ransome, “Cloud Computing, Implementation, Management and Strategy”, CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert C. Elsenpeter, “Cloud Computing, A Practical Approach”, Tata McGraw-Hill Edition, 2010.
4. Dan C Marinescu-Cloud Computing Theory and Practice. Elsevier(MK) 2013.
5. Rajkumar Buyya, James Broberg, Andrzej Goscinski- Cloud Computing Principles and Paradigms, Willey 2014.

SEMESTER/YEAR : I SEM
COURSE CODE : 20CSE5003
TITLE OF THE COURSE : DEEP LEARNING-I
L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES

- To understand the basic building blocks and general principles that allows one to design Deep learning algorithms
- To become familiar with specific, widely used Deep learning networks
- To introduce building blocks of Convolution neural network architecture
- To learn to use deep learning tools and framework for solving real-life problems

COURSE OUTCOMES:

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

- Build various deep learning models
- Identify and Apply the deep learning algorithms which are more appropriate for various types of learning tasks in various domains
- Implement deep learning algorithms and solve real-world problems using deep learning tools and framework

Module-1 Introduction to Machine learning - Types of Machine Learning problems, Linear Regression- Basic elements of linear regression, Vectorization for Speed, From Linear Regression to Deep Networks, Softmax Regression

7 Hrs

Module-2 Mathematical background for Deep learning- Data Manipulation and Data Preprocessing, Linear Algebra, Calculus, Probability

5 Hrs

Module-3 Multilayer Perceptrons-hidden layers, activation functions, Model Selection, underfitting, overfitting, weight decay, dropout

5 Hrs

Module 4: Forward Propagation, Backward Propagation, and Computational Graphs Layers and Blocks, shallow neural network, deep neural network, Optimization for training Deep Models.

6 Hrs

Module 5: Foundations of Convolutional Neural Networks- Convolution operation, Convolutional Layers, Object Edge Detection in Images, Padding and Stride, Multiple Input and Multiple Output Channels, 1×1 Convolutional Layer, Pooling, Convolutional Neural Networks (LeNet) 5 Hrs

Text Books

1. [Aston Zhang](#), [Zack C. Lipton](#), [Mu Li](#), [Alex J. Smola](#), “Dive into Deep Learning”, Amazon Science, 2020
2. François Chollet, “Deep Learning Python”, Manning Publications, 2018
3. Ethem Alpaydin, “Introduction to Machine Learning”, PHI, 2005
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, The MIT Press, 2016.

Reference Books

5. Tom Mitchell, Machine Learning, McGraw-Hill, 1997
6. Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems”, O'Reilly Media; 1 edition (April 9, 2017)
7. Josh Patterson, “Deep Learning: A Practitioner's Approach”, O'Reilly Media; 1 edition (August 19, 2017)

DEEP LEARNING – II

SEMESTER/YEAR : II/I
COURSE CODE : 20CSE5004
TITLE OF THE COURSE : DEEP LEARNING-II
L: T/A:P: C : 3:0:2:4

COURSE OBJECTIVES

1. To understand the building blocks and working principles of advanced Deep learning models
2. To become familiar with few advanced topics in Deep learning

COURSE OUTCOMES

1. Identify and apply the learnt deep learning algorithms on specific tasks in various domains
2. Implement deep learning algorithms and solve real-world problems in various domains
3. To use learnt models for solving few real-life problems

MODULE 1

09 Hrs

Introduction to RNN: Basics of RNN, Rnns Computational Graph across Time, RNN's For Sequence Modeling- Language Modeling, Back Propagation Through Time, Standard RNN Gradient Flow, LSTM Network

MODULE 2

08 Hrs

Applications of RNN: Music Generation, Sentiment Classification, Machine Translation, Environment Modeling, Stock Market Prediction, Next Word Prediction

MODULE 3

09 Hrs

Deep Generative models: Generative Modelling, Autoencoders, Variational Autoencoders, Latent Perturbations, Image and Video Applications

MODULE 4

09 Hrs

GANs: Generative Adversarial Networks – Intuition behind Gans, Training Gans, Recent Advances In Gans

MODULE 5

07 Hrs

Success Stories and Limitations of using DL: Limitations and New Frontiers, Bias and Fairness, Taming Dataset Bias, Success Stories From Industry Domains

Text Books

1. Aston Zhang, Zachary C. Lipton, Mu Li, And Alexander J. Smola, "Dive Into Deep Learning", April 2021
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", The MIT Press, 2016.

Reference Books

1. Palash Goyal Sumit Pandey Karan Jain, "Deep Learning For Natural LanguageProcessing : Creating Neural Networks With Python", Apress, 2018
2. Umberto Michelucci, "Applied Deep Learning A Case-Based Approach To Understanding Deep Neural Networks", 2018
3. Aureilien Geron, Hands-On Machine Learning With Scikit-Learn & Tensorflow:Concepts, Tools, And Techniques To Build Intelligent Systems, O'Reilly, 2017
4. Josh Patterson, "Deep Learning: A Practitioner's Approach", O'Reilly Media; 1 Edition (August 19, 2017)

BUSINESS INTELLIGENCE

SEMESTER/YEAR : II/I
COURSE CODE : 20CSE5013
TITLE OF THE COURSE : BUSINESS INTELLIGENCE
L: T/A:P: C : 3:0:2:4

COURSE OBJECTIVES

1. To understand the fundamentals of Business Intelligence
2. To identify the appropriateness and need Analysis the data
3. To learn the preprocessing, mining and post processing of the data
4. To understand various methods, techniques and algorithms in Business Intelligence

COURSE OUTCOMES:

At the end of the course the students will be able to:

1. Apply basic, intermediate and advanced techniques to analysis the data
2. Analyze the output generated by the process of Business Intelligence
3. Explore the hidden patterns in the data
4. Optimize the mining process by choosing best Business Intelligence technique

MODULE 1

09 Hrs

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

MODULE 2

09 Hrs

Knowledge Delivery: The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis. **Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards**, Geographic Visualization

MODULE 3

09 Hrs

Decision Making Concepts Concepts of Decision Making, **Techniques of Decision Support System (DSS)**, Types of Decision Support System (DSS), Development of Decision Support System (DSS), **Applications of DSS**, Role of Business Intelligence in DSS

MODULE 4

09 Hrs

Classification & Unsupervised Learning: **Classification:** Classification Problem, Classification Models, Classification Trees, Bayesian Method; Association Rule: Structure of

Association Rule, Apriori Algorithm, General Association; Clustering: Clustering Methods, Partition Methods, Hierarchical Methods.

MODULE 5

09 Hrs

Business Intelligence Applications: Data analytics, business analytics, ERP and Business Intelligence, BI Applications in CRM, BI Applications in Marketing, BI Applications in Logistics and Production, Role of BI in Finance, BI Applications in Banking, BI Applications in Telecommunications

Text Books:

1. R. Sharda, D. Delen, & E. Turban, Business Intelligence and Analytics. Systems for Decision Support, 10th Edition. Pearson/Prentice Hall, 2015. ISBN-13: 978-0-13-305090-5, ISBN-10: 0-13-305090-4;
2. Business Process Automation, Sanjay Mohapatra, PHI.

References

1. Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", Addison Wesley, 2003.
2. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2009.
3. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager's Guide", Second Edition, 2012.
4. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw-Hill, 2007.
5. Ralph Kimball, Margy Ross, Warren Thornthwaite, Joy Mundy, Bob Becker, "The Data Warehouse Lifecycle Toolkit", Wiley Publication Inc., 2007.

MATHEMATICAL FOUNDATIONS FOR EMERGING TECHNOLOGIES

SEMESTER/YEAR : I/I
COURSE CODE : 20CSE5101
TITLE OF THE COURSE : MATHEMATICAL FOUNDATIONS FOR EMERGING TECHNOLOGIES
L: T/A: P: C : 3: 2: 0: 5

COURSE OBJECTIVES:

1. To gain knowledge of Mathematical foundations that are needed for Machine Learning/ IoT/Artificial Intelligence/Cloud Computing
2. To mathematically analyze different techniques in Machine Learning/ IoT/ Artificial Intelligence/Cloud Computing domain

COURSE OUTCOMES:

At the end of the course students will be able to:

1. Analyze the mathematical concepts behind various Emerging Technologies and algorithms
2. Apply the knowledge to do mathematical analysis and proofs of various algorithms in the respective domain
3. Apply algorithm to avoid any pitfalls that occur due to shallow understanding of the mathematical concepts

MODULE 1 Review of Machine Learning

09 hrs

Machine Learning Problem, Linear Regression, Generalization, Logistic Regression, k-Nearest Neighbors, k-Means, Revision of Variables, coefficients, and functions: logarithmic and exponential functions such as Sigmoid, trigonometric such as tanh, Softmax

MODULE 2 - Calculus and Optimization methods

09 hrs

Calculus: Concept of a derivative and partial derivative, Gradients, Gradient Descent Algorithm, Chain rule Optimization methods, Overflow and Underflow, Poor Conditioning, Gradient-Based Optimization, Constrained Optimization

MODULE 3 - Linear Algebra

10 hrs

Scalars, Vectors, Matrices and Tensors, Multiplying Matrices and Vectors, Identity and Inverse Matrices, Linear Dependence, Rank, Norms, Special Kinds of Matrices and Vectors, Eigen decomposition, Singular Value Decomposition, The Trace Operator, The Determinant, Dimensionality Reduction

MODULE 4 - Probability and Information Theory

12 hrs

Random Variables, Probability, Distributions, Marginal Probability, Conditional Probability, The Chain Rule of Conditional Probabilities, Independence and Conditional Independence, Expectation, Variance and Covariance, Common Probability Distributions, Naïve Bayes', Bias and Variance tradeoff, Maximum Likelihood Estimation, Information Theory, Entropy, Mutual Information, Cross Entropy, Decision Trees

MODULE 5 - Trends In Emerging Technologies

10 hrs

Mathematical analysis of latest research papers in machine Learning/Artificial Intelligence/IoT/Cloud Computing

Text Books

1. [Aston Zhang, Zack C. Lipton, Mu Li, Alex J. Smola](#), Dive into Deep Learning, Amazon Science, 2020
2. Deep Learning By Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press
3. Mathematics for Machine Learning. Marc Peter Deisenroth, A. Aldo Faisal, and ChengSoonOng., Cambridge University Press, 2020

Reference Books

1. Linear Algebra and Optimization for Machine Learning: A Textbook 1st ed. 2020 by CharuC.Aggarwal
2. Foundations of Machine Learning, Second Edition, Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar, MIT Press, 2018
3. Computational Linear Algebra for Coders, Jeremy Howard and Rachel Thomas, fast.ai

<https://github.com/fastai/numerical-linear-algebra/blob/master/README.md>

CLEVER ALGORITHMS DESIGN

SEMESTER/YEAR : I/I
COURSE CODE : 20CSE5102
TITLE OF THE COURSE : CLEVER ALGORITHMS DESIGN
L: T/A: P: C : 3:0:4:5

COURSE OBJECTIVES

1. To understand the design of advanced algorithms and data Structures.
2. To understand the applications of algorithms in different fields such as AI, geometry, number theory, signal processing and linear algebra.
3. To get acquainted with various search and optimization algorithms.

COURSE OUTCOMES

1. Skill of advanced algorithm design.
2. Knowledge of advanced data structures
3. Knowledge of search and optimization algorithms

MODULE 1:

9 hrs

INTRODUCTION: What is AI, Problem Domains, and Unconventional Optimization.

STOCHASTIC ALGORITHMS: Overview, Random Search, Stochastic Hill Climbing, Iterated LocalSearch, Guided local search, Scatter Search, Tabu Search.

MODULE 2:

9 hrs

EVOLUTIONARY ALGORITHMS: Genetic Algorithm, Genetic Programming, Evolution Strategies, Differential Evolution, Evolutionary Programming, Grammatical Evolution

MODULE 3:

9 hrs

PHYSICAL ALGORITHMS: Simulated Annealing, Harmony Search, Cultural Algorithm, MemeticAlgorithm.

PROBABILISTIC ALGORITHMS: Population-Based Incremental Learning, Distribution Algorithm, Cross-Entropy Method

MODULE 4:

9 hrs

SWARM ALGORITHMS: Particle Swarm Optimization, Ant System, Ant Colony System, BeesAlgorithm

MODULE 5:

9 hrs

ADVANCED TOPICS: Programming Paradigms, Devising New Algorithms, Testing Algorithms, Visualizing Algorithms, Problem Solving Strategies, Benchmarking Algorithms

Text Books:

1. Jason Brownlee, Clever Algorithms: Nature-Inspired Programming Recipes, Revision 2. 16th June 2012

BIG DATA ANALYTICS

SEMESTER/YEAR : I/I
COURSE CODE : 20CSE5103
TITLE OF THE COURSE : BIG DATA ANALYTICS
L: T/A: P: C : 3: 0: 4: 5

COURSE OBJECTIVES

1. To optimize business decisions and create competitive advantage with Big Data analytics
2. To explore the fundamental concepts of big data analytics.
3. To learn to analyze the big data using intelligent techniques.
4. To understand the various search methods and visualization techniques.
5. To learn to use various techniques for mining data stream.
6. To understand the applications using Map Reduce Concepts.
7. To introduce programming tools PIG & HIVE in Hadoop ecosystem.

COURSE OUTCOMES:

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

1. Work with big data platform and explore the big data analytics techniques/business applications.
2. Design efficient algorithms for mining the data from large volumes.
3. Analyze the HADOOP and Map Reduce technologies associated with big data analytics
4. Explore on Big Data applications Using Pig and Hive.
5. Understand the fundamentals of various big data analytics techniques.
6. Build a complete business data analytics solution

MODULE 1:

08 hrs

Introduction to big data : Introduction to Big Data Platform – Characteristics of big data-Data in the warehouse and data in Hadoop- Importance of Big data- Big data Use cases: Patterns for Big data deployment Challenges of Conventional Systems - Analytic Processes and Tools - Analysis vs Reporting.

MODULE 2:

09 hrs

Mining data streams: Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – **Realtime Analytics Platform(RTAP) Applications** - Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.

MODULE 3:

10 hrs

Hadoop: History of Hadoop- the Hadoop Distributed File System – Components of

Hadoop Analysing the Data with Hadoop- Scaling Out- Hadoop Streaming- 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.

MODULE 4:

09 hrs

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 -IBM InfoSphere Big Insights and Streams.

MODULE 5:

09 hrs

Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications

Text Books

1. Tom White “Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012.
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.

Reference Books

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP, 2012.
3. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
4. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007.
5. Pete Warden, “Big Data Glossary”, O’Reilly, 2011.
6. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, 2 nd Edition, Elsevier, Reprinted 2008.

SEMESTER II
YEAR I
COURSE CODE 20CSE5201
TITLE OF THE COURSE Data Management

Perquisite Courses (if any)

#	Sem/Year	Course Code	Title of the Course
1	II/I	20CSE5201	Data Management

COURSE OBJECTIVES:

- To understand advanced Data base concepts, query optimization
- To understand database concepts and structures and query language
- To understand the E R model and relational model
- To understand Data Warehouse, Data Mining, Relational Data BaseModelling, and Storage Management and Indexing
- To understand query processing and techniques involved in query optimization.
- To understand the principles of storage structure and recovery management.

COURSE OUTCOMES:

- Understand and apply the advanced concepts in Real time DBMS applications using structured query language and query optimization.
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
- Analyze performance characteristics of RDBMS & Perform PL/SQL programmingusing concept of Cursor Management, Error Handling, Package and Triggers
- Apply various Normalization techniques to avoid data redundancy & applythe principles of storage structure and recovery management
- Implement various advance SQL queries related to Transaction Processing& Locking using concept of Concurrency control.

COURSE CONTENT:

MODULE 1

08Hrs

OVERVIEW OF DATABASE SYSTEMS: Managing Data, A Historical Perspective, File Systems versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS
INTRODUCTION TO DATABASE DESIGN: Database Design and **ER Diagrams**, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, ConceptualDesign with the ER Model.

MODULE 2

08Hrs

RELATIONAL DATABASE MODELING: An overview of data models, Basics of Relational Model, Defining a Relation Schema in SQL, **An algebraic Query Language**, Constraints on Relations, Functional Dependencies, Rules About Functional Dependencies,Design of Relational Database Schemas.

MODULE 3

8Hrs

SQL: QUERIES, CONSTRAINTS, TRIGGERS: Overview, The Form of a Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Introductionto NoSQL, Applications of NoSQL.

MODULE 4

8Hrs

STORING DATA: DISKS AND FILES: The Memory Hierarchy, Buffer Manager, Files of Records, Page Formats, Record Formats

SECURITY AND AUTHORIZATION: Introduction to Database Security, Access Control, Discretionary Access Control, Mandatory Access Control, Security for Internet Applications.

MODULE 5

8Hrs

STORAGE MANAGEMENT AND INDEXING: Physical Storage Systems: Storage Interfaces, Magnetic Discs, Flash Memory, RAID, Data Storage Structures: Database Storage Architecture, File Organization, Database Buffer, Storage Organization in Main Memory, Indexing.

List of Laboratory/Practical Experiments activities to be conducted:

1. Advanced SQL: Perform queries for DCL Commands and Locks, implement authorization, authentication, privileges on database, perform queries to Create synonyms, sequence and index, perform queries to Create, Alter and update views.
2. PL / SQL and Triggers: Implement PL/SQL programs using control structures, Implement PL/SQL programs using Cursors, Implement PL/SQL programs using exception handling, implement user defined procedures and functions using PL/SQL blocks, perform various operations on packages, Implement various triggers.

TEXT BOOKS :

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition, 2003.
2. Database Systems The complete Book, Hector Garcia-Molina Jeffrey D. Ullman Jennifer Widom, 2nd Edition, 2002.
3. Data base System Concepts, A. Silberschatz, H.F. Korth, S. Sudarshan, McGrawhill, VII edition, 2006.
4. Fundamentals of Database Systems 6th edition. Ramez Elmasri, Shamkant B. Navathe, Pearson Education, 2008.

AGILE PROJECT MANAGEMENT & DEVOPS

SEMESTER/YEAR	: II/I
COURSE CODE	: 20CSE5202
TITLE OF THE COURSE	: AGILE PROJECT MANAGEMENT & DEVOPS
L: T/A:P: C	: 3:1:2:5

COURSE OBJECTIVES:

The objectives of the course are to learn.

1. Agile methodology, Scrums, Sprints.
2. Agile testing, test automation, DevOps.
3. Agile Start-up, Design Thinking, Lean Startup.

COURSE OUTCOMES:

After undergoing this course, students will be able to

1. Be able to compare and contrast the differences between Agile and other project management methodologies
2. Be able to interpret and apply various principles, phases and activities of the Scrum methodology
3. Be able to understand Agile Testing principles for real life situations and learn the basics of SAFe for scaled agile
4. Be able to identify and use various tools for Agile development and DevOps principles for CI/CD
5. Enable start-up mindset through design thinking, lean startup and due-diligence

MODULE-1

09 hrs

Introduction to Agile. Introduction to Software engineering, SDLC, Software process models-waterfall, V model, Iterative model, Spiral model; Introduction to Agile: Agile versus traditional method comparisons and process tailoring; Introduction to Agile, Various Agile methodologies - Scrum, XP, Lean, and Kanban, Agile Manifesto, Scrum: Scrum process, roles - Product Owner, ScrumMaster, Team, Release manager, Project Manager, product manager, architect, events, and artifacts; Product Inception: Product vision, stakeholders, initial backlog creation; Agile Requirements – User personas, story mapping, user stories, 3Cs, INVEST, acceptance criteria, sprints, requirements, product backlog and backlog grooming; Test First Development; Pair Programming and Code reviews; Tools: Agile tracking tools such as JIRA for defect tracking; Scaled agile frameworks: SAFe, Scrum@Scale, Disciplined Agile.

MODULE-2

09 hrs

Scrum and Sprint. Definition of Done, Definition of Ready; Estimation; Agile forecasting and project Management - Big visible information radiators, velocity, progress tracking, Track Done pattern, project forecasting, Ux Design, Control the Flow: Sprint Planning, Sprint Reviews, Sprint Retrospectives, Sprint Planning - Agile release and iteration (sprint) planning, Develop Epics and Stories, Estimating Stories, Prioritizing Stories (WSJF technique from SAFe), Create product roadmap Sprints: Iterations/Sprints Overview. Velocity

Determination, Iteration Planning Meeting, Iteration, Planning Guidelines, Development, Testing, Daily Stand-up Meetings, Progress Tracking, Velocity Tracking, Monitoring and Controlling: Burn down Charts, Inspect & Adapt (Fishbone Model), Agile Release Train.

MODULE-3

09 hrs

Introduction to Agile Testing. **Testing:** Functionality Testing, UI Testing, Performance Testing, Security Testing, A/B testing; Agile Testing: Principles of agile testers; The agile testing quadrants, Agile automation, Test automation pyramid; Test Automation Tools - Selenium, Appium, AI based testing; Unit testing of Kafka real-time streams; Traceability matrix

MODULE-4

09 hrs

DevOps. DevOps: Continuous Integration and Continuous Delivery; CI/CD: Jenkins, Git/Github Creating pipelines, Setting up runners Containers and container orchestration (Dockers and Kubernetes) for application development and deployment; Build tools - maven; Checking build status; Configuration management - puppet, chef, ansible; Fully Automated Deployment; CM - Continuous monitoring with Nagios; Introduction to DevOps on Cloud.

MODULE-5

09 hrs

Agile Start-up. Agile Start-up = Design thinking + Lean startup + Agile; Design thinking - Empathize, Define, Ideate, Prototype, Test; Lean Startup - Ideas, Build, Product, Empathize, Data, Learn; Due diligence - Reverse Engineering, Design thinking, Triz, Product Design and Development, Patenting, Start-up commercials, Funding aspects; Regulations - GDPR, Open source licensing.

Practice Exercises

1. Applying an Agile Mindset
2. Agile Estimation
3. Sprint Review, Retrospective and Execution
4. Scrum using Jira
5. Test Automation using Selenium
6. Test Automation using Appium
7. Unit Testing of Kafka Real-Time Streaming
8. CI/CD using Jenkins
9. Build a virtual start-up

Textbooks

1. Henrik Kniberg, Scrum and XP from the Trenches, 2nd Edition, 2015, Published by C4Media, publisher of InfoQ.com
2. Kenneth S. Rubin, Essential Scrum: A Practical Guide to the Most Popular Agile Process, 2012, published by Addison-Wesley Professional
3. Alistair Cockburn, Agile Software Development: The Cooperative Game, 2nd Edition, 2006, Addison-Wesley Professional

Reference Books

1. Agile Project Management: Creating Innovative Products, Second Edition By Jim Highsmith, Addison-Wesley Professional, 2009
2. Agile Project Management: Managing for Success, By James A. Crowder, Shelli Friess, Springer 2014
3. Learning Agile: Understanding Scrum, XP, Lean, and Kanban, By Andrew Stellman, Jennifer Greene, 2015, O Reilly
4. DevOps: Continuous Delivery, Integration, and Deployment with DevOps: Dive ...By Sricharan Vadapalli, Packt, 2018
5. Agile Testing: A Practical Guide For Testers And Agile Teams, Lisa Crispin, Janet Gregory, Pearson, 2010
6. More Agile Testing: Learning Journeys for the Whole Team By Janet Gregory, Lisa Crispin, Addison Wesley, 2015
7. DevOps: Puppet, Docker, and Kubernetes By Thomas Uphill, John Arundel, Neependra Khare, Hideto Saito, Hui-Chuan Chloe Lee, Ke-Jou

ARTIFICIAL INTELLIGENCE: PRINCIPLES AND TECHNIQUES

SEMESTER/YEAR	: II/I
COURSE CODE	: 20CSE5203
TITLE OF THE COURSE	: ARTIFICIAL INTELLIGENCE: PRINCIPLES AND TECHNIQUES
L: T/A:P: C	: 3:0:4:5

COURSE OBJECTIVES:

1. To understand basic principles of Artificial Intelligence
2. To learn and design intelligent agents
3. To understand the basic areas of Artificial Intelligence including problem solving, knowledge representation, reasoning, decision making, planning, perception and action
4. To master the fundamentals of mathematical framework and learning algorithms

COURSE OUTCOMES:

At the end of the course, students will be able to:

1. Design Intelligent Agent for AI system
2. Apply the AI Principles and Implement AI based problem-solving techniques for solving realtime problems

MODULE 1

09 hrs

Introduction – Definition – **Foundations of Artificial Intelligence** – Characteristics of Intelligent Agents – Typical Intelligent Agents – Structure Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

MODULE 2

10 hrs

AI Problems, AI Techniques and Types – The Level of the Model, Criteria for Success – Defining the Problem as a State Space Search – Problem Characteristics Un-Informed Search, Heuristic Search Techniques: Generate-And- Test, Hill Climbing – Constraint Satisfaction Problem – game trees – Adversarial Search: Minimax algorithm – Alpha beta pruning – Game playing.

MODULE 3

09 hrs

Logical Agent – **Knowledge Representation** – Propositional logic – First Order Predicate Logic – inferences in first order logic – forward chaining – backward chaining – Natural Deduction – Representing Knowledge using rules – Techniques – Matching Techniques.

MODULE 4

09 hrs

Quantifying Uncertainty – Probabilistic Reasoning - Probabilistic Reasoning over Time – Planning with state-space search – Partial-order planning – planning graphs – planning and acting in the realworld – Learning from observation – Inductive learning – **Decision trees** – Explanation based learning – Statistical Learning methods - Reinforcement Learning.

MODULE 5

10 hrs

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

Text Books

2. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.
3. Ivan Bratko, —Prolog: Programming for Artificial Intelligence, Fourth edition, Addison Wesley Educational Publishers Inc, 2011.
4. Kishan Mehrotra, “Elements of ANN”, II Edition, Pen ram International Publishing (I) Pvt. Ltd. Unit.
5. M. Tim Jones, —Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; 1 edition, 2008
6. Nils J. Nilsson, —The Quest for Artificial Intelligence

SEMESTER	IV					
YEAR	II					
COURSE CODE	20AM2401					
TITLE OF THE COURSE	Artificial Intelligence I					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	03	-	-	-	40	03

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
*	**	***	*****

COURSE OBJECTIVES:

- To search and discover intelligent characteristics of existing AI projects,
- To map a new problem – as search and create an animation – showing different search strategies for a problem,
- To program a new game/ problem in Prolog,
- To evaluate different Knowledge Representation schemes for typical AI problems,
- To design and implement a typical AI problem to be solved Using Machine Learning Techniques, design and implement a futuristic AI application

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Apply artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning	L2
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception, intelligent agents & differentiate the key aspects of evolutionary computation, including genetic algorithms and genetic programming	L3
CO3	Apply search strategies, probability theorem and Bayesian networks and solve problems by applying a suitable search method	L4
CO4	Describe and list the key aspects of planning in artificial intelligence to analyze and apply knowledge representation	L3
CO5	Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications, design and implement appropriate solutions for search problems and for planning problems	L5

COURSE CONTENT:	
MODULE 1	08Hrs
INTRODUCTION: What is intelligence? Foundations of artificial intelligence (AI). History of AI; Knowledge based Agents, Problem Solving Formulating problems, problem types, states and operators, state space, search strategies. INFORMED SEARCH STRATEGIES: Best first search, A* algorithm, heuristic functions, Iterative deepening A*(IDA), small memory A*(SMA); Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning	
MODULE 2	08Hrs
PROBLEM SOLVING METHODS: Search Strategies- Uninformed - Informed – Heuristics- Local Search Algorithms and Optimization Problems - Searching with Partial Observations Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search-Game Playing -Optimal Decisions in Games -Alpha--Beta Pruning -Stochastic Games	
MODULE 3	08Hrs
UNCERTAINTY: Overview of Probability and Baye’s rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic; Decision making- Utility theory, utility functions, Decision theoretic expert systems.	
MODULE 4	08Hrs
KNOWLEDGE REPRESENTATION: First Order Predicate Logic – Prolog Programming - Unification Forward Chaining -Backward Chaining - Resolution – Knowledge Representation Ontological Engineering - Categories and Objects- Events - Mental Events and Mental Objects	
MODULE 5	08Hrs
REASONING: Representation, Inference, Propositional Logic, predicate logic (first order logic), logical reasoning, forward chaining, backward chaining; AI languages and tools - Lisp, Prolog, CLIPS. PLANNING: Basic representation of plans, partial order planning, planning in the blocks world, hierarchical planning, conditional planning, representation of resource constraints, measures, temporal constraints.	

TEXT BOOKS:

1. Stuart Russell and Peter Norvig. Artificial Intelligence – A Modern Approach, Pearson Education Press, 2001.
2. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, 2008.

REFERENCE BOOKS:

1. George F. Luger, Artificial Intelligence, Pearson Education, 2001.
2. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002.

MACHINE LEARNING

Semester/Year : II Sem / 1st Year
Course Code : 20CSE5001
Title of the Course : MACHINE LEARNING
L: T/A: P: C : 3 :0: 2 : 4

COURSE OBJECTIVES:

1. To know about basic concepts of Machine Learning
2. To obtain a thorough knowledge of various Machine learning techniques and their representation schemes
3. To study about Evaluating Hypothesis
4. To have an overview of various Machine Learning applications

COURSE OUTCOMES: At the end of the course students will be able to:

1. Technical knowhow of Machine Learning applications, heuristics, Knowledge representation Systems,
2. To Acquire knowledge of various Machine Learning techniques

Module 1:

6 hrs

Introduction: Basic definitions **Statistical Learning:** Estimate F, Supervised Versus Unsupervised Learning, Regression Versus Classification Problems **Assessing Model Accuracy:** Quality of fit, Bias –Variance trade-off, Classification Setting.

Module 2

6 hrs

Linear Regression: Simple Linear Regression, Multiple Linear Regression

Classification: Logistic Regression, Linear Discriminant Analysis: Baye's Theorem for classification, Quadratic Discriminant Analysis, KNN Method, Comparison of classification methods .

Module 3

6 hrs

Resampling Methods: Cross Validation: Leave-One-Out Cross-Validation, k-fold cross validation, Bootstrap.

Tree based methods: The Basics of Decision Tree: Regression tree method, Classification trees, Trees Versus Linear Models, Advantages and Disadvantages of Trees, Bagging ,Random forest, boosting.

Module 4

6 hrs

Support Vector Machines: Maximal Margin classifier, Support Vector classifier, Classification with non-linear decision boundaries, SVM with more than two classes.

Unsupervised Learning: Challenges, Principal component Analysis Clustering –K-Means clustering, Hierarchical clustering.

Module 5

6 hrs

Deep Learning: Artificial Neural Networks: Universal Approximation Theorem, Feedforward Neural networks. Gradient descent and the Backpropagation Algorithm.

Convolutional Neural Networks : Architectures, convolution / pooling layers

Recurrent Neural Networks : LSTM, GRU, Encoder Decoder architectures A Case Study -Computer Vision

Text Books

1. James, G., Witten, D., Hastie, T., Tibshirani, R. An Introduction to Statistical Learning with Applications in R, Springer Texts in Statistics.

Reference Books

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation. (2015).
2. [Thomas M. Mitchell](#), Machine Learning, McGraw-Hill, Inc. New York, ISBN:0070428077 9780070428072
3. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; second edition, 2009

DATA SCIENCE

SEM/YEAR : III/II
COURSE CODE : 20CSE5008
TITLE OF THE COURSE: DATA SCIENCE
L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVE:

1. To use the statistical and computational techniques to Discover, Analyze, Visualize and Present the Data.

COURSE OUTCOMES:

At the end of the course the students will be able to:

1. To Summarize the data using visual & summary analytics and common probability distributions
2. To make inference about a sample & population using hypothesis test.
3. To fit, interpret, and assess regression models and classification with one or more predictors.
4. To assess the data integrity and data relevancy to a specific application

COURSE CONTENTS:

MODULE 1: INTRODUCTION

10 Hrs

Overview of the Data Science process. Different types of data, Data Preprocessing: Data Cleaning- Missing values, Noisy data, Data cleaning as process, Data Reduction: Principal Components Analysis, Data Transformation: Strategies Overview, Data Transformation by normalization, Discretization by binning. Introducing Python Libraries (Pycharm)

MODULE 2: EXPLORATORY DATA ANALYSIS AND HYPOTHESIS TESTING

09 Hrs

Exploratory Data Analysis: Central Tendency, Dispersions, Five number Distributions, CrossTabulations. Data Visualization: Histogram, Box Plot, Correlation Plot, Scatter Plot, Line Chart, Bar Chart, Pie Chart, Bubble Chart, Decision Tree, Cluster Charts.

Hypothesis Testing: Confidence Intervals, Constructing a hypothesis, Null Hypothesis & Alternative Hypothesis, Type I and Type II errors, Power Value

MODULE 3: PARAMETRIC AND NON-PARAMETRIC TESTS

07 Hrs

Parametric test: Z test, One Sample T-TEST, Paired T-TEST, Independent Sample T-TEST, ANOVA, MANOVA, Level of significance, Power of a test.

Non parametric test: Chi Square Test, Fisher's Test, Mann-Whitney U test, Kruskal-Wallis Rank Test, Wilcoxon sign rank.

MODULE 4: CLASSIFICATION MODELS**8 Hrs**

Classification Models: Logistic Regression, Discriminate Regression Analysis, Test of Associations, Chi-square strength of association, Maximum likelihood estimation, Confusion matrix, Support Vector Machines (SVM), Naive Bayes, Random Forests: Bagging & Boosting, CHAID Analysis, Decision trees, k-Nearest Neighbors, Neural Network.

MODULE 5: UNSUPERVISED LEARNING**7 Hrs**

Unsupervised Learning: Principle component analysis, Reliability Test, KMO tests, Eigen Value Interpretation, Rotation and Extraction steps. Clustering Methods: K Means clustering, Agglomerative Clustering

Text Books:

1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services, Wiley
2. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, 3rd edition, Elsevier, 2012
3. Statistics for Managers Using Microsoft Excel, 8th Edition, by [David M. Levine](#), [David F. Stephan](#), and [Kathryn A. Szabat](#), Publisher: Pearson

References

1. Data Mining in excel: Lecture Notes and cases by Galit Shmueli, Publisher: Wiley
2. Hastie, Tibshirani, Friedman, "The Elements of Statistical Learning" (2nd ed), Springer, 2008.

SEMESTER	IV					
YEAR	II					
COURSE CODE	20CY2401					
TITLE OF THE COURSE	INTRODUCTION TO ETHICAL HACKING					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	-	42	3

Prerequisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES:

- To understand and analyze Information security threats & countermeasures
- To perform security auditing & testing
- To understand issues relating to ethical hacking
- To study & employ network defense measures
- To understand penetration and security testing issues

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Understand vulnerabilities, mechanisms to identify vulnerabilities/threats/attacks	L2
CO2	Perform penetration & security testing	L2
CO3	Become a professional Ethical hacker and Network Defender	L2

COURSE CONTENT:	
MODULE 1- ETHICAL HACKING OVERVIEW & PENETRATION TESTING	9 Hrs
Understanding the importance of security, Concept of ethical hacking and essential Terminologies Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking. Penetration Test – Vulnerability Assessments versus Penetration Test – Pre-Engagement – Rules of Engagement -Penetration Testing Methodologies – OSSTMM – NIST – OWASP – Categories of Penetration Test – Types of Penetration Tests – Vulnerability Assessment Summary -Reports.	
MODULE 2- FOOTPRINTING & PORT SCANNING	8 Hrs
Foot printing - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS	

MODULE 3- SYSTEM HACKING	8 Hrs
Aspect of remote password guessing, Role of eavesdropping, Various methods of password cracking, Keystroke Loggers, Understanding Sniffers, Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing.	
MODULE 4- HACKING WEB SERVICES & SESSION HIJACKING	10 Hrs
Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools.	
MODULE 5- HACKING WIRELESS NETWORKS	7 Hrs
Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.	

TEXT BOOKS:

1. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010

REFERENCES:

1. Rajat Khare, "Network Security and Ethical Hacking", Luniver Press, 2006
2. Ramachandran V, BackTrack 5 Wireless Penetration Testing Beginner's Guide (3rd ed.). PacktPublishing, 2011
3. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003

SEMESTER	IV					
YEAR	II					
COURSE CODE	20DS2401					
TITLE OF THE COURSE	DATA SCIENCE - I					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	03	-	-	-	42	03

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
*	**	**	***

COURSE OBJECTIVES:

- To study and understand the use of High dimensional space in modelling data and the use of geometry and linear algebra to model the multi-dimensional data
- To study and understand the mathematics required for SVD applications such as centering data, PCA, clustering and ranking
- To deal with situations involving enormous amount of data and different models
- To understand randomized graph algorithms to model real life applications (WWW, internet, social networks, journal citations)

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Understand High dimensional space in modelling data and apply the concepts of geometry and linear algebra to model the multi-dimensional data.	L2
CO2	Design the mathematical model required for SVD applications.	L3
CO3	Analyze the applications involving enormous amount of data and different models and deal with them	L4
CO4	Understand randomized graph algorithms	L2
CO5	Apply randomized graph algorithms to model real life applications (WWW, internet, social networks, journal citations)	L3

COURSE CONTENT:

MODULE 1	08Hrs
High Dimensional Space: Introduction, The Law of Large Numbers, The Geometry of High Dimensions, Properties of the Unit Ball, Volume of the Unit Ball, Volume Near the Equator,	

Generating Points Uniformly at Random from a Ball, Gaussians in High Dimension, Random Projection and Johnson-Lindenstrauss Lemma, Separating Gaussians, Fitting a Spherical Gaussian to Data.	
MODULE 2	10Hrs
Best-Fit Subspaces and Singular Value Decomposition (SVD): Introduction, Singular Vectors, Singular Value Decomposition (SVD), Best Rank-k Approximations, Left Singular Vectors, Power Method for Singular Value Decomposition, A Faster Method, Singular Vectors and Eigenvectors, Centering Data, Principal Component Analysis, Clustering a Mixture of Spherical Gaussians, Ranking Documents and Web Pages, An Application of SVD to a Discrete Optimization Problem.	
MODULE 3	08Hrs
Algorithms for Massive Data Problems: Streaming, Sketching, and Sampling: Introduction, Frequency Moments of Data Streams, Number of Distinct Elements in a Data Stream, Number of Occurrences of a Given Element, Frequent Elements, The Second Moment, Matrix Algorithms using Sampling, Matrix Multiplication using Sampling, Implementing Length Squared Sampling in Two Passes, Sketch of a Large Matrix, Sketches of Documents.	
MODULE 4	08Hrs
Random Graphs-1: The $G(n, p)$ Model, Degree Distribution, Existence of Triangles in $G(n, d/n)$, Phase Transitions, Giant Component, Existence of a giant component, No other large components, The case of $p < 1/n$, Cycles and Full Connectivity, Emergence of Cycles, Full Connectivity, Threshold for $O(\ln n)$ Diameter, Phase Transitions for Increasing Properties,	
MODULE 5	08Hrs
Random Graphs-2: Branching Processes, CNF-SAT, SAT-solvers in practice, Phase Transitions for CNF-SAT, Non uniform Models of Random Graphs, Giant Component in Graphs with Given Degree Distribution, Growth Models, Growth Model Without Preferential Attachment, Growth Model With Preferential Attachment, Small World Graphs, Case Studies	

TEXT BOOKS :

1. Foundations of Data Science, Avrim Blum, John Hopcroft, and Ravindran Kannan, January, 2018

SEM/YEAR	: II SEM/1st Year
COURSE CODE	: 21VI207
TITLE OF THE COURSE	: SQL Lab
L: T/A: P: C	: 0: 0: 6: 6

Course Objectives:

1. To provide a sound introduction to the creation of problem statements from real life situations.
2. To give a good formal foundation on the relational model of data and usage of Relational Algebra.
3. To introduce the concepts of basic SQL as a universal Database language.
4. To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.
5. To enable the design of an efficient database using normalization concepts.
6. To enable students to be create indexes for databases for efficient retrieval

Course Outcomes:

1. Construct problem definition statements for real life applications and implement a database for the same.
2. Write queries in SQL to retrieve any type of information from a data base

List of Programs

1. Demo on **Creating Databases**
2. Demo on **Modify Databases**
3. Demo on database and files **Viewing a Database**
4. Demo on Renaming a Database
5. Demo on **Deleting Database**
6. Demo on database and files
7. Demo on database and files groups
8. Creating tables with different Data types
9. Demo on altering the table
10. Creating tables with User Defined Data Types
11. Dropping User Defined Data Types
12. Demo on Data Manipulation Language with different types Inserting values
13. Demo on Data Manipulation Language with different types updating values
14. Demo on Data Manipulation Language with different types Deleting Rows
15. Demo on Truncating a Table, Demo on Deleting a Table

16. Writing a Basic select statement, Writing a Basic select statement using where clause
17. Write a query to perform Arithmetic Operations
18. Write a query to perform Relational operators
19. Write a query to perform Logical operators
20. Write a query to perform Special operators
21. Generate query using TOP and DISTINCT keywords
22. Generate query to perform ORDER BY clause
23. Generate query to perform GROUP BY and HAVING clauses
24. Generate query using String functions, Generate query using Date functions
25. Generate query using Mathematical Functions, Generate query using Aggregate functions
26. Creating tables with different types of Constraints
27. Perform demo on Nested sub queries, Perform demo on Correlated Sub queries
28. Perform demo on sub queries with Operators, Generate a query to create an identity column
29. Perform demo on Cross Join, Perform demo Natural Join
30. Perform demo Equi Join, Perform demo on inner Join
31. Perform demo on outer Join, Write a query to creating Views
32. Write a query to retrieve Results from Views
33. How to Altering Views, Write a query to Dropping Views
34. Write a query to Renaming Views
35. Write a query to Manipulating Data through Views
36. Write a query to Implementing Indexes with different types of indexes
37. Creating Triggers
38. Write programs to declare different types of variables with different data types
39. Write program to Printing Messages
40. Write program to Implementing Stored Procedures
41. Write program on Types of Stored Procedures
42. Write program on Types of Parameters
43. Demo on Altering a Stored Procedure
44. Demo on how to Viewing a Stored Procedure
45. Demo on Deleting a Stored Procedure
46. Write a program to Create a function
47. Demo on IF statement and WHILE loop
48. Demo on exception handling and Demo on Explicit Transaction
49. Demo on Implicit Transactions

Reference Books:

1. SQL Server 2008 r2 - Black Book
2. SQL Server – Patrick Paul
3. SQL Server 2008 programming – Robert vieira

Reference Website:

1. www.msdn.microsoft.com
2. www.tutorialspoint.com
3. www.techonthenet.com

SEM/YEAR	: II SEM/1st Year
COURSE CODE	: 21VI208
TITLE OF THE COURSE	: Data Structures with Python Lab
L: T/A: P: C	: 0: 0: 6: 6

Course Objectives:

1. Basics of Python programming
2. Decision Making and Functions in Python
3. Object Oriented Programming using Python
4. Files Handling in Python
5. GUI Programming and Databases operations in Python
6. Network Programming in Python

Course Outcomes:

1. Interpret Object oriented programming in Python
2. Design and develop Client Server network applications using Python
3. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python

SL NO	MAJOR TOPICS
1.0	Introduction to Python
1.1	Write a python program to find the square Root
1.2	Write a python program to calculate the Area of a Triangle
1.3	Write a python program to solve quadratic Equation
1.4	Write a python program to swap Two Variables
2.0	Python Data types and Operators
2.1	Write a python program to sum all the items in a list.
2.2	Write a python program to program to add two matrices
2.2	Write a python program to multiply two matrices
2.3	Write a python program to check Whether a string is palindrome or not
2.4	Write a program to demonstrate operators in python

3.0 Python Program Flow Control

- 3.1 Write a python program to check if a number is positive, negative or zero
- 3.2 Write a python program to check prime number
- 3.3 Write a python program to find the factorial of a number
- 3.4 Write a python program to display the multiplication Table
- 3.5 Write a python program to print the Fibonacci series
- 3.6 Write a python program to check Armstrong number

4.0 Python Functions, Modules And Packages

- 4.1 Write a python program to find numbers divisible by another number by using functions.
- 4.2 Write a python program to find factors of number
- 4.3 Write a python program to find factorial of number using recursion
- 4.4 Write a python program to display powers of 2 using anonymous function
- 4.5 Write a python program to find Factors of Number by importing module.
- 4.6 Write a python program to demonstrate calculator using package

5.0 Python Input ,Output and File operations

- 5.1 Write a python program to read from one file and copy to another file.
- 5.2 Write a python program to rename and delete the file.
- 5.3 Write a python program to demonstrate input and raw_input functions

6.0 Exception Handling

- 6.1 Write a python program to perform zero division error.
- 6.2 Write a python program to demonstrate exception handling while opening a file where you do not have write permission.

7.0 Python Object Oriented Programming – Oops

Write a python program to demonstrate on creating a class, creating instance objects and accessing attributes

- 7.1
- 7.2 Write a python program to demonstrate Inheritance.
- 7.3 Write a python program to demonstrate Overriding
- 7.4 Write a python program to demonstrate Overloading

8.0 Regular Expressions

- 8.1 Write a Python program to check that a string contains only a certain set of characters (a-z, A-Z and 0-9).

- 8.2 Write a Python program that matches a string that has an 'a' followed by zero or more 'b's and an 'a' followed by three 'b's.
- 8.3 Write a Python program that matches a word at the beginning of a string.
- 8.4 Write a Python program to check for a number at the end of a string.
- 8.5 Write a Python program to remove leading zeros from an IP address.
- 8.6 Write a Python program to replace all occurrences of space, comma, or dot with a colon.

9.0 CGI Programming

- 9.1 Write a CGI program to pass values using HTML form and submit button by GET and POST Method

10.0 Databases

- 10.1 Write a python program to create a database and perform insert operation
- 10.2 Write a python program to perform update operation on database
- 10.3 Write a python program to perform delete operation on database

11.0 Networking

- 11.1 Write a python program to create a socket and demonstrate on socket methods.

12.0 Sending Email

- 12.1 Write a python program to send an email.

13.0 GUI programming

- 13.1 Create a GUI window and add different widgets

14.0 Working with Excel Spreadsheets

- 14.1 Write a python program to demo on retrieve the Worksheet object for a sheet named 'Sheet1'?
- 14.2 Write a python program to demo on retrieve the Worksheet object for the workbook's active sheet?
- 14.3 Write a python program to demo on retrieve the value in the cell C5?
- 14.4 Write a python program to demo on set the value in the cell C5 to "Hello"?
- 14.5 Write a python program to demo on retrieve the cell's row and column as integers?
- 14.6 Write a python program to demo on get_highest_column() and get_highest_row() sheet methods return, and what is the data type of these return values?
- 14.7 Write a python program to demo on function to get the integer index for column 'M'.
- 14.8 Write a python program to demo on function needed to get the string name for column 14,
- 14.9 Write a python program to demo on retrieve a tuple of all the Cell objects from A1 to F1?

15.0 Working with PDF and Word Documents

Write a python program to demo on modes do the File objects for PdfFileReader() and

15.1 PdfFileWriter() need to be opened in?

15.2 Write a python program to demo on acquire a Page object for page 5 from a PdfFileReader

object? Write a python program to demo on PdfFileReader variable stores the number of pages in the PDF
15.3 document?

15.4 Write a python program to demo on methods do you use to rotate a PDF page?

15.5 Write a python program to demo on method returns a Document object for a file named demo.docx

15.6 Write a python program to demo on the difference between a Paragraph object and a Run object? Write a python program to demo on you obtain a list of Paragraph objects for a Document object

15.7 that's stored in a variable named doc?

16.0 Web Scraping

16.1 Write a python program to demo on Downloading Files from the Web with the requests Module

16.2 Write a python program to demo on Downloading Files from the Web with the requests Module and save in hard disk

17.0 Working with CSV Files and JSON Data

17.1 Write a python program to demo on read file from CSV file.

17.2 Write a python program to demo on read file from JSON file

SEM/YEAR	: II SEM/1st Year
COURSE CODE	: 21VI209
TITLE OF THE COURSE	: Computer Networks Lab
L: T/A: P: C	: 0: 0:6: 6

LIST OF PROGRAMS:

Navigate the IOS

- Explore EXEC Modes
- Set the Clock

Configure Initial Switch Settings

- Host Name -Banner MOTD
- Save Configuration Files to NVRAM

Configure Initial Switch Settings

- Verify the Default Switch Configuration
- Enable Password -Enable Secret
- Configure Line Passwords
- Encrypt all plain text passwords
- Save Configuration Files to NVRAM

Implement Basic Connectivity

- Perform a Basic Configuration on Switch
- Configure the PCs
- Configure the Switch Management Interface

Connect a Wired and Wireless LANConfigure Initial Router Settings

- Verify the Default Router Configuration
- Configure and Verify the Initial Router Configuration
- Save the Running Configuration File

Connect a Router to a LAN

- Display Router Information
- Configure Router Interfaces
- Verify the Configuration

Configure IPv6 Addressing

- Configure IPv6 Addressing on the Router
- Configure IPv6 Addressing on Clients
- Test and Verify Network Connectivity

Configure Secure Passwords and SSH

Verify Directly Connected Networks

- Verify IPv4 Directly Connected Networks
- Verify IPv6 Directly Connected Networks

VLAN Configuration

- Verify the Default VLAN Configuration
- Configure VLANs
- Assign VLANs to Ports

Configure Trunks

- Configure & Verify VLANs
- Configure Trunks

Configure DTP

- Configure static trunking
- Configure and Verify DTP

Configure Router-on-a-Stick Inter-VLAN

- Add VLANs to a Switch
- Configure Sub interfaces
- Test Connectivity with Inter-VLAN Routing

Configure Layer 3 Switching and Inter-VLAN Routing

- Configure Layer 3 Switching
- Configure Inter-VLAN Routing
- Configure IPv6 Inter-VLAN Routing

Configure Ether Channel

- Configure Basic Switch Settings
- Configure an Ether Channel with Cisco PAgP

Configure Ether Channel

- Configure Basic Switch Settings
- Configure an 802.3ad LACP Ether Channel

Configure DHCPv4

- Configure a Router as a DHCP Server
- Configure DHCP Relay
- Configure a Router as a DHCP Client
- Verify DHCP and Connectivity

Configure DHCPv6

- Configure and verify a Stateless DHCPv6 Server
- Configure and verify a State full DHCPv6 Server
- Configure and verify a DHCPv6 Relay

HSRP Configuration

- Configure an HSRP active router.
- Configure an HSRP standby router.
- Verify HSRP operation.

SEM/YEAR	: V SEM/3rd Year
COURSE CODE	: 19VI503
TITLE OF THE COURSE	: English Technical Writing
L: T/A: P: C	: 2: 0: 0: 2

Course Outcomes

By the end of the course, students should be able to:

- Identify and understand the facets and functions of the primary genres of technical writing, including letters, memos, emails, resumes, reports, proposals, technical descriptions, and technical definitions
- Produce professional caliber technical documents
- Analyze and adapt to the constraints of specific rhetorical situations, including audiences, purposes, and uses
- Write documents that are accessible and reader-centered
- Produce documents both collaboratively and independently
- Develop and administer user tests; analyze and synthesize user test data
- Refine writing style for clarity, concision, coherence, cohesion, and emphasis

Unit 1:

6hrs

Writing Introductory Emails workshop, Audience and Purpose Activity, **Professional Letter Activity**

Unit 2:

6hrs

Application Letter Activity, Analyzing Job and Internship Descriptions, **Resume Activity**, Peer Review Application Packet, Technical Description Podcast Discussion, Mini-lecture on technical descriptions

Unit 3:

6hrs

Document analysis activity, Writing Workshop, Peer Review, -Brainstorming instructional assignment ideas

Unit 4:

6hrs

Form groups for instruction manual project, Group podcast series description, Team feedback, Script revisions, Audacity workshop

Unit 5:

6hrs

Conduct usability test, Finalize edits to instruction manual based on data gathered from User- Testing, Course wrap up discussion, Fill out student work release forms.

SEM/YEAR	: V SEM/3rd Year
COURSE CODE	: 19VI504
TITLE OF THE COURSE	: Information System Analysis
L: T/A: P: C	: 2: 0: 0: 2

Objectives:

After studying this course student will be able to:

Analyze any system, identify system boundaries and interfaces, capture user requirements by applying different techniques, generate logical design of user requirements using various structured design tools, understand various quality assurance issues related to system.

Unit 1: 6hrs

Introduction to Information Systems Development: System Analyst, **System Analysis & Design**, Categories of Information Systems, System Development Strategies, Implementation and Evaluation, Managing the application development portfolio-Information system Planning, Managing project review & Selection, Information Systems & User-groups Committee Methods

Unit 2: 6hrs

Analysis: Preliminary Investigation, Scope of Study, Conducting the investigation, Testing Project Feasibility, Handling infeasible projects

Unit 3: 6hrs

Tools for System Requirements: Requirement Determination, Activities, Types. Fact-finding techniques: Interview, Questionnaire, Record Review, Observation. Tools for documenting Procedures and Decisions: Decision Trees, Decision Tables, Structured English

Unit 4: 6hrs

Structured Analysis Development Strategy: Features, Data Flow Tools, Tools for Structured Design: **Data Flow Diagrams**, Data Dictionaries. Application Prototypes: Purpose, Steps, Use, Tools. Prototype example, **Computer Aided System Tools: Role, Categories, CASE Tools.**

UNIT 5: 6hrs

Analysis To Design transition: Objectives, Features. Element of Design: Output, Files, Database Interaction, Input, Control, Procedures, Program Specifications.

Text Book:

Analysis and Design of Information Systems, Excel Books Private Limited, New Delhi

SEM/YEAR	: V SEM/3rd Year
COURSE CODE	: 19VI505
TITLE OF THE COURSE	: Principles of Business Operations
L: T/A: P: C	: 2: 0: 0: 2

OBJECTIVES:

To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization .

Unit 1: **6hrs**

Definition of Management – Science or Art – **Manager Vs Entrepreneur** – types of managers – managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company- public and private sector enterprises – Organization culture and Environment – Current trends and issues in Management.

Unit 2: **6hrs**

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – **Strategic Management** – Planning Tools and Techniques – Decision making steps and process.

Unit 3: **6hrs**

Nature and purpose – Formal and informal organization – **organization chart** – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design – **Human Resource Management** – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

Unit 4: **6hrs**

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – **leadership** – types and theories of leadership – communication – process of communication – barrier in communication – **effective communication** – communication and IT.

Unit 5: **6hrs**

System and process of controlling – **budgetary and non-budgetary control techniques** – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

Text Books:

1. Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.
2. Harold Koontz & Heinz Weihrich "Essentials of management" Tata Mc Graw Hill, 1998.
3. Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999.

SEM/YEAR	: V SEM/3rd Year
COURSE CODE	: 19VI506
TITLE OF THE COURSE	: Big Data Analytics (Elective I)
L: T/A: P: C	: 2: 0: 0: 2

OBJECTIVES:

- Optimize business decisions and create competitive advantage with Big Data analytics
- Introducing Java concepts required for developing map reduce programs
- Derive business benefit from unstructured data
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm
- To introduce programming tools PIG & HIVE in Hadoop ecosystem.

UNIT-I

6hrs

Working with Big Data: Google File System, **Hadoop Distributed File System (HDFS)** – Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), **Introducing and Configuring Hadoop cluster** (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-II

6hrs

Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner

UNIT-III

6hrs

Hadoop I/O: The Writable Interface, WritableComparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, BytesWritable, NullWritable, ObjectWritable and GenericWritable, Writable collections, Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators

UNIT-IV

6hrs

Pig: Hadoop Programming Made Easier, Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin

UNIT-V

6hrs

Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

TEXT BOOKS:

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown,Rafael Coss

REFERENCE BOOKS:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, SrinathPerera, ThilinaGunarathne

SEM/YEAR	: V SEM/3rd Year
COURSE CODE	: 19VI507
TITLE OF THE COURSE	: Full Stack Development Lab
L: T/A: P: C	: 0: 0: 5: 5

List of Experiments

1. Write code in **HTML5** to develop simple webpage.
2. Write **CSS5 & HTML5** Code to show Dropdown Menu.
3. Write HTML5, CSS and **Javascript** code to Create one-page website having different menuitems.
4. Write a program in CSS to show your city with building and moving cars.
5. Write a program to validate web form using javascript.
6. Write jquery code to show website slider.
7. Show version control in **Github**.
8. Write a program in javascript to Create a user login system.
9. Create a website showing **jquery** slider.
10. Write a program to show user details using HTML, CSS & AJAX
11. Write a program to display options in a search engine using **Ajax**.

SEM/YEAR	: V SEM/3rd Year
COURSE CODE	: 19VI508
TITLE OF THE COURSE	: Business Intelligence Lab
L: T/A: P: C	: 0: 0: 2: 2

List of Experiments:

1. Import the legacy data from different sources such as (Excel, SqlServer, Oracle etc.) and load in the target system.
2. Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver / Power BI.
3. Data Visualization from ETL Process
4. Creating a Cube in SQL server 2012
5. Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.

SEM/YEAR	: III SEM/2nd Year
COURSE CODE	: 20VI301
TITLE OF THE COURSE	: Oracle
L: T/A: P: C	: 2: 0: 0: 2

Course objectives

- Understand linear system of equations
- Understand the structure of Matrices and Determinants
- Infer different co-ordinate systems and applications of vectors.

Unit 1

6hrs

Introduction to Oracle Database: Feature of RDBMS, Advantages of RDBMS over FMS ad DBMS, The 12 rules (E.F Codd's Rules –RDBMS), Need for Database Design, Support of Normalization

Introduction to SQL: DDL and DML, DESCRIBE command, Restricting and sorting data, Using group functions, Sub queries, Set operators, Using manipulating data

Unit 2

6hrs

PL/SQL: Introduction to PL/SQL, Features and benefits of PL/SQL, PL/SQL block and syntax, Data types , variables and constants, Conditional statements Loops, Subprograms , Procedure, Function, Cursors, Types: Implicit and explicit cursor, Passing parameter into cursor Exception, Types of exception, Declaring exception, RAISE_APPLICATION_ERROR , procedure, Triggers, Packages

Unit 3

6hrs

Advance SQL

SQL Constraints, Sub Queries, Identity column, **SQL Joins**, **Views**, **Index**, **Triggers**

Unit 4

6hrs

Principles of Dimensional Modelling: ER Modelling Verses Dimensional Modelling, the **STAR Schema**, STAR schema Keys, Advantages of STAR Schema, The Snowflake Schema, The Fact Constellation

Unit 5

6hrs

Transact-SQL

Stored Procedure, Function, Control Structures, Conditional Processing using IF statements, While loop, Exception handling by TRY...CATCH, Error functions used within CATCH block

Reference books:

1. Oracle 9i - Complete reference
2. SQL,PL/SQL – The Programming language of Oracle,3 rd Revised Edition-Ivan Bayross
3. Database Management System – Navathe
4. Principles of Database – Jeffrey D.Ullman
5. Oracle Database 11g PL/SQL Programming (Oracle Press) - Michael McLaughlin

SEM/YEAR	: III SEM/2 nd Year
COURSE CODE	: 20VI302
TITLE OF THE COURSE	: OOP'S with C++
L: T/A: P: C	: 2: 0: 0: 2

Course Objectives

To learn the basic principles of object-oriented programming paradigm using C++

Course outcomes

Students will be able to:

1. Identify classes with attributes and functions for given problem
2. Analyze the relationship between the classes link them using appropriate concepts
3. Design and implement abstract data types.
4. Devise generic classes capable of manipulating primitive and user defined data types.

Unit 1

6hrs

Programming Paradigms - Introduction to OOP – Overview of C++ - **Classes** – Structures – Union – Friend Functions – Friend Classes – Inline functions – Constructors – Destructors –Dynamic **Initialization of Objects** - Static Members – Passing objects to functions – Function returning objects- Arrays of Objects, Object as Function Arguments

Unit 2

6hrs

Arrays – Pointers – this pointer – References – Dynamic memory Allocation – functions Overloading – Default arguments – Overloading Constructors – Pointers to Functions – OperatorOverloading - Type Conversion.

Unit 3

6hrs

Inheritance – Types - Derived Class Constructors- Issues in Inheritance – Virtual base Class – Polymorphism – Virtual functions – Pure virtual functions

Unit 4

6hrs

Class templates and generic classes – Function templates and generic functions – Overloading function templates – power of templates – Exception Handling – Derived class Exception – over handling generic functions – Exception handling Functions

Unit 5

6hrs

Streams – Formatted I/O with IOS class functions and manipulators –File I/O – Name spaces – Array based I/O – Error handling during file operations - Formatted I/O – STL: Overview-ContainerClasses Lists- Maps- Algorithms Using Functions and Objects-String Class - Sequence Containers,

Iterators-Specialized Iterators - Associative Containers, Storing User- Defined Objects - Function Objects

Text Books

1. Stephen Prata, "C++ Primer Plus", 6th Edition ,Addison-Wesley Professional, 2011
2. Bjarne Stroustrup, "Programming: Principles and Practice Using C++", 1st Edition, Addison-Wesley Professional, 2008

Reference Books

1. Andrew Koenig and Barbara E. Moo, "Accelerated C++: Practical Programming by Example", 1st Edition, Addison-Wesley Professional, 2000
2. Bruce Eckel , "Thinking in C++: Introduction to Standard C++: Volume One" 2nd Edition, Prentice Hall, 2000
3. Andrei Alexandrescu , "Modern C++ Design: Generic Programming and Design Patterns Applied" , 1st Edition, Addison-Wesley Professional, 2001

SEM/YEAR	: III SEM/2 nd Year
COURSE CODE	: 20VI303
TITLE OF THE COURSE	: Information System & Organization
L: T/A: P: C	: 1: 0: 0: 1

Course objectives

- Understand linear system of equations
- Understand the structure of Matrices and Determinants
- Infer different co-ordinate systems and applications of vectors.

Unit 1

3hrs

Organizations and Information Systems: Value chain and value system, Definitions of data, information and knowledge, Information Systems classification, influence on organizations structures and activities, Management View.

Social Contexts and Perspectives on IS : Common perspectives on the organizations, Impact of technology, Approaches to technology initiatives

Unit 2

3hrs

Internal IS and Enterprise Systems: Value chain and value system, internal applications and IS, Enterprise systems (ES) and Enterprise, Applications Integration (EAI).

Organizational Strategy and IS: Organizational strategy, Aligning IS/IT to organizational strategy, Measuring success in strategy execution, Strategy execution and the Balanced Scorecard

Unit 3

3hrs

Evaluating IS: Tangible and intangible cost and a benefit, Relevance of cost benefit measures to evaluating IS, Different aspects of evaluation, Interaction of evaluation and organizational contexts.

Unit 4

3hrs

People and IS Interpretation: Interpretation, use and sharing of information, Care and security of information, Ethics and stakeholders in IS, Data protection and legal principles

The 21st Century Organization: How technology is changing working practices and possibilities, Contemporary vs future organizational forms, Changing relationships with the organizations, Management of distributed work.

Unit 5

3hrs

IS and the Customer: IS and customers, Customer Relationship Management (CRM), e-Business and e-Commerce.

IS and Organizational Change: Barriers to change, Change in organizations, Change models, IS and organizational change.

References:

1. Boddy, D., Boonstra ,A., Kennedy, G. (2008) Managing Information Systems : strategy and organisation 3rd ed. FT Pearson. ISBN-13: 978-0273716815
2. Hassall, J.C. (1999 and 2010), "Some Thoughts on Information Systems and Organisations", unpublished monograph
3. Ingram, D. (2016) What Are the Advantages and Disadvantages of a Bureaucratic Organization Structure? Available from <http://smallbusiness.chron.com/advantages-disadvantages-bureaucratic-organization-structure-2761.html> (April, 2016)
4. Terry, L. (2011). The Management Theory of Max Weber. Available from <http://www.business.com/management/management-theory-of-max-weber/> (April, 2016)

SEM/YEAR : III SEM/2nd Year
COURSE CODE : 20VI304
TITLE OF THE COURSE : Design Thinking
L: T/A: P: C : 1: 0: 0: 1

Course objectives

- Understand linear system of equations
- Understand the structure of Matrices and Determinants
- Infer different co-ordinate systems and applications of vectors.

Unit 1

3hrs

WHAT IS DESIGN THINKING AND WHY IS IT SO POPULAR: What is Design Thinking and Why Is It So Popular? Design Thinking: New Innovative Thinking for New Problems, Obstacles to Problem Solving and Innovation in Design Thinking Wicked Problems: 5 Steps to Help You Tackle Wicked Problems by Combining, Systems Thinking with Agile Methodology, Essential Design Thinking Videos and Methods

Unit 2

3hrs

THE DESIGN THINKING PROCESS: Stages in the Design Thinking Process, Stage 1 in the Design Thinking Process: Empathize with Your Users, Stage 2 in the Design Thinking Process: Define the Problem and Interpret the Results, Stage 3 in the Design Thinking Process: Ideate, Stage 4 in the Design Thinking Process: Prototype

Unit 3

3hrs

EMPATHISE WITH THE PEOPLE YOU DESIGN FOR: The Power of Empathy, Design Thinking: Getting Started with Empathy, How to Develop an Empathic Approach in Design Thinking, Empathy – How to Improve Your Designs by Developing Empathy for Your Target Group, Probes for Context Mapping – How to Design and Use Them

Unit 4

3hrs

DEFINE THE DESIGN CHALLENGE: Stage 2 in the Design Thinking Process – Define the Problem by Synthesising Information, Methods to Help You Define Synthesise and Make Sense in Your Research, Affinity Diagrams – Learn How to Cluster and Bundle Ideas and Facts, Empathy Map – Why and How to Use It, Personas – A Simple Introduction

Unit 5

3hrs

IDEATE: What is Ideation – and How to Prepare for Ideation Sessions? Understand the Elements and Thinking Modes that Create Fruitful Ideation Sessions, Create Some Space – for Ideation Sessions and Design Thinking, Introduction to the Essential Ideation Techniques which are the Heart of Design Thinking. **PROTOTYPE AND TEST:** The Key Benefits of Prototyping, Design Thinking: Get Started with Prototyping, Prototyping in Design Thinking: How to Avoid Six Common Pitfalls, What Kind of Prototype Should You Create? Prototyping: Learn Eight Common Methods and Best Practices, Building a Strong business Model – A case Study, The fundamental problem of new products/ start-ups, Case Study – Great business Ideas and Success, Case Study – Failure and dealing with Failure

SEM/YEAR	: III SEM/2 nd Year
COURSE CODE	: 20VI305
TITLE OF THE COURSE	: Artificial Intelligence
L: T/A: P: C	: 2: 0: 0: 2

Course objectives

- Understand linear system of equations
- Understand the structure of Matrices and Determinants
- Infer different co-ordinate systems and applications of vectors.

Unit 1

6 hrs

Introduction to Artificial Intelligence and Machine Learning: Artificial Intelligence: Introduction to Artificial Intelligence: **Machine Learning:** Walk-through, **Data Analytics:** Application and use cases. **Introduction to Python:** Overview, Environment setup, Basic Syntax, Basic Operators, Loops, Strings, List, **Open source Tools for Data Analytics implementation** - Data Analytics Tools: Numpy, Data Analytics Tools: Pandas, Data Analytics Tools: Matplotlib

Unit 2

7 hrs

Exploring and Implementation of Data Analytics Tools on Real Datasets & Machine Learning Algorithms: Inferring useful information from Non-synthetic Databases: Two case studies in Data Analytics using different Real Databases where we observe and implement following data processing methods using open source tools. **Introduction to Machine Learning:** Build and Setup, Machine learning fundamentals, Relation between AI, Machine Learning and Deep Learning, Types of Machine Learning Algorithm, Popular Machine Learning Algorithms using Scikit-learn library: Simple Linear & Multiple Linear Regression Algorithm, Regression: Model Evaluation & Evaluation Metrics, Hands-on Session

Unit 3

6 hrs

Supervised Machine Learning in Classification (Decision Tree and K-NN Algorithms): Popular Machine Learning Algorithms using Scikit-learn library Classification Algorithms, Evaluation Metrics in Classification, Decision Trees Algorithms, Hands-on Session, K-NN Algorithms, Hands-on Sessions

Unit 4

5 hrs

Supervised Machine Learning in Classification (Logistic Regression and SVM Algorithms): Logistic Regression Algorithms, Hands-on Session, SVM Algorithms, Hands-on Session

Unit 5

6 hrs

Unsupervised Machine Learning & Deep Learning: Open source Tools for Machine Learning implementation, Popular Machine Learning Algorithms using Scikit-learn library Clustering Algorithms - K-Mean Clustering Algorithms, Hands-on Session, **Introduction to Deep Learning** - Origin and evolution of Deep learning Applications and use cases on Deep Learning

References:

1. <https://medium.com/machine-learning-for-humans/why-machine-learning-matters-6164faf1df12>
2. <https://www.import.io/post/defining-data-extraction-for-business/>
3. <https://www.simplilearn.com/machine-learning-tutorial>

SEM/YEAR	: III SEM/2nd Year
COURSE CODE	: 20VI306
TITLE OF THE COURSE	: Linux
L: T/A: P: C	: 1: 0: 0: 1

Course objectives

- Written technical communication and effective use of concepts and terminology.
- Facility with UNIX command syntax and semantics.
- Ability to read and understand specifications, scripts and programs.
- Individual capability in problem solving using the tools presented within the class.

UNIT-I 6hrs

Introduction to unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

UNIT-II 6hrs

The File system –The Basics of Files-What’s in a File-Directories and File Names-Permissions-I Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

UNIT-III 6hrs

Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

UNIT-IV 6hrs

Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters

UNIT-V 6hrs

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.

TEXT BOOKS:

1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.

REFERENCE BOOKS:

3. 1. Unix and shell programming by B.M. Harwani, OXFORD university press

SEM/YEAR	: III SEM/2 nd Year
COURSE CODE	: 20VI307
TITLE OF THE COURSE	: Statistical Foundations of Data Science and AnalyticsL:
T/A: P: C	: 2: 0: 0: 2

Course Objectives

This course will cover the statistical foundation for our discussion on data science

Course Outcomes: On successful completion of this course students will be able to:

- Fundamental skills in data analytics
- Over view of Statistical analysis and applications.
- Over view of Sampling Theory and applications.
- Over view of Various Statistical Methods
- Over view of Regression analysis.

Module 1: Descriptive Statistics

4 Hrs

Frequency Distributions, Graphic representation of a frequency Distribution, Measures of Central Tendency, Requisites for a Ideal Measure of Central Tendency, Mean (Arithmetic, Geometric and Harmonic), Median, Mode, Selection of an Average, Partition Values: Practical Learning Using Python.

Module 2: Over view of Mathematical Expectations

8 Hrs

Mathematical Expectation, Expectation of a Function of a Random Variable, Addition Theorem of Expectation, Multiplication Theorem of Expectation, Expectation of a Linear Combination of Random Variables, Covariance, Variance of a Linear Combination of Random Variables, Moments of Bi-variate Probability Distributions, Conditional Expectation and Conditional Variance, Business Case studies: Practical Learning Using Python.

Module 3: Sampling and Large Sample Tests

8 Hrs

Overview of Sampling, Types of Sampling (Purposive, Random, Simple, Stratified), Parameter and Statistic, Tests of Significance, Hypothesis (Null and Alternative), Errors in Sampling, Critical Region and Level of Significance, Test of Significance for Large Samples, Sampling of Attributes, Sampling of Variables, Unbiased Estimates population mean and variance, Standard Error of Sample Mean, Test of Significance (Single Mean, Difference means and Difference of Standard Deviations). Practical Learning Using Python

Module 4: Testing of Hypothesis**6 Hrs**

Introduction, Statistical Hypothesis (Simple and-Composite), Steps in Solving Testing of Hypothesis Problem, Optimum Tests Under Different Situations, Neyman-Pearson lemma, Likelihood Ratio Test (One Normal, Two Normal and Several Normal Populations). Tools: Minitab

Module 5:**4 Hrs****Mini Project****Text Books:**

S.C.Gupta, V.K. Kapoor: Fundamentals of Mathematical Statistics a Modern Approach, 10th Edition 2000.

SEM/YEAR	: III SEM/2nd Year
COURSE CODE	: 20VI308
TITLE OF THE COURSE	: OOP'S with C++ Lab
L: T/A: P: C	: 0: 0: 4: 4

List of Experiments:

Exercise – 1 (Basics)

Write a Simple Program on printing “Hello World” and “Hello Name” where name is the input from the user

a) Convert any two programs that are written in C into C++

b) Write a description of using g++ (150 Words) Exercise – 2 (Expressions Control Flow)

a) Write a Program that computes the simple interest and compound interest payable on principal amount (in Rs.) of loan borrowed by the customer from a bank for a given period of time (in years) at specific rate of interest. Further determine whether the bank will benefit by charging simple interest or compound interest.

b) Write a Program to calculate the fare for the passengers traveling in a bus. When a Passenger enters

the bus, the conductor asks “What distance will you travel?” On knowing distance from passenger (as an approximate integer), the conductor mentions the fare to the passenger according to following criteria.

Exercise – 3 (Variables, Scope, Allocation)

a) Write a program to implement call by value and call by reference using reference variable.

b) Write a program to illustrate scope resolution, new and delete Operators. (Dynamic Memory Allocation)

c) Write a program to illustrate Storage classes

d) Write a program to illustrate Enumerations Exercises – 4 (Functions)

Write a program illustrating Inline Functions

a) Write a program illustrate function overloading. Write 2 overloading functions for power.

b) Write a program illustrate the use of default arguments for simple interest function.

Exercise -5 (Functions –Exercise Continued)

a) Write a program to illustrate function overloading. Write 2 overloading functions for adding two numbers

b) Write a program illustrate function template for power of a number.

c) Write a program to illustrate function template for swapping of two numbers. Exercise -6

(Classes Objects)

Create a Distance class with:

- feet and inches as data members
- member function to input distance
- member function to output distance
- member function to add two distance objects

a). Write a main function to create objects of DISTANCE class. Input two distances and output the sum.

b). Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)

c) Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

d). Write a C++ program demonstrating a Bank Account with necessary methods and variables

Exercise – 7 (Access)

Write a program for illustrating Access Specifiers public, private, protected

a) Write a program implementing Friend Function

b) Write a program to illustrate this pointer

c) Write a Program to illustrate pointer to a class

Exercise -8 (Operator Overloading)
a). Write a program to Overload Unary, and Binary Operators as Member Function, and NonMember Function

i. Unary operator as member function

ii. Binary operator as nonmember function

b). Write a c++ program to implement the overloading assignment = operator

c). Write a case study on Overloading Operators and Overloading Functions (150 Words)
Exercise -9 (Inheritance)

a) Write C++ **Programs and incorporating various forms of Inheritance**

i) Single Inheritance

ii) Hierarchical Inheritance

iii) Multiple Inheritances

iv) Multi-level inheritance

v) Hybrid inheritance

b) Write a **program to show Virtual Base Class**

c) Write a case study on using virtual classes (150 Words)Exercise-10 (Inheritance –Continued)

a) Write a Program in C++ to illustrate the order of execution of constructors and destructors in Inheritance

b) Write a Program to show how constructors are invoked in derived classExercise -11 (Polymorphism)

a) Write a program to **illustrate runtime polymorphism**

b) Write a program to illustrate this pointer

c) Write a program illustrates pure virtual function and calculate the area of different shapesBy using abstract class

d) Write a case study on virtual functions (150 Words)Exercise -12(Templates)

a) Write a C++ Program to **illustrate template class**

b) Write a Program to **illustrate class templates** with multiple parameters

c) Write a Program to illustrate member function templatesExercise -13 (Exception Handling)

a).Write a **Program for Exception Handling** Divide by zero b). Write a Program to re throw an Exception

SEM/YEAR	: III SEM/2 nd Year
COURSE CODE	: 20VI309
TITLE OF THE COURSE	: Artificial Intelligence Lab
L: T/A: P: C	: 0: 0: 4: 4

LIST OF PROGRAMS:

1. **SpaCy (in Python) – Case Study** : About spaCy and Installation, SpaCy pipeline and properties, Tokenization, Pos Tagging, Entity Detection, Dependency Parsing, Noun Phrases, Word Vectors, Integrating spaCy with Machine Learning, Comparison with NLTK and CoreNLP.

Note : Algorithm used – SVM

<https://www.analyticsvidhya.com/blog/2017/04/natural-language-processing-made-easy-using-spacy-%E2%80%8Bin-python/>

Project 1: Develop a Chat bot for NTTF admission activities. (Tools: chatfuel, python or any other sdk.)

<https://medium.com/analytics-vidhya/building-a-simple-chatbot-in-python-using-nltk-7c8c8215ac6e>

2. **Dog Breed Identification – Case Study** : Classify Images Using TensorFlow,
Task 1: Download the Pre-trained model. Task 2: Implement . Task 3: Remove the pre-training and retrain the model. Task 4: Evaluate

<https://medium.com/@RaghavPrabhu/a-simple-tutorial-to-classify-images-using-tensorflow-step-by-step-guide-7e0fad26c22>

https://github.com/RaghavPrabhu/Deep-Learning/tree/master/dogs_breed_classification

Project 2: **Build Image Classification Model for Identifying NTTFCard.**

Tools(Python packages: numpy, pandas, matplotlib)

<https://www.analyticsvidhya.com/blog/2019/01/build-image-classification-model-10-minutes/>

SEM/YEAR	: III SEM/2 nd Year
COURSE CODE	: 20VI310
TITLE OF THE COURSE	: Oracle Lab
L: T/A: P: C	: 0: 0: 6: 6

LIST OF PROGRAMS:

1. Identify the syntax for creating a table.
2. Identify the syntax for defining constraints.
3. Identify the code for using the INSERT statement.
4. Identify the code for using the UPDATE statement.
5. Identify the code for using the DELETE statement.
6. Identify the SQL statement to retrieve data from tables.
7. Identify the arithmetic expressions used to perform operations on data.
8. Identify the use of the WHERE clause in restricting the result set of an SQL query.
9. Identify the use of the comparison operators used in a WHERE clause to restrict the query results.
10. Identify the rules of precedence associated with WHERE clause.
11. Identify the methods of the sorting result set of a query using the ORDER BY clause.
12. Identify substitution variables that are used while retrieving data by using SQL statements.
13. Identify guidelines for using the GROUP BY clause.
14. Identify the features of the ROLLUP operator and CUBE operator.
15. Identify the syntax for altering and dropping a table.
16. Identify features of views.
17. Identify syntax for performing various tasks for managing views.
18. Identify the syntax for creating and dropping synonyms.
19. Identify the syntax for creating and dropping indexes.
20. Identify the syntax for creating and using a sequence.
21. Identify the features of single row character functions.
22. Match the number functions with their purpose.
23. Identify the features of Date functions.
24. Identify features the functions used to convert data types.(to_char,to_num,to_date)
25. Identify the syntax for displaying dates in different formats.
26. Identify features of general functions.(NVL,NVL2)
27. Demonstrate the use of CASE expand DECODE functions.
28. Identify the use of nested functions in retrieving data from tables.
29. Identify use of single row and multiple row sub queries sub queries to retrieve from multiple tables.
30. Identify the syntax for performing multiple-column and correlated sub queries.
31. Identify the use of different types of join to retrieve data from multiple tables.
32. Identify the syntax of the unconditional INSERT ALL statement

33. Identify the syntax of the conditional INSERT ALL statement.
34. Identify the syntax of the conditional INSERT FIRST statement.
35. Identify the code for retrieving data hierarchically from a table.
36. Generate a query using the following SET OPERATORS, UNION, UNION ALL, INTERSECT, MINUS
37. Controlling User Access. Create User, Grant, Revoke
38. Identify features of various PL/SQL data types.
39. Identify the syntax for declaring PL/SQL variables using the %type attributes.
40. Identify features of bind variables and substitution variables.
41. Identify the syntax of the % ROWTYPE attributes.
42. Identify the syntax for creating a PL/SQL table based record.
43. Identify the syntax for creating a PL/SQL cursor based record.
44. Identify the syntax for creating a PL/SQL user defined record.
45. Identify the features of nested blocks.
46. Identify uses of PL/SQL operators.
47. Identify codes for manipulating data using DML statements in PL/SQL block.
48. Identify the syntax of decision making statement.
49. Identify the syntax of looping statement.
50. Identify the syntax for controlling implicit cursors and use the attributes.
51. Identify the syntax for controlling explicit cursors and use the attributes.
52. Identify the syntax for using cursor FOR loops, FOR UPDATE, WHERE CURRENT OF.
53. Identify guidelines for trapping system built in exceptions.
54. Identify guidelines for trapping user defined exceptions.
55. Identify the syntax for raise_application_error.
56. Identify the syntax for passing parameters to a stored procedure.
57. Identify tasks involved in using stored procedures.(IN,OUT,IN OUT)
58. Identify the syntax for creating PL/SQL function.
59. Trapping predefined and user defined exception in subprogram.
60. Identify sequence steps for developing PL/SQL packages.
61. Identify the code to create a trigger.
62. Write program to show use of new and old keywords in a trigger program.
63. Demonstrate the following TCL operations with suitable Example: COMMIT- COMMIT, SAVEPOINT, ROLLBACK

Reference :

- SQL,PL/SQL The programming language of Oracle by Ivan Byross
- Oracle PLSQL programming by Steven Feuerstein
 - www.tutorialspoint.com
 - www.oracle.com
 - www.plsqltutorials.com

SEM/YEAR	: III SEM/2 nd Year
COURSE CODE	: 20VI311
TITLE OF THE COURSE	: Linux Lab
L: T/A: P: C	: 0: 0: 4: 4

List of Programs:

1. a) Study of **Unix/Linux general purpose utility command** list
man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
b) Study of vi editor.
c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
d) Study of Unix/Linux file system (tree structure).
e) Study of .bashrc, /etc/bashrc and Environment variables.
2. Write a C program that makes a **copy of a file using standard I/O, and system calls**
3. Write a C program to emulate the UNIX **ls -l** command.
4. Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - **ls -l | sort**
5. Write a C program that illustrates **two processes communicating using shared memory**
6. Write a C program to **simulate producer and consumer problem using semaphores**
7. Write C program to **create a thread using pthreads** library and let it run its function.
8. Write a C program to illustrate concurrent execution of threads using pthreads library

SEM/YEAR	: IV SEM/2 nd Year
COURSE CODE	: 20VI401
TITLE OF THE COURSE	: Dynamic Website
L: T/A: P: C	: 2: 0: 0: 2

Course objectives

- Understand linear system of equations
- Understand the structure of Matrices and Determinants
- Infer different co-ordinate systems and applications of vectors.

Unit 1

4hrs

Re-Take (Understanding web for 2019 & beyond): The need of web, What is web technology?, How web works? (HTTP,DNS), The History & future of Web. (PWAs). What is Full-stack web development? [MEAN stack]: Frontend (HTML/CSS with frontend frameworks), Backend (Node JS as server side scripting), DB (Mongo DB for storage)

Unit 2

8hrs

Frontend: HTML for frontend development-HTML DOM, Semantic HTML, SEO / Accessibility

CSS for frontend development -Basics of CSS, CSS layout (Grid, Flex Box), Media queries for responsive web design, What is CSS3?. **Javascript for frontend development:** Syntax and constructs, DOM Manipulation, Fetch API / HTTP, Modular programming (ES6), Package managers (NPM, Yarn), CSS Pre-processors (SAAS, Less), CSS Frameworks (Bootstrap, Material Design). **Build tools:** Task runners (NPM scripting), Module bundlers (Webpack), Formatter (Prettier, JSLint), MVC Architecture and Angular JS

Unit 3

8hrs

What is server side scripting? : Scripting languages -Intro to Node.js (syntax, application & deployment), Comparison with other scripting languages (Ruby, Go lang). **Package manager NPM with Node. js** -Using NPM libraries, Creating NPM modules. **Best practices of Node JS** - Functional inheritance, Granular modeling, Error handling

Database: Intro to web Database for storage (Relational, NoSQL), Mongo DB - Overview,Advantages and Environment. **Using Mongo DB for web:** Data modeling, DB Operations

Advanced Mongo DB: Relationships, Atomic operations, Map reduce, Brief intro to Caching (Redis, Meme Cache)

Unit 4

5hrs

Web APIs : REST API (RESTful systems)- HTTP Verbs, CRUD & Paths, Brief intro to gRPC (REST Alternative). **Web Security:** What is web security? Why it's important ? , Understanding Different Auth Mechanisms – oAuth, Basic Authentication, Token authentication

Unit 5

5hrs

Web Server: Introduction to Web servers, Create node server with express JS. **Extras (Testing, PWAs):** APIs for PWA (Storage, Web sockets, service workers), Performance enhancements (Using dev tools/lighthouse), Testing using cypress/Jest

Reference:

<https://github.com/kamranahmedse/developer-roadmap>

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 20VI402
TITLE OF THE COURSE	: Software Testing
L: T/A: P: C	: 2: 0: 0: 2

OBJECTIVE:

Fundamentals for various testing methodologies

- Describe the principles and procedures for designing test cases.
- Provide supports to debugging methods.
- Acts as the reference for software testing techniques and strategies.

UNIT-I: 6hrs

Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs. **Flow graphs and Path testing**: Basics Concepts of Path Testing, Predicates, Path Predicates And Achievable Paths, Path Sensitizing, Path Instrumentation, Application of PathTesting

UNIT-II: 6hrs

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques. **Dataflow testing**: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.

UNIT-III: 6hrs

Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains an Interfaces Testing, Domain and Interface Testing, Domains and Testability. Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.

UNIT-IV: 6hrs

Syntax Testing: Why, What and How, A Grammar for formats, Test Case Generation, Implementation and Application and Testability Tips. Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, and Specifications.

UNIT – V: 6hrs

Software Testing Tools: Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner ,Using Win runner, Mapping the GUI, Recording Test, Working with Test, Enhancing Test, Checkpoints, Test Script Language, Putting it all together, Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard

TEXT BOOKS:

1. Software testing techniques – Boris Beizer, Dreamtech, second edition.
2. Software Testing- Yogesh Singh, Camebridge

REFERENCE BOOKS:

1. The Craft of software testing - Brian Marick, Pearson Education.
2. Software Testing, 3rd edition, P.C. Jorgensen, Aurbach Publications (Dist.by SPD).
3. Software Testing, N.Chauhan, Oxford University Press.
4. Introduction to Software Testing, P.Ammann&J.Offutt, Cambridge Univ.Press.
5. Effective methods of Software Testing, Perry, John Wiley, 2nd Edition, 1999.
6. Software Testing Concepts and Tools, P.NageswaraRao, dreamtech Press
7. Win Runner in simple steps by Hakeem Shittu, 2007Genixpress.

Foundations of Software Testing, D.Graham& Others, Cengage Learning

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 20VI403
TITLE OF THE COURSE	: Business Intelligence
L: T/A: P: C	: 2: 0: 0: 2

OBJECTIVES:

The student should be made to:

- Be exposed with the basic rudiments of business intelligence system
- understand the modeling aspects behind Business Intelligence
- understand of the business intelligence life cycle and the techniques used in it
- Be exposed with different data analysis tools and techniques

UNIT I: BUSINESS INTELLIGENCE

6hrs

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

UNIT II KNOWLEDGE DELIVERY

6hrs

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

UNIT III EFFICIENCY

6hrs

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

UNIT IV BUSINESS INTELLIGENCE APPLICATIONS

6hrs

Marketing models – Logistic and Production models – Case studies.

UNIT V FUTURE OF BUSINESS INTELLIGENCE

6hrs

Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & **Text Analytics** – Advanced Visualization – Rich Report, Future beyond Technology

TEXT BOOK:

1. Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", 9 th Edition, Pearson 2013.

REFERENCES:

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

SEM/YEAR	: IV SEM/2 nd Year
COURSE CODE	: 20VI404
TITLE OF THE COURSE	: Java Programming
L: T/A: P: C	: 2: 0: 0: 2

OBJECTIVES:

- Understanding the OOP's concepts, classes and objects, threads, files, applets, swings And act.
- This course introduces computer programming using the JAVA programming language With object-oriented programming principles
- Emphasis is placed on event-driven programming methods, including creating and Manipulating objects, classes, and using Java for network level programming and middleware development

UNIT-I:

6hrs

Introduction to OOP, procedural programming language and **object oriented language**, principles of OOP, applications of OOP, history of java, java features, JVM, program structure. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting, flow of control.

UNIT-II:

6hrs

Classes and objects, class declaration, creating objects, methods, constructors and constructor Overloading, garbage collector, importance of static keyword and examples, this keyword, arrays, Command line arguments, nested classes

UNIT-III:

6hrs

Inheritance, types of inheritance, super keyword, final keyword, overriding and abstract class. Interfaces, creating the packages, using packages, importance of CLASSPATH and java.lang package Exception handling, importance of try, catch, throw, throws and finally block, user defined exceptions, Assertions.

UNIT-IV:

6hrs

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. Reading data from files and writing data to files, random access file,

UNIT-V:

6hrs

Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

TEXT BOOKS:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

REFERENCE BOOKS:

1. Swing: Introduction, JFrame, JApplet, JPanel, Componets in Swings, Layout Managers in
2. Swings, JList and JScrollPane, Split Pane, JTabbedPane, JTree, JTable, Dialog Box

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 20VI405
TITLE OF THE COURSE	: Enterprise Applications - Basics of ERP
L: T/A: P: C	: 2: 0: 0: 2

Course objectives

- Understand linear system of equations
- Understand the structure of Matrices and Determinants
- Infer different co-ordinate systems and applications of vectors.

Unit 1

6hrs

Introduction to ERP : What is ERP?, Evaluation of ERP ,Reasons for the Growth of ERP, Structure of ERP, Various Modules of ERP, Advantages of ERP.

An Overview of Enterprise : An overview of Enterprise, Business Functions and Business, Processes, Business Modelling. Importance of Information: Characteristics of information; Types of information, Information System: Components of an information system; Integrated Management Systems.

Unit 2

6hrs

ERP and Related Technologies : Business Process Reengineering (BPR), Management Information, System, Decision Support Systems, Executive Information Systems, Data Warehousing, Data Mining, CRM, Supply Chain management.

Unit 3

6hrs

ERP System : Introduction to ERP System, Functional Module-Finance, Sales and Distribution, Materials Management, Production Planning, Quality Management, Human Resource, Plant Maintenance, Integration of ERP, Supply Chain and Customer Relationship Application.

Unit 4

6hrs

ERP Implementation Life cycle : ERP Tools and Software, Implementation Challenges, ERP Implementation Strategies, ERP Implementation Life Cycle, Implementation Methodologies, Pre-evaluation Screening ,Package Evaluation, Project Planning phase, Gap Analysis, Reengineering, Configuration, Implementation, Team Training, Post Implementation

Unit 5

6hrs

ERP Market: Introduction, ERP Market Place and Market Place Dynamics, Market, Overview, The Changing ERP Market, SAP AG, Oracle, Peoplesoft ,JD, Edwards. Future Directives in ERP. **Customer Relationship Management and ERP**: Role of ERP in CRM, Concept of CRM: Objectives of CRM; Benefits of CRM; Components of CRM, Types of

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 19VI406
TITLE OF THE COURSE	: Data Handling and Visualization
L: T/A: P: C	: 2: 0: 0: 2

Course objectives

- Explain what data visualization is and its importance in our world today
- Understand why Python is considered one of the best data visualization tools
- Describe matplotlib and its data visualization features in Python
- List the types of plots and the steps involved in creating these plots
- Critically synthesize the theory and practical application of visualization for problem solving.

Course Out comes

- Produce compelling and useful data visualizations.
- Apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques.

Unit 1: Data Collection Structures

6Hrs

Lists: Creating Lists, Accessing Values in Lists, Adding and Updating Lists, Deleting List Elements, Basic List Operations, Indexing, Slicing, and Matrices, Built-in List Functions and Methods,

Dictionaries: Creating Dictionaries, Updating and Accessing Values in Dictionaries, Deleting Dictionary Elements, Built-in Dictionary Functions, Methods, Tuples: Creating Tuples, Concatenating, Basic Tuples Operations,

Unit 2: Data Frames

6Hrs

Creating Data Frames from a Dict of Series or Dicts, Creating Data Frames from a Dict of Ndarrays/Lists, Creating Data Frames from a Structured or Record Array, Creating Data Frames from a List of Dicts, Creating Data Frames from a Dict of Tuples, Selecting, Adding, and Deleting Data Frame Columns, Indexing and Selecting Data Frames, Transposing a Data Frame, Data Frame Interoperability with Numpy Functions,

Unit 3: Data Gathering and Cleaning**5Hrs**

Cleaning Data, Checking for Missing Values, Handling the Missing Values, Reading and Cleaning CSV Data, Merging and Integrating Data, Reading Data from the JSON Format, Reading Data from the HTML Format, Reading Data from the XML Format

Unit 4: The Importance of Data Visualization in Business Intelligence**8Hrs**

Why Is Data Visualization Important? Why Do Modern Businesses Need Data Visualization? The Future of Data Visualization, How Data Visualization Is Used for Business Decision-Making: Faster Responses, Simplicity, Easier Pattern Visualization, Team Involvement, Unify Interpretation

Introducing Data Visualization Techniques:

Loading Libraries, Popular Libraries for Data Visualization in Python: Matplotlib, Plotly, Geoplotlib, Pandas, Introducing Plots in Python

Unit 5: Data Visualization**5Hrs**

Direct Plotting: Line Plot, Bar Plot, Pie Chart, Box Plot, Histogram Plot, Scatter Plot, Seaborn Plotting System: Strip Plot, Box Plot, Swarm Plot, Joint Plot, Matplotlib Plot: Line Plot, Bar Chart, Histogram Plot, Scatter Plot, Stack Plot, Pie Chart

Text Books:

Data Analysis and Visualization Using Python by Dr. Ossama Embarak, APress, 2018

SEM/YEAR	: IV SEM/2 nd Year
COURSE CODE	: 20VI407
TITLE OF THE COURSE	: Java Programming Lab
L: T/A: P: C	: 0: 0: 5: 5

List of Programs

1. Write a program to display your Information on the Console.
2. WAP to use the Conditional Statements.
3. WAP to use the Control Statements.
4. WAP to pass Command Line Arguments & display the same on the console.
5. WAP to declare a String Array of with varying Width & display the content of the Array in the same manner in which the data is stored.
6. WAP to demonstrate the use of Operators.
7. WAP to demonstrate Pass By Value & passing the Objects as Parameters.
8. WAP to demonstrate Method Overloading & Method Overriding.
9. WAP to demonstrate **Constructor Overloading**.
10. WAP to use **Abstract Classes**.
11. **Create a Package** & Import the same in the other class.
12. Demonstrate the use of Access Modifiers with the help of Packages.
13. WAP to **demonstrate Multiple Inheritance** with the help of Interfaces.
14. WAP to **handle the Exceptions**.
15. WAP to use 'finally' & the Nested 'try' block.
16. Demonstrate the use of 'try', 'catch', 'finally', 'throw' & 'throws' in Exception handling.
17. Create your own Exception class & throw the same in the other class.
18. WAP to **demonstrate the Life Cycle of Thread**.
19. WAP to **Create Multiple Threads** & set the Priorities.
20. WAP to demonstrate Thread Synchronization.
21. WAP to take the Input from the User **using Basic IO** & display the output.
22. WAP to demonstrate the use of static Methods & static Blocks.
23. Demonstrate the use of transient in Serialization.
24. Usage of String & String Buffer.
25. WAP to create a Process & display the output given by that Process.
26. WAP to set the System Properties.

27. WAP to **use Array List**, Sort the Elements, retrieve the values & the Keys from the Map.
28. Programs to work with Collection **Interfaces & Classes**.
29. WAP to retrieve all the File Properties & display the same.
30. WAP to demonstrate the various Input & Output Streams (Character Streams, Byte Streams, Object Streams).
31. WAP for **Serializing the Objects** & to Deserialize the same.
32. WAP to display your information on to the Applet Window.
33. WAP to pass your information to the Applet & display the same on to the Applet Window (Using
param tag).
34. Demonstrate various Methods of Graphics class.
35. Create a GUI Form (Applet) using all the possible awt Controls.
36. **Create a GUI Application** form using all the possible awt Controls.
37. Create a Notepad with all the functionalities.
38. WAP to **demonstrate various Events** in Java.
39. WAP using Anonymous classes & Adapter classes.
40. WAP to **Communicate from one System to other, using Networking (TCP/IP)**.
41. WAP to Communicate from one System to other, using Networking (UDP).
42. WAP to call the Method from a **Remote System using RMI**.

SEM/YEAR	: IV SEM/2 nd Year
COURSE CODE	: 20VI408
TITLE OF THE COURSE	: Software Testing lab
L: T/A: P: C	: 0: 0: 5: 5

LIST OF PROGRAMS:

1. Understand The **Automation Testing Approach** (Theory Concept).
2. Using Selenium IDE, Write a test suite containing minimum 4 test cases.
3. Understanding **Test Automation**. Using Selenium write a simple test script to validate each field of the registration page (Eg: Facebook Registration Page)
4. **Install Selenium server** and demonstrate it using a script in Java/PHP.
5. Conduct a test suite for any two web sites.
6. Write and test a program to login a specific web page.
7. **Write test cases** to validate a mobile number using one time pin identification (OTP)
8. Write and Test a program to find out list of employees having salary greater than Rs 50,000 and age between 30 to 40 years.
9. Write and test a program to update 10 student records into table into Excel file.
10. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects).
11. Write and test a program to provide total number of objects present / available on the page.
12. Write and test a program to get the number of list items in a list / combo box.
13. Write and test a program to count number of items present on a desktop.
14. Understanding the use of bug tracking and testing tool Bugzilla and Jira.

Open ended Experiment: **Mini Project** – Not for exam but to compulsory to be included in Record. (Test cases for Admission form, Shopping cart, Travel Booking, Hotel Booking, Utility Bill Payment.).

SEM/YEAR	: IV SEM/2 nd Year
COURSE CODE	: 20VI409
TITLE OF THE COURSE	: Dynamic website lab
L: T/A: P: C	: 0: 0: 4: 4

LIST OF PROGRAMS:

1. **Getting started with HTML**: Heading & paragraphs, Links, Images, Lists & Tables.
2. **Getting started with CSS**: Colors, Fonts and font family, Width height and backgrounds, Classes.
3. **The basic layout** : The structure of header, The layout of header, Padding, Structure and layout of footer, Structure and layout of header
4. **Forms** : The layout and structure of forms
5. **Responsive web design** : Using media queries & Graphics, Box- sizing, Responsive font size, Max/Min width attribute, IFrames, Filepaths, Drag & Drop, Web storage
6. **Getting started with Javascript** : Console.log (),Arithmetic calculations, Strings, Using and updating Variables, Constants, Template literals, If-else statements, Switch statements, Booleans & comparison operators, Iterations and loops, Arrays and it's elements, Objects and it's usage
7. **In depth Javascript with ES6** : Classes and instances, Constructors, Methods, Inheritance, Overriding, Packages (Using NPM), Array methods (for each, find, filter)
8. **Angular JS** : Directives & expressions, Models, Data binding, Controllers, Scopes, Filters, Angular JS Services, HTTP with Angular js, Angular JS DOM, Angular JS API, Routing.
9. **Node JS** : Getting starts with HTTP server, Node modules, File system, Events
10. **Node js with Mongo DB** : Create Database, Create collection, Sort, Insert/Update/Delete/Drop, Join & Limit
11. **Chrome dev tools** : Console Logs, Run Javascript, Application Cache, Performance analysis, Optimize website speed

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 19VI410
TITLE OF THE COURSE	: Business Intelligence Lab
L: T/A: P: C	: 0: 0: 4: 4

List of Experiments:

1. Import the legacy data from different sources such as (Excel, SqlServer, Oracle etc.) and load in the target system.
2. Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver / Power BI.
3. Data Visualization from ETL Process
4. Creating a Cube in SQL server 2012
5. Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.

SEM/YEAR	: IV SEM/2 nd Year
COURSE CODE	: 20VC402
TITLE OF THE COURSE	: Java Programming
L: T/A: P: C	: 2: 0: 0: 2

OBJECTIVES:

- Understanding the OOP's concepts, classes and objects, threads, files, applets, swingsAnd act.
- This course introduces computer programming using the JAVA programming languageWith object-oriented programming principles
- Emphasis is placed on event-driven programming methods, including creating and Manipulating objects, classes, and using Java for network level programming and middlewaredevelopment

UNIT-I:**6hrs**

Introduction to OOP, procedural programming language and **object oriented language**, principles of OOP, applications of OOP, history of java, java features, JVM, program structure.Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting, flow of control.

UNIT-II:**6hrs**

Classes and objects, class declaration, creating objects, methods, constructors and constructorOverloading, garbage collector, importance of static keyword and examples, this keyword, arrays, Command line arguments, nested classes

UNIT-III:**6hrs**

Inheritance, types of inheritance, super keyword, final keyword, overriding and abstract class.Interfaces, creating the packages, using packages, importance of CLASSPATH and java.lang package Exception handling, importance of try, catch, throw, throws and finally block, user defined exceptions, Assertions.

UNIT-IV:**6hrs**

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. Reading data from files and writing data tofiles, random access file,

UNIT-V:**6hrs**

Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: eventdelegation model, sources of event, Event Listeners, adapter classes, inner classes.

TEXT BOOKS:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson

REFERENCE BOOKS:

1. Swing: Introduction, JFrame, JApplet, JPanel, Componets in Swings, Layout Managers in Swings, JList and JScrollPane, Split Pane, JTabbedPane, JTree, JTable, Dialog Box

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 20VC403
TITLE OF THE COURSE	: WSA & Linux Server Administration
L: T/A: P: C	: 2: 0: 0: 2

Objectives:

1. Install, administer and maintain a Windows Server 2003 implementation;
2. Create user and group accounts in Windows 2003;
3. Install and configure Active Directory services;
4. Identify network protocols and services supported by Windows Server 2003; and
5. Implement a backup, recovery and disaster recovery plan.

Unit 1: **6hrs**

Installation of Windows Server, Windows Server file systems, NTFS Security

Unit2: **6hrs**

Installation and administration of Active Directory services, Create and administer user and group accounts, user and group policies

Unit 3: **6hrs**

Network protocols and services supported by Windows Server

Unit 4: **6hrs**

Enable and configure Routing and Remote Access Service, Backup and restoration of data. Implementation of a disaster recovery plan

Unit 5: **6hrs**

Monitoring and optimizing performance of a Windows Server implementation

Text Books:

1. Windows Server 2012: Pocket Consultant. Microsoft Press by Stanek, W., Microsoft Press ISBN-10: | ISBN-13: 978-0-735-66633-7
2. Windows Server 2016: Server Infrastructure. Stanek & Associates by Stanek, W., Stanek & Associates

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 20VC404
TITLE OF THE COURSE	: IoT
L: T/A: P: C	: 2: 0: 0: 2

COURSE OBJECTIVES:

1. To learn the building blocks of Internet of Things (IoT) and their characteristics.
2. To introduces the students to the programming aspects of Internet of Things witha view towards rapid prototyping of IoT applications.
3. To learn Reference architectures for different levels of IoT applications.
4. To learn IoT data analytics and Tools for IoT.

COURSE OUTCOMES:

At the end of the course students will be able to

1. Will be able to identify a suitable IOT data analytics and a tool for IOT
2. Will know in a manner how the general Internet as well as Internet of Things work

UNIT 1 - Introduction

6hrs

Introduction: Concepts behind the Internet of Things. - **The IoT paradigm** - Smart objects - Bitsand atoms - Goal orientation - Convergence of technologies. Introduction to Internet of ThingsIntroduction, Definition & Characteristics of IoT ,**Physical Design of IoT** , Things in IoT , **IoT Protocols** . IoT Levels & Deployment Templates

UNIT 2 - Domain Specific IOTs:

6hrs

Introduction, **Home Automation**, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, IoT and M2M- Introduction, M2M , Difference between IoT and M2M , SDN and NFVfor IoT, **Software Defined Networking** , Network Function Virtualization

UNIT 3 - IOT SYSTEM MANAGEMENT WITH NETCONF

6hrs

Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Limitationsof SNMP, Network Operator Requirements, NETCONF 83 4.5 YANG, IoT Systems Management with NETCONF-YAN , NETOPEER

UNIT 4 - DEVELOPING INTERNET OF THINGS

6hrs

IoT Platforms Design Methodology , Introduction, **IoT Design Methodology**, Case Study on IoTSystem for Weather Monitoring, DATA ANALYTICS FOR IOT -Introduction , Apache Hadoop ,MapReduce Programming Model , **Using Apache Storm for Real-time Data Analysis** ,**REST**-basedapproach ,WebSocket-based approach , Structural Health Monitoring Case Study

UNIT 5 - Tools for IoT Introduction

6hrs

Chef, Setting up Chef , Chef Case Studies, Multi-tier Application Deployment ,Hadoop Cluster , Storm Cluster, Puppet, Puppet Case Study - Multi-tier Deployment, NETCONF- YANG Case Studies ,Steps for IoT device Management with NETCONF-YANG , Managing Smart Irrigation IoTSystem with NETCONF-YANG , Managing Home Intrusion Detection IoT System with NETCONF- YANG , IoT Code Generator

Text books:

1. Arshdeep Bahga and Vijay Madisetti , Internet of Things - A Hands-On Approach, VPT; 1edition (August 9, 2014)

Reference Books:

1. Ian G Smith, The Internet of Things 2012 New Horizons, IERC - Internet of Things European Research Cluster, 2012.
2. IEEE 802.3 Working Group, <http://www.ieee802.org/3>, Retrieved 2014. Paul Deitel, C How to Program, 7th Edition, Deitel How to Series.
3. M. Wang, G. Zhang, C. Zhang, J. Zhang, C. Li, An IoT-based Appliance Control System for Smart Homes, ICICIP 2013.
4.] H. Zhang, J. Guo, X. Xie, R. Bie, Y, Sun, Environmental Effect Removal Based Structural Health Monitoring in the Internet of Things, International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing (IMIS), 2013

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 20VC405
TITLE OF THE COURSE	: Web Programming
L: T/A: P: C	: 2: 0: 0: 2

OBJECTIVES:

- This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web. The course will introduce web-based media-rich programming tools for creating interactive web pages.

UNIT-I: HTML, CSS

6hrs

Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext

Links, Lists, Tables, Forms, HTML5 CSS: Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution

UNIT-II:

6hrs

Java script: The Basic of Java script: Objects, Primitives Operations and Expressions, ScreenOutput and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions DHTML: Positioning Moving and Changing Elements

UNIT-III:

6hrs

XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches, AJAX A New Approach: Introduction to AJAX, Integrating PHP and AJAX.

UNIT-IV:

6hrs

PHP Programming: Introducing PHP: Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators, Controlling program flow, Conditional statements, Control statements, Arrays, functions, working with forms and Databases such as MySQL.

UNIT-V:

6hrs

Introduction to **PERL**, Operators and if statements, Program design and control structures, Arrays, Hashes and File handling, Regular expressions, Subroutines, Retrieving documents from the web with Perl. Introduction to Ruby

TEXT BOOKS:

1. Programming the World Wide Web, Robert W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrell, Gosselin, Zak, Karparhi, MacIntyre, Morrissey, Cengage

REFERENCE BOOKS:

1. Ruby on Rails Up and Running, Lightning fast Web development, Bruce Tate, CurtHibbs, Oreilly (2006)
2. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012)
3. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book,Dream Tech.
4. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, CengageLearning

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 20VC406
TITLE OF THE COURSE	: Design and Analysis of Algorithms
L: T/A: P: C	: 2: 0: 0: 2

OBJECTIVES:

Upon completion of this course, students will be able to do the following:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

UNIT-I: 6hrs

Introduction: What is an Algorithm, Algorithm Specification, Pseudocode conventions RecursiveAlgorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance measurement?

UNIT-II: 6hrs

Dived and Conquer: General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement, RandomizedSorting Algorithms.

UNIT-III: 6hrs

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, An Optimal RandomizedAlgorithm, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT-IV: 6hrs

Dynamic Programming: All - Pairs Shortest Paths, Single – Source Shortest paths GeneralWeights, String Edition, 0/1 Knapsack, Reliability Design,

UNIT-V: 6hrs

Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Coloring ,Hamiltonian Cycles

TEXT BOOKS:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, University Press
2. Introduction to AlgorithmsThomas H. Cormen, PHI Learning

REFERENCE BOOKS

1. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman
2. Algorithm Design, Jon Kleinberg, Pearson.

M/2nd Year

COURSE CODE

: 20VC408

TITLE OF THE COURSE

: WSA & Linux Server Administration Lab

L: T/A: P: C

: 0: 0: 4: 4

List of Experiments:

1. Deploying and configuring Windows Server
 - a) Deploying and configuring Server Core
 - b) Implementing and using remote server administration
2. Implementing identity services and Group Policy
 - a) Deploying a new domain controller on Server Core
 - b) Configuring Group Policy
 - c) Deploying and using certificate services
3. Implementing and configuring network infrastructure services in Windows Server
 - a) Deploying and configuring DHCP
 - b) Deploying and configuring DNS
4. Implementing storage solutions in Windows Server
5. Implementing and configuring virtualization in Windows Server

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 20VCXXX
TITLE OF THE COURSE	: Java Programming Lab
L: T/A: P: C	: 0: 0: 5: 5

List of Programs

1. Write a program to display your Information on the Console.
2. WAP to use the Conditional Statements.
3. WAP to use the Control Statements.
4. WAP to pass Command Line Arguments & display the same on the console.
5. WAP to declare a String Array of with varying Width & display the content of the Array in the same manner in which the data is stored.
6. WAP to demonstrate the use of Operators.
7. WAP to demonstrate Pass By Value & passing the Objects as Parameters.
8. WAP to demonstrate Method Overloading & Method Overriding.
9. WAP to demonstrate Constructor Overloading.
10. WAP to use Abstract Classes.
11. Create a Package & Import the same in the other class.
12. Demonstrate the use of Access Modifiers with the help of Packages.
13. WAP to demonstrate Multiple Inheritance with the help of Interfaces.
14. WAP to handle the Exceptions.
15. WAP to use 'finally' & the Nested 'try' block.
16. Demonstrate the use of 'try', 'catch', 'finally', 'throw' & 'throws' in Exception handling.
17. Create your own Exception class & throw the same in the other class.
18. WAP to demonstrate the Life Cycle of Thread.
19. WAP to Create Multiple Threads & set the Priorities.
20. WAP to demonstrate Thread Synchronization.
21. WAP to take the Input from the User using Basic IO & display the output.
22. WAP to demonstrate the use of static Methods & static Blocks.
23. Demonstrate the use of transient in Serialization.
24. Usage of String & String Buffer.
25. WAP to create a Process & display the output given by that Process.
26. WAP to set the System Properties.

27. WAP to use Array List, Sort the Elements, retrieve the values & the Keys from the Map.
 28. Programs to work with Collection Interfaces & Classes.
 29. WAP to retrieve all the File Properties & display the same.
 30. WAP to demonstrate the various Input & Output Streams (Character Streams, Byte Streams, Object Streams).
 31. WAP for Serializing the Objects & to Deserialize the same.
 32. WAP to display your information on to the Applet Window.
 33. WAP to pass your information to the Applet & display the same on to the Applet Window(Using param tag).
 34. Demonstrate various Methods of Graphics class.
 35. Create a GUI Form (Applet) using all the possible awt Controls.
 36. Create a GUI Application form using all the possible awt Controls.
 37. Create a Notepad with all the functionalities.
 38. WAP to demonstrate various Events in Java.
 39. WAP using Anonymous classes & Adapter classes.
 40. WAP to Communicate from one System to other, using Networking (TCP/IP).
 41. WAP to Communicate from one System to other, using Networking (UDP).
 42. WAP to call the Method from a Remote System using RMI.
- Reference books:
1. The complete reference Java 2 - Patrick Naughton
 2. Pure Java 2 -Techmedia
 3. Java 2 - Sun Microsystems
 4. Java 2 - O'Reilly
 5. Java Programming - Balaguruswamy

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 20VC410
TITLE OF THE COURSE	: IOT Lab
L: T/A: P: C	: 2: 0: 0: 2

List of Experiments:

1. Introduction to **Arduino platform and programming**
2. Interfacing Arduino to Zigbee module
3. Interfacing Arduino to GSM module
4. Interfacing Arduino to Bluetooth Module
5. Introduction to **Raspberry PI platform and python programming**
6. Interfacing sensors to Raspberry PI
7. Communicate between Arduino and Raspberry PI using any wireless medium
8. Setup a cloud platform to log the data
9. Log Data using Raspberry PI and upload to the cloud platform
10. **Design an IOT based system**

SEM/YEAR	: III SEM/2 nd Year
COURSE CODE	: 20VC301
TITLE OF THE COURSE	: Data structures with C
L: T/A: P: C	: 2: 0: 0: 2

OBJECTIVE

- Learning program independent view of data structures, including its representation and
- Operations performed on them, which are then linked to sorting, searching and indexing
- Methods to increase the knowledge of usage of data structures in algorithmic perspective

UNIT I: LINEAR DATA STRUCTURES

6 Hrs

Abstract Data Types - Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Definition and an example – Arrays and its representations – Stacks and Queues – Linked lists – Linked list based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition.

UNIT II: NON-LINEAR DATA STRUCTURES

6 Hrs

Trees – Binary Trees – Binary tree representation and traversals – Threaded binary trees – Binary tree representation of trees – Application of trees: Set representation and Union-Find operations – Graph and its representations – Graph Traversals – Connected components.

UNIT III: SEARCH STRUCTURES AND PRIORITY QUEUES

6 Hrs

AVL Trees – Red-Black Trees – Splay Trees – Binary Heap – Leftist Heap

UNIT IV: SORTING

6 Hrs

Insertion sort – Merge sort – Quick sort – Heap sort – Sorting with disks – k-way merging – Sorting with tapes – Poly-phase merge

UNIT V: SEARCHING AND INDEXING

6 Hrs

Linear Search – Binary Search - Hash tables – Overflow handling – Cylinder Surface Indexing – Hash Index – B-Tree Indexing.

TEXT BOOKS:

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Galgotia Book Sorce, Gurgaon, 1976.
2. Gregory L. Heilman, Data Structures, Algorithms and Object Oriented Programming, Tata McGraw-Hill, New Delhi, 2002.

REFERENCES:

1. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, New Delhi, 1991.
2. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi, 2006.

SEM/YEAR	: III SEM/2nd Year
COURSE CODE	: 20VC302
TITLE OF THE COURSE	: OOP'S with C++
L: T/A: P: C	: 2: 0: 0: 2

Course Objectives

To learn the basic principles of object-oriented programming paradigm using C++Course outcomes

Students will be able to:

1. Identify classes with attributes and functions for given problem
2. Analyze the relationship between the classes link them using appropriate concepts
3. Design and implement abstract data types.
4. Devise generic classes capable of manipulating primitive and user defined data types.

UNIT 1

6hrs

Programming Paradigms - Introduction to OOP – Overview of C++ - **Classes** – Structures – Union – Friend Functions – Friend Classes – Inline functions – Constructors – Destructors –DynamicInitialization of **Objects** - Static Members – Passing objects to functions – Function returningobjects-Arrays of Objects, Object as Function Arguments

UNIT 2

6hrs

Arrays – Pointers – this pointer – References – Dynamic memory Allocation – functionsOverloading – Default arguments – Overloading Constructors – Pointers to Functions –Operator Overloading - Type Conversion.

UNIT 3

6hrs

Inheritance – Types - Derived Class Constructors- Issues in Inheritance – Virtual base Class –Polymorphism – Virtual functions – Pure virtual functions

UNIT 4

6hrs

Class templates and generic classes – Function templates and generic functions – **Overloading function templates** – power of templates – **Exception Handling** – Derived class Exception – overhandling generic functions – Exception handling Functions

UNIT 5

6hrs

Streams – Formatted I/O with IOS class functions and manipulators –File I/O – Name spaces –Array based I/O – Error handling during file operations - Formatted I/O – STL: Overview- Container Classes Lists-Maps- Algorithms Using Functions and Objects-String Class - SequenceContainers, Iterators-Specialized Iterators - Associative Containers. Storing User- Defined Objects - Function Objects

Text Books

1. Stephen Prata, "C++ Primer Plus", 6th Edition ,Addison-Wesley Professional, 2011
2. Bjarne Stroustrup, "Programming: Principles and Practice Using C++", 1st Edition, Addison-Wesley Professional, 2008

Reference Books

1. Andrew Koenig and Barbara E. Moo, "Accelerated C++: Practical Programming by Example", 1st Edition, Addison-Wesley Professional, 2000
2. Bruce Eckel , "Thinking in C++: Introduction to Standard C++: Volume One" 2nd Edition, Prentice Hall, 2000
3. Andrei Alexandrescu , "Modern C++ Design: Generic Programming and Design Patterns Applied" , 1st Edition, Addison-Wesley Professional, 2001

SEM/YEAR	: III SEM/2nd Year
COURSE CODE	: 20VC303
TITLE OF THE COURSE	: Computer Networks-II
L: T/A: P: C	: 2: 0: 0: 2

Course Objectives

- To introduce the fundamental aspects of various types of computer networks
- To demonstrate the TCP/IP and OSI models with merits and demerits.

Course outcomes

- At the end of the course
- Students should be understand and explore the basics of Computer Networks and Various Protocols
- He/She will be in a position to understand the World Wide Web concepts
- Students will be in a position to administrate a network and flow of information
- Further he/she can understand easily the concepts of network security, mobile And ad hoc networks

UNIT 1

6hrs

Overview of the Internet: Protocol, Layering Scenario, **TCP/IP Protocol Suite: The OSI Model**, Internet history standards and administration; Comparison of the OSI and TCP/IP Reference model, Physical Layer: Introduction to Guided transmission media and wireless transmission Media, Transmission mode, Classification of networks Parallel & Serial Transmissions, Analog & Digital Signals, Periodic & Aperiodic Signals, Nyquist criteria and Shannon theorem Modulation-
--Amplitude Modulation, Frequency Modulation, Phase Modulation Data Link Layer - Design issues, CRC codes, Elementary Data Link Layer Protocols, stop and wait, sliding window, go- back-N protocols .

UNIT 2

6hrs

Multi Access Protocols - ALOHA, CSMA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.

UNIT 3

6hrs

Network Layer: Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Control to Infinity Problem, Hierarchical Routing, Congestion control algorithms, admission control.

UNIT 4

6hrs

The Internet Transport Protocols: UDP, RPC, Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Connection Management Modeling, The TCP Sliding Window, The TCP Congestion Control, The future of TCP

UNIT 5

6hrs

Application Layer- Introduction, providing services, Applications layer paradigms, Client server model, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS, SSH, SNMP, Socket Programming

Text Books

1. Behrouz A. Forouzan, Data Communications and Networking -, Fifth Edition TMH,2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.

Reference Books

1. W. Tomasi, "Advanced Electronic Communication Systems", 2000
2. James Martin, "Telecommunications & the Computer", 3rd Edition, PHI. 2001
3. P. C. Gupta, "Data Communications, PHI, 2001.

SEM/YEAR	: III SEM/2nd Year
COURSE CODE	: 20VC304
TITLE OF THE COURSE	: Microprocessor & Micro Controller
L: T/A: P: C	: 2: 0: 0: 2

Course Objectives

1. To introduce microprocessors and basics of system design using microprocessors.
2. To introduce h/w architecture, instruction set and programming of 8086 microprocessor
3. To introduce the peripheral interfacing of microprocessors.
4. To introduce the h/w architecture, instruction set, programming and interfacing of 8051 microcontroller

Course outcomes

At the end of the course student will be able

1. To Know the basics of system design using microprocessors.
2. To implement the h/w architecture, instruction set and programming of 8086 Microprocessor
3. To implement peripheral interfacing of microprocessors.
4. To know the h/w architecture, instruction set, programming and interfacing of 8051 microcontroller

UNIT 1

6hrs

INTRODUCTION TO MICROPROCESSOR

Introduction-Evolution of Microprocessor, The Microprocessor-Based Personal Computer Systems, The **Microprocessor and its Architecture**: Introduction and difference between 8085 and 8086 microprocessor. 8086 pin diagram, Minimum mode maximum Mode

UNIT 2

6hrs

8086 ARCHITECTURE

Internal Architecture of 8086, Registers, **Addressing Modes**-Immediate addressing, Register addressing, direct addressing, indirect addressing, relative addressing, **Memory Paging**, Flat Mode Memory Addressing Modes

UNIT 3

6hrs

PROGRAMMING 8086

Data Movement Instructions: MOV Revisited, PUSH/POP, Load-Effective Address, String Data Transfers, Miscellaneous Data Transfer Instructions, Arithmetic and Logic Instructions: Addition, Subtraction and Comparison, Multiplication and Division, BCD and ASCII Arithmetic, Basic Logic Instructions, Shift and Rotate, String Comparisons. Program Control Instructions: The Jump Group, Controlling the Flow of the Program, Bit manipulation instruction.

UNIT 4

6hrs

I/O INTERFACING

Memory Interfacing and I/O interfacing –8255 pin diagram, Parallel communication interface – Serial communication interface – Timer – Keyboard /display controller – Interrupt controller – DMA controller – Applications.

UNIT 5

6hrs

8051 MICROCONTROLLERS

Architecture of 8051 – Pin Diagram of 8051, Operational features – Memory and I/O addressing – Interrupts – Instruction set – Applications.

Text Books

1. Douglas V Hall, "MICROPROCESSORS AND INTERFACING, PROGRAMMING ANDHARDWARE" TMH, 2006.
2. Barry B Brey: The Intel Microprocessors, 8th Edition, Pearson Education, 2009

Reference Books

1. Krishna Kant, "MICROPROCESSORS AND MICROCONTROLLERS Architecture,programming and system design using 8085, 8086, 8051 and 8096". PHI 2007.
2. Mohammed Rafiquzzaman, Microprocessors and Microprocessor Based Systems,2nd Edition CRC Press, 2000
3. Muhammad Ali Mazidi, Janice GillispieMazidi, RolinD.MCKinlay The 8051 Microcontroller and Embedded Systems, Second Edition, Pearson Education2008.
4. Kenneth J. Ayala, "The 8086 Microprocessor: Programming & Interfacing ThePC", Delmar Publishers, 2007.

SEM/YEAR	: III SEM/2nd Year
COURSE CODE	: 20VC305
TITLE OF THE COURSE	: Operating System
L: T/A: P: C	: 2: 0: 0: 2

Course Objectives

1. To tell the students the how the operating system is making computer system more Convenient
2. How to efficiently utilize the computer resources.

Course outcomes

At the end of the course student will be able to

1. Understand functions, structures and history of operating systems
2. Master understanding of design issues associated with operating systems
3. Master various process management concepts including scheduling, synchronization, Deadlocks, file sharing.

UNIT 1

6hrs

Computer System and Operating System Overview: Overview of computer system, Over View of Operating Systems, operating systems functions protection and security distributed systems special purpose systems operating systems structures, Operating System Services and systems calls, Virtual Machines, Operating System Design and Implementation, operating systems generation

UNIT 2

6hrs

Process Management – Process concepts, threads, scheduling-criteria algorithms, their evaluation, thread scheduling. Concurrency: Process synchronization, the critical- section problem, Peterson’s Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors.

UNIT 3

6hrs

Principles of deadlock – system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock, **Memory Management**: Swapping, contiguous memory allocation, paging, structure of the page table , segmentation, virtual memory, demand paging, page-Replacement, algorithms, case studies UNIX

UNIT 4

6hrs

I/O systems, Hardware, application interface, kernel I/O subsystem, Transforming IO requests, Hardware operation, STREAMS, performance. **File system Interface**- the concept of a file, Access Methods, Directory structure, File system mounting, and file sharing, protection. File System implementation- File system structure, file system implementation, directory implementation, directory implementation, **allocation methods**, free-space management, efficiency and performance.

UNIT 5

6hrs

Protection: Protection, Goals of Protection, Principles of Protection, Domain of protection Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights, Capability- Based systems, Language-Based Protection, Security- the Security problem, program threats, system and network threats **cryptography as a security tool**, user authentication, implementing security defenses, firewalling to protect systems and networks, computer –security classifications. Introduction to Mass-storage structure: NAS and SAN.

Text Books

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, TMH.

Reference Books

1. Operating Systems' – Internal and Design Principles Stallings, Fifth Edition–2005, Pearson education/PHI
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 2nd edition Pearson/PHI.

SEM/YEAR	: III SEM/2nd Year
COURSE CODE	: 20VC306
TITLE OF THE COURSE	: Computer Organization
L: T/A: P: C	: 2: 0: 0: 2

Course Objectives

1. Provide in depth knowledge of designing a processor considering both the data part and control parts of a processor
2. Give students thorough knowledge of memory technology , different types of memory, I/Osub systems, and I/O operations
3. Help students understand the concept of pipeline processing, parallel architectures and multi core architectures

Course outcomes

At the end of the course student will be able

1. To design the data part and control part of a processor
2. To understand memory technology, I/O systems and I/O operation and use them i the designof a computing system
3. To understand and appreciate the pipe line processing and parallel processing

UNIT 1

6hrs

Basic organization of computers, Block level description of the functional units as related to the execution of a program; Fetch, decode and execute cycle. Machine instructions, Instructions set architectures, Assembly language programming, addressing modes, instruction cycles, registers and storage, addressing modes; discussions about **RISC versus CISC architectures**

UNIT 2

6hrs

Information representation, Floating point representation (IEEE754), computer arithmetic and their implementation; Data Part Design: Fixed-Point Arithmetic-Addition, Subtraction, Multiplication and Division, Arithmetic Logic Units control and data path, data path components, design of ALU and **data-path**, **Control Part Design**: Control unit design; Hardwired and Microprogrammed Control unit

UNIT 3

6hrs

Memory Technology, static and dynamic memory, Random Access and Serial Access Memories, Cache memory and Memory Hierarchy, Address Mapping, Cache updating schemes, Virtual memory and memory management unit

UNIT 4

6hrs

I/O subsystems: Input-Output devices such as Disk, CD-ROM, Printer etc.; interfacing with IO devices, keyboard and display interfaces; Basic concepts Bus Control, Read Write operations, Programmed IO, Concept of handshaking, Polled and Interrupt-driven I/O, DMA data transfer.

UNIT 5

6hrs

Pipeline Processing, Instruction and Arithmetic Pipeline, Pipeline hazards and their resolution, Parallel Processing Systems, Multi-core Architectures

Text Books

1. Mano, M.M., Computer System Architecture, Prentice Hall of India, New Delhi, 1992
2. V. Carl Hamacher, Safwat G. Zaky and Zvonko G. Vranesic , Computer Organization , McGraw Hill series 2002

Reference Books

1. Hayes, J.P , Computer Architecture and Organization, McGraw-Hill, 1998
2. Vincent P. Heuring and Harry F. Jordan , Computer Systems Design and Architecture (2nd Edition), Dec, 2003
3. David Patterson and John Hennessey Computer Organization and Design, Elsevier. 2008

SEM/YEAR	: III SEM/2nd Year
COURSE CODE	: 20VC308
TITLE OF THE COURSE	: Data structures with C Lab
L: T/A: P: C	: 0: 0: 4: 4

List of Experiments:

1. Design a problem to search an element in two dimensional array.
2. Design a problem to perform following operations on tables using function only addition, Subtraction, Multiplication.
3. Design a program for performing various Basic elementary Operations (Push , Pop , Peek , isfull , isempty) using ARRAY on stack .
4. Design a program for performing various Basic elementary Operations (Enqueue , Dequeue , Peek etc.) using ARRAY on Queue.
5. Write a program using iteration and recursion concept for Quicksort.
6. Design a problem for Linked list creation and perform operations such as insert, delete , update and reverse on it.
7. Design a problem to simulate following sorting algorithm. a) Merge sort, b) Insertion Sort, c) Bubble Sort
8. Design a solution for following Search Techniques. a) Linear Search, b) Binary Search
9. Design a Program for various Graph traversal techniques
10. Design a program for various tree traversal techniques.
11. Design a program for Binary Tree and Perform the following operations: Creation, Insertion & Traversal on the tree.
12. Implement Circular Linked list.
13. Design a program for performing various Basic elementary Operations (Push, Pop , Peek , isfull, isempty) using Linked List on Stack .
14. Design a program for performing various Basic elementary Operations (Enqueue , Dequeue, Peek etc.) using Linked List on Queue.
15. Design a Problem to Evaluate Prefix expression.

SEM/YEAR	: II SEM/2nd Year
COURSE CODE	: 20VC309
TITLE OF THE COURSE	: Computer Networks-II Lab
L: T/A: P: C	: 0: 0: 4: 4

LIST OF EXPERIMENTS

1. Design and implement a C program to copy a file using command line arguments passed to a user defined function.
2. Write a C/C++ POSIX compliant program to check the following limits on the system:
 - (i) Maximum number of characters allowed in a path name
 - (ii) Maximum number of child processes that may be created
 - (iii) Maximum number of characters allowed in a file name (iv) Number of clock ticks per second
 - (iv) Maximum number of files that can be opened simultaneously by a process.
3. Design and implement a C program that demonstrates interprocess communication between two processes using mkfifo, open, read, write and close APIs.
4.
 - a) Write a C program that prints the contents of its environment list.
 - b) Design and implement a C program to implement the mv command in Unix using link and unlink APIs.
5. Design and implement a C program to illustrate the race condition using parent and child processes.
6. Design and implement a C program to implement the system function.
7. Design and implement C programs for both server and client to demonstrate inter-process communication using connection oriented (TCP) sockets. Client requests a file from server. The file received from server should be displayed on the client's terminal. Otherwise appropriate error message should be printed.
8. Design and implement C programs for both server and client to demonstrate inter-process communication using connectionless (UDP) sockets. Client requests a file from server. The file received from server should be displayed on the client's terminal. Otherwise appropriate error message should be printed.

9. Design and implement a **simple Linux driver**.

10. Simulate three nodes point to point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.

Simulate transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.

SEM/YEAR	: III SEM/2 nd Year
COURSE CODE	: 20VC310
TITLE OF THE COURSE	: Microprocessor & Micro Controller Lab
L: T/A: P: C	: 0: 0: 5: 5

List of experiments:

- a) Programming experiments to implement software programs using stacks, and queues,
- b) Programming experiments to implement software programs using linked lists
- c) Programming experiments to implement software programs on bit operations
- d) Programming experiments to implement software programs using arithmetic operations
- e) Programming experiments to implement software programs - searching and sorting
- f) Interface ADC to microprocessor kit
- g) Interface DAC to microprocessor kit
- h) Interface Logic Controller to microprocessor kit
- i) Interface Stepper motor to microprocessor kit
- i) Interface Additional Keyboard and display units to microprocessor kit
- j) Interface 2 compatible devices

SEMESTER	V					
YEAR	III					
COURSE CODE	19CS3501					
TITLE OF THE COURSE	FINITE AUTOMATA AND FORMAL LANGUAGES					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	1	2	-	50	5

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
1	IV/II	19CS2401	DISCRETE MATHEMATICAL STRUCTURES

COURSE OBJECTIVES :

- To learn general theory of automata, properties of regular sets and regular expressions.
- To understand basics of formal languages.
- To know push-down automata, context- free languages, Turing machines.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Understand the concept of Automata	L1
CO2	Explain the concept of Regular Expression, languages and abstract machines to recognize them	L2
CO3	Know the generalized computation model and different types Computation	L2

COURSE CONTENT:	
MODULE 1	9Hrs
Introduction to Finite Automata: Study and Central concepts of automata theory, An informal picture of finite automata, deterministic and non-deterministic finite automata, applications of finite automata, finite automata with epsilon – transitions.	
MODULE 2	12Hrs
Regular expression and languages: Regular expressions, finite automata and regular expressions, algebraic laws of regular expressions. applications of regular expressions such as Grep, and Lex etc.. Properties of Regular Languages: closure properties of regular languages, Pumping Lemma, equivalence and minimization of automata	

MODULE 3	10Hrs
Context – free Grammars and Languages: Context free grammars, Context-free languages, Parse trees, Ambiguity in grammars and languages Pushdown Automata: Pushdown automation (PDA), the language of PDA, equivalence of PDA's and CFG's, Deterministic Pushdown Automata,	
MODULE 4	9Hrs
Properties of Context – Free Languages: Normal forms of context free grammars, pumping lemma for context free languages, closure properties of context free languages. Applications of CFG - such as spec of programming languages, parsing techniques, and Yacc	
MODULE 5	10Hrs
Introduction to Turing Machine- The Turing machine, programming techniques for Turing machine, extensions to the basic Turing machine, restricted Turing Machines, Turing Machines and Computers. Chomsky hierarchy	

TEXT BOOKS :

1. Daniel I. A. Cohen, Introduction to Computer Theory, 2nd Edition, Wiley India Student Edition, 2008.
2. J.E. Hopcroft , R. Motwani, and J. D. Ullman, Introduction to Automata Theory, Languages and Computation, 3rd Edn. Pearson Education , New Delhi 2008

REFERENCES :

1. K.L.P. Misra and N. Chandrashekar. Theory of Computer Science- Automata, Languages and Computation, 3rd Edn. PHI, New Delhi, 2007
2. C. Martin - Introduction to Languages and the Theory of Computation 2ndEdn, TMH, New Delhi, 2000.

SEMESTER	V					
YEAR	III					
COURSE CODE	19CS3503					
TITLE OF THE COURSE	Object Oriented Design and Programming with Java					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	4	-	42	5

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES:

- Understand the basic concepts of object-oriented design techniques.
- Understand the fundamentals of object-oriented programming with Java.
- Draw UML diagrams for the software system.
- Impart basics of multi-threading and database connectivity.
- Develop GUI using event handling techniques in Java.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Apply the concepts of object-oriented programming in software design process.	L3
CO2	Develop Java programs using Java libraries and construct to solve real-time problems.	L3
CO3	Understand, develop and apply various object-oriented features using Java to solve computational problems	L2
CO4	Implement exception handling and JDBC connectivity in Java.	L3
CO5	Build an event-oriented GUI (graphical user interface).	L6

COURSE CONTENT:	
MODULE 1	09 Hrs
An Overview of Object-Oriented Systems Development: Introduction; Two Orthogonal Views of the Software; Object-Oriented Systems Development Methodology; Why an Object-Oriented? Overview of the Unified Approach. Object Basics: Introduction; An Object-Oriented Philosophy; Objects; Objects are Grouped in Classes; Attributes: Object State and Properties; Object behaviour and Methods; Object Respond to Messages; Encapsulation and Information Hiding; Class Hierarchy: Inheritance; Multiple Inheritance; Polymorphism; Object Relationships and Associations: Consumer-Producer Association; Aggregation and Object Containment; Case Study - A Payroll Program; Object-Oriented Systems Development Life Cycle: Introduction; Software Development Process; Building High-Quality Software; Object-Oriented Systems Development: A Use Case Driven Approach; Reusability.	
MODULE 2	08 Hrs
Unified Modelling Language :Introduction; Static and Dynamic models; Why Modeling? Introduction to the UML; UML Diagrams; UML Class Diagram; Use-Case Diagram. Introduction to Java: Java's Magic: The Bytecode; JVM; Object-Oriented Programming; Simple Java programs; Two Control Statements; Lexical Issues; Data Types; Variables, Arrays and String constructors; Operators; Control Statements; Introducing Classes: Class Fundamentals; objects; methods; constructors; this Keyword; Garbage Collection; finalize() method; Parameter Passing; Overloading; Access Control Keywords. Inheritance basics; method overriding; abstract classes; Packages and interfaces. Exception handling fundamentals; multiple catch; nested try statements.	
MODULE 3	09 Hrs
Multi-Threaded Programming :Multi-Threaded Programming: Java Thread Model; The main Thread; Creating a thread and multiple threads; Extending threads; Implementing Runnable; Synchronization; Inter Thread Communication; producer consumer problem. Input/Output: I/O Basic; Reading console input Writing Console output.	
MODULE 4	08 Hrs
Event and GUI Programming: Introducing Swing; The Origins of Swing; Swing Is Built on the AWT; Two Key Swing Features; The MVC Connection; Components and Containers; The Swing Packages; A Simple Swing Application; Event Handling; JLabel; JTextField; JButton	
MODULE 5	08 Hrs
Database Access: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet.	

TEXT BOOK:

1. Bahrami A.; Object Oriented Systems Development using the Unified Modeling Language; McGraw Hill; 1999.
2. Schildt; Herbert. Java The Complete Reference; 8th Edition. US: McGraw-Hill Osborne Media; 2011.
3. Jim Keogh; J2EE: The Complete Reference; McGraw Hill Education in 2002.

REFERENCES:

1. Barclay K., J. Savage, Object Oriented Design with UML and Java, Elsevier, 2004.
- 2.Y. Daniel Liang, Introduction to Java Programming, 7th edition, Pearson, 2013.

SEMESTER	V					
YEAR	III					
COURSE CODE	19CS3504					
TITLE OF THE COURSE	DATABASE MANAGEMENT SYSTEMS + Lab					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	2	-	42	4

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES:

- To learn data models, conceptualize and depict a database system using ER diagram
- To understand the internal storage structures in a physical DB design
- To know the fundamental concepts of transaction processing techniques

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Demonstrate the basic elements of a relational database management system	L2
CO2	Identify the data models for relevant problems	L2
CO3	Apply normalization for the development of application software's	L3
CO4	Use Structured Query Language (SQL) for database manipulation.	L3
CO5	Understand transactions and their properties (ACID)	L2
CO6	Design and develop a large database with optimal query processing	L6

COURSE CONTENT:

MODULE 1	8Hrs
Introduction: Purpose of Database System--Views of data--data models, database management system, three-schema architecture of DBMS, components of DBMS. E/R Model - Conceptual data modeling - motivation, entities, entity types, attributes, relationships, relationship types, E/R diagram notation, examples.	

MODULE 2	9 Hrs
Relational Model: Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators, SQL -Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL, notion of aggregation, aggregation functions group by and having clauses.	
MODULE 3	10 Hrs
Database Design: Dependencies and Normal forms, dependency theory – functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF , decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, 4NF, and 5NF	
MODULE 4	9 Hrs
Transactions: Transaction processing and Error recovery - concepts of transaction processing, ACID properties , concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.	
MODULE 5	9 Hrs
Embedded SQL: triggers, procedures and database connectivity. Introduction to NoSQL	

TEXT BOOK:

1. Silberschatz, Henry F. Korth, and S. Sudharshan, “Database System Concepts”, 5thEd, Tata McGraw Hill, 2006.
2. J. Date, A. Kannan and S. Swamynathan, “An Introduction to Database Systems”, 8thed, Pearson Education, 2006.

REFERENCES:

1. Ramez Elmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, Fourth Edition, Pearson/Addison Wesley, 2007
2. Raghu Ramakrishnan, “Database Management Systems”, Third Edition, McGraw Hill, 2003
3. S. K. Singh, “Database Systems Concepts, Design and Applications”, First Edition, Pearson Education, 2006

SEMESTER	VI					
YEAR	III					
COURSE CODE	19CS3601					
TITLE OF THE COURSE	Compiler Design and System Software					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	1	2	-	52	5

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
1	V	19CS3501	Finite Automata and Formal Languages

COURSE OBJECTIVES:

- To discuss the techniques of scanning, parsing & semantic elaboration well enough to build or modify front end.
- To expose the critical issues in modern compilers & provide them with the background to tackle those problems.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Understand the major phases of compilation and to understand the knowledge of Lex tool & YACC tool	L2
CO2	Develop the parsers and experiment the knowledge of different parsers design without automated tools	L3
CO3	Construct the intermediate code representations and generation	L3
CO4	Convert source code for a novel language into machine code for a novel computer	L3
CO5	Apply for various optimization techniques for dataflow analysis	L3

COURSE CONTENT:

MODULE 1		10Hrs
Introduction to System Software, Machine Architecture of SIC and SIC/XE. ASSEMBLERS: Basic assembler functions: A simple assembler, Assembler algorithm and data structures, Machine dependent assembler features: Instruction formats and addressing modes – Program relocation, Machine independent assembler features: Literals, Symbol- defining statements, Expressions, Program blocks, Control Sections and Program Linking.		

MODULE 2	9 Hrs
LOADERS AND LINKERS Basic loader functions: Design of an Absolute Loader, A Simple Bootstrap Loader, Machine dependent loader features :Relocation, Program Linking ,Algorithm and Data Structures for Linking Loader, Machine-independent loader features: Automatic Library Search, Loader Options, Loader design options :Linkage Editors, Dynamic Linking	
MODULE 3	11 Hrs
COMPILERS: Introduction: Language Processors, Structure of compiler, The science of building a compiler, Applications of compiler technology. LEXICAL AND SYNTAX ANALYSIS: Role of lexical Analyser, Specification of Tokens, Lexical Analyzer generator Lex. SYNTAX ANALYSIS I: Role of Parser, Syntax error handling, Error recovery strategies, Writing a grammar: Lexical vs Syntactic Analysis, Eliminating ambiguity, Left recursion, Left factoring.	
MODULE 4:	12 hrs
SYNTAX ANALYSIS II:- Top down parsing: Recursive Descent Parsing, First and follow, LL (1), –Bottom up parsing:Shift Reduce Parsing ,Introduction to LR parsing Simple LR: Why LR Parsers, Items and LR0 Automaton, The LR Parsing Algorithm, Constructing SLR Parsing Tables. SYNTAX-DIRECTED TRANSLATION: Syntax-Directed Definitions: Inherited and Synthesized Attributes, Evaluation orders for SDDs: Dependency graphs, Ordering the evaluation of Attributes, S-Attributed Definition, L-Attributed Definition, Application: Construction of Syntax Trees.	
MODULE 5	10 Hrs
INTERMEDIATE CODE GENERATION: Three Address Code: Addresses and Instructions, Quadruples, Triples, Static Single Assignment form. CODE GENERATION: Issues in the design of code generator, Basic Blocks, Optimization of Basic Blocks, The Code Generation Algorithm, Peephole optimization. MACHINE INDEPENDENT OPTIMIZATION: The Principal Sources of Optimization	

TEXT BOOK:

1. Leland L. Beck, “System Software – An Introduction to Systems Programming”, 3rd Edition, Pearson Education Asia, 2006.
2. Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, “Compilers – Principles, Techniques and Tools”, 2nd Edition, Pearson Education, 2007.

REFERENCES:

1. V. Raghavan, Principles of Compiler Design, Tata McGraw Hill Education Publishers, 2010.
2. Keith D Cooper and Linda Torczon, Engineering a Compiler, Morgan Kaufmann Publishers Elsevier Science, 2004.
3. D.M.Dhamdhere, Systems Programming and operating systems, Second Revised edition, Tata McGraw Hill.

SEMESTER	VI					
YEAR	III					
COURSE CODE	19CS3603					
TITLE OF THE COURSE	Software Engineering and Project Management					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	2	-	42	4

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES :

- This course is introduced to give the students necessary knowledge.
- Understanding and Design aspects in Software Engineering

To understand the Software Project Planning and Evaluation techniques

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Understand software development life cycle models, process models, and various design engineering techniques.	L2
CO2	Understand the importance of testing and use different types of testing techniques.	L3
CO3	Understand Project Management principles while developing software.	L2

COURSE CONTENT:	
MODULE 1	9Hrs
Introduction to Software Engineering: FAQs about software engineering, Professional and ethical responsibility. Socio-Technical systems: Emergent system properties, Organizations, people and computer systems; Legacy systems, the evolving role of software, Changing Nature of Software, Software myths. A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models. Software Cost Estimation: Productivity; Estimation techniques	

MODULE 2	7Hrs
Process models: A simple safety- critical system; System dependability; Availability and reliability, the waterfall model, Incremental process models, Evolutionary process models, The Unified process. Comparison of different models with case studies, Agile Development: Agile Tech, Extreme Programming, and other Agile Process Models: Scrum Methodology	
MODULE 3	9Hrs
Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. System models: Context Models, Behavioural models, Data models, Object models, structured methods.	
MODULE 4	9Hrs
Testing Strategies: Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods. A strategic approach to software testing, System testing, the art of Debugging; Component testing; Test case design; Test automation - Selenium, Test strategies for conventional software: Black-Box and White-Box testing, Validation tests, System testing.	
MODULE 5	8Hrs
Software Project Management Introduction to Software Project Management – all life cycle activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.	

TEXT BOOKS :

1. Software Engineering, by Ian Sommerville Eighth edition, International Computer Science Series.
2. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition. McGraw Hill International Edition.

REFERENCES :

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
2. SoftwareEngineering-K.K.Agarwal&YogeshSingh,NewAgeInternationalPublishers
3. Software Engineering, an Engineering approach-JamesF. Peters, WitoldPedrycz, John Wiley.
4. Systems Analysis and Design –Shelly Cashman Rosenblatt, Thomson Publications.
5. Software Engineering principles and practice-Waman Jawadekar,The McGraw-Hill Companies

SEMESTER/YEAR	:	IV SEM/II YEAR
COURSE CODE	:	19CS2401
TITLE OF THE COURSE	:	DISCRETE MATHEMATICAL STRUCTURES
L:T: P: S/P: C	:	3 : 1 : 0 : 0 : 4

Course Objectives

The objectives of the Course are:

- Solve problems using relations and generating functions.
- Understand and Construct mathematical arguments
- Use propositional and predicate logic in knowledge representation and program verification.
- Develop recursive algorithms based on mathematical induction.
- Know essential concepts in graph theory and related algorithms.
- Apply knowledge of discrete mathematics in Elementary Number Theory and problem solving.

Course Outcomes

After undergoing this course student will be able to:

- Classify functions, basic set theory relations
- Demonstrate the correctness of an argument using propositional and predicate logic, laws and truth tables
- Solve Algebraic Structures like groups, rings, domains
- Compare and differentiate graphs in different geometries related to edges.
- Apply mathematical induction, counting principles, recursion, elementary number theory
- Apply and solve Euclidean Division Algorithm and Chinese Remainder Theorem

Course Content

Module 1: Relations, Types of relations, Closure Properties, Equivalence Relations, Partial Ordering Relations, n-ary relations, Functions: one-to-one, onto and invertible functions, sequences, indexed classes of sets, recursively defined functions, cardinality, Counting Principles: Permutation, combination, the pigeon hole principle, inclusion-exclusion principle

Module 2: Logic and Propositional Calculus: Propositions and truth tables, tautologies and contradictions, logical equivalence, algebra of propositions, logical implications, Introduction to Predicate Calculus

Module 3: Graph Theory: Introduction, data structures, graphs and multi-graphs, sub-graphs, isomorphic and homomorphic graphs, paths, connectivity, the bridges of Konigsberg, traversable multi-graphs, labelled and weighted graphs, complete, regular and bipartite graphs.

Module 4: Properties of Integers: Introduction, order and inequalities, absolute value, mathematical induction, division algorithm, divisibility, primes, greatest common divisor, Euclidean algorithm, fundamental theorem of arithmetic, congruence relation, congruence equations.

Module 5: Algebraic Structures : Introduction, operations, semi-groups, groups, subgroups, normal subgroups, isomorphism and homomorphism, rings, integral domains and fields, polynomials over a field.

Text Book and References Text books:

- S. Lipschutz and M. L. Lipson, Discrete Mathematics, Schaum's outline, 3rd Edition, McGrawHill Higher Education, 2006.
- C L Liu, Elements of Discrete Mathematics, 2nd Edition, Tata McGraw Hill, 2000.

Reference books:

- K. Rosen. *Discrete Mathematics and Its Applications (4th edition)*. McGraw-Hill. 1999
- Ronald R. Graham, D. E. Knuth, and Oren Patashnik, Concrete Mathematics, 2nd Edition, Addison- Wesley Publishing Company, 1994

SEMESTER/YEAR	:	III SEM/II YEAR
COURSE CODE	:	19CS2303
TITLE OF THE COURSE	:	DIGITAL ELECTRONICS & LOGIC DESIGN
L: T: P: S/P : C	:	3 : 0 : 2 : 0 : 4

Course Objectives

The objectives of the Course are:

- To understand various number systems and conversion from one to other number systems
- To understand the difference between analog and digital signals
- To cite the basic characteristics of TTL and CMOS logic families
- To familiar with basic logic gates and their truth tables
- To introduce basic postulates of Boolean algebra
- To manipulate expressions into POS or SOP form.
- To introduce the methods for simplifying Boolean expressions like K-Map and Quine McClusky
- To understand the concept of don't care conditions and how they can be used to further optimize the logical functions
- To design simple combinational circuits such as multiplexers, decoders, encoders
- To understand the differences between combinational and sequential Logic circuits
- To familiar with basic sequential logic component-SR Latch
- To understand the basics of various types of memories.
- To present the working of various Flip-Flops (T flip-flop, D flip-flop, R-S flip-flop, JK flip-flop)
- To design combinational circuits using programmable logic devices.
- To design sequential circuits such as different types of Counters, Shift Registers

2.1 Course Outcomes

After undergoing this course, students will be able to:

- Demonstrate the knowledge of binary number systems, logic families, boolean algebra and logic gates
- Analyze different methods used for simplification of Boolean expressions.
- Design combinational logic circuits using combinational logic elements
- Design combinational circuits using Programmable Logic Devices
- Analyze sequential logic elements in the design of synchronous and asynchronous systems
- Design sequential systems composed of standard sequential modules, such as counters and registers

Course Content

Module 1: NUMBER SYSTEMS, BOOLEAN ALGEBRA AND LOGIC GATES:

Review of number systems-Binary, Octal, Hexadecimal. Introduction to Analog and Digital signals. TTL and CMOS technology, TTL and CMOS Parameters.

Truth table of Basic Gates: NOT, OR, AND, Universal Logic Gates: NOR, NAND, Positive and Negative Logic, Laws of Boolean algebra, Theorems of Boolean algebra, Boolean/Switching functions and their implementation.

SIMPLIFICATION OF BOOLEAN EXPRESSIONS AND FUNCTIONS:

Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions.

Practical:

1. Study and verification of Basic gates with Truth Tables
2. Simplification of expressions using Karnaugh Maps and realizing circuits using Basic Gates
3. Realize binary to gray code converter and vice versa

Module 2: SIMPLIFICATION OF BOOLEAN EXPRESSIONS AND FUNCTIONS:

Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine-McClusky Method.

DESIGN OF COMBINATIONAL LOGIC CIRCUITS:

Modular combinational logic elements- Multiplexers and Demultiplexers, Decoders, Encoders, Priority encoders, Magnitude comparator – BCD converter, Parity Generators and Checkers.

Practicals:

1. Simplify the given expression using tabular method and to realize circuits using Multiplexers.
2. Design and implementation parallel adder and subtractor
3. Design and implementation of comparators
4. Design various combinational logic circuits like encoders, decoders

Module 3: PROGRAMMABLE LOGIC:

Memories: RAM, ROM, SRAM, DRAM, Addressing schemes, Design of Combinational Circuits using Programmable Logic Devices (PLDs): Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PAL) devices.

SEQUENTIAL CIRCUITS:

Introduction to Sequential Circuits. Combinational v/s Sequential circuits. Asynchronous v/s Synchronous circuits. State table and state diagram

Module 4: SEQUENTIAL CIRCUITS (continued):

State assignment – Memory elements and their excitation functions –T flip-flop, D flip-flop, R-S flip-flop, JK flip-flop and their excitation requirements – Design of synchronous sequential circuits like Sequence Detectors and binary counters.

Module 5: APPLICATION OF SEQUENTIAL CIRCUITS:

Registers-Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In -Parallel Out, Universal Shift Register, Applications of Shift Registers, Asynchronous and Synchronous Counters, Changing the Counter Modulus, Decade Counters, Presettable Counters, Counter Design.

Practicals:

1. Design and implementation of shift register
2. Design and implementation synchronous counters
3. Design and implementation ring counter and Johnson counter
4. Study of 7490 BCD counter
5. Design and implementation of asynchronous counters

Textbooks and References Text Books:

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 6th Edition, Pearson Education, 2018
2. Donald P. Leach, Albert Paul Malvino & Goutam Saha: Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015

References:

1. R D Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2010.
2. Charles H. Roth: Fundamentals of Logic Design, Jr., 7th Edition, Cengage Learning, 2014
3. John M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.

SEMESTER/YEAR	:	III SEM/II YEAR
COURSE CODE	:	19CS2305
TITLE OF THE COURSE	:	COMPUTATIONAL THINKING WITH PYTHON
L: T: P: S/P: C	:	2: 0: 2: 0: 3

Course Objectives:

The objectives of the Course are:

1. To understand basic concepts of computational thinking.
2. To introduce python programming for problem solving.
3. To introduce different debugging and unit testing tools.
4. To solve real world problems using python data structures.
5. Learn to handle files and exception handling in python.
6. To explore Python's object-oriented features.
7. To build Web services and Networked programs in python.
8. To train students to design an application as part of the course mini- project using computational thinking with python.

Course Outcomes

After undergoing this course, students will be able to:

- Understand basic concepts of computational thinking.
- Outline basic python programming for problem solving.
- Apply computational thinking to solve real world programs using python.
- Build python programs using core data structures like list, dictionaries and tuples
- Implement object oriented concepts using python
- Design applications related to web services and network Programming.

Course Content

Module 1: Introduction to Computational Thinking and Python:

Introduction to computational thinking: Stages of Computational thinking, Design using Flowcharts, Implementation, Testing
Python Basics: Values, expressions and statements, Conditional execution, Functions Iterations

Module 2: Python Environment and Data Structures

Python Environment: Usage of Debugging and Unit Testing tools in python, Introduction to Github, Executing the python programs using Jupyter notebooks, **Python Data Structures:** Strings, Arrays, Lists, Tuples, Sets and Dictionaries

Module 3: Python Files and Exception Handling

Files: File types, modes, File functions, File attributes, File positions, Looping over file,. **Exception Handling:** Try-Except, Exception syntax, examples, Types of exception with except, multiple exceptions with except, Try-Finally, Raise exceptions with arguments, Python built-in exceptions, User-defined exceptions, Assertions.

Module 4: Python Objects

Classes and Objects: Creating classes, Using Objects, Accessing attributes, Classes as Types, Introduction to Multiple Instances, Inheritance.

Module 5: Applications of Python

Applications: Networked Programs, Using web services

Text Book and References Text Books:

1. "Python for Everybody-Exploring Data Using Python 3", Dr. Charles R. Severance, Shroff Publishers; First edition (10 October 2017)
2. "Introduction to Computing & Problem Solving with Python", Jeeva Jose, P. Sojan Lal, Khanna Book Publishing; First edition (2019).

Reference Books:

2. "Computer Science Using Python: A Computational Problem- Solving Focus", Charles Dierbach, Introduction John Wiley, 2012.
3. "Introduction to Computation and Programming Using Python", John V Guttag, Prentice Hall of India, 2015.
4. "How to think like a Computer Scientist, Learning with Python", Allen Downey, Jeffrey Elkner and Chris Meyers, Green Tea Press, 2014.
5. "Learning to Program with Python", Richard L. Halterman, 2011.

SEMESTER	III					
YEAR	II					
COURSE CODE	20CS2306					
TITLE OF THE COURSE	AGILE SOFTWARE ENGINEERING					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2	-	-	2	42	3

Perquisite Courses (if any)

#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES :

- Agile methodology, Scrums, Sprints.
- Agile testing, test automation, DevOps.

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Compare and contrast the differences between Agile and other project management methodologies	L4
CO2	Interpret and apply various principles, phases and activities of the Scrum methodology	L3
CO3	Define the benefits of using an Agile approach to managing projects	L2
CO4	Understand Agile Testing principles for real life situations and learn the basics of SAFe for scaled agile	L2
CO5	Identify and use various tools for Agile development and DevOps principles for CI/CD	L3

COURSE CONTENT:

MODULE 1	9Hrs
INTRODUCTION TO AGILE : Introduction to Software engineering, SDLC, Software process models- waterfall, V model, Iterative model, Spiral model; Introduction to Agile: Agile versus traditional method comparisons and process tailoring; Introduction to Agile, Various Agile methodologies -Scrum, XP, Lean, and Kanban, Agile Manifesto.	
MODULE 2	9Hrs
SCRUM AND SPRINT: Scrum: Scrum process, roles - Product Owner, Scrum Master, Team, Release manager, Project Manager, product manager, architect, events, and artifacts; Product Inception: Product vision, stakeholders, initial backlog creation; Agile Requirements – User personas, story mapping, user stories, 3Cs, INVEST, acceptance criteria, sprints, requirements, product backlog and backlog grooming; Test First Development; Pair Programming and Code reviews;	

MODULE 3	9Hrs
AGILE PROJECT MANAGEMENT: Sprint Planning, Sprint Reviews, Sprint Retrospectives, Sprint Planning - Agile release and iteration (sprint) planning, Develop Epics and Stories, Estimating Stories, Prioritizing Stories (WSJF technique from SAFe), Iterations/Sprints Overview. Velocity Determination, Iteration Planning Meeting, Iteration, Planning Guidelines, Development, Testing, Daily Stand-up Meetings, Progress Tracking, Velocity Tracking, Monitoring and Controlling: Burn down Charts, Inspect & Adapt (Fishbone Model), Agile Release Train	
MODULE 4	7Hrs
AGILE TESTING : Testing: Functionality Testing, UI Testing(Junit, Sonar), Performance Testing, Security Testing, A/B testing; Agile Testing: Principles of agile testers; The agile testing quadrants, Agile automation, Test automation pyramid; Test Automation Tools - Selenium, Traceability matrix;	
MODULE 5	8Hrs
DEVOPS: DevOps: Continuous Integration and Continuous Delivery; CI/CD: Jenkins, Git/Github Creating pipelines, Setting up runners Containers and container orchestration (Dockers and Kubernetes) for application development and deployment; Build tools - maven; Checking build status; Configuration management - puppet, chef, ansible; Fully Automated Deployment; CM - Continuous monitoring with Nagios; Introduction to DevOps on Cloud	

List of Laboratory/Practical Experiments activities to be conducted :
1. Setting up Devops Environment
2. Writing Requirements Document, Requirement Analysis (user stories)
3. Estimation and Scrum Planning
4. Implementation and Testing Using Iterative Sprint Model
5. Test Automation using Selenium
6. Unit Testing using Junit or Sonar or Python Test framework
7. CI/CD using Jenkins as Orchestrion platform
8. Containerzation using Docker or Kubernetes

TEXT BOOKS :

1. Essential Scrum: A Practical Guide to the Most Popular Agile Process Kenneth S.Rubin 2012, published by Addison-Wesley Professional
2. Agile Software Development: The Cooperative Game Alistair Cockburn 2nd Edition,2006, Addison-Wesley Professional

REFERENCES :

- 1 Scrum and XP from the Trenches Henrik Kniberg 2nd Edition, 2015, Published by C4Media, publisher of InfoQ.com
2. Agile Project Management: Creating Innovative Products, Second Edition By Jim Highsmith, Addison-Wesley Professional, 2009
3. Agile Project Management: Managing for Success, By James A. Crowder, Shelli Friess, Springer

SEMESTER	III					
YEAR	II					
COURSE CODE	20CS2307					
TITLE OF THE COURSE	DATA STRUCTURES LAB					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	-	-	2	-	30	1

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
*	**	**	***

COURSE OBJECTIVES:

- To introduce C language concepts required for data structures
- To design data structure operations to solve problems
- To introduce applications of data structures
- To implement linear data structures – stack, queue, linked list
- To implement non-linear data structures – trees and graphs

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Design and develop the programs in C to understand the different concepts of data structures.	L3
CO2	Implement stack & queue data structure and their applications, Analyse the output based on the given input data.	L3
CO3	Implement Conversions of Polish and reverse polish expressions and Record Experimental process and results	L4
CO4	Apply and implement concepts of dynamic memory allocation	L3
CO5	Use the concepts of file structures and communicate results effectively	L3

List of Laboratory/Practical Experiments activities to be conducted

Writing C programs:

1. To perform arithmetic storage/operations using arrays
2. To implement C programs with concepts of pointers, structures
3. To implement multidimensional array Matrix Multiplication
4. To search element(s) in a multidimensional array
5. To search elements in data structure with different search methods
6. To implement stack, queue and their variations using arrays
7. To implement stack, queue and their variations using linked lists

8. To Implement Linked Lists and variations and use them to store data.
9. To implement graph & binary tree traversal techniques
10. To evaluate/convert infix/prefix/postfix expressions
11. To perform basic file operations

Open-Ended Experiments

1. A man in an automobile search for another man who is located at some point of a certain road. He starts at a given point and knows in advance the probability that the second man is at any given point of the road. Since the man being sought might be in either direction from the starting point, the searcher will, in general, must turn around many times before finding his target. How does he search to minimize the expected distance travelled? When can this minimum expectation be achieved?
2. The computing resources of a cloud are pooled and allocated according to customer demand. This has led to increased use of energy on the part of the service providers due to the need to maintain the computing infrastructure. What data structure will you use for allocating resources which addresses the issue of energy saving? Why? Design the solution.
3. Mini-Project on applying suitable data structure to a given real-world problem

Textbooks

1. A M Tannenbaum, Y Langsam, M J Augentien "Data Structures using C", Pearson, 2013
2. R.L. Kruse, B.P. Leary, C.L. Tondo, "Data Structure and Program Design in C" PHI

Reference Books

1. Horowitz Anderson-Freed, and Sahni, "Fundamentals of Data structures in C", 2nd Edition, Orient Longman, 2008
2. Data Structures and Algorithm analysis in C by Mark Allen Weiss, Published by Addison Wesley (3rd Indian Reprint 2000).
3. D E Knuth, The Art of Computer Programming, Volume 1, Addison-Wesley Publishing, 2013

SEMESTER	III					
YEAR	II					
COURSE CODE	20CS2308					
TITLE OF THE COURSE	DATABASE MANAGEMENT SYSTEMS LAB					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	-	-	2	-	30	1

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
*	**	**	****

COURSE OBJECTIVES :

- Understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation.
- To provide a strong formal foundation in database concepts, recent technologies and best industry practices.
- To give systematic database design approaches covering conceptual design, logical design and an overview of physical design.
- To learn the SQL and NoSQL database system.
- To learn and understand various Database Architectures and its use for application development.
- To programme PL/SQL including stored procedures, stored functions, cursors and packages

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Install and configure database systems.	L3
CO2	Analyze database models & entity relationship models.	L3
CO3	Design and implement a database schema for a given problem-domain	L3
CO4	Understand the relational and document type database systems.	L2
CO5	Populate and query a database using SQL DML/DDl commands.	L3

Laboratory/Practical Experiments activities to be conducted	
1.	Design any database with at least 3 entities and relationships between them. Apply DCL and DDL commands. Draw suitable ER/EER diagram for the system.
2.	Design and implement a database and apply at least 10 different DML queries for the following task. For a given input string display only those records which match the given pattern or a phrase in the search string. Make use of wild characters and LIKE operator for the same. Make use of Boolean and arithmetic operators wherever necessary.
3.	Execute the aggregate functions like count, sum, avg etc. on the suitable database. Make use of built in functions according to the need of the database chosen. Retrieve the data from the database based on time and date functions like now (), date (), day (), time () etc. Use group by and having clauses.
4.	Implement nested sub queries. Perform a test for set membership (in, not in), set comparison (<some, >=some, <all etc.) and set cardinality (unique, not unique).
5.	Write and execute suitable database triggers .Consider row level and statement level triggers.
6.	Write and execute PL/SQL stored procedure and function to perform a suitable task on the database. Demonstrate its use.
7.	Write a PL/SQL block to implement all types of cursor.
8.	Execute DDL statements which demonstrate the use of views. Try to update the base table using its corresponding view. Also consider restrictions on updatable views and perform view creation from multiple tables.
9.	Mini project.

TEXT BOOKS :

1. Ramon A. Mata-Toledo, Pauline Cushman, Database management systems, TMGH, ISBN: IS978-0-07-063456-5, 5th Edition.

REFERENCES :

1. Dr. P. S. Deshpande, SQL and PL/SQL for Oracle 10g Black Book, DreamTech.
2. Ivan Bayross, SQL, PL/SQL: The Programming Language of Oracle, BPB Publication.
3. Dalton Patrik, SQL Server – Black Book, DreamTech Press.

SEMESTER	IV					
YEAR	II					
COURSE CODE	20CS2401					
TITLE OF THE COURSE	PROBABILITY AND STATISTICS					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	-	42	3

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES :

- Understand probability, random variable and random process concepts and their importance in Computer Engineering course.
- Calculate statistics related to Random variables and process such as mean, variance, etc.
- Evaluate standard distribution functions such as Poisson's, Normal distributions
- Apply functions of random variables such as characteristic function, moment generating function to calculate statistics.
- Understand probability, random variable and random process concepts and their importance in Computer Engineering course.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Compute and interpret descriptive statistics using numerical and graphical techniques.	L4
CO2	Understand the basic concepts of random variables and find an appropriate distribution for analyzing data specific to an experiment.	L2
CO3	Extend the concepts to multiple random variables and apply them to analyze practical problems.	L2
CO4	Make appropriate decisions using statistical inference that is the central to experimental research.	L4

COURSE CONTENT:	
MODULE 1	6 Hrs
INTRODUCTION TO PROBABILITY THEORY : Basic Notions of Probability, Axiomatic definition, properties, Conditional Probability and Independence – Baye's Theorem.	
MODULE 2	7 Hrs
DISCRETE PROBABILITY DISTRIBUTIONS: Discrete random variables and its properties - Bernoulli trials – Binomial Distribution and its properties – Poisson Distribution and its properties.	
MODULE 3	10 Hrs

CONTINUOUS PROBABILITY DISTRIBUTIONS	
Continuous random variables and its properties - Gamma Distribution and its properties – Exponential Distribution and its properties - Normal Distribution and its properties.	
BIVARIATE DISTRIBUTIONS:	
Bivariate random variables – Joint – Marginal - Conditional distribution.	
MODULE 4	9 Hrs
RANDOM PROCESS AND QUEUING THEORY	
Classification – Stationary process – Markov process – Markov chain – Poisson process – Random telegraph process.	
Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.	
Queuing Models, Methods for generating random variables and Validation of random numbers	
MODULE 5	10 Hrs
TESTING OF HYPOTHESIS	
Testing of hypothesis – Introduction-Types of errors, critical region, procedure of testing hypothesis- Large sample tests- Z test for Single Proportion - Difference of Proportion, mean and difference of mean	
- Small sample tests- Student's t-test, F-test-chi-square test- goodness of fit - independence of attributes.	

TEXT BOOKS :

1. A First Course in Probability, S. Ross, Pearson International Edition, 9th Edition.
2. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, 11th Edition.

REFERENCES :

1. K. S. Trivedi, Probability and Statistics with Reliability, Queuing, and L.Computer Science Applications, 2nd Ed., Wiley, 2001.
2. Robert V. Hogg, J.W. McKean, and Allen T. Craig: Introduction to Mathematical Statistics, Seventh Edition, Pearson Education, Asia.
3. Rohatgi, V K. and Saleh , A. K. Md. Ehsanes, "An Introduction to Probability and Statistics", (John Wiley and Sons) , (2nd edition) (2000)
4. Higher Engineering Mathematics by B S Grewal, 42 nd Edition, Khanna Publishers.
5. Probability and Statistics for engineers and scientists, R.,E.Walpole, R.H.Myers, S.L.Mayers and K.Ye, 9th Edition, Pearson Education (2012).
6. An Introduction to Probability Theory and its Applications, W. Feller , Vol. 1, 3rd Ed., Wiley, 1968

SEMESTER	IV					
YEAR	II					
COURSE CODE	20CS2402					
TITLE OF THE COURSE	OBJECT ORIENTED DESIGN AND PROGRAMMING					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	-	42	3

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES:

- Understand the basic concepts of object-oriented design techniques.
- Understand the fundamentals of object-oriented programming with Java.
- Draw UML diagrams for the software system.
- Impart basics of multi-threading and database connectivity.
- Develop GUI using event handling techniques in Java.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Apply the concepts of object-oriented programming in software design process.	L3
CO2	Develop Java programs using Java libraries and construct to solve real-time problems.	L3
CO3	Understand, develop and apply various object-oriented features using Java to solve computational problems	L2
CO4	Implement exception handling and JDBC connectivity in Java.	L3
CO5	Build an event-oriented GUI (graphical user interface).	L6

COURSE CONTENT:	
MODULE 1	09 Hrs
An Overview of Object-Oriented Systems Development: Introduction; Two Orthogonal Views of the Software; Object-Oriented Systems Development Methodology; Why an	

Object-Oriented? Overview of the Unified Approach. Object Basics: Introduction; An Object-Oriented Philosophy; Objects; Objects are Grouped in Classes; Attributes: Object State and Properties; Object behaviour and Methods; Object Respond to Messages; Encapsulation and Information Hiding; Class Hierarchy: Inheritance; Multiple Inheritance; Polymorphism; Object Relationships and Associations: Consumer-Producer Association; Aggregation and Object Containment; Case Study - A Payroll Program; Object-Oriented Systems Development Life Cycle: Introduction; Software Development Process; Building High-Quality Software; Object-Oriented Systems Development: A Use Case Driven Approach; Reusability.	
MODULE 2	08 Hrs
Unified Modelling Language :Introduction; Static and Dynamic models; Why Modeling? Introduction to the UML; UML Diagrams; UML Class Diagram; Use-Case Diagram. Introduction to Java: Java's Magic: The Bytecode; JVM; Object-Oriented Programming; Simple Java programs; Two Control Statements; Lexical Issues; Data Types; Variables, Arrays and String constructors; Operators; Control Statements; Introducing Classes: Class Fundamentals; objects; methods; constructors; this Keyword; Garbage Collection; finalize() method; Parameter Passing; Overloading; Access Control Keywords. Inheritance basics; method overriding; abstract classes; Packages and interfaces. Exception handling fundamentals; multiple catch; nested try statements.	
MODULE 3	09 Hrs
Multi-Threaded Programming :Multi-Threaded Programming: Java Thread Model; The main Thread; Creating a thread and multiple threads; Extending threads; Implementing Runnable; Synchronization; Inter Thread Communication; producer consumer problem. Input/Output: I/O Basic; Reading console input Writing Console output.	
MODULE 4	08 Hrs
Event and GUI Programming: Introducing Swing; The Origins of Swing; Swing Is Built on the AWT; Two Key Swing Features; The MVC Connection; Components and Containers; The Swing Packages; A Simple Swing Application; Event Handling; JLabel; JTextField; JButton	
MODULE 5	08 Hrs
Database Access: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet.	

TEXT BOOK:

1. Bahrami A.; Object Oriented Systems Development using the Unified Modeling Language; McGraw Hill; 1999.
2. Schildt; Herbert. Java The Complete Reference; 8th Edition. US: McGraw-Hill Osborne Media; 2011.
3. Jim Keogh; J2EE: The Complete Reference; McGraw Hill Education in 2002.

REFERENCES:

1. Barclay K., J. Savage, Object Oriented Design with UML and Java, Elsevier, 2004.
- 2.Y. Daniel Liang, Introduction to Java Programming, 7th edition, Pearson, 2013.

SEMESTER	IV					
YEAR	II					
COURSE CODE	20CS2403					
TITLE OF THE COURSE	PRINCIPLES OF MICROPROCESSORS & COMPUTER ORGANIZATION					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	4	-	-	-	52	4

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
*	*	**	***

COURSE OBJECTIVES:

- To introduce the architecture of 8086
- To understand the importance and function of each pin of 8086 Microprocessor
- To familiarize with the architecture of 8086 microprocessor and its operation
- To understand the various addressing modes required for assembly language Programming and to calculate the physical address.
- To learn the 8086 instruction set and write 8086 Assembly level programs
- To understand the importance of different peripheral devices and their interfacing to 8086
- Understand the concepts of Hardwired control and micro programmed control.
- To explain the current state of art in memory system design
- Discuss the concept of memory organization.
- Summarize the types of memory.
- Learn about various I/O devices and the I/O interface.
- Learn the different types of serial communication techniques.
- To understand DMA technique
- To provide the knowledge on Instruction Level Parallelism
- To understand the concepts of pipelining techniques.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Identify the basic building blocks of 8086 microprocessor and use the addressing modes for executing programs efficiently	L2
CO2	Develop 8086 assembly language programs using modern assembler tools	L3
CO3	Discuss the computer arithmetic and design algorithms for various Arithmetic operations.	L2
CO4	Design data part and control part of a processor	L3
CO5	Analyze the performance of various classes of Memories	L4
CO6	Understand pipeline & parallel processing	L2

COURSE CONTENT:	
MODULE 1	8 Hrs
Introduction to Microprocessor & its Architecture: Introduction-Evolution of Microprocessor, The Microprocessor-Based Personal Computer Systems, Internal Microprocessor Architecture , Real mode memory addressing, Memory paging, 8086 pin diagram, Internal Architecture of 8086, Registers, Addressing Modes-Immediate addressing, Register addressing, direct addressing, indirect addressing, relative addressing, Instruction formats	
MODULE 2	12 Hrs
Programming 8086: Assembler directives, Data Movement Instructions, String Data Transfers, Miscellaneous Data Transfer Instructions, Arithmetic and Logic Instructions, BCD and ASCII Arithmetic, Basic Logic Instructions, Shift and Rotate, String Comparisons. Program Control Instructions: The Jump Group, Assembly language programming with 8086, macros, procedures	
MODULE 3	10 Hrs
Processor Organization: Basic organization of computers, Block level description of the functional units as related to the execution of a program; Fetch, decode and execute cycle. Execution cycle in terms machine instructions. Information representation, Floating point representation (IEEE754), computer arithmetic and their implementation; Data Part Design: Fixed-Point Arithmetic-Addition, Subtraction, Multiplication and Division, Arithmetic Logic Units control and data path, data path components, design of ALU and data-path, Control Part Design: Control unit design; Hardwired and Micro programmed Control unit. Discussions about RISC versus CISC architectures.	
MODULE 4	12 Hrs
Memory Technology: Memory hierarchy, static and dynamic memory, RAM and ROM chips, Memory address map, Auxiliary Memory, Associative Memory, Cache Memory and organization. Input/Output Organization: Peripheral devices, Input-Output Interface; I/O Bus and Interface Modules, Isolated versus Memory-Mapped I/O, Example of an I/O interface unit, keyboard interface, Modes of Transfer; Programmed I/O, Interrupt-initiated I/O, Direct memory access (DMA)	
MODULE 5	10 Hrs
Pipelining: Basic Concepts, Arithmetic Pipeline, Instruction Pipeline; Four-Segment Instruction Pipeline, Pipeline hazards and their resolution, Parallel Processing; Flynn's classification, Multicore architectures, Introduction to Graphics Processing Units, Example: NVIDIA GPU Architecture	

TEXT BOOK:

1. Barry B Brey: The Intel Microprocessors, 8th Edition, Pearson Education, 2009
2. Mano, Morris M. Computer system architecture. Dorling Kindesley Pearson, 2005.

REFERENCES:

1. Krishna Kant, "MICROPROCESSORS AND MICROCONTROLLERS Architecture, programming and system design using 8085, 8086, 8051 and 8096". PHI 2007.
2. Douglas V Hall, "MICROPROCESSORS AND INTERFACING, PROGRAMMING AND HARDWARE" TMH, 2006.
3. Kenneth J. Ayala, "The 8086 Microprocessor: Programming & Interfacing The PC", Delmar Publishers, 2007
4. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Danny Causey, The x86 PC Assembly Language Design and Interfacing, 5th Edition, Pearson, 2013.
5. V. Carl Hamacher, Safwat G. Zaky and Zvonko G. Vranesic , Computer Organization ,McGraw-Hill series 2002
6. Hayes, J.P , Computer Architecture and Organization, McGraw-Hill, 1998
7. Vincent P. Heuring and Harry F. Jordan , Computer Systems Design and Architecture (2nd Edition), Dec, 2003
8. David Patterson and John Hennessey , Computer Organization and Design, Elsevier. 2008
9. Comer, Douglas. Essentials of computer architecture. Chapman and Hall/CRC, 2017.
10. Hord, R. Michael. Parallel supercomputing in MIMD architectures. CRC press, 2018.
11. Tanenbaum, Andrew S. Structured computer organization. Pearson Education India, 2016.
12. William Stallings-Computer Organization and Architecture, Seventh Edition, Pearson Education

SEMESTER	IV					
YEAR	II					
COURSE CODE	20CS2405					
TITLE OF THE COURSE	INTRODUCTION TO NETWORKS AND CYBERSECURITY					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	-	42	3

Prerequisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES:

- To introduce the fundamental aspects of various types of computer networks.
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- Understand the basic concepts of cyber security, how it has evolved, and some key techniques used today.
- Have an insight view of Security, Cryptography, Malware, IDS, Secure Programming etc
- Explore the subject through prescribed book, case studies, seminars and Assignments.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Understand and explore the basics of Computer Networks and working principles.	L2
CO2	Understand the concepts of Network security corresponding to various Internet Layers.	L2
CO3	Determine appropriate mechanisms for protecting the Network.	L2

COURSE CONTENT:	
MODULE 1	9Hrs
Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet Architecture; Comparison of the OSI and TCP/IP reference model. Top-down approach Cybersecurity: Basics of Cyber Security-Attacks, Vulnerabilities and Threats. Need for Network Security, Data Security and physical security.	
MODULE 2	9 Hrs

Application Layer- Introduction, providing services, Applications layer paradigms, Client server model, Standard client-server application-HTTP, DNS, SSH. Malware Detection System, Types of Malware, Viruses & Counter Measures, Worms, Bots. E-mail Security: PGP, S/MIME. Secure socket programming using UDP and TCP.	
MODULE 3	9 Hrs
Transport Level Security: Functionality and services, TCP and UDP basics, Principles of Cryptography, Web Security Considerations, Secure Sockets Layer (SSL), Transport Layer Security, Data/Message Integrity and Digital Signatures.	
MODULE 4	9 Hrs
Network Layer Security: Network Security and Services, IP Security Overview, IP Security Policy, Encapsulation Security Payload (ESP), Internet Key Exchange. Virtual Private Network (VPN), Wireless Networks Security.	
MODULE 5	9 Hrs
Data Link Layer: LLC and MAC Sublayer services, Error detection and correction Techniques. Physical Layer: Introduction to Guided transmission media and wireless transmission media. Transmission mode, Classification of networks. Firewall, Intrusion Detection System (IDS)	

TEXT BOOK:

1. Computer Networking- A top-down approach- James F Kurose and Keith W Ross, 6th Edition, Pearson Education.
2. Computer Security- Principles and Practice, William Stalling, Laurie Brown 4th Edition, Pearson

REFERENCES:

1. Behrouz A. Forouzan, Data Communications and Networking -, Fifth Edition TMH, 2013.
 2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.
- James Graham, Richard Howard, Ryan Olson- Cyber Security Essentials CRC Press.

SEMESTER	IV					
YEAR	II					
COURSE CODE	20CS2407					
TITLE OF THE COURSE	OBJECT ORIENTED PROGRAMMING LAB					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	-	-	2	-	30	1

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
*	**	**	****

COURSE OBJECTIVES :

- To learn an object oriented way of solving problems using java.
- To write Java programs using multithreading concepts and handle exceptions
- To write Java programs that connects to a database and be able to perform various operations.
- To create the Graphical User Interface using AWT Components & Swing Components.

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Develop simple java programs that make use of classes and objects	L3
CO2	Write Java application programs using OOP principles and proper program structuring.	L3
CO3	Make use of inheritance and interfaces to develop java application	L3
CO4	Model exception handling, multi threading concepts in java	L3
CO5	Create the Graphical User Interface based application programs by utilizing event handling features and Swing in Java	L3
CO6	Develop Java program that connects to a database and be able to perform various operations.	L3

List of Laboratory/Practical Experiments activities to be conducted
1. Basic programs using data types, operators, and control statements in Java.
2. Basic programs using Arrays, , Strings in java
3. Object Oriented Programming Concepts: Problem on the use of constructors, inheritance, method overloading & overriding, polymorphism and garbage collection
4. Programs involving: Exception handling, Multi-threading in Java
5. Programs involving: Packages, Interfaces in Java

6. Programs involving: Input and Output in Java
7. GUI Programming in Java
8. Programs involving : Database connectivity in Java
9. Mini Project

TEXT BOOKS :

1. Bahrami A.; Object Oriented Systems Development using the Unified Modeling Language; McGraw Hill; 1999.
2. Schildt; Herbert. Java The Complete Reference; 8th Edition. US: McGraw-Hill Osborne Media; 2011.
3. Jim Keogh; J2EE: The Complete Reference; McGraw Hill Education in 2002.

SEMESTER	IV					
YEAR	II					
COURSE CODE	20CS2408					
TITLE OF THE COURSE	MICROPROCESSORS LAB					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	-	-	2	-	30	1

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
*	**	**	****

COURSE OBJECTIVES :

- To develop and execute variety of assembly language programs of Intel 8086 including arithmetic and logical, sorting, searching, and string manipulation operations
- To develop and execute the assembly language programs for interfacing Intel 8086 with peripheral devices.

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Implement 8086 assembly language programs for microprocessor application using 8086 training boards	L3
CO2	Implement 8086 assembly language programs for microprocessor application using assembler and debuggers	L3
CO3	Design interfacing of various peripherals with 8086 microprocessor for simple applications	L3
CO4	Use Macros and Procedures in 8086 Programs	L3
CO5	Use assembly language and debugging tools when writing programs for a microprocessor	L3
CO6	Communicate effectively on the work done in the laboratory using formal report	L3

List of Laboratory/Practical Experiments activities to be conducted
Part-A: Software Programs Using Microprocessor Trainer Kit i) Programs involving : arithmetic operations, sorting ii) Programs on : code conversion (BCD TO HEX, Binary to ASCII, Binary to Gray) iii) Programs involving - Bit manipulation like checking: 1. Whether given data is positive or negative 2. Whether given data is odd or even 3. Logical 1"s and 0"s in a given data

Part- B: Software Programs Using MASM/TASM software

- i) Programs on : searching and sorting
- ii) Programs on : palindrome, string comparison
- iii) Programs on : current time display, Decimal up-counter display

Part-C: Hardware Programs to interface microprocessor with various peripherals Using Microprocessor Trainer Kit

- i) DC Motor Interface
- ii) Stepper Motor Interface
- iii) Matrix Keypad Interface
- iv) 7 Segment Display Interface

TEXT BOOKS :

1. Microprocessor and Interfacing - Douglas V Hall, SSSP Rao, 3rd edition TMH, 2012.
2. The Intel Microprocessor, Architecture, Programming and Interfacing - Barry B. Brey, 6e, Pearson Education / PHI, 2003.

SEMESTER	III					
YEAR	II					
COURSE CODE	20CS2309					
TITLE OF THE COURSE	MANAGEMENT & ENTREPRENEURSHIP					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2		-	-	30	2

Perquisite Courses (if any)

#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES :

- Identify and analyze the factors that contribute to the process of successfully launching an entrepreneurial venture and managing a new business.
- Learn the entrepreneurial process from idea generation to implementation.
- Acquaint with special problems of starting new ventures, finding products and services, which can support new enterprises, and raising capital.
- Discuss how to start own business and also to work in or with small business or are involved with entrepreneurship.

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Demonstrate knowledge of the key elements of the entrepreneurial process	L2
CO2	Employ strategies to generate new ideas for startups	L2
CO3	Outline how to protect IP legally	L2
CO4	Examine different ways of generating funding	L2
CO5	Explain organizing managing people, finance and customers	L2

COURSE CONTENT:	
MODULE 1	6Hrs
OVERVIEW OF ENTREPRENEURSHIP: THE ENTREPRENEURIAL PERSPECTIVE : Nature and Development of Entrepreneurship. Defining Manager, Entrepreneur, Entrepreneurship and Entrepreneurship. Key Elements of Entrepreneurship . Personality Characteristics of Successful Entrepreneurs. Common Myths about Entrepreneurs. Ethics and Social Responsibility of Entrepreneurs. Types of Start-Up Firms . Process of New Venture Creation. Role of Entrepreneurship in Economic Development. Emerging Trends and Issues in Entrepreneurship. Case Study: Successful Entrepreneurs Narayana Murthy Infosys	
MODULE 2	6Hrs
THE ENTREPRENEURIAL AND ENTREPRENEURIAL MIND: The Entrepreneurial Process: Identify and Evaluate the Opportunity, Develop a Business Plan, Determine the Resources Required, Manage the Enterprise. Managerial Versus Entrepreneurial Decision Making: Strategic Orientation, Commitment to Opportunity, Commitment of Resources, Control of Resources, Management Structure, Entrepreneurial Venturing inside a Corporation, Causes for Interest in Entrepreneurship, Climate for Entrepreneurship, Entrepreneurial Leadership Characteristics. Case study: How to develop effective Business Plan	
MODULE 3	6Hrs
CREATIVITY AND BUSINESS IDEA : Identify and Recognizing Opportunities: Observing Trends and Solving Problems. Creativity: Concept, Components and Types of Creativity, Stages of Creative Process. Sources of New Venture Ideas . Techniques for Generating Ideas . Stages of Analyzing and Selecting the Best Ideas. Protecting the Idea: Intellectual Property Rights and its Components. Linking Creativity, Innovation and Entrepreneurship. Case study : Application of Design Thinking in New business ideas generation in particular sector (Health care, Water Saving, Energy saving)	
MODULE 4	6Hrs
PREPARING THE PROPER ETHICAL AND LEGAL FOUNDATION: Initial Ethical and Legal Issues Facing a New Firm , Establishing a Strong Ethical Culture, Choosing an attorney (Lawyer), Drafting a founder's agreement, Avoiding legal disputes, Choosing a form of business organization, Obtaining business licenses and permits, Choosing a Form of Business Ownership (Sole, Proprietorship, Partnership, Corporation & Limited Liability Company) Case study: Startup Law A to Z IP https://techcrunch.com/2019/02/25/startup-law-a-to-z-intellectual-property/	
MODULE 5	6Hrs
MANAGING EARLY GROWTH AND CHALLENGES Recruiting and Selecting Key Employees. Lenders and Investors. Funding Requirements: Sources of Personal Financing. Venture Capital. Commercial Banks. Sources of Debt Financing. Key Marketing Issues for New Ventures . Why marketing is critical for Entrepreneurs. Entrepreneurs face unique Marketing Challenges. Guerrilla Marketing. Business Growth: Nature of Business Growth, Planning for Growth, Reasons for Growth. Managing Growth: Knowing and Managing the Stages of Growth, Challenges of Growing a Firm. Strategies for Firms Growth: Internal and External Growth Strategies. Implications of Growth for the Firm and Entrepreneur. Entrepreneurial Skills and Strategies to Overcome Pressures On: Financial Resources (Financial Control, Managing Inventory and Maintaining Good Records). Human Resources, Management of Employees, Time Management.	

Case study: 9 ways to get startups funded

<https://www.quicksprout.com/how-to-get-your-startup-funded/>

TEXT BOOKS :

2. Barringer, Ireland, "Entrepreneurship: Successfully Learning New Ventures", Pearson, Latest Edition.
3. Hisrich, Peters, Shepherd, "Entrepreneurship", Mc Graw Hill, Sixth Edition.

SEMESTER	V					
YEAR	III					
COURSE CODE	19CS3511					
TITLE OF THE COURSE	CYBERSECURITY					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	-	42	3

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES:

- Understand the basic concepts of cyber security, how it has evolved, and some key techniques used today.
- Have 1st depth view of Perimeter Security, Authentication and Access management, Cryptography, Malware, Secure Programming etc
- Explore the subject through prescribed book, case studies, hands on experience, extra readings for alternate view or real time application

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Explain the basic concepts of confidentiality, availability and integrity in Information Assurance, Including Defence technologies for Perimeter security, Authentication, Access Control.	L2
CO2	Develop solutions for security problems, balancing business concerns, technical issues and security.	L3
CO3	Understand about Intruders and Intruder Detection mechanisms, Types of Malicious software	L2
CO4	Determine appropriate mechanisms for protecting the network.	L4
CO5	Write Safe programs for some common vulnerability.	L3

COURSE CONTENT:	
MODULE 1	7 Hrs
Overview and Basics of Crypto and its Applications : Overview : Computer Security Concepts, Requirements, Design Principles, Trends, Strategy Cryptographic Tools: Confidentiality with symmetric encryption, Message Authentication &	

Hash Functions, Digital Signatures, Certificates, Random Numbers Reading Discussion (Optional) : Why crypto systems fail - Ross Anderson	
MODULE 2	8 Hrs
User Authentication and Access Control: User Authentication: Principles, Password-based, token based, Biometric, Remote User authentication, Security Issues, Oauth (reference wikipedia) Access Control: Principles, Access Rights, Discretionary Access Control, Unix File Access Control, Role Based Access Control, Attribute based Reading Discussion (Optional) : The Quest to Replace Passwords: A Framework for Comparative Evaluation of Web Authentication Schemes.	
MODULE 3	9Hrs
Malwares: Malicious Software: Types of Malware, Viruses & Counter Measures, Worms, Bots, Different types of Payloads, Rootkits , Countermeasures Reading Discussion (Optional) : Measuring Pay-per-Install: The Commoditization of Malware Distribution by J. Caballero, C. Grier, C. Kreibich, V. Paxson (gives a feel of security market)	
MODULE 4	9 Hrs
Network Security: Firewall and Intrusion Prevention systems: Firewalls, Types of Firewalls, Intrusion Prevention, Unified Threat management Intrusion Detection: Intruders, Intrusion Detection, Analysis, Host based, Network based Reading Discussion (Optional) : Next generation firewalls by Gartner, Palo Alto	
MODULE 5	9 Hrs
Internet Security Protocol: Internet Security Protocols and standards: SSL, TLS, HTTPS.	

TEXT BOOK:

1. Computer Security- Principles and Practice, William Stalling, Laurie Brown 4th Edition, Pearson

REFERENCES:

1. James Graham, Richard Howard, Ryan Olson- Cyber Security Essentials CRC Press
2. James A. Lewis, security: turning national solutions into international cooperation
3. Dan Shoemaker, Ph.D., William Arthur Conklin, Wm Arthur Conklin, security: The Essential Body of Knowledge
4. John Rittinghouse, PhD, William M. Hancock, PhD, security Operations Handbook.

SEMESTER	V					
YEAR	III					
COURSE CODE	19CS3515					
TITLE OF THE COURSE	DEEP LEARNING					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2	-	2	-	56	3

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
1	III	19CS2301	ENGINEERING MATHEMATICS – III

COURSE OBJECTIVES:

- To understand the basic building blocks and general principles that allows one to design Deep learning algorithms
- To become familiar with specific, widely used Deep learning networks
- To introduce building blocks of Convolution neural network architecture
- To learn to use deep learning tools and framework for solving real-life problems

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Build various deep learning models	L6
CO2	Identify and Apply the deep learning algorithms which are more appropriate for various types of learning tasks in various domains	L3
CO3	Implement deep learning algorithms and solve real-world problems deep learning tools and framework	L3

COURSE CONTENT:	
MODULE 1	5 Hrs
Mathematical background for Deep learning- Data Manipulation and Data Preprocessing, Linear Algebra, Calculus, Probability	
MODULE 2	7 Hrs
Introduction to Machine learning - Types of Machine Learning problems, Linear	

Regression- Basic elements of linear regression, Vectorization for Speed, From Linear Regression to Deep Networks, Softmax Regression	
MODULE 3	5 hrs
Multilayer Perceptrons-hidden layers, activation functions , Model Selection, underfitting, overfitting, weight decay, dropout	
MODULE 4	6 Hrs
Forward Propagation, Backward Propagation, and Computational Graphs Layers and Blocks, shallow neural network, deep neural network , Optimization for training Deep Models.	
MODULE 5	5 Hrs
Foundations of Convolutional Neural Networks - Convolution operation, Convolutional Layers, Object Edge Detection in Images, Padding and Stride, Multiple Input and Multiple Output Channels, 1×1 Convolutional Layer, Pooling, Convolutional Neural Networks (LeNet)	

TEXT BOOK:

1. **Aston Zhang, Zack C. Lipton, Mu Li, Alex J. Smola, “Dive into Deep Learning”, Amazon Science, 2020**
2. **Ethem Alpaydin, “Introduction to Machine Learning”, PHI, 2005**

REFERENCES:

1. **Tom Mitchell, Machine Learning, McGraw-Hill, 1997**
2. **Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, The MIT Press, 2016**
3. **François Chollet, “Deep Learning Python”, Manning Publications, 2018**
4. **Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems”, O'Reilly Media; 1 edition (April 9, 2017)**
5. **Josh Patterson, “Deep Learning: A Practitioner's Approach”, O'Reilly Media; 1 edition (August 19, 2017)**

SEMESTER	VI					
YEAR	III					
COURSE CODE	UG Research Project-I/Product Development Foundation- I					
TITLE OF THE COURSE	19CS3612					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	-	-	-	6	-	3

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES:

- To identify key research questions within a field to carry out research in a team
- To identify and summarize the literature review of the relevant field
- To demonstrate relevant referencing and inculcate new skills in various aspects of academic writing
- To demonstrate the knowledge and understanding of writing the publication/report
- To showcase the strong evidence on the clarity of the argument, understanding of the selected domain area and presentation of its technical information
- To detail description of the process of carrying out the independent research in written document along with results and conclusions with reference to the existing literature
- To analyze and synthesize the new research findings

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Draft of the Publication or Demonstration of the Proof-of-concept product, Draft of patent application	L6

COURSE CONTENT:

The research topic proposed by both the guide and the student team should be approved by the department chairman to proceed further. A degree of industrial input and involvement will be encouraged, and can be facilitated through existing academic-industrial collaborations or by addressing specific topics that are of interest to industrial partners.

All projects will be closely supervised by the Project Guide with ongoing feedback and guidance at all stages of the project from the conception to completion.

The following criteria will be checked by the department chairman to approve for the

research proposal:

a. Department staff as course guide

1. Ability to provide research direction to the student in the chosen field of interest
2. Ability to design an appropriate research strategy and methodology to carry out the research by student
3. Ability to provide and evaluate the strong literature review document for the chosen research topic
4. Ability to train students on research paper / technical writing skills
5. Conduct reviews in regular time period and submit the evaluation to department chairman

b. Student Team

1. To be dedicated and committed to **work on a new research topic by learning new technical skills**
2. To have fair knowledge on what is **product development or research topic**
3. To have constant interaction with allocated guide by providing weekly updates
4. To be committed to complete the project and submitting the technical paper within the stipulated time framed by the university

Evaluation:

There will be CIA evaluation as well as the Semester end evaluation of the work done. It will be done by a committee of senior researchers of the Department.

SEMESTER	VI					
YEAR	III					
COURSE CODE	19CS3614					
TITLE OF THE COURSE	MOBILE COMPUTING AND APPS DEVELOPMENT					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2	-	2	-	56	3

Perquisite Courses (if any)

#	Sem/Year	Course Code	Title of the Course
1	V	19CS3503	Object Oriented Design and Programming with Java

COURSE OBJECTIVES :

- To understand the basic concepts of mobile computing
- To learn the setup of Android development environment
- To illustrate the interaction of app with the user interface and handling various activities
- To identify the options for saving the persistent application data
- To gain knowledge about different mobile platforms and application development

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Create, test and debug Android application by setting up the Android development environment	L6
CO2	Implement adaptive and responsive user interfaces that work across various devices	L3
CO3	Demonstrate the techniques involved to store, share and retrieve data in Android applications	L2
CO4	Acquire technical competency and skills in developing applications using Android and cross-platform	L2

COURSE CONTENT:

MODULE 1

6Hrs

INTRODUCTION TO MOBILE COMPUTING

Introduction to mobile computing, Architecture of mobile network, Generations of mobile communication, mobile operating systems, Application of mobile communication, Challenges of mobile communication.

MODULE 2

6Hrs

Introduction, trends, platforms, Android Development Setup like, Android Studio, Eclipse,

Android SDK , tools. Emulator setup. App behaviour on the Android Runtime (ART). Platform Architecture. Application framework and basic App Components resources. Hello World program in Android Studio	
MODULE 3	6Hrs
MOBILE APP DEVELOPMENT USING ANDROID: Android user Interface – Layouts (Linear, Absolute, Table, Relative, Frame and Scroll), values, asset XML representation, generate R.Java file, Android manifest file. Activities, Intent and UI Design - activities life-cycle. Android Components – layouts, fragments, basic views (Button, Edit Text, Check box, Toggle Button, Radio Button), list views, picker views, adapter views, Spinner views, Menu, Action Bar and Managing data using SQLite database (Database create, Read, Update and delete).	
MODULE 4	6Hrs
MESSAGING AND LOCATION BASED SERVICES Sending SMS and mail, Google Maps – Displaying Google Maps in Android application, Networking – How to connect to Web using HTTP, Publishing Android Applications – how to prepare application for deployment, exporting application as an APK file and signing it with new certificate, how to distribute new android application and publish android application on market place	
MODULE 5	4Hrs
DATA PERSISTENCE AND GOOGLE APIS FOR ANDROID: Introduction of Google APIs for Android. SQLite Databases. CROSS-PLATFORM APP DEVELOPMENT - Introduction to Cross platform App Development - Difference to native apps, Pros and cons, Development tools.	

TEXT BOOKS :

1. **Mobile Cloud Computing by Debashis De, CRC Press, Taylor & Francis Group**
2. **Head First Android Development by Jonathan Simon O'reilly Publications**

REFERENCES :

1. **Learning Android by Marko Gargenta O'reilly Publications**
2. Jochen H. Schller, "Mobile Communications", Second Edition, Pearson Education, New Delhi, 2007.
3. Uwe Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
4. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014
5. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt Ltd, 2016.

SEMESTER	VI					
YEAR	III					
COURSE CODE	19CS3618					
TITLE OF THE COURSE	Introduction to Blockchain and distributed ledger					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2	-	2	-	56	3

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES :

- Learn the underlying principles and techniques associated with block chain technologies.
- Understand and describe how blockchain works
- Familiarize with Ethereum, smart contracts and related technologies, and solidity language.
- Understand several types of blockchain use cases.

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Describe the basic concepts and technology used for blockchain	L2
CO2	Explore the usage of merkle tree, cryptography and mining in Blockchain	L2
CO3	Use smart contract in real world applications.	L3
CO4	Implement Ethereum block chain contract.	L3
CO5	Apply hyperledger platform to implement the Block chain Application	L3
CO6	Apply the learning of solidity and de-centralized apps on Ethereum.	L3

COURSE CONTENT:	
MODULE 1	6Hrs
Introduction to Blockchain Distributed systems, P2P network Architecture of Blockchain , Generic elements of a blockchain : How blockchain works, Benefits, features, and limitations of blockchain How blockchain accumulates blocks, types of blockchain, Distributed ledger, Consensus	

mechanisms-Proof of work, Proof of Stake, Proof of Authority, CAP theorem, Decentralization, Disintermediation, Ecosystem - Storage, Communication and Computation, Dapps	
MODULE 2	6Hrs
Cryptography and Smart Contracts Symmetric cryptography (DES, AES), Asymmetric cryptography, Public and Private keys, Algorithms - RSA, Hash functions, SHA, SHA-256, ECDSA Smart contracts - Benefits of Smart contracts, Solidity programming-Types, Literals, Enums, Function types, Reference types, mappings, Global variables, Control structures (Events, Inheritance, Libraries, Functions), Compile, verify and Deploy.	
MODULE 3	6Hrs
Ethereum Blockchain The Ethereum network, Components of the Ethereum ecosystem, Ethereum Virtual Machine – Execution Environment, Opcodes and their meaning, Structure of a Block, Genesis Block, Merkle tree, Geth, Transactions, Transaction receipts, Nonce, Gas - gasPrice, gasLimit, Ether, Mining, Wallets, Ethereum network (main net, test net)	
MODULE 4	6Hrs
Ethereum development Ropsten test net, Mist, Metamask, Infura, Web3.0 - POST requests, HTML & Javascript frontend, Web3J -Java frontend, Creating Blockchain network and peering, Truffle - build contract, migrate and deploy, Ganache CLI Case studies: Smart Home Solution using Smart Contract (https://anbunathanramaiah.medium.com/smart-home-solution-using-smart-contract-7eb7cd3407d3)	
MODULE 5	5Hrs
Hyperledger Projects under Hyperledger, Hyperledger reference architecture, Hyperledger design principles, Hyperledger Fabric, Hyperledger Sawtooth Case studies: Blockchain in Health Care, Blockchain in IoT	

TEXT BOOKS :

1. Imran Bashir, “Mastering Blockchain”, Third Edition, Published by Packt Publishing Ltd, 2020
2. Max Hooper, David Metcalf, VikramDhillon, “Blockchain Enabled Applications: Understand the Blockchain Ecosystem and How to Make it Work for You”, Published by Apress, 2017

REFERENCES :

1. Ritesh Modi” Solidity Programming Essentials, First Edition, Published by Packt Publishing Ltd, April 2018
2. Blockchain for Dummies, Manav Gupta, IBM Limited Edition, John Wiley & Sons, Inc. 2017
3. Mohinuddin Ahmed, Abu S S M BarkatUllah, AI-Sakib Kahn Pathan “Security Analytics for IoT”, CRC Press, 2020

SEM/YEAR : I SEM/1st Year
COURSE CODE : 20VC104
TITLE OF THE COURSE : Problem Solving Techniques
L: T/A: P: C : 3: 0: 0: 3

Course objectives

- To understand the basic computers and component of computer
- To understand about various classes of computers, speed and memory
- To gain knowledge about input and output devices
- To learn about data storage devices.

Course outcomes

- Students are able to learn about components of computer
- Students are able to identify the various data storage devices and its applications
- Acquire the skills about Operating systems and GUI

UNIT 1

(8 hours)

Introduction to Algorithm

What is an algorithm? Characteristics of an Algorithm

UNIT 2

(10 hours)

Method for Developing an Algorithm

Sequence structure, Selection structure, repetition structure, Flowcharts, Flowchart Constructs,

Flowchart Example

UNIT 3

(9 hours)

Pseudo code (or Program Design Language)

Pseudocode Language Constructs, Computation/Assignment, Input/Output, Selection, Repetition, Pseudo code Example

UNIT 4

(9 hours)

Programming using C

How to develop a program using C language, Simple program examples

UNIT 5

(9 hours)

Problem solving

Introducing Computational Thinking, What is CT? Exploring Algorithms, Computational Thinking is a problem-solving process that includes the following characteristics. Finding Patterns, Developing



SEM/YEAR : I SEM/1st Year
COURSE CODE : 20VC106
TITLE OF THE COURSE : Basics of Electrical & Electronics LAB
L: T/A: P: C : 0: 0: 12:6

Course objectives

- To understand Circuit operation of different types of voltage regulation circuits, including series.
- To explain the construction and characteristics of diodes, bipolar junction transistors and optical devices.

Course outcomes

- Ability to understand and analyse, linear and digital electronic circuits.

List of experiments:

1. Familiarization of toolkit
2. Soldering Practice
3. Familiarization of CRO
4. Familiarization of function Generator
5. Familiarization of Digital Multi meters
6. Color coding of the resistor
7. Verification of Ohm 's law
8. Verification of KVL and KCL
9. Study of diode datasheet and V.I Characteristics of diodes
10. Study of Zener datasheet and V.I Characteristics of Zener diodes
11. Rectifiers-Half-wave and centre -tapped full-wave rectifier
12. Bridge rectifier with capacitor filter
13. Familiarization of Logic Inverter(TTL)
14. Familiarization of AND Gate(TTL)
15. Familiarization of OR Gate(TTL)
16. Familiarization of NAND Gates(TTL)
17. Familiarization of NOR Gates(TTL)
18. Familiarization of EXOR Gates(TTL)
19. Universal Property of NAND and NOR Gates



SEM/YEAR : I SEM/1st Year
COURSE CODE : 20VC107
TITLE OF THE COURSE : Basics of Computer LAB
L: T/A: P: C : 0: 0: 12:6

Course objectives

- To learn about DOS commands
- To increase typing speed and confidence
- To create bio-data with suitable alignments
- To create the presentation& to create the email

Course outcomes

- Student can able to learn about DOS Commands
- Students are able to increase the typing speed and confidence
- Students are able to create the bio-data, power point presentation and email on their own.

List of experiments:

Exercise 1: Components of Computer

1. Input devices and output devices
2. Functional units of computer Functional units of computer

Exercise 2: DOS Commands

1. Write the syntax and definition of following commands: cls, cd, copy, copy con, Mem, Tree, ver, exit, find, sort, time, edit, erase, date, del, dir, md, rd, type.
2. Write the syntax for appending the content of two files, copy the output of dir command to file, listing of files and directories: dir/b, dir/l, dir/on, dir/w, definition of following commands: dir/ad, dir/oe, dir/p, dir/ar.

Exercise 3: Typing Tutorial

1. Familiarize typing in standard QWERTY keyboards.
2. Touch Typing Course: In this course, Trainee will learn the positions of the letter keys and common punctuation by heart, after completing the course you will be able to type with all ten finger without looking at the keyboard.
3. Speed Building course: This course is designed to increase your typing speed and confidences. The Trainee will focus on the keys for each finger, type longer texts and train with some of the most common English words
4. Numbers, Special marks and 10-key pad.4.1: Numbers Course: This two lesson course teaches how to type numbers on the number row 4.2: Special Marks Course: Extend Trainees skills to cover special marks, including Internet characters.
5. Mathematical symbols and brackets: 10-key Number pad Course: Learn to use the 10-key number



12. Open Ms-Excel insert 4 sheets hide the sheet 2 and 3 and apply different colour to sheet tabs.
13. Demonstrate mathematical function in MS-Excel.
14. How to insert Rows, Columns, Cells and Worksheet in MS-Excel?
15. Create the presentation about you daily activity
16. Create the presentation of your organization company with suitable diagrams.
17. Create the presentation to explain any technology with suitable diagrams.
18. Create the presentation for any educational organization which should consist of hyperlinks, custom animation, slide transition
19. Create the DATABASES for the Company consisting of the tables: EMPLOYEE, DEPARTMENT, DESIGNATION, ACCOUNTS. And the fields are as follows EMP: Name, City, Add, Phno, Place, and Id. DEPARTMENT: Id, Dep Name, and Location. DESIGNATION: Id, Qualification, Experience, Skills. ACCOUNTS: Id, Basics, DA, HRA, PF. (MAKE ID AS PRIMARYKEY) and create the query to select the fields as: EMP=ID, NAME, PHNO, PALCE. DEP=DEPNAME, LOCATION. DESIG=QUALIFOICATION, EXP.ACCOU=TOTAL, BASICS, DA, PF.

Exercise 7: Internet

1. Write the steps to create the email.
2. Write the steps to search the details about historical places in internet.
3. Write the steps to create a mail and send it your friend.
4. Write the steps to create a mail which should attach some data and send it to your friend.



SEM/YEAR : II SEM/1st Year
COURSE CODE : 20VC201
TITLE OF THE COURSE : Computer Networks - I
L: T/A: P: C : 2: 0: 0: 2

Course objectives

Upon completion of this subject, the trainee will be able to:

- Explain network technologies and explain how devices access local and remote network resources.
- Describe router hardware and Explain how switching operates in a small to medium-sized business network. Design an IP addressing scheme to provide network connectivity for a small to medium-sized business network.
- Configure initial settings on a network device and implement basic network connectivity between devices.
- Configure monitoring tools available for small to medium sized business networks.
- Determine how a router will forward traffic based on the contents of a routing table
- Use monitoring tools and network management protocols to troubleshoot data networks
- Configure Ethernet switch ports and Implement VLANs.
- Implement static routing and RIPv2 and Implement DHCP on a router.
- Implement network address translation (NAT) and Implement access control lists (ACLs) to filter traffic.

Unit 1

(6hrs)

Introduction to Networks: What is a network? Real world networks, The OSI seven-layer model,
Network Protocols and Standards: Communications and network protocols and the OSI model, Protocols in real world networks, The Internet

Unit 2

(6hrs)

Wireless Networking Standards: Wireless devices, Wireless networking standards, Issues for wireless networks, Wireless networking protocols, **Network Topology and Architecture:** Network topology concepts, Common network topologies and their application, Topologies and protocols

Unit 3

(6hrs)

Network Media and Connectors: Network media, Network connectors, selecting media and connectors,
Network Hardware: Network hardware, Hardware selection, creating a network

Unit 4

(6hrs)

Wireless Network Hardware: Wireless network hardware, Wireless hardware selection creating a wireless network, Security Software, Network security threats, Security countermeasures Security software, Firewalls, Functions of a firewall, Types of firewall

Unit 5

(6hrs)

Network and Server Software: Network software requirements, Wireless network software requirements, Configuring network software Voice over IP and, Video Conferencing Voice over IP (VoIP), Video conferencing, Installing and configuring voice and video networks **Virtual Private Networks:** Virtual private networks (VPN), Advantages and disadvantages of VPN

Reference Books: Computer Networks III and IV Edition – Andrew S. Tanenbaum, PHI



SEM/YEAR : II SEM/1st Year
COURSE CODE : 20VC202
TITLE OF THE COURSE : Python
L: T/A: P: C : 3: 0: 0: 3

Course objectives

- Master the fundamentals of writing Python scripts.
- Learn core Python scripting elements such as variables and flow control structures.
- Discover how to work with lists and sequence data.
- Write Python functions to facilitate code reuse.
- Use Python to read and write files.
- Make their code robust by handling errors and exceptions properly
- Work with the Python standard library
- Explore Python's object-oriented features
- Search text using regular expressions

Course outcomes

- Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
- Interpret Object oriented programming in Python
- Design and develop Client Server network applications using Python

Unit 1: Introduction to Python

(9 Hrs)

History and Features of Python, Installing Python, Very Simple Programs, Variables, Python Data types and Operators: Python data types, Numbers, Python Strings, Functions and methods, Lists, working with list, Functions and methods, Tuples, working with tuples, Functions and methods, Dictionaries, working with dictionary, Functions, Python Basic operators, Python Program Flow Control: Conditional and control statements, Loops, For Loops in ranges, string, list and directory

Unit 2: Python Functions, Modules and Packages

(9Hrs)

Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables, Importing module, Importing own module as well as external modules, Packages, Composition, Powerful Lambda function in python. Python Input, Output and File operations: Printing on screen, Reading data from keyboard, Opening and closing files, Reading and writing Files, Renaming and deleting file. Manipulating file pointer using seeks. Exception Handling: Exceptions, Assertions in Python, Exception Handling, try, except clause and try-finally clause

Unit 3: Python Object Oriented Programming – OOPS

(9Hrs)

OOPs concepts, Classes and objects, Attributes, Inheritance, Overloading, Overriding, Data Hiding, Encapsulation and polymorphism. Regular Expressions: Character matching and searching in regular expressions, Extracting data using regular expressions, Regular Expression modifiers, Patterns. CGI Programming: CGI, CGI architecture, Environment variable, CGI Examples, HTTP Header, GET and POST methods



SEM/YEAR	: II SEM/1 st Year
COURSE CODE	: 20VC203
TITLE OF THE COURSE	: Mathematics II
L: T/A: P: C	: 2: 0: 0: 2

Course objectives

Upon successful completion of this course, the trainee will be able to analyse and apply mathematical equations

- Solve mathematically technical problems and apply the concepts of Mathematics to engineering problems
- Awareness of correlation and regression.
- Know the basic concepts of statistics.
- Understand and use concepts of Integration and Differential Equations and its applications
- Know the solution of percentage, ratios and proportions

Course outcomes

- Solve system of Probability and Statistics
- Solve problem of Analytical Geometry
- Describe and Develop Correlation and Regression analysis model

Unit 1: RATIOS, PERCENTAGE AND PROPORTIONS

(02 Hrs)

Ratios, proportion and percentage

Unit 2: ANALYTICAL GEOMETRY

(05Hrs)

Rectangles and Squares, Parallelogram, Triangle, Rhombus, Trapezium, Circle, Sector and Arc, Cartesian Co-Ordinates, Equation of axis, Distance, Midpoint, Slope, Condition for Perpendicularity and parallelism, Equation of straight line

Unit 3: INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

(9Hrs)

Integrals of functions, Rules of Integration, Integration by parts. Definite Integrals. Area under plane curves – simple problems. Differential equations

Unit 4: CORRELATION AND REGRESSION

(06 Hrs)

Meaning of correlation and Regression, Correlation Analysis, Regression Analysis, Simple Linear Regression

Unit 5: PROBABILITY AND DISTRIBUTION

(8Hrs)



Probability, Sample and Event Space, Conditional Probability, Data Types, Uniform Distribution, Normal Distribution, Binomial Distribution, Poisson distribution.

Text Books:

1. Thomas, Weir and Hass(2009), Thomas's Calculus, Twelfth edition, Pearson, India
2. Goon A.M., Gupta M.K. & Dasgupta B: Fundamentals of Statistics, Vol. 1, The World Press Pvt. Ltd., Kolkata.
3. Thomas's Calculus, G.B.Thomas, M.Weir, J. Hass, Pearson , 12th edition



SEM/YEAR : II SEM/1st Year
COURSE CODE : 20VC204
TITLE OF THE COURSE : C- Programming
L: T/A: P: C : 2: 0: 0: 2

Course objectives

- use data types ,operators and expressions in writing ' C ' Programmer;
- use function; external variables, multiple source files and also processors
- pointers approximately in the ' C ' Program
- employ the standard library in developing in C program

Unit 1

(6 Hrs)

Introduction to Programming, Program and Programming Languages, Types of software's, Compiler and Interpreter, Overview of C, Introduction, Importance of C, Sample C program with inbuilt Library functions, Basic structure of C program, Programming style, Execution of C program in Unix and Turbo C

Unit 2

(6 Hrs)

Constants, Variables and Data Types: Character set, C tokens, Keywords and identifiers, Constants, variables and data types Declaration of variables, Assigning values to variables, Declaring a variable as constant, volatile, Operators and Expressions: Arithmetic operators, Relational operators Logical operators, Assignment operators Increment and decrement operators Conditional operators Bitwise operators, Special operators, Precedence of arithmetic, relational & logical operators Arithmetic expressions Evaluation of expressions, Operators precedence and associativity Mathematical functions

Unit 3

(6 Hrs)

Managing Input and Output Operations : Reading a character , Writing a character, Formatted input & output , Decision Making, Branching and Looping: Decision making with IF statement, Simple IF statement, The IF...Else statement, Nesting of IF...Else statement, The Else If ladder, The Switch statement, The WHILE statement, The DO... statement, The FOR statement, Jump statements Continue, break, return and GOTO, **Arrays**: One-dimensional arrays- Declaration and initialization of one dimensional array, Two-dimensional arrays- Declaration and initialization Of two dimensional array, Multidimensional arrays, Sample programs using arrays

Unit 4

(6 Hrs)

Handling of Character-Strings: Declaring and initializing string variables, Reading strings from terminal, Writing strings to screen, Arithmetic operations on characters, Putting strings together, String-handling functions, User-Defined Functions: Need for user-defined functions, Elements of user defined function - Function declaration., Definition of functions, Return values and their types, Calling a function, Category of functions: No arguments and no return values, Arguments but no return values, Arguments with return values, No Arguments but returns a value. Nesting of functions, Recursion, Functions with arrays -



SEM/YEAR : II SEM/1st Year
COURSE CODE : 20VC205
TITLE OF THE COURSE : Data Base
L: T/A: P: C : 3: 0: 0: 3

Course objectives

Upon successful completion of this subject, the trainee will be able to

- Understand the Database concepts
- Design the database with planning and coding
- Normalize the database
- Administration of data and data base
- Solve queries related to the database

Course outcomes

- Ability to Install, configure, and interact with a relational database management system
- Ability to master the basics of SQL and construct queries using SQL
- Ability to design and develop a large database with optimal query processing

Unit 1: Introduction to Database System

(8 Hrs)

File System versus a DBMS, Purpose of Database system, Database Applications, Basic concepts and definitions

Unit 2: Data Models

(9 Hrs)

Entity-Relationship Model, Object Oriented Model, Network Model, Hierarchical Model, Relational Model. **Normalization**: What is Normalization? First Normal form, Second Normal form, Third Normal form, Boyce-codd Normal Form

Unit 3: SQL

(10 Hrs)

Introduction to SQL, DDL Commands, DML Commands, DCL Commands, TCL Commands, User defined data type, Where Clause operators, Order By, Group By, Having Clauses, DISTINCT, TOP Keywords, Aggregate functions, Built-in functions-numeric, string and Date Functions

Unit 4: Advance SQL

(9 Hrs)

SQL Constraints, Sub Queries, Identity column, SQL Joins, Views, Index, Triggers

Unit 5: Transact-SQL

(9 Hrs)

Stored Procedure, Function, Control Structures, Conditional Processing using IF statements, While loop, Exception handling by TRY...CATCH, Error functions used within CATCH block

DATA ADMINISTRATION

Database Administrator, Concurrency control, Database Recovery, Database Security



Reference Books:

1. SQL Server 2008 r2 - Black Book
2. SQL Server – Patrick Paul
3. SQL Server 2008 programming – Robert vieira
4. J. Date, A. Kannan and S. Swamynathan, "An Introduction to Database Systems", 8thed, Pearson Education, 2006
5. Raghu Ramakrishnan, "Database Management Systems", Third Edition, McGraw Hill, 2003



SEM/YEAR	: II SEM/1 st Year
COURSE CODE	: 20VC206
TITLE OF THE COURSE	: SQL Server 2008 Lab
L: T/A: P: C	: 0: 0:12: 6

LIST OF PROGRAMS:

1. Demo on Creating Databases
2. Demo on Modify Databases
3. Demo on database and files Viewing a Database
4. Demo on Renaming a Database
5. Demo on Deleting Database
6. Demo on database and files
7. Demo on database and files groups
8. Creating tables with different Data types
9. Demo on altering the table
10. Creating tables with User Defined Data Types
11. Dropping User Defined Data Types
12. Demo on Data Manipulation Language with different types Inserting values
13. Demo on Data Manipulation Language with different types updating values
14. Demo on Data Manipulation Language with different types Deleting Rows
15. Demo on Truncating a Table
16. Demo on Deleting a Table
17. Writing a Basic select statement
18. Writing a Basic select statement using where clause
19. Write a query to perform Arithmetic Operations
20. Write a query to perform Relational operators
21. Write a query to perform Logical operators
22. Write a query to perform Special operators
23. Generate query using TOP and DISTINCT keywords
24. Generate query to perform ORDER BY clause
25. Generate query to perform GROUP BY and HAVING clauses
26. Generate query using String functions
27. Generate query using Date functions
28. Generate query using Mathematical Functions



Reference Books:

- SQL Server 2008 r2 - Black Book
- SQL Server – Patrick Paul
- SQL Server 2008 programming – Robert vieira

Reference Website:

- www.msdn.microsoft.com
- www.tutorialspoint.com
- www.techonthenet.com



SEM/YEAR	: II SEM/1 st Year
COURSE CODE	: 20VC207
TITLE OF THE COURSE	: C – Programming & Python Lab
L: T/A: P: C	: 0: 0:12: 6

LIST OF PROGRAMS:

C Programming

• INTRODUCTION AND DATA TYPES

1. Write a program in C language to display 'hello world'. Analyze Sub main (), compilation and execution process of a C program.
2. Write a program in C language to perform arithmetic operation like +, -, X, / and % and display the result.
3. By declaring int type variables.
4. By declaring float type variables
5. Write a program in C language to calculate the area of the circle. Formula for calculating area of a circle $A = \pi r^2$ where r is the radius and π is a constant.

• DECISION MAKING AND LOOPING

1. Write a program in C language to find whether an input number is even or odd.
2. Write a program in C language to check whether an entered alphabet is vowel, consonant, digit or special character.
3. Write a program in C language to print counting numbers from 1 to 100 using 'for loop'
4. Write a program in C language to find the sum of digits of an input number less than 99999.
5. Write a program in C language to display a menu as given below and Execute arithmetic operations. Use switch case.

Menu

Addition 1

Subtraction..... 2

Multiplication3

Division 4

Module Termination 0

Enter your choice (0/1/2/3/4)

• ARRAY

1. Create an array and store data into the array and print the same.
2. Write a C program to accept an array and search for an element.
3. Write a C program to create an arrays and sort in descending order and ascending order.
4. Write a C program to perform a transpose of a matrix.

• STRING

1. Write a C program to read text and display it
2. Write a C program to accept a string and find the number of vowels and display it
3. Write a C program to find the length, concatenate, copy of the string using non built in function
4. Write a C program to check whether the string is palindrome or not



- **FUNCTION**

1. Write a function LEAP_YEAR() that receives year as a parameter and display proper message, that the particular year is leap year or not
2. Write a recursive function to calculate the factorial of a number.

- **STRUCTURE**

1. Write a C program to illustrate the comparison of two structure variables and print equal or not taking individual members.
2. Write a program to add two times using structure.

- **POINTER AND FILE**

1. Write a program to create a pointer variable and display the address and value using pointer variable.
2. Create a file write some content into the file and read the content of the file and display it on monitor.

Python

Introduction to Python

1. Write a python program to find the square Root
2. Write a python program to calculate the Area of a Triangle
3. Write a python program to solve quadratic Equation
4. Write a python program to swap Two Variables

Python Data types and Operators

1. Write a python program to sum all the items in a list.
2. Write a python program to program to add two matrices
3. Write a python program to multiply two matrices
4. Write a python program to check Whether a string is palindrome or not
5. Write a program to demonstrate operators in python

Python Program Flow Control

1. Write a python program to check if a number is positive, negative or zero
2. Write a python program to check prime number
3. Write a python program to find the factorial of a number
4. Write a python program to display the multiplication Table
5. Write a python program to print the Fibonacci series
6. Write a python program to check Armstrong number

Python Functions, Modules And Packages

1. Write a python program to find numbers divisible by another number by using functions.
2. Write a python program to find factors of number
3. Write a python program to find factorial of number using recursion
4. Write a python program to display powers of 2 using anonymous function
5. Write a python program to find Factors of Number by importing module.
6. Write a python program to demonstrate calculator using package



SEM/YEAR	: II SEM/1 st Year
COURSE CODE	: 20VC208
TITLE OF THE COURSE	: Networking Lab
L: T/A: P: C	: 0: 0:12: 6

LIST OF PROGRAMS:

Navigate the IOS

- Explore EXEC Modes
- Set the Clock

Configure Initial Switch Settings

- Host Name -Banner MOTD
- Save Configuration Files to NVRAM

Configure Initial Switch Settings

- Verify the Default Switch Configuration
- Enable Password -Enable Secret
- Configure Line Passwords
- Encrypt all plain text passwords
- Save Configuration Files to NVRAM

Implement Basic Connectivity

- Perform a Basic Configuration on Switch
- Configure the PCs
- Configure the Switch Management Interface

Connect a Wired and Wireless LAN

Configure Initial Router Settings

- Verify the Default Router Configuration
- Configure and Verify the Initial Router Configuration
- Save the Running Configuration File

Connect a Router to a LAN

- Display Router Information
- Configure Router Interfaces
- Verify the Configuration

Configure IPv6 Addressing

- Configure IPv6 Addressing on the Router
- Configure IPv6 Addressing on Clients
- Test and Verify Network Connectivity

Configure Secure Passwords and SSH

Verify Directly Connected Networks

- Verify IPv4 Directly Connected Networks



-Verify IPv6 Directly Connected Networks

VLAN Configuration

- Verify the Default VLAN Configuration
- Configure VLANs
- Assign VLANs to Ports

Configure Trunks

- Configure & Verify VLANs
- Configure Trunks

Configure DTP

- Configure static trunking
- Configure and Verify DTP

Configure Router-on-a-Stick Inter-VLAN

- Add VLANs to a Switch
- Configure Sub interfaces
- Test Connectivity with Inter-VLAN Routing

Configure Layer 3 Switching and Inter-VLAN Routing

- Configure Layer 3 Switching
- Configure Inter-VLAN Routing
- Configure IPv6 Inter-VLAN Routing

Configure Ether Channel

- Configure Basic Switch Settings
- Configure an Ether Channel with Cisco PAgP

Configure Ether Channel

- Configure Basic Switch Settings
- Configure an 802.3ad LACP Ether Channel

Configure DHCPv4

- Configure a Router as a DHCP Server
- Configure DHCP Relay
- Configure a Router as a DHCP Client
- Verify DHCP and Connectivity

Configure DHCPv6

- Configure and verify a Stateless DHCPv6 Server
- Configure and verify a State full DHCPv6 Server
- Configure and verify a DHCPv6 Relay

HSRP Configuration

- Configure an HSRP active router.
- Configure an HSRP standby router.
- Verify HSRP operation.



SEM/YEAR	: I SEM/1st Year
COURSE CODE	: 20VC108
TITLE OF THE COURSE	: PC hardware LAB
L: T/A: P: C	: 0: 0: 12: 6

List of experiments:

1. Basic Health & Safety Practices
2. Discussion about basic concepts & terminologies used in PC's
3. Evolution of Microprocessors
4. Identification of various Motherboards, Add-on cards & I/O connectors
5. Study of Bus & Memory technologies.
6. Dis-assembly & Assembly of an AT & ATX system.
7. Usage of CMOS setup & familiarization of user manual
8. Installation of Hard disk drive using various utilities
9. Installation of Operating systems such as Windows 7,8,10, Windows Server with ADS, Linux as a dual boot and Virtualization in VMware), Device drivers & application software.
10. Study of Keyboard, Mouse & Floppy disk drives
11. Tools for System Management and Troubleshooting of PC
12. PC Optimization utilities & Antivirus packages
13. Study of Monitors & Display cards
14. Study of Printers.
15. Overview of Compact Discs & Drives, Scanner & Modem
16. Discussion about preventive maintenance & the tools required
17. Study of Networking Basics
18. Overview of Laptop Technologies
19. Discussion of Emerging trends in IT & the system configuration for best buy



SEM/YEAR : III SEM/2nd Year
COURSE CODE : 19VI301
TITLE OF THE COURSE : Oracle & Data Warehousing
L: T/A: P: C : 2: 0: 0: 2

Course objectives

Understand linear system of equations
Understand the structure of Matrices and Determinants
Infer different co-ordinate systems and applications of vectors.

Course outcomes

Unit 1 6hrs

Introduction to Oracle Database: Feature of RDBMS, Advantages of RDBMS over FMS and DBMS, The 12 rules (E.F Codd's Rules –RDBMS), Need for Database Design, Support of Normalization

Introduction to SQL: DDL and DML, DESCRIBE command, Restricting and sorting data, Using group functions, Sub queries, Set operators, Using manipulating data

Unit 2 6hrs

PL/SQL: Introduction to PL/SQL, Features and benefits of PL/SQL, PL/SQL block and syntax, Data types, variables and constants, Conditional statements Loops, Subprograms, Procedure, Function, Cursors, Types: Implicit and explicit cursor, Passing parameter into cursor Exception, Types of exception, Declaring exception, RAISE_APPLICATION_ERROR, procedure, Triggers, Packages

Unit 3 6hrs

Data Warehousing: Introduction to data warehousing, Historical Information About Data Warehouses, How does a data warehouse differ from database, Difference between Operational database Systems and Data Warehouses. Advantages and Disadvantages of Data warehousing

Unit 4 6hrs

Principles of Dimensional Modelling: ER Modelling Verses Dimensional Modelling, The STAR Schema, STAR schema Keys, Advantages of STAR Schema, The Snowflake Schema, The Fact Constellation

Unit 5 6hrs

Data warehouse architecture: Steps for the Design and Construction of Data Warehouses, A Three – Tier Data Warehouse Architecture, OLAP in the Data Warehouse, Demand for OLAP, Major Features and Functions
OLAP Models

Reference books:

1. Oracle 9i - Complete reference
2. SQL,PL/SQL – The Programming language of Oracle,3 rd Revised Edition-Ivan Bayross
3. Database Management System – Navathe
4. Principles of Database – Jeffrey D.Ullman
5. Oracle Database 11g PL/SQL Programming (Oracle Press) - Michael McLaughlin

SEM/YEAR : III SEM/2nd Year
COURSE CODE : 19VI303
TITLE OF THE COURSE : Software Engineering& software testing
L: T/A: P: C : 2: 0: 0: 2

Course objectives

Understand linear system of equations
Understand the structure of Matrices and Determinants
Infer different co-ordinate systems and applications of vectors.

Course outcomes

Unit 1 6hrs

The software Problem & Software process: Software Problem - Cost, Schedule and quality, Scale and Change. Software Process - Process and Project, Component Software Processes **Software development Process Models**, **Waterfall**, **Prototyping**, **Iterative development**, Rational Unified Process, Time boxing Model, Extreme programming and Agile processes, Using process model in a project, Project Management Process.

Unit 2 6hrs

Software requirements analysis and specifications: Value of good SRS, Requirement process, Requirement Specification, Desirable Characteristics of an SRS, Components of an SRS, Structure of a Requirements Documents, Functional Specification with use cases, Basics, Examples, Extensions, Developing use cases, Other Approaches for Analysis, Data Flow Diagram, Validation.

Unit 3 6hrs

Software architecture & Planning a software project : Role of Software Architecture, Architecture Views, Component and Connector view, Components, Connectors, Example, Architecture styles for C&C View, Pipe and Filter, Shared data Style, Client Server style, Some other styles, Documenting Architecture Design, Evaluating Architectures. Planning a software project -Effort Estimation, Top-Down Estimation Approach, Bottom-Up Estimation Approach, Project Schedule and Staffing, Quality Planning, Risk Management Planning, Risk Management Concepts, Risk Assessment, Risk Control, A Practical Risk Management Approach, Project Monitoring Plan, Measurements, Project Monitoring and tracking, Detailed Scheduling

Unit 4 6hrs

Design, Coding & Testing: Design Concepts, Coupling, Cohesion, the Open-Closed Principle Function Oriented Design, Structure Charts, Structured Design Methodology, Example, Object Oriented Design, OO Concepts Unified Modelling Language (UML), A Design Methodology, Examples. Detailed Design, Logic/Algorithm Design, State Modelling of Classes, Verification.
Coding & Testing: Coding - Programming Principles and Guidelines, Structured Programming, Information Hiding, Some Programming Practices, Coding Standards, Incrementally Developing Code, An incremental coding process. Test Driven development, Pair Programming, Managing

Evolving Code, Source Code Control and Build, Refactoring, Unit Testing, Testing procedural units, Unit testing of Classes, Code Inspection, Planning, Self-review, Group review meeting, Testing - Testing Concept, Error, Fault and Failure Test Case, Test Suite and Test Harness, Psychology of Testing, Levels of Testing, Testing Process, Test Plan, Test Case Design, Test Case Execution

Unit 5

6hrs

Software Testing Life Cycle and Testing Techniques: **Test Planning & Test Case Design**, Test Execution & Test Summary Report, Bug Report, Static Testing Technique, Reviews and Types of reviews. Dynamic Testing Techniques, Black Box Testing, White Box Testing, Test case Design Techniques, ECP & BVA, Cyclomatic Complexity, Types of defects, Bug Reporting & Tool Used, Bug Life Cycle, Functional Testing- Database Testing, Regression Testing, Retesting etc, Non Functional testing- Usability Testing, Security Testing etc

Text books

1. Software Engineering –A Precise Approach, Pankaj Jalote, edition 2010, Wiley India, ISBN: 9788126523115.
2. <https://en.wikipedia.org/wiki/DevOps>
3. <http://www.informationweek.com/devops/agile-vs-devops-10-ways-theyre-different/d/d-id/1326121>

References:

1. Software Engineering A Practitioners Approach, Roger S Pressman, 2010, Tata McGraw Hill Publishing Co Ltd, ISBN 9780070701137
2. Software Engineering, Sajan Mathew, 2009 Reprint, S Chand publications.
3. Software Engineering Principles and Practices, Rajesh Narang. Mc Graw Hill Education.
4. Software Engineering, Subramanian Dutt, 2015 Pearson

SEM/YEAR : III SEM/2nd Year
COURSE CODE : 19VI304
TITLE OF THE COURSE : Design Thinking
L: T/A: P: C : 1: 0: 0: 1

Course objectives

Understand linear system of equations
Understand the structure of Matrices and Determinants
Infer different co-ordinate systems and applications of vectors.

Unit 1 **3hrs**

WHAT IS DESIGN THINKING AND WHY IS IT SO POPULAR: What is Design Thinking and Why Is It So Popular? Design Thinking: New Innovative Thinking for New Problems, Obstacles to Problem Solving and Innovation in Design Thinking Wicked Problems: 5 Steps to Help You Tackle Wicked Problems by Combining, Systems Thinking with Agile Methodology, Essential Design Thinking Videos and Methods

Unit 2 **3hrs**

THE DESIGN THINKING PROCESS: Stages in the Design Thinking Process, Stage 1 in the Design Thinking Process: Empathize with Your Users, Stage 2 in the Design Thinking Process: Define the Problem and Interpret the Results, Stage 3 in the Design Thinking Process: Ideate, Stage 4 in the Design Thinking Process: Prototype

Unit 3 **3hrs**

EMPATHISE WITH THE PEOPLE YOU DESIGN FOR: The Power of Empathy, Design Thinking: Getting Started with Empathy, How to Develop an Empathic Approach in Design Thinking, Empathy – How to Improve Your Designs by Developing Empathy for Your Target Group, Probes for Context Mapping – How to Design and Use Them

Unit 4 **3hrs**

DEFINE THE DESIGN CHALLENGE: Stage 2 in the Design Thinking Process – Define the Problem by Synthesising Information, Methods to Help You Define Synthesise and Make Sense in Your Research, Affinity Diagrams – Learn How to Cluster and Bundle Ideas and Facts, Empathy Map – Why and How to Use It, Personas – A Simple Introduction

Unit 5 **3hrs**

IDEATE: What is Ideation – and How to Prepare for Ideation Sessions? Understand the Elements and Thinking Modes that Create Fruitful Ideation Sessions, Create Some Space – for Ideation Sessions and Design Thinking, Introduction to the Essential Ideation Techniques which are the Heart of Design Thinking. **PROTOTYPE AND TEST:** The Key Benefits of Prototyping, Design Thinking: Get Started with Prototyping, Prototyping in Design Thinking: How to Avoid Six Common Pitfalls, What Kind of Prototype Should You Create? Prototyping: Learn Eight Common Methods and Best Practices, Building a Strong business Model

– A case Study, The fundamental problem of new products/ start-ups, Case Study – Great business Ideas and Success, Case Study – Failure and dealing with Failure

SEM/YEAR : III SEM/2nd Year
COURSE CODE : 19VI308
TITLE OF THE COURSE : Computer Network Lab
L: T/A: P: C : 2: 0: 0: 2

Course objectives

Understand linear system of equations

Understand the structure of Matrices and Determinants

Infer different co-ordinate systems and applications of vectors.

LIST OF PROGRAMS :

1. **Introduction to network and hardware components:** Overview of Networks and layered communications, understanding of Network equipment wiring details, CAT6 UTP EIA/TIA 568A/B . straight and cross-over wiring with testing.
2. **Software familiarization :** Packet Tracer installation for windows and Ubuntu, Packet Tracer familiarization, wiring connection and tool selection concepts
3. **Command line key word :** network command, configuration commands.
4. **Overview of Intellectual protocol :** IP Addressing, sub-netting, Static IP concepts setting, dynamic IP concepts
5. **Switch Configuration :** Basic configuration, small network configuration, small office setup and packet sending and receiving
6. **Router configuration :** Basic configuration, small network configuration, small office setup and packet sending and receiving, Packet sending and receiving between to network, Observing Static and Dynamic Routing.
7. **Creating of a LAN and connectivity test in the LAN,** creation of VLAN and VLAN trunking.
8. **Implementation of Dynamic/interior/exterior routing** (RIP, OSPF, BGP).
9. Firewall Implementation, Router Access Control List (ACL).
10. Examining Network Address Translation (NAT).
11. Packet capture and header analysis by wire-shark (TCP, UDP, IP).
12. **DNS, Web, DHCP, FTP server configuration.** Network establishment with private and public IP

Reference

1. Computer Networks III and IV Edition – Andrew S. Tanenbaum, PHI

SEM/YEAR : III SEM/2nd Year
COURSE CODE : 19VI309
TITLE OF THE COURSE : Software Testing Lab
L: T/A: P: C : 2: 0: 0: 2

LIST OF PROGRAMS :

1. Understand The **Automation Testing Approach** (Theory Concept).
2. **Using Selenium** IDE, Write a test suite containing minimum 4 test cases.
3. Understanding Test Automation. Using Selenium write a simple test script to validate each field of the registration page (Eg: Facebook Registration Page)
4. **Install Selenium server and demonstrate it using a script in Java/PHP.**
5. Conduct a test suite for any two web sites.
6. Write and test a program to login a specific web page.
7. **Write test cases** to validate a mobile number using one time pin identification (OTP)
8. Write and Test a program to find out list of employees having salary greater than Rs 50,000 and age between 30 to 40 years.
9. **Write and test a program to update 10 student records into table into Excel file.**
10. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects).
11. Write and test a program to provide total number of objects present / available on the page.
12. Write and test a program to get the number of list items in a list / combo box.
13. Write and test a program to count number of items present on a desktop.
14. **Understanding the use of bug tracking and testing tool Bugzilla and Jira.**

Open ended Experiment: **Mini Project** – Not for exam but to compulsory to be included in Record. (Test cases for Admission form, Shopping cart, Travel Booking, Hotel Booking, Utility Bill Payment.).

Text Books

ISTQB Certification Study Guide, Dr. K.V.K.K. Prasad, Wiley-Dreamtech Press, ISBN: 9788177227116

References

1. Software Testing Principles and Practices, Srinivasn desikan, Goplaswamy Ramesh, Pearson, ISBN: 9788177581218
2. Software Testing Tools, Dr. K.V.K.K. Prasad, Wiley- Dreamtech Press, ISBN 10: 8177225324 ISBN 13: 9788177225327
3. Software Testing Concepts and Tools, Nageshwara Rao Pusuluri, DreamTech, ISBN 10: 8177227122 ISBN 13: 9788177227123

SEM/YEAR : III SEM/2nd Year
COURSE CODE : 19VI310
TITLE OF THE COURSE : Oracle Lab
L: T/A: P: C : 2: 0: 0: 2

LIST OF PROGRAMS :

1. Identify the syntax for creating a table.
2. Identify the syntax for defining constraints.
3. Identify the code for using the INSERT statement.
4. Identify the code for using the UPDATE statement.
5. Identify the code for using the DELETE statement.
6. Identify the SQL statement to retrieve data from tables.
7. Identify the arithmetic expressions used to perform operations on data.
8. Identify the use of the WHERE clause in restricting the result set of an SQL query.
9. Identify the use of the comparison operators used in a WHERE clause to restrict the query results.
10. Identify the rules of precedence associated with WHERE clause.
11. Identify the methods of the sorting result set of a query using the ORDER BY clause.
12. Identify substitution variables that are used while retrieving data by using SQL statements.
13. Identify guidelines for using the GROUP BY clause.
14. Identify the features of the ROLLUP operator and CUBE operator.
15. Identify the syntax for altering and dropping a table.
16. Identify features of views.
17. Identify syntax for performing various tasks for managing views.
18. Identify the syntax for creating and dropping synonyms.
19. Identify the syntax for creating and dropping indexes.
20. Identify the syntax for creating and using a sequence.
21. Identify the features of single row character functions.
22. Match the number functions with their purpose.
23. Identify the features of Date functions.
24. Identify features the functions used to convert data types.(to_char,to_num,to_date)
25. Identify the syntax for displaying dates in different formats.
26. Identify features of general functions.(NVL,NVL2)
27. Demonstrate the use of CASE and DECODE functions.
28. Identify the use of nested functions in retrieving data from tables.
29. Identify use of single row and multiple row sub queries

retrieve from multiple tables.

30. Identify the syntax for performing multiple-column and correlated sub queries.
31. Identify the use of different types of join to retrieve data from multiple tables.
32. Identify the syntax of the unconditional INSERT ALL statement
33. Identify the syntax of the conditional INSERT ALL statement.
34. Identify the syntax of the conditional INSERT FIRST statement.
35. Identify the code for retrieving data hierarchically from a table.
36. Generate a query using the following SET OPERATORS, UNION, UNION ALL, INTERSECT, MINUS
37. Controlling User Access. Create User, Grant, Revoke
38. Identify features of various PL/SQL data types.
39. Identify the syntax for declaring PL/SQL variables using the %type attributes.
40. Identify features of bind variables and substitution variables.
41. Identify the syntax of the % ROWTYPE attributes.
42. Identify the syntax for **creating a PL/SQL table** based record.
43. Identify the syntax for creating a PL/SQL cursor based record.
44. Identify the syntax for creating a PL/SQL user defined record.
45. Identify the features of nested blocks.
46. Identify uses of PL/SQL operators.
47. Identify codes for manipulating data using DML statements in PL/SQL block.
48. Identify the syntax of decision making statement.
49. Identify the syntax of looping statement.
50. Identify the syntax for controlling implicit cursors and use the attributes.
51. Identify the syntax for controlling explicit cursors and use the attributes.
52. Identify the syntax for using cursor FOR loops, FOR UPDATE, WHERE CURRENT OF.
53. Identify guidelines for trapping system built in exceptions.
54. Identify guidelines for trapping user defined exceptions.
55. Identify the syntax for raise_application_error.
56. Identify the syntax for passing parameters to a stored procedure.
57. Identify tasks involved in using stored procedures.(IN,OUT,IN OUT)
58. Identify the syntax for creating PL/SQL function.
59. Trapping predefined and user defined exception in subprogram.
60. Identify sequence steps for developing PL/SQL packages.
61. Identify the code to **create a trigger**.
62. Write program to show use of new and old keywords in a trigger program.
63. Demonstrate the following TCL operations with suitable Example:
COMMIT- COMMIT, SAVEPOINT, ROLLBACK

Reference :

- **SQL,PL/SQL The programming language of Oracle by Ivan Byross**
- **Oracle PLSQL programming by Steven Feuerstein**
- www.tutorialspoint.com
- www.oracle.com
- www.plsqltutorials.com

SEM/YEAR : IV SEM/2nd Year
COURSE CODE : 19VI402
TITLE OF THE COURSE : R Programming
L: T/A: P: C : 2: 0: 0: 2

Course objectives

Understand linear system of equations
Understand the structure of Matrices and Determinants
Infer different co-ordinate systems and applications of vectors.

Unit 1

6hrs

History and Overview of R : What is R?, What is S?, The S Philosophy, Back to R, Basic Features of R, Free Software, Design of the R System, Limitations of R, R Resources.

Getting Started with R & R Nuts and Bolts : **Installation**, Getting started with the R interface, Entering Input, Evaluation, R Objects, Numbers, Attributes, Creating Vectors Mixing Objects, Explicit Coercion, Matrices, Lists, Factors, Missing Values, Data Frames, Names, Summary

Unit 2

6hrs

Getting Data In and Out of R : Reading and Writing Data, Reading Data Files with read.table(), Reading in Larger Datasets with read.table, Calculating Memory Requirements for R Objects.

Using the reader Package & Using Textual and Binary Formats for Storing Data: Using the readr Package, Using Textual and Binary Formats for Storing Data, Using dput() and dump(), Binary Formats

Unit 3

6hrs

Interfaces to the Outside World : File Connections, Reading Lines of a Text File, Reading From a URL Connection.

Subsetting R Objects, Vectorized Operations & Dates and Times: Subsetting a Vector, Subsetting a Matrix, Subsetting Lists, Subsetting Nested Elements of a List, Extracting Multiple Elements of a List, Partial Matching, Removing NA Values, Vectorized Operations, Vectorized Operations, Dates and Times, Dates in R, Times in R, Operations on Dates and Times, Summary

Unit 4

6hrs

Managing Data Frames with the dplyr package: Data Frames, The dplyr Package, dplyr Grammar, Installing the dplyr package, select(), filter(), arrange(), rename(), mutate(), group_by(), %>%, Summary.

Control Structures & Functions : if-else, for Loops, Nested for loops, while Loops, repeat Loop, next, break, Summary, Functions in R, Your First Function, Argument Matching, Lazy Evaluation, The ... Argument, Arguments Coming After the ... Argument, Summary

Unit 5

6hrs

Scoping Rules of R : A Diversion on Binding Values to Symbol, Scoping Rules, Lexical Scoping: Why Does It Matter?, Lexical vs. Dynamic Scoping, Plotting the Likelihood, Summary, Coding Standards for R.

Loop Functions : Looping on the Command Line : lapply(),sapply(),split().Splitting a Data Frame-tapply() , apply(),Col/Row Sums and Means, Other Ways to Apply, mapply(),Vectorizing a Function, Summary

References:

https://www.tutorialspoint.com/r/r_overview.htm

<https://www.w3schools.in/r/>

<https://www.guru99.com/r-tutorial.html>

SEM/YEAR : IV SEM/2nd Year

COURSE CODE : 19VI403

TITLE OF THE COURSE : Information System & Organization

L: T/A: P: C : 2: 0: 0: 2

Course objectives

Understand linear system of equations

Understand the structure of Matrices and Determinants

Infer different co-ordinate systems and applications of vectors.

Unit 1

6hrs

Organizations and Information Systems: Value chain and value system, Definitions of data, information and knowledge, Information Systems classification, influence on **organizations structures and activities** , Management View.

Social Contexts and Perspectives on IS : Common perspectives on the organizations, Impact of technology, Approaches to technology initiatives

Unit 2

6hrs

Internal IS and Enterprise Systems : Value chain and value system, Internal applications and IS, Enterprise systems (ES) and Enterprise, Applications Integration (EAI).

Organizational Strategy and IS : Organizational strategy, Aligning IS/IT to organizational strategy, Measuring success in strategy execution, Strategy execution and the Balanced Scorecard

Unit 3

6hrs

Evaluating IS: Tangible and intangible cost and benefits, Relevance of cost benefit measures to evaluating IS, Different aspects of evaluation, Interaction of evaluation and organisational contexts.

Cultural, Structural and Political Aspects of IS; IS and structure, Centralised and localised decision-

making, Political and cultural aspects of IS, ‘Structuration’

Unit 4

7hrs

People and IS Interpretation : Interpretation, use and sharing of information, Care and security of information, Ethics and stakeholders in IS, Data protection and legal principles

The 21st Century Organisation : How technology is changing working practices and possibilities, Contemporary vs future organisational forms, Changing relationships with the organisations, Management of distributed work.

User Acceptance and the Socio-technical Approach : User acceptance and the Technology Adoption Model, HCI principles in the design of IS interactions, Work design with socio-technical principles, User experience and IS design

Unit 5

5hrs

IS and the Customer : IS and customers, Customer Relationship Management (CRM), e-Business and e- Commerce.

IS and Organisational Change: Barriers to change, Change in organisations, Change models, IS and organisational change.

IS Benefit Management : Benefits management, Key module content

References:

1. Boddy, D., Boonstra ,A., Kennedy, G. (2008) Managing Information Systems : strategy and organisation 3rd ed. FT Pearson. ISBN-13: 978-0273716815
2. Hassall, J.C. (1999 and 2010), “Some Thoughts on Information Systems and Organisations “,
unpublished monograph
3. Ingram, D. (2016) What Are the Advantages and Disadvantages of a Bureaucratic Organization Structure? Available from <http://smallbusiness.chron.com/advantages-disadvantages-bureaucratic-organization-structure-2761.html> (April, 2016)
4. Terry, L. (2011).The Management Theory of Max Weber.Available from <http://www.business.com/management/management-theory-of-max-weber/> (April, 2016)
5. Plenhart, G (2016).Value Chain Management. Available from <http://www.referenceforbusiness.com/management/Tr-Z/Value-Chain-Management.html> (April, 2016)

SEM/YEAR : IV SEM/2nd Year
COURSE CODE : 19VI404
TITLE OF THE COURSE : Advanced Java
L: T/A: P: C : 2: 0: 0: 2

Course objectives

Understand linear system of equations
Understand the structure of Matrices and Determinants
Infer different co-ordinate systems and applications of vectors.

Course outcomes

Unit 1 **8hrs**

JDBC: Types of Drivers & categories, Interfaces and classes of java.sql package, Callable statement, Prepared statement, Error & warning management in JDBC, Cursor management in JDBC.

Servlets : History of web Applications, Introduction to Servlets, Servlet Architecture, Configuring the development environment, configuring and using the web server, Servlet Basics, Life cycle, Types of Servlets, Servlets & HTML, Thread safety, Session management, Cookies, Database connectivity, Connection pooling, Servlet Security, SSL

Unit 2 **6hrs**

JAVA Server Pages (JSP) : Introduction to JSP, JSP Architecture, Life cycle of JSP, JSP Scripting Elements , Directives, Creating a simple JSP, Implicit Objects, Java Beans with JSP, Session Management, JDBC with JSP.

Unit 3 **6hrs**

Introduction to Struts Framework: Configuring Struts Application, Struts configuration file, MVC architecture, Struts Controller components, ActionServlet, RequestProcessor, Action, ActionForward. Struts Model components, Struts View Components - ActionForm, ActionErrors, ActionMessage, DynaActionForm,

Unit 4 **6hrs**

Introduction to Hibernate Framework : Hibernate architecture, Hibernate core concepts, Overview of persistence lifecycle, Object-Relational mapping, Hibernate mappings, Configuring Hibernate, Working with Persistence objects Object identity, the importance of equals() and hashCode(), Simple Relationships

Unit 5

4hrs

Spring: Introduction to Spring , Spring Modules, Dependency Injection, Spring AOP(Aspects Oriented Programming).

Text Book:

Advanced Java Programming Paperback – 21 April 2015 by [Uttam Roy](#)

SEM/YEAR : IV SEM/2nd Year
COURSE CODE : 19VI405
TITLE OF THE COURSE : Enterprise Applications - Basics of ERP CRM
L: T/A: P: C : 2: 0: 0: 2

Course objectives

Understand linear system of equations
Understand the structure of Matrices and Determinants
Infer different co-ordinate systems and applications of vectors.

Course outcomes

Unit 1 **6hrs**

Introduction to ERP : What is ERP?, Evaluation of ERP ,Reasons for the Growth of ERP, Structure of ERP, Various Modules of ERP, Advantages of ERP.

An Overview of Enterprise : An overview of Enterprise, Business Functions and Business, Processes, Business Modelling. Importance of Information: Characteristics of information; Types of information, Information System: Components of an information system; Integrated Management Systems.

Unit 2 **6hrs**

ERP and Related Technologies : Business Process Reengineering (BPR), Management Information, System, Decision Support Systems, Executive Information Systems, Data Warehousing, Data Mining, CRM, Supply Chain management.

Unit 3 **6hrs**

ERP System : Introduction to ERP System, Functional Module-Finance, Sales and Distribution, Materials Management, Production Planning, Quality Management, Human Resource, Plant Maintenance, Integration of ERP, Supply Chain and Customer Relationship Application.

Unit 4 **6hrs**

ERP Implementation Life cycle : ERP Tools and Software, Implementation Challenges, ERP Implementation Strategies, ERP Implementation Life Cycle, Implementation Methodologies, Pre-evaluation Screening ,Package Evaluation, Project Planning phase, Gap Analysis, Reengineering, Configuration, Implementation, Team Training, Post Implementation

Unit 5 **6hrs**

ERP Market: Introduction, ERP Market Place and Market Place Dynamics, Market, Overview, The Changing ERP Market, SAP AG, Oracle, Peoplesoft ,JD, Edwards. Future Directives in ERP.

Customer Relationship Management and ERP: Role of ERP in CRM, Concept of CRM: Objectives of CRM; Benefits of CRM; Components of CRM, Types of CRM

SEM/YEAR : IV SEM/2nd Year
COURSE CODE : 19VI406
TITLE OF THE COURSE : Data Handling and Visualization
L: T/A: P: C : 2: 1: 0: 2

Course objectives

- Explain what data visualization is and its importance in our world today
- Understand why Python is considered one of the best data visualization tools
- Describe matplotlib and its data visualization features in Python
- List the types of plots and the steps involved in creating these plots
- Critically synthesize the theory and practical application of visualization for problem solving.

Course Out comes

- Produce compelling and useful data visualizations.
- Apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques.

Module 1: Data Collection Structures

(6 Hrs)

Lists: Creating Lists, Accessing Values in Lists, Adding and Updating Lists, Deleting List Elements, Basic List Operations, Indexing, Slicing, and Matrices, Built-in List Functions and Methods, Dictionaries: Creating Dictionaries, Updating and Accessing Values in Dictionaries, Deleting Dictionary Elements, Built-in Dictionary Functions, Methods, Tuples: Creating Tuples, Concatenating, Basic Tuples Operations,

.Module 2: Data Frames

(6 Hrs)

Creating Data Frames from a Dict of Series or Dicts, Creating Data Frames from a Dict of Ndarrays/Lists, Creating Data Frames from a Structured or Record Array, Creating Data Frames from a List of Dicts, Creating Data Frames from a Dict of Tuples, Selecting, Adding, and Deleting Data Frame Columns, Indexing and Selecting Data Frames, Transposing a Data Frame, Data Frame Interoperability with Numpy Functions,

Module 3: Data Gathering and Cleaning

(5 Hrs)

Cleaning Data, Checking for Missing Values, Handling the Missing Values, Reading and Cleaning CSV Data, Merging and Integrating Data, Reading Data from the JSON Format, Reading Data from the HTML Format, Reading Data from the XML Format

Module 4: The Importance of Data Visualization in Business Intelligence

(8 Hrs)

Why Is Data Visualization Important? Why Do Modern Businesses Need Data Visualization? The Future of Data Visualization, How Data Visualization Is Used for Business Decision-Making: Faster Responses, Simplicity, Easier Pattern Visualization, Team Involvement, Unify Interpretation

Introducing Data Visualization Techniques:

Loading Libraries, Popular Libraries for Data Visualization in Python: Matplotlib, Plotly, Geoplotlib, Pandas, Introducing Plots in Python

Module 5: Data Visualization

(5 Hrs)

Direct Plotting: Line Plot, Bar Plot, Pie Chart, Box Plot, Histogram Plot, Scatter Plot, Seaborn Plotting System: Strip Plot, Box Plot, Swarm Plot, Joint Plot, Matplotlib Plot: Line Plot, Bar Chart, Histogram Plot, Scatter Plot, Stack Plot, Pie Chart

Text Books:

Data Analysis and Visualization Using Python by Dr. Ossama Embarak, APress, 2018

SEM/YEAR : IV SEM/2nd Year
COURSE CODE : 19VI408
TITLE OF THE COURSE : R Programming Lab
L: T/A: P: C : 2: 0: 0: 2

LIST OF PROGRAMS :

1. Write R program to demonstrate:
 - a) How to Create Vector ,Mixing Objects
 - b) Explicit Coercion
 - c) Subsetting a vector
 - d) Vectorized Operations
2. Write R program to demonstrate:
 - a) Matrices
 - b) Subsetting a matrix
 - c) Dropping matrix
 - d) Lists
 - e) Subsetting Lists
 - f) Subsetting nested elements of a list and extracting multiple
 - g) elements of list
3. Write R program to demonstrate:
 - a) Factors
 - b) Missing values
 - c) Dataframes,names
4. Write R program to demonstrate :
 - a) Using dput()and dump()
 - b) Binary Formats
 - c) File Connections
 - d) Reading lines of a TextFile and reading from a URL connection

5. Write R program to demonstrate :
 - a) Partial Matching
 - b) Removing NA values
 - c) dates and times and operations on it in R
6. Write R program for Installing dplyr package using:
 - a) select()
 - b) filter()
 - c) arrange()
 - d) rename()
 - e) mutate()
 - f) groupby()
7. Write R program to demonstrate:
 - a) Control Structure-if-else statements
 - b) For loops and Nested For loops
 - c) While loop,repeat loop,next,break
8. Write R program to demonstrate function using :
 - a) lapply()
 - b) sapply()
 - c) split()
 - d) tapply()
 - e) Vectorizing a function
9. Write R program to demonstrate :
 - a) Scoping Rules of R
 - b) Application Optimization
 - c) Plotting Likelihood
 - d) Using system.time()
10. Write R program to demonstrate Debugging using:
 - a) NaN
 - b) Using traceback()
 - c) Using debug()
 - d) Using recover()
11. Write R program to demonstrate :
 - a) Simulation using rnorm() ,clnorm(),pnorm(),pnorm(),rpois()
 - b) for setting the random numbers seed
 - c) for simulating a Linear Model

d) for Random Sampling

- 12. Project: Movie Recommendation System in R.**
- 13. Project: Customer Segmentation using Machine Learning in R.**
- 14. Project: Sentiment Analysis Model in R**
- 15. Project: Uber Data Analysis Project in R**
- 16. Project: Credit Card Fraud Detection in R**

SEM/YEAR : IV SEM/2nd Year
COURSE CODE : 19VI409
TITLE OF THE COURSE : Adv. JAVA LAB
L: T/A: P: C : 2: 0: 0: 2

Course objectives

LIST OF PROGRAMS :

1. write a program to find the factorial of entered number?
2. write a program to display Floyd's triangle?
3. write a program to demonstrate constructor/method overloading?
4. write a program to demonstrate method overriding?
5. write a program to demonstrate multiple inheritance?
6. write a program to handle exceptions?
7. write a program to demonstrate the Life Cycle of Thread?
8. write a program to insert an element in array?
9. write a program to read a file? 10. Write a program to demo on linked list? 11. Write a program to demo on queue? 12. Write a program to demo on vector?
13. write a program to connect to a database using Connection, Statement and Result Set Interfaces.
14. write a program to demonstrate the use of CallableStatement. 15. write a program to demonstrate the use of PreparedStatement 16. write a program to demonstrate error & warning management in JDBC 17. write a program to implement cursor management in JDBC.
18. write a program to demonstrate the Servlet Life cycle and types of Servlets
19. write a program to demonstrate thread safety in servlets.
20. write a program to demonstrate session management in servlets using cookies 21. write a program to create servlet for Database connectivity and connection pooling 22. write a program to create servlet for servlet security and SSL.
23. write a program to create a simple JSP
24. write a program to demonstrate the life cycle of JSP
25. write a program to demonstrate the use of JSP Scripting Elements

26. write a program to demonstrate the use of JSP directives
27. write a program to use implicit objects in JSP
28. write a program to create the JSP for Session Management
29. write a program to demonstrate using JDBC with JSP
30. write a program to create a simple struts application
31. write a program to demonstrate the use of DynaActionForm
32. write a program to perform simple validation in a struts application
33. write a program to demonstrate the use of ActionErrors class
34. write a program to demonstrate the use of ActionMessage class
35. write a program to demonstrate the implementation of hibernate framework
36. write a program to find the factorial of entered number?
37. write a program to display Floyd's triangle?
38. write a program to demonstrate constructor/method overloading?
39. write a program to demonstrate method overriding?
40. write a program to demonstrate multiple inheritance?
41. write a program to handle exceptions?
42. write a program to demonstrate the Life Cycle of Thread?
43. write a program to insert an element in array?
44. write a program to read a file?
45. Write a program to demo on linked list?
46. Write a program to demo on queue?
47. Write a program to demo on vector?
48. write a program to connect to a database using Connection, Statement and Result Set Interfaces.
49. write a program to demonstrate the use of CallableStatement.
50. write a program to demonstrate the use of PreparedStatement
51. write a program to demonstrate error & warning management in JDBC
52. write a program to implement cursor management in JDBC.
53. write a program to demonstrate the Servlet Life cycle and types of Servlets
54. write a program to demonstrate thread safety in servlets.
55. write a program to demonstrate session management in servlets using cookies
56. write a program to create servlet for Database connectivity and connection pooling
57. write a program to create servlet for servlet security and SSL.
58. write a program to create a simple JSP
59. write a program to demonstrate the life cycle of JSP
60. write a program to demonstrate the use of JSP Scripting Elements
61. write a program to demonstrate the use of JSP directives
62. write a program to use implicit objects in JSP
63. write a program to create the JSP for Session Management
64. write a program to demonstrate using JDBC with JSP
65. write a program to create a simple struts application
66. write a program to demonstrate the use of DynaActionForm
67. write a program to perform simple validation in a struts application
68. write a program to demonstrate the use of ActionErrors class
69. write a program to demonstrate the use of ActionMessage class
70. write a program to demonstrate the implementation of hibernate framework

SEM/YEAR : IV SEM/2nd Year
COURSE CODE : 19VI410
TITLE OF THE COURSE : Data Handling and Visualization Lab
L: T/A: P: C : 0: 0: 0: 3

Course objectives

- Explain what data visualization is and its importance in our world today
- Understand why Python is considered one of the best data visualization tools
- Describe matplotlib and its data visualization features in Python
- List the types of plots and the steps involved in creating these plots

List of Programs:

Sl.No	Programs
1	Creating a 2-D Plot
2	Multiple Plots
3	Subplots
4	Layout and Spacing Adjustments
5	create different types of plots using matplotlib: • Histogram • Scatter Plot • Heat Map • Pie Chart • Error Bar
6	Seaborn

7	Data Visualization Using Tableau - 1 Introduction to Tableau - o Data Import and Management - o Data import - o Extract and live - o Data management – Join - o Data management – Relationship - o Data Management - Replace Data Type and Operation - o Data type - o Pivot and separate - o Change type
8	Data Visualization Using Tableau - 2 Different types of data visualizations - o Visual encoding - o Bar chart and pie chart - o Line chart - o Multiple chart and distribution - o Highlight tables - o Scatter plot and trend lines
9	Data Visualization Using Tableau - 3 Calculation and parameters - o Table calculation - o Forecast - o Log distribution - o Reference line - o Table

	Dashboard and story Create dashboard - o Tiled and floating - o Telling the story
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SEM/YEAR : I SEM/1st Year
COURSE CODE : 20VI107
TITLE OF THE COURSE : Basics of Computer Lab
L: T/A: P: C : 0: 0: 4: 6

Course Objectives:

- To learn about DOS commands
- To increase typing speed and confidence
- To create bio-data with suitable alignments
- To create the presentation& to create the email

Course outcomes:

- Student can able to learn about DOS Commands
- Students are able to increase the typing speed and confidence
- Students are able to create the bio-data, power point presentation and email on their own.

List of experiments:

Exercise 1: ComponentsofComputer

1. Input devices andoutput devices
2. Functionalunits ofcomputer Functionalunits ofcomputer

Exercise 2: DOS Commands

1. Write the syntax and definition of following commands: cls, cd, copy, copy con, Mem, Tree, ver, exit, find, sort, time, edit, erase, date, del, dir, md, rd, type.
2. Write the syntax for appending the content of two files, copy the output of dir command to file, listing of files and directories: dir/b, dir/l, dir/on, dir/w, definition of following commands: dir/ad, dir/oe, dir/p, dir/ar.

Exercise 3: Typing Tutorial

1. Familiarize typing in standard QWERTY keyboards.
2. Touch Typing Course: In this course, Trainee will learn the positions of the letter keys and common punctuation by heart, after completing the course you will be able to type with all ten finger without looking at the keyboard.
3. Speed Building course: This course is designed to increase your typing speed and confidences. The Trainee will focus on the keys for each finger, type longer texts and train with some of the most common English words
4. Numbers, Special marks and 10-key pad.4.1: Numbers Course: This two lesson course teaches how to type numbers on the number row 4.2: Special Marks Course: Extend Trainees skills to cover special marks, including Internet characters.
5. Mathematical symbols and brackets: 10-key Number pad Course: Learn to use the 10-key number pad with touch typing technique.

Exercise 4: Creating Document

1. Create the document in word pad with following information Name, qualification, city, date of birth, phone number, and increase the size of font to 24, make it bold ,put the heading as information and align it centre.
2. Create your bio data in note pad with suitable formats.
3. Demonstrate procedure for creating, naming, renaming of a folder in computer and familiarize properties like changing the icon, hiding a folder and changing attributes.

Exercise 5: Applications

1. How to open DOS, NOTEPAD, PAINT, CALCULATOR, and WORDPAD THROUGH RUN.?
2. How to create shortcuts, disappearing the desktop items, auto hide the task bar?
3. What is Status bar, Menu bar, Taskbar, Standard Toolbar, and specify their locations.
4. What is the extension of the following application: WordPad, Notepad, and Paint?

Exercise 6: MS-Office

1. Create your CV (Bio Data) in MS-word with suitable alignments.
2. Create the paint file insert the picture in it by choosing from different place and modify it in WordPad.
3. What is Border and Shading? Write the steps for applying Border & Shading to a Paragraph in WordPad.
4. What is Bullets and Numbering? Write the steps for applying Bullets and Numbering, and its different types in WordPad
5. What is spelling and grammar check. Write the steps for this and different option present in it in WordPad.
6. What is the use of Find and Replace and Go to option? Write the steps for that with example in WordPad.
7. Write the steps for inserting Symbols and special characters and inserting Date and Time, File, Object with example in WordPad.
8. Demonstrate the steps to create and enter records mailmerge
9. Type the invitation for calling your friends on the occasion of your birthday using mail merge, WordArt, select the field names yourself.
10. Write the steps for creating a table. Explain merge cells and split cells options.
11. Open Ms-Excel and insert 10 sheets, apply different backgrounds to different sheets, fill different colours in different cells.
12. Open Ms-Excel insert 4 sheets hide the sheet 2 and 3 and apply different colour to sheet tabs.
13. Demonstrate mathematical function in MS-Excel.
14. How to insert Rows, Columns, Cells and Worksheet in MS-Excel?
15. Create the presentation about you daily activity
16. Create the presentation of your organization company with suitable diagrams.

17. Create the presentation to explain any technology with suitable diagrams.
18. Create the presentation for any educational organization which should consist of hyperlinks, custom animation, slide transition
19. Create the DATABASES for the Company consisting of the tables: EMPLOYEE, DEPARTMENT, DESIGNATION, ACCOUNTS. And the fields are as follows EMP: Name, City, Add, Phno, Place, and Id. DEPARTMENT: Id, Dep Name, and Location. DESIGNATION: Id, Qualification, Experience, Skills. ACCOUNTS: Id, Basics, DA, HRA, PF. (MAKE ID AS PRIMARYKEY) and create the query to select the fields as: EMP=ID, NAME, PHNO, PALCE. DEP=DEPNAME, LOCATION. DESIG=QUALIFOCATION, EXP.ACCOU=TOTAL, BASICS, DA, PF.

Exercise 7: Internet

1. Write the steps to create the email.
2. Write the steps to search the details about historical places in internet.
3. Write the steps to create a mail and send it your friend.
4. Write the steps to create a mail which should attach some data and send it to your friend.

SEM/YEAR : I SEM/1st Year
COURSE CODE : 20VI109
TITLE OF THE COURSE : Web Programming lab
L: T/A: P: C : 0: 0: 4: 6

Course Objectives:

- Define the basics and principles of Web page design
- Visualize the basic concept of HTML
- Develop the concept of web publishing
- Introduce basics concept of CSS.

Course outcomes:

- Ability to understand and develop the website.

List of experiments:

1. Write a program in C language to display 'hello world'. Analyze Submain(), Compilation and execution process of a C program.
2. Write a program in C language to perform arithmetic operation like +, -, X, / and %

And display the result. (i) by declaring in to type variables. (ii) by declaring float type variables. (iii) by declaring double type variables. (iv) by declaring long int type variables. (v) by declaring unsigned int type variables

3. Write a program in C language to calculate the area of the circle. Formula for Calculating area is where r is the radius and is a constant.
4. Write a program in C language to find whether an input number is even or odd.
5. Write a program in C language to find whether an input number is positive or Negative
6. Write a program in C language to find the greatest among three input numbers.
7. Write a program in C language to check whether an entered alphabet is vowel, consonant, digit or special character.
8. Write a program in C language to interchange the values of two numeric variables Without using a third variable.
9. Write a program in C language to print counting numbers from 1 to 100 using 'for loop'.
10. Write a program in C language to print all odd numbers less than 100 using 'while loop'.
11. Write a program in C language to print all even numbers less than 100 using 'while loop'.
12. Write a program to print all the ASCII values and their equivalent characters Using a while loop.
13. Write a program in C language to find the sum of digits of an input number less than 99999.
14. Write a program in C language to find the sum of first and last digit of any input number less than 999999.
15. Write a program in C language to reverse any input number less than 99999

16. Write a program in C to generate Fibonacci series 0,1,1,2,3,5,8,...<1000.
17. Write a program in C language to find sum of series $(1^2) + (2^2) + \dots + (n^2)$, where $n < 25$.
18. Write a program in C language to display the output as given below using proper loops

```

1234
234
34
4

```

19. Write a program in C language to find all the factors of an input number less than 1000.
20. Write a program in C language to find whether an input number is prime or composite.
21. Write a program in C language to display a menu as given below and Execute Arithmetic operations. Use switch case. Menu

Addition	1
Subtraction	2
Multiplication	3
Division	4
Modulo Division	5
Enter your choice. (0/1/2/3/4)	
22. Write a program to print the prime numbers up to a given limit. Also print the number of prime numbers present in the given limit (Use nested loops, break and continue).
23. Write a program to enter the number till the user wants and at the end it should display the count of positive, negative and zero entered.

HTML

24. Create a HTML document using the following tags <html>, <head>, <title>, <body>
25. Create a HTML document which contains the following properties: Headings, paragraphs and breaks, divisions and centering quotations, preformatted text, inserted and deleted text, character entities, comments, block level elements- block quote tag, text- level elements, font tags.
26. Create a HTML document for creating lists-ordered list, unordered list and definition list.
27. Create a HTML document to implement nested list
28. Create 6 HTML pages, make one as main and make other 5 as sub pages. Create links in main page to link to all subpages and create link in all subpages for moving throughout the pages and to come back to main page
29. Create a html document containing images by using tag.
30. Create an HTML document to implement Image map.
31. Create a HTML document and give different colors for text, set back ground color, background image.
32. Create an HTML document to create the following tables (Table with caption, Headings, Row span, Col span, Cell padding, Cell spacing, Add background color, back ground image in a table, Border properties)
33. Create an HTML document and divide the page into frames use vertical frame and horizontal frame, include pages in all the frames, give links in the page and open the link in the frame, use target

34. Create an HTML document to implement inline frame
35. Create an HTML document and attach audio, video, animation, PDF format using `<embed>`
36. Create an HTML document to add a form in that and add form elements such as, field set, legend, labels, text box, text area, radio button, check box, drop down list, select menu, file uploads, submit button, reset button
37. Create an HTML document to add style to a document (use different selectors)
38. Create an HTML document for adding style to a document a) Inline style sheet b) Embedded style sheet c) External style sheet d) Import link
39. Create an HTML document to include CSS background properties.
40. Create an HTML document to include CSS text properties
41. Create an HTML document to include CSS list properties
42. Create an HTML document to include CSS fancy Table
43. Create an HTML document to include CSS Box Model
44. Create an HTML document to include CSS border properties
45. Create an HTML document to include CSS outline
46. Create an HTML document to include CSS positioning properties
47. Create an HTML document to implement CSS pseudo-class. Add different colors to a hyperlink, add other style to hyperlinks

SEM/YEAR : II SEM/1st Year
COURSE CODE : 20VI201
TITLE OF THE COURSE : Python
L: T/A: P: C : 2: 0: 0: 2

Course Objectives:

1. Master the fundamentals of writing Python scripts.
2. Learn core Python scripting elements such as variables and flow control structures.
3. Discover how to work with lists and sequence data.
4. Write Python functions to facilitate code reuse.
5. Use Python to read and write files.
6. Make their code robust by handling errors and exceptions properly
7. Work with the Python standard library
8. Explore Python's object-oriented features
9. Search text using regular expressions

Course Outcomes:

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Interpret Object oriented programming in Python
3. Design and develop Client Server network applications using Python

Unit 1: Introduction to Python

(6 Hrs)

History and Features of Python, **Installing Python**, Very Simple Programs, Variables, Python Data types and Operators: Python data types, Numbers, Python Strings, Functions and methods, Lists, working with list, Functions and methods, Tuples, working with tuples, Functions and methods, Dictionaries, working with dictionary, Functions, Python Basic operators, Python Program Flow Control: Conditional and control statements, Loops, For Loops in ranges, string, list and directory

Unit 2:

(6Hrs)

Calling a function, Types of functions ,Function Arguments ,Anonymous functions, Global and local variables, Importing module, Importing own module as well as external modules, Packages, Composition, Powerful Lambda function in python. Python Input, Output and File operations: Printing on screen, Reading data from keyboard, Opening and closing files, Reading and writing Files, Renaming and deleting file. Manipulating file pointer using seeks. Exception Handling: Exceptions, Assertions in Python, Exception Handling, try, except clause and try-finally clause

Unit 3: Python Object Oriented Programming – Oops

(6Hrs)

OOPs concepts, Classes and objects, Attributes, Inheritance, Overloading, Overriding, Data Hiding, Encapsulation and polymorphism. Regular Expressions: Character matching and searching in regular expressions, Extracting data using regular expressions, Regular Expression modifiers, Patterns. CGI Programming: CGI,CGI architecture, Environment variable, CGI Examples, HTTP Header, GET and POST methods

Unit 4:Databases

(6Hrs)

Introduction, database connection, executing queries, performing transactions. Networking: Socket, Socket Module, Methods, Client and server, Internet modules. Sending Email: Sending Emailusing SMTP, Sending an HTML e-mail using Python, Sending Attachmentsasan E-mail

Unit 5: GUI programming

(6 Hrs)

Python - **GUI Programming (Tkinter)**, **Tkinter Programming**, Tkinter Widgets, Attributes. Web Scraping: Project: mapIt.py with the web browser Module, Downloading Files from the Web with the requests Module, Saving Downloaded Files to the Hard Drive. Working with Excel Spreadsheets: Installing the openpyxl Module, Reading Excel Documents. Working with PDF and Word Documents: Read PDF Documents, Extracting Text from PDFs, Decrypting PDFs, Creating PDFs

Text Books:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning,
2. Learning Python 2nd edition by [MARK LUTZ, David Ascher](#), O; Reilly Publications
3. Python Programming: A Complete Guide for Beginners to Master, Python Programming Language by Brain Draper

SEM/YEAR : II SEM/1st Year
COURSE CODE : 20VI205
TITLE OF THE COURSE : Data Base 1
L: T/A: P: C : 2: 0: 0: 2

Course Objectives:

1. Understand the Database concepts
2. Design the database with planning and coding
3. Normalize the database
4. Administration of data and data base
5. Solve queries related to the database

Course Outcomes:

4. Ability to Install, configure, and interact with a relational database management system
5. Ability to master the basics of SQL and construct queries using SQL
6. Ability to design and develop a large database with optimal query processing

Unit 1: Introduction to Database System (5 Hrs)

File System versus a DBMS, Purpose of Database system, Database Applications, Basic concepts and definitions

Unit 2: Data Models (6 Hrs)

Entity-Relationship Model, Object Oriented Model, Network Model, Hierarchical Model, Relational Model. **Normalization:** What is Normalization? First Normal form, Second Normal form, Third Normal form, Boyce-codd Normal Form

Unit 3: SQL (8 Hrs)

Introduction to SQL, DDL Commands, DML Commands, DCL Commands, TCL Commands, User defined data type, Where Clause operators, Order By, Group By, Having Clauses, DISTINCT, TOP Keywords, Aggregate functions, Built-in functions-numeric, string and Date Functions

Unit 4: Advance SQL (6 Hrs)

SQL Constraints, Sub Queries, Identity column, SQL Joins, Views, Index, Triggers

Unit 5: Transact-SQL (5 Hrs)

Stored Procedure, Function, Control Structures, Conditional Processing using IF statements, While loop, Exception handling by TRY...CATCH, Error functions used within CATCH block

DATA ADMINISTRATION

Database Administrator, Concurrency control, Database Recovery, Database Security

Reference Books:

1. SQL Server 2008 r2 - Black Book
2. SQL Server – Patrick Paul
3. SQL Server 2008 programming – Robert vieira
4. J. Date, A. Kannan and S. Swamynathan, “An Introduction to Database Systems”, 8thed,

Pearson Education, 2006

5. Raghu Ramakrishnan, “Database Management Systems”, Third Edition, McGraw Hill, 2003

SEM/YEAR : II SEM/1st Year

COURSE CODE : 20VI206

**TITLE OF THE COURSE : Mathematical Foundations of Data Science & Analytics L: T/A: P:
C : 2: 0: 0: 2**

Course Objectives:

The course will introduce students to the fundamental mathematical concepts required for a program in data science

Course Outcomes:

1. Demonstrate understanding of basic mathematical concepts in data science, relating to linear algebra, probability, and calculus.
2. Employ methods related to these concepts in a variety of data science applications.
3. Apply logical thinking to problem-solving in context.
4. Demonstrate skills in writing mathematics.

Module1: Basics of Data Science

(5Hrs)

Introduction: Typology of problems; Importance of linear algebra, statistics and optimization from a data science perspective; structured thinking for solving data science problems.

Module2: Fundamental structures

(05Hrs)

Functions - surjections, injections, inverses, composition. Relations - reflexivity, symmetry, transitivity, equivalence relations. **Sets** - Venn diagrams, complements, Cartesian products, power sets, finite and infinite sets, introduction to lattices. Abstract orders: quasi-order, partial order, well-order, (Advanced, optional topics: Zorn's lemma, Koenig's theorem.)

Module3: Logic

(8 Hrs)

Propositional and predicate logic: syntax, semantics, soundness, completeness, unification, inferencing, resolution principle, proof system. Proof techniques (negation, contradiction, contraposition, mathematical induction) and the structure of formal proofs: efficiency of proof-systems.

Module4: Linear Algebra

(07Hrs)

Matrices and their properties (determinants, traces, rank, nullity, etc.); Eigenvalues and eigenvectors; Matrix factorizations; Inner products; Distance measures; Projections; Notion of hyperplanes; half-planes.

Module5: Number Theory

(5Hrs)

Elementary number theory, fundamental theorem of arithmetic, gcd, unique factorization, Euler's function, modular arithmetic, Fermat's little theorem, Chinese remainder theorem, modular exponentiation, RSA public key encryption.

Text Books:

1. **C. Liu and D. P. Mohapatra, Elements of Discrete Mathematics, 3/e, Tata-McGraw Hill, 2008.**

1. G. Strang (2016). Introduction to Linear Algebra, Wellesley-Cambridge Press, Fifth edition, USA.

Reference Books:

1. Cathy O'Neil and Rachel Schutt (2013). Doing Data Science, O'Reilly Media
2. E. Lehman, F. T. Leighton, and A. R. Meyer, Mathematics for Computer Science, 2013
3. A. Aho and J. Ullman, Foundations of Computer Science, W. H. Freeman, 1992.
4. T. Koshy, Discrete Mathematics with Applications, Academic Press, 2003.
5. J. Hein, Discrete Structures, Logic, and Computability, 3/e, Jones and Barlett, 2009

SEM/YEAR : II SEM/1st Year
COURSE CODE : 20VI207
TITLE OF THE COURSE : SQL Server Lab
L: T/A: P: C : 0: 0: 4: 6

Course Objectives:

1. To provide a sound introduction to the creation of problem statements from real life situations.
2. To give a good formal foundation on the relational model of data and usage of Relational Algebra.
3. To introduce the concepts of basic SQL as a universal Database language.
4. To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.
5. To enable the design of an efficient database using normalization concepts.
6. To enable students to be create indexes for databases for efficient retrieval

Course Outcomes:

1. Construct problem definition statements for real life applications and implement a database for the same.
2. Write queries in SQL to retrieve any type of information from a data base

List of Programs

1. Demo on Creating Databases
2. Demo on Modify Databases
3. Demo on database and files Viewing a Database
4. Demo on Renaming a Database
5. Demo on Deleting Database
6. Demo on database and files
7. Demo on database and files groups
8. Creating tables with different Data types
9. Demo on altering the table
10. Creating tables with User Defined Data Types
11. Dropping User Defined Data Types
12. Demo on Data Manipulation Language with different types Inserting values
13. Demo on Data Manipulation Language with different types updating values
14. Demo on Data Manipulation Language with different types Deleting Rows
15. Demo on Truncating a Table, Demo on Deleting a Table
16. Writing a Basic select statement, Writing a Basic select statement using where clause
17. Write a query to perform Arithmetic Operations
18. Write a query to perform Relational operators
19. Write a query to perform Logical operators
20. Write a query to perform Special operators
21. Generate query using TOP and DISTINCT keywords

22. Generate query to perform **ORDER BY clause**
23. Generate query to perform **GROUP BY and HAVING clauses**
24. Generate query using String functions, Generate query using Date functions
25. Generate query using Mathematical Functions, Generate query using Aggregate functions
26. Creating tables with different types of Constraints
27. Perform demo on Nested sub queries, Perform demo on Correlated Sub queries
28. Perform demo on sub queries with Operators, Generate a query to create an identity column
29. Perform **demo on Cross Join, Perform demo Natural Join**
30. Perform demo Equi Join, Perform demo on inner Join
31. Perform demo on outer Join, Write a query to creating Views
32. Write a query to retrieve Results from Views
33. How to Altering Views, Write a query to Dropping Views
34. Write a query to Renaming Views
35. Write a query to Manipulating Data through Views
36. Write a query to Implementing Indexes with different types of indexes
37. Creating Triggers
38. Write programs to declare different types of variables with different data types
39. Write program to Printing Messages
40. Write program to **Implementing Stored Procedures**
41. Write program on Types of Stored Procedures
42. Write program on Types of Parameters
43. Demo on Altering a Stored Procedure
44. Demo on how to Viewing a Stored Procedure
45. Demo on Deleting a Stored Procedure
46. Write a program to Create a function
47. Demo on IF statement and WHILE loop
48. Demo on exception handling and Demo on Explicit Transaction
49. Demo on Implicit Transactions

Reference Books:

1. SQL Server 2008 r2 - Black Book
2. SQL Server – Patrick Paul
3. SQL Server 2008 programming – Robert vieira

Reference Website:

1. www.msdn.microsoft.com
2. www.tutorialspoint.com
3. www.techonthenet.com

SEM/YEAR : II SEM/1st Year
COURSE CODE : 20VI208
TITLE OF THE COURSE : Java Lab
L: T/A: P: C : 0: 0: 4: 6

Course Objectives:

1. To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions
2. To understand the importance of Classes & objects along with constructors, Arrays and Vectors
3. Discuss the principles of inheritance, interface and packages and demonstrate through problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
4. To understand importance of Multi-threading & different exception handling mechanisms.

Course Outcomes:

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.

List of Programs

1. Write a program to display your Information on the Console.
2. WAP to use the Conditional Statements.
3. WAP to use the Control Statements.
4. WAP to pass Command Line Arguments & display the same on the console.
5. WAP to declare a String Array of with varying Width & display the content of the Array in the same manner in which the data is stored.
6. WAP to demonstrate the use of Operators.
7. WAP to demonstrate Pass By Value & passing the Objects as Parameters.
8. WAP to demonstrate Method Overloading & Method Overriding.
9. WAP to demonstrate Constructor Overloading.
10. WAP to use Abstract Classes.
11. Create a Package & Import the same in the other class.
12. Demonstrate the use of Access Modifiers with the help of Packages.
13. WAP to demonstrate Multiple Inheritance with the help of Interfaces.
14. WAP to handle the Exceptions.
15. WAP to use 'finally' & the Nested 'try' block.
16. Demonstrate the use of 'try', 'catch', 'finally', 'throw' & 'throws' in Exception handling.
17. Create your own Exception class & throw the same in the other class.
18. WAP to demonstrate the Life Cycle of Thread.
19. WAP to Create Multiple Threads & set the Priorities.
20. WAP to demonstrate Thread Synchronization.
21. WAP to take the Input from the User using Basic IO & display the output.

22. WAP to demonstrate the use of static Methods & static Blocks.
23. Demonstrate the use of transient in Serialization.
24. Usage of String & String Buffer.
25. WAP to create a Process & display the output given by that Process.
26. WAP to set the System Properties.
27. WAP to use Array List, Sort the Elements, retrieve the values & the Keys from the Map.
28. Programs to work with Collection Interfaces & Classes.
29. WAP to retrieve all the File Properties & display the same.
30. WAP to demonstrate the various Input & Output Streams (Character Streams, Byte Streams, Object Streams).
31. WAP for Serializing the Objects & to Deserialize the same.
32. WAP to display your information on to the Applet Window.
33. WAP to pass your information to the Applet & display the same on to the Applet Window (Using param tag).
34. Demonstrate various Methods of Graphics class.
35. Create a GUI Form (Applet) using all the possible awt Controls.
36. Create a GUI Application form using all the possible awt Controls.
37. Create a Notepad with all the functionalities.
38. WAP to demonstrate various Events in Java.
39. WAP using Anonymous classes & Adapter classes.
40. WAP to Communicate from one System to other, using Networking (TCP/IP).
41. WAP to Communicate from one System to other, using Networking (UDP).
42. WAP to call the Method from a Remote System using RMI.

Reference books:

1. The complete reference Java 2 - Patrick Naughton
2. Pure Java 2 -Techmedia
3. Java 2 - Sun Microsystems
4. Java 2 - O'Reilly
5. Java Programming - Balaguruswamy

SEM/YEAR : II SEM/1st Year
COURSE CODE : 20VI209
TITLE OF THE COURSE : Python Lab
L: T/A: P: C : 0: 0: 4: 6

Course Objectives:

1. Basics of Python programming
2. Decision Making and Functions in Python
3. Object Oriented Programming using Python
4. Files Handling in Python
5. GUI Programming and Databases operations in Python
6. Network Programming in Python

Course Outcomes:

1. Interpret Object oriented programming in Python
2. Design and develop Client Server network applications using Python
3. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python

SL NO	MAJOR TOPICS
1.0	Introduction to Python
1.1	Write a python program to find the square Root
1.2	Write a python program to calculate the Area of a Triangle
1.3	Write a python program to solve quadratic Equation
1.4	Write a python program to swap Two Variables
2.0	Python Data types and Operators
2.1	Write a python program to sum all the items in a list.
2.2	Write a python program to program to add two matrices
2.2	Write a python program to multiply two matrices
2.3	Write a python program to check Whether a string is palindrome or not
2.4	Write a program to demonstrate operators in python
3.0	Python Program Flow Control
3.1	Write a python program to check if a number is positive, negative or zero
3.2	Write a python program to check prime number
3.3	Write a python program to find the factorial of a number
3.4	Write a python program to display the multiplication Table
3.5	Write a python program to print the Fibonacci series
3.6	Write a python program to check Armstrong number
4.0	Python Functions, Modules And Packages
4.1	Write a python program to find numbers divisible by another number by using functions.

4.2	Write a python program to find factors of number
4.3	Write a python program to find factorial of number using recursion
4.4	Write a python program to display powers of 2 using anonymous function
4.5	Write a python program to find Factors of Number by importing module.
4.6	Write a python program to demonstrate calculator using package
5.0	Python Input ,Output and File operations
5.1	Write a python program to read from one file and copy to another file.
5.2	Write a python program to rename and delete the file.
5.3	Write a python program to demonstrate input and raw_input functions
6.0	Exception Handling
6.1	Write a python program to perform zero division error.
6.2	Write a python program to demonstrate exception handling while opening a file where you do not have write permission.
7.0	Python Object Oriented Programming – Oops
7.1	Write a python program to demonstrate on creating a class, creating instance objects and accessing attributes
7.2	Write a python program to demonstrate Inheritance.
7.3	Write a python program to demonstrate Overriding
7.4	Write a python program to demonstrate Overloading
8.0	Regular Expressions
8.1	Write a Python program to check that a string contains only a certain set of characters (a-z, A-Z and 0-9).
8.2	Write a Python program that matches a string that has ana followed by zero or more b's and an a followed by three 'b'.
8.3	Write a Python program that matches a word at the beginning of a string.
8.4	Write a Python program to check for a number at the end of a string.
8.5	Write a Python program to remove leading zeros from an IP address.
8.6	Write a Python program to replace all occurrences of space, comma, or dot with a colon.
9.0	CGI Programming
9.1	Write a CGI program to pass values using HTML form and submit button by GET and POST Method
10.0	Databases
10.1	Write a python program to create a database and perform insert operation
10.2	Write a python program to perform update operation on database
10.3	Write a python program to perform delete operation on database

11.0	Networking
11.1	Write a python program to create a socket and demonstrate on socket methods.
12.0	Sending Email
12.1	Write a python program to send an email.
13.0	GUI programming

13.1	Create a GUI window and add different widgets
14.0	Working with Excel Spreadsheets
14.1	Write a python program to demo on retrieve the Worksheet object for a sheet named 'Sheet1'?
14.2	Write a python program to demo on retrieve the Worksheet object for the workbook's active sheet?
14.3	Write a python program to demo on retrieve the value in the cell C5?
14.4	Write a python program to demo on set the value in the cell C5 to "Hello"?
14.5	Write a python program to demo on retrieve the cell's row and column as integers?
14.6	Write a python program to demo on get_highest_column() and get_highest_row() sheet methods return, and what is the data type of these return values?
14.7	Write a python program to demo on function to get the integer index for column 'M'.
14.8	Write a python program to demo on function needed to get the string name for column 14,
14.9	Write a python program to demo on retrieve a tuple of all the Cell objects from A1 to F1?
15.0	Working with PDF and Word Documents
15.1	Write a python program to demo on modes do the File objects for PdfFileReader() and PdfFileWriter() need to be opened in?
15.2	Write a python program to demo on acquire a Page object for page 5 from a PdfFileReader object?
15.3	Write a python program to demo on PdfFileReader variable stores the number of pages in the PDF document?
15.4	Write a python program to demo on methods do you use to rotate a PDF page?
15.5	Write a python program to demo on method returns a Document object for a file named demo.docx
15.6	Write a python program to demo on the difference between a Paragraph object and a Run object?
15.7	Write a python program to demo on you obtain a list of Paragraph objects for a Document object that's stored in a variable named doc?
16.0	Web Scraping
16.1	Write a python program to demo on Downloading Files from the Web with the requests Module
16.2	Write a python program to demo on Downloading Files from the Web with the requests Module

	and save in hard disk
17.0	Working with CSV Files and JSON Data
17.1	Write a python program to demo on read file from CSV file.
17.2	Write a python program to demo on read file from JSON file

SEM/YEAR : V SEM
COURSE CODE : 16CS301
TITLE OF THE COURSE : PROBABILITY MODELS
L: T/A:P: C : 3 : 0 : 0 : 3

Course Objectives

Give students necessary probability models such as stochastic processes, queuing theory and models so that they can use them in their areas

Course outcomes

At the end of the course students will be able to

1. Understand stochastic processes, queuing models and their application to computer science and communication areas
2. Apply the concepts learnt to systems and devices to study their working and performance.

Module 1 Overview of Probability Theory **8hrs**

Conditional Distribution and expectation: Introduction, Mixture Distributions, Conditional Expectation, Imperfect fault coverage and reliability. Random sums

Module 2 Stochastic Processes

Introduction, Classification of Stochastic Processes, The Bernoulli Process, The Poisson Process, Renewal Processes, Availability Analysis, Random Incidence, Renewal Model of Program Behavior

9hrs

Module 3 Discrete-Time Markov Chains

Introduction, Computation of n-step Transition Probabilities, State Classification and Limiting Probabilities, Distribution of Times Between State Changes, Markov Modulated Bernoulli Process, Irreducible Finite Chains with Aperiodic States, Discrete-Time Birth- Death Processes

9hrs

Module 4 Continuous-Time Markov Chains

Introduction, The Birth-Death Process, Other Special Cases of the Birth-Death Model, Non- Birth-Death Processes, Markov Chains with Absorbing States Solution Techniques

9hrs

Module 5 Networks of Queues

Introduction, Open Queuing Networks, Closed Queuing Networks, General Service Distribution and Multiple Job Types, Non-product-form Networks, Computing Response Time Distribution

10hrs

Text Books

1.Kishor Shridharbhai Trivedi, Probability and Statistics with Reliability, Queuing, and Computer Science Applications, John Wiley & Sons, 2nd Edition

Reference Books

1.Sheldon M Ross, Introduction to Probability Models, Elsevier, 9th Edition

SEM/YEAR : V SEM
COURSE CODE : 16CS305
TITLE OF THE COURSE : OBJECT ORIENTED PROGRAMMING
L: T/A:P: C : 3 : 0 : 2 : 4

Course Objectives

To learn the basic principles of object-oriented programming paradigm using C++

Course outcomes

Students will be able to:

Identify classes with attributes and functions for given problem

Analyze the relationship between the classes link them using appropriate concepts

Design and implement abstract data types.

Devise generic classes capable of manipulating primitive and user defined data types.

Module 1

Programming Paradigms - Introduction to OOP – Overview of C++ - **Classes** – Structures – Union – Friend Functions – Friend Classes – Inline functions – Constructors – Destructors – **Dynamic Initialization of Objects** - Static Members – Passing objects to functions – Function returning objects-Arrays of Objects, Object as Function Arguments

8hrs

Module 2

Arrays – Pointers – this pointer – References – Dynamic memory Allocation – functions **Overloading** – Default arguments – Overloading Constructors – Pointers to Functions – Operator **Overloading** - Type Conversion.

9hrs

Module 3

Inheritance – Types - Derived Class Constructors- Issues in Inheritance – Virtual base Class – Polymorphism – Virtual functions – Pure virtual functions

10hrs

Module 4

Class templates and generic classes – Function templates and generic functions – Overloading function templates – power of templates – Exception Handling – Derived class Exception – over handling generic functions – Exception handling Functions

9hrs

Module 5

Streams – Formatted I/O with IOS class functions and manipulators –File I/O – Name spaces – Array based I/O – Error handling during file operations - Formatted I/O – STL: Overview- Container Classes Lists-Maps- Algorithms Using Functions and Objects-String Class - Sequence Containers, Iterators-Specialized Iterators - Associative Containers. Storing User- Defined Objects - Function Objects

Text Books

Stephen Prata, "C++ Primer Plus", 6th Edition ,Addison-Wesley Professional, 2011

Bjarne Stroustrup, "Programming: Principles and Practice Using C++", 1st Edition, Addison-Wesley Professional, 2008

Reference Books

Andrew Koenig and Barbara E. Moo, "Accelerated C++: Practical Programming by Example", 1st Edition, Addison-Wesley Professional, 2000

Bruce Eckel, "Thinking in C++: Introduction to Standard C++: Volume One" 2nd Edition, Prentice Hall, 2000

Andrei Alexandrescu, "Modern C++ Design: Generic Programming and Design Patterns Applied", 1st Edition, Addison-Wesley Professional, 2001

SEM/YEAR : VI SEM
COURSE CODE : 16CS306
TITLE OF THE COURSE : COMPUTER GRAPHICS
L: T/A:P: C : 3 : 0 : 0 : 3

Course Objectives

The student should be made to:

- ☐ Gain knowledge about graphics hardware devices and software used.
- ☐ Understand the two dimensional graphics and their transformations.
- ☐ Understand the three dimensional graphics and their transformations.
- ☐ Appreciate illumination and color models.
- ☐ Be familiar with understand clipping techniques.

Course outcomes

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

- ☐ To Design two dimensional graphics, Apply two dimensional transformations.
- ☐ To Design three dimensional graphics and Apply three dimensional transformations.
- ☐ To Apply Illumination and color models and Apply clipping techniques to graphics.
- ☐ Designing the animation sequences.

Module 1

Overview of computer graphics: representing pictures, preparing, presenting& interacting with pictures for presentations; Visualization& image processing; RGB color model. Geometry and Generation of Simple Primitives: Line generation algorithms, Circle generation algorithms, Character generation and Ellipse generation. Graphical Devices: Input Devices, Display devices Scan Converting Polygons: Raster displays and Vector displays. **9Hrs**

Module 2

Algorithms to scan convert polygons. Two Dimensional Transformations: Translation, Scaling, Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Rotation, Reflection Shear. **9Hrs**

Module 3

Lighting and Shading - light sources, normal computation, reflection models, flat and smooth shading , Introduction to Textures and Mapping - Rendering Techniques - slicing, volume rendering, iso-surface extraction, ray casting, multi resolution representations for large data rendering. Data Structures for efficient implementation. **10 Hrs**

Module 4

Hidden Surfaces and Lines: Z –Buffer algorithm, Scan Line algorithm, Painter’s algorithm, Sub – division algorithm Light, Colour and Shading: Illumination, Shadows, Transparency and Colour, Shading Algorithm, Ray tracing, Halftones. Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model -YIQ colour model. **7 Hrs**

Module 5

Animation: Design of Animation Sequences, Animation Functions, Raster Animations and Animation Languages, Key-Frame Systems, Motion Specification. Curve and Surfaces: Parametric Functions and Properties of Curves. Advanced animation techniques.

10 Hrs

Text Books

1. Donald Hearn & M Pauline Baker, “Computer Graphics”, Pearson Education.
2. Newman, W M and Sproull R F, “Principles of Interactive Computer Graphics”, McGraw Hill, Tokyo.

Reference Books

1. Alan Watt, “3D Computer Graphics”, Addison Wesley.
2. Foley, Vandam, Feiner, Hughes – “Computer Graphics principles, Pearson Education.
3. F S Hill, “Computer Graphics Using Open GL”, Pearson Education.

SEM/YEAR : VI SEM
COURSE CODE : 16CS309
TITLE OF THE COURSE : UNIX SYSTEM PROGRAMMING
L: T/A:P: C : 3 : 0: 0 : 3

Course Objectives

- To understand the fundamental design of the unix operating system
- To become fluent with the systems calls provided in the unix environment
- To be able to design and build an application/service over the unix operating system

Course outcomes

At the end the course the students will have

- i) Ability to understand and reason out the working of Unix Systems
- ii) To be able to build an application/service over a Unixsystem.

Module 1

Introduction UNIX and ANSI Standards, X/Open Standards, POSIX APIs, POSIX Development Environment, API Common Characteristics, File types, Attributes, Inodes in UNIX System V, APIs to Files, UNIX Kernel support for files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.

5Hrs

Module 2

UNIX File APIs General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO file APIs, Symbolic Link File APIs, General File Class, regfile Class for Regular Files, dirfile Class for Directory File, FIFO file Class, Device File Class, Symbolic Link File Class, File Listing Program.

8Hrs

Module 3

UNIX Processes The Environment of a UNIX Process, main function, Process termination, command-line arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp functions, getrlimit, setrlimit functions, UNIX Kernel Support for Processes.

11Hrs

Module 4

Process Control and Signals Process Identifiers, fork, vfork, exit, wait, waitpid, race conditions, exec functions, changing user ids, Interpreter files, systems function, Process Accounting, User Identification, Process Times, Signals : The Unix Kernel Support for Signals, Signal Mask, sigaction, the SIGCHLD signal and waitpid function, the sigsetjmp and siglongjmp functions, Kill, Alarm, Interval Timers.

11Hrs

Module 5

Daemon Processes and Inter Process Communication Daemon Processes, Daemon Characteristics, Daemon Conventions, client-server Model. Inter Process Communication, Pipes, popen, pclose, FIFOs, Message Queues, Semaphores.

Text Books

1. Maurice J Bach, "The design of the UNIX Operating System", Pearson Education/PHI, 1987.

2. Terrance Chan, “Unix System Programming Using C++”, Prentice Hall India, 1999.

Reference Books

1. W. Richard Stevens, “Advanced Programming in the UNIX Environment”, 2nd Edition, Pearson Education/PHI, 2005.
2. Marc J Rochkind, “Advanced Unix Programming”, 2nd Edition, Pearson Education, 2005.

SEM/YEAR : V SEM
COURSE CODE : 16CS323
TITLE OF THE COURSE : DATA COMMUNICATIONS
L: T/A:P: C : 3 : 0 : 0 : 3

Course Objectives

This course give the students who want to get specialized in computer networks all necessary back ground on Physical layer, Transmission media, switching techniques, and Analog and digital communication.

Course outcomes

At the end of the course the students will

- i) understand transmission of data in the analog and digital form, data representation, categories of networks and protocols
- ii) understand the transmission media and signal transmission, transmission of digital transmission and derive the data rate limits.
- iii) Understand and analyze switching systems, different types of switching systems
- iv) Analyze and design different blocks in Analog and Digital Communication Systems, and understand the fundamental of Modems, Spread Spectrum Wireless Systems and Cellular Communication Systems.

Module 1

Data Transmission: Concepts and Terminology- Analog and Digital Data Transmission- Transmission Impairments-Channel Capacity-Components- Data Representation- Data Flow. Network Criteria-Physical Structures - Network Models - Categories of Networks- Interconnection of Networks. Protocols-standards-Internet-Internet standards.

8hrs

Module 2

Transmission Media and Signal Transmission: Guided Transmission Media- Wireless Transmission-Wireless Propagation-Line-of-Sight-Transmission-Data and Signals- Analog and Digital Signals-Periodic and non-periodic signals. Digital signals- transmission. Signal Transmission overheads-Data rate limits-Performance parameters.

9hrs

Module 3

Switching Systems: Telecommunications Transmission: Basic Switching System, Simple Telephone Communication, evolution of switching systems -Stronger switching systems Switching Used in telecommunications cross bar switching, Electronic Switching
– **Space Division Switching**, Time Division Switching –Time Division space switching, Time Division Time Switching, Time multiplexed space switching, Time multiplexed Time Switching, Combination Switching Control of Switching Systems: Call processing functions, common control, stored program control (For all type of switching systems)

10hrs

Module 4

Analog and Digital Communication: **Basic blocks in a communication system- transmitter, channel and receiver**- baseband and passband signals and their representations; concept of modulation and demodulation. Continuous wave (CW) modulation: AM, DSB, DSBSC,

SSBSC, VSB Angle modulation –PM, FM, narrow and wideband FM. Pulse Modulation: sampling process; PAM; PWM, PPM ; PCM; line coding; DPCM, DM,. Geometric representation of signal waveforms: Gram-Schmidt procedure for baseband and bandpass signal representation, constellations. Baseband and Bandpass transmission through AWGN channel: Baseband and Bandpass modulation schemes- MPAM, QAM, MPSK and MFSK. **9hrs**

Module 5

Communication Systems: Fundamentals of Modems-Spread spectrum- Wireless system: Frequency bands for Radio and TV broadcasting, propagation characteristics, point-to- point two-way communication system in HF, VHF and UHF band, transmitter and receiver for Radio and TV; Cellular communication systems-basic concepts; Microwave and line of sight communication.

9hrs

Text Books

1. W. Stallings, Data and Computer Communications, 8th Ed, Pearson India, 2007.
2. B. Forouzan, Data Communications and Networking, 4th Ed, Tata Mcgraw Hill, 2006.

Reference Books

1. Viswanathan T, “Telecommunication switching systems and networks” 17th Indian reprint, PHI, India, (2003).
2. J. G. Proakis and M. Salehi, Communication system engineering, 2/e, Pearson Education Asia, 2002.
3. R. E. Ziemer, W. H. Tranter, Principles of Communications: Systems, Modulation, and Noise, 5/e, John Wiley & Sons, 2001.
4. Flood J E, “Telecommunications switching, traffic and networks” first Indian reprint, Pearsoneducation Asia, (2001)

SEM/YEAR : VI SEM

COURSE CODE : 16CS338

TITLE OF THE COURSE : MOBILE COMPUTING AND APPS DEVELOPMENT

L: T/A:P: C : 3 : 0: 0 : 3

Course Objectives

- The student should be made to:
- Understand the basic concepts of mobile computing
- Be familiar with the network protocol stack
- Learn the basics of mobile telecommunication system
- Be exposed to Ad-Hoc networks
- Gain knowledge about different mobile platforms and application development

Course outcomes

Acquire technical competency and skills in developing applications using Android

Module 1

INTRODUCTION TO MOBILE COMPUTING

Characteristics and advantages of mobile communication, types of mobile applications – development approaches, overview of mobile strategy and designing mobile solutions. Mobile computing project structure, building and testing. Evolution of Modern Mobile Wireless communication system. Mobile computing vs. wireless - MAC Protocols Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.

09hrs

Module 2

MOBILE PLATFORMS AND APPLICATIONS

Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone –M-Commerce – Structure – Pros & Cons – Mobile Payment System.

09hrs

Module 3

INTRODUCTION TO ANDROID

Android: Introduction, trends, platforms, Android Development Setup like, Android Studio,Eclipse, Android SDK, tools. Emulator setup. App Behaviour on the Android Runtime (ART).

Platform Architecture. Application framework and basic App Components resources.

09hrs

Module 4

MOBILE APP DEVELOPMENT USING ANDROID

Android App Use Case (Use Case Diagram (UML)) Implement user Interface - layout, values, asset XML representation, generated R.Java file, Android manifest file. Activities, Intent and UI Design - activities life-cycle. Android Components – layouts, fragments, basic views, list views, picker views, adapter views, Menu, Action Bar etc. - Managing data using SQLite database.

Module 5

DATA PERSISTENCE AND GOOGLE APIS FOR ANDROID

Managing data using SQLite, user content provider and persisting data into database Google APIs for Android - Maps, Cloud Messaging, Authentication, Storage, Hosting and Google Play services.

09hrs

TEXT BOOKS

1. Learning Android by Marko Gargenta O'reilly Publications
2. Professional Android™ Application Development by Reto Meier ,Wrox Publication
3. Head First Android Development by Jonathan Simon O'reilly Publications

REFERENCES

1. Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2007.
2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
3. Uwe Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.

Elective Courses: UG Research Project/Product Development

- 1. 16CS340 UG Research Project/Product Development Foundation**
- 2. 16CS432 UG Research Project/Product Development**

Course credit: 03 for each of the above course

Introduction

16CS340 is a prerequisite for 16CS432. Apart from that, students can take this in any semester from 6th Sem onwards.

Students can register only for the foundation course or both the courses.

Course Introduction

These courses are intended to give highly motivated students the opportunity to learn how to do **research and develop products by participating in an ongoing research/Product development project** leading to a publication or a PoC implementation that can be pitched for funding opportunity.

Course Objectives

1. To identify key research questions within a field to carry out research in a team
2. To identify and summarize the literature review of the relevant field
3. To demonstrate relevant referencing and inculcate new skills in various aspects of academic writing
4. To demonstrate the knowledge and understanding of writing the publication/report
7. To showcase the strong evidence on the clarity of the argument, understanding of the selected domain area and presentation of its technical information
8. To detail description of the process of carrying out the independent

research in written document along with results and conclusions with reference to the existing literature

9. To analyze and synthesize the new research findings

Course Outcomes

1. Draft of the Publication or Demonstration of the Proof-of-concept product, Draft of patent application

The research topic proposed by both the guide and the student team should be approved by the department chairman to proceed further. A degree of industrial input and involvement will be encouraged, and can be facilitated through existing academic-industrial collaborations or by addressing specific topics that are of interest to industrial partners.

All projects will be closely supervised by the Project Guide with ongoing feedback and guidance at all stages of the project from the conception to completion.

The following criteria will be checked by the department chairman to approve for the research proposal:

a. Department staff as course guide

1. Ability to provide research direction to the student in the chosen field of interest
2. Ability to design an appropriate research strategy and methodology to carry out the research by student
3. Ability to provide and evaluate the strong literature review document for the chosen research topic

5. Ability to train students on research paper / technical writing skills

6. Conduct reviews in regular time period and submit the evaluation to department chairman

b. Student Team

1. To be dedicated and committed to work on a new research topic by learning new technical skills

2. To have fair knowledge on what is product development or research topic

3. To have constant interaction with allocated guide by providing weekly updates

4. To be committed to complete the project and submitting the technical paper within the stipulated time framed by the university

Evaluation:

There will be CIA evaluation as well as the Semester end evaluation of the work done It will be done by a committee of senior researchers of the Department.

The rubrics for this will be worked out shortly.

SEMESTER/YEAR : VI SEM / III YEAR

COURSE CODE : 16CS373

TITLE OF THE COURSE : COMPILER DESIGN & SYSTEMS SOFTWARE LAB

L: T/A: P: C : 0: 0 : 4 : 2

COURSE OBJECTIVES: The student should be made to:

1. Experiment on the basic techniques of compiler construction and tools that can be used to perform syntax directed translation of a high-level programming language into an executable code
2. Know the implementation of assemblers, loaders and various parsing techniques.
3. Learn how to optimize and effectively generate machine codes

COURSE OUTCOMES:

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

1. Understand the working of lex and yacc compiler for debugging of programs.
2. Understand and define the role of lexical analyzer, absolute loader and symbol table.
3. Learn & use the new tools and technologies used for designing a compiler.
4. Develop program for solving parser problems.
5. Learn how to write programs that execute faster.

LIST OF EXPERIMENTS:

1. Implementation of symbol table
2. Implementation of absolute loader
3. Implementation of token separation using lex tool
4. Implementation of calculator using yacc tool
5. Construction of operator precedence parse table
6. Construction of lr-parsing table
7. Generation of code for a given intermediate code
8. Implementation of simple code optimization techniques
9. Mini project

SEMESTER/YEAR : VI SEM / III YEAR

COURSE CODE : 16CS374

**TITLE OF THE COURSE : COMPUTER NETWORKS & UNIX SYSTEM
PROGRAMMING LAB**

L: T/A: P: C : 0: 0 : 4 : 2

COURSE OBJECTIVES:

- 1) To understand the basics of Unix internals and systems programming.
- 2) To get familiar with POSIX standards, interfaces and device driver functionality.
- 3) To implement inter-process communication mechanisms among the processes.
- 4) To simulate various network scenarios and protocols using NS2 and Cisco packet router.

COURSE OUTCOMES:

At the end of this practical course, students should be able

- 1) To design and implement race condition and system functions on Unix platform
- 2) To design and implement connection oriented and connectionless socket interfaces
- 3) To experience the Unix environment and device driver functionality.
- 4) To simulate various networking topologies and protocols using NS2 and Cisco packet router

LIST OF EXPERIMENTS

1. Design and implement a C program to copy a file using command line arguments passed to a user defined function.
2. Write a C/C++ POSIX compliant program to check the following limits on the system:
(i) Maximum number of characters allowed in a path name (ii) Maximum number of child processes that may be created (iii) Maximum number of characters allowed in a file name (iv) Number of clock ticks per second (v) Maximum number of files that can be opened simultaneously by a process.
3. Design and implement a C program that demonstrates interprocess communication between two processes using mkfifo, open, read, write and close APIs.
4. a) Write a C program that prints the contents of its environment list.
b) Design and implement a C program to implement the mv command in Unix using link and unlink APIs.
5. Design and implement a C program to illustrate the race condition using parent and child processes.
6. Design and implement a C program to implement the system function.
7. Design and implement C programs for both server and client to demonstrate inter- process communication using connection oriented (TCP) sockets. Client requests a file from server. The file received from server should be displayed on the client's terminal. Otherwise appropriate error message should be printed.

8. Design and implement C programs for both server and client to demonstrate inter-process communication using connectionless (UDP) sockets. Client requests a file from server. The file received from server should be displayed on the client's terminal. Otherwise appropriate error message should be printed.
9. Design and implement a simple Linux driver.
10. Simulate three nodes point to point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.
11. Simulate transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
12. Study of basic network command and Network configuration commands. Configure a network topology using packet tracer software. Configure Cisco router and ping it. All commands related to Network configuration which includes how to switch to privilege mode and normal mode and how to configure router interface and how to save this Configuration to flash memory or permanent memory. This commands includes
 - a) Configuring the Router commands
 - b) General Commands to configure network c) Privileged Mode commands of a router
 - d) Router Processes & Statistics
 - e) IP Commands
 - f) Implementation of Authentication of client on server
 - g) Uses of ARP and DHCP Protocol

SEMESTER/YEAR : 7TH SEM / 4TH YEAR

COURSE CODE : 16CS421

TITLE OF THE COURSE : PATTERN RECOGNITION

L: T/A:P: C : 3 :0: 0 : 3

COURSE OBJECTIVES:

1. Numerous examples from machine vision, speech recognition and movement recognition have been discussed as applications.
2. Unsupervised classification or clustering techniques have also been addressed in this course.
3. Analytical aspects have been adequately stressed so that on completion of the course the students can apply the concepts learnt in real life problems.

COURSE OUTCOMES: At the end of the course students will be able to:

2. Know feature extraction techniques and representation of patterns in feature space.
3. Measure of similarity between two patterns. Statistical, nonparametric and neural network techniques for pattern recognition.
4. Understand Techniques for recognition of time varying patterns.

MODULE 1-INTRODUCTION AND STATISTICAL PATTERN RECOGNITION 9hrs

Introduction: Feature extraction and Pattern Representation, Concept of Supervised and Unsupervised Classification, Introduction to Application Areas.

Statistical Pattern Recognition: Bayes Decision Theory, Minimum Error and Minimum Risk Classifiers, Discriminant Function and Decision Boundary, Normal Density, Discriminant Function for Discrete Features, Parameter Estimation.

MODULE 2-DIMENSIONALITY PROBLEM AND NONPARAMETRIC PATTERN CLASSIFICATION 10hrs

Dimensionality Problem: Dimension and accuracy, Computational Complexity, Dimensionality Reduction, Fisher Linear Discriminant, Multiple Discriminant Analysis.

Nonparametric Pattern Classification: Density Estimation, Nearest Neighbour Rule, Fuzzy Classification.

MODULE 3- LINEAR DISCRIMINANT FUNCTIONS 10Hrs

Linear Discriminant Functions: Separability, Two Category and Multi Category Classification, Linear Discriminators, Perceptron Criterion, Relaxation Procedure, Minimum Square Error Criterion, Widrow-Hoff Procedure, Ho-Kashyap Procedure Kesler's Construction

MODULE4-NEURAL NETWORK CLASSIFIER AND TIME VARYING PATTERN RECOGNITION **10Hrs**

Neural Network Classifier: Single and Multilayer Perceptron, Back Propagation Learning, Hopfield Network, Fuzzy Neural Network

Time Varying Pattern Recognition: First Order Hidden Markov Model, Evaluation, Decoding, Learning

MODULE 5 - UNSUPERVISED CLASSIFICATION **7hrs**

Unsupervised Classification: Clustering, Hierarchical Clustering, Graph Based Method, Sum of Squared Error Technique, Iterative Optimization

Text Books

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", John Wiley & Sons, 2001.
2. Earl Gose, Richard Johnsonbaugh and Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall, 1999.

Reference Books

1. Robert J. Schalkoff, Pattern Recognition Statistical, Structural and Neural Approaches, John Wiley & Sons Inc., New York, 1992.
2. Tou and Gonzales, Pattern Recognition Principles, Wesley Publication Company, London, 1974.

SEMESTER/YEAR : 8TH SEM / 4TH YEAR
COURSE CODE : 16CS422
TITLE OF THE COURSE : WIRELESS NETWORKS
L: T/A: P: C : 3 : 0 : 0 : 3

Course Objectives:

1. Understand the architecture and applications of current and next generation wireless networks
2. Get a basic introduction to the key concepts and techniques underlying modern physical layer wireless and mobile communications
3. Learn how to design and analyze various medium access and resource allocation techniques
4. Learn how to design and analyze network layer routing protocols, along with key component mechanisms
5. Learn to design and analyze transport layer protocols

Course Outcomes: At the end of the course students will be able to

1. Get an idea about the entire wireless network and the functionalities.
2. Get an idea about 5 G technologies.

Module I **8Hrs**

Introduction, Fundamentals of cellular systems, mobile ad-hoc and sensor networks, wireless PAN/LAN/MAN. Overview of probability theory, traffic theory, queuing theory, and discrete event driven simulations.

Module II **9 Hrs**

Mobile radio propagation, multi-path propagation, path loss, slow fading, fast fading. Channel coding and Error Control Techniques. Cellular concept, frequency reuse, cell splitting, cell sectoring. Multiple radio access protocols, CSMA, CSMA/CD, CSMA/CA and standards.

Module III **9Hrs**

Multiple division techniques: FDMA, TDMA, CDMA, OFDM, SDMA. Static and dynamic channel allocation techniques. Mobile Communication Systems: Registration, Roaming, Multicasting, Security and Privacy.

Module IV **9Hrs**

Ad-hoc networks, routing in MANETs. Wireless sensor networks, MAC protocols for wireless sensor networks, routing in sensor networks. Wireless PAN (Bluetooth), Wireless LAN (Wi-Fi), Wireless MAN (WiMAX)

Module V

10Hrs

Introduction – 5G vision – 5G features and challenges – Applications of 5G – 5G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

Text Books

1. Dharma PrakashAgrawal and Qing-An Zeng, Introduction to Wireless and Mobile Systems, Tomson, 2010, 3rd edition
2. William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India, 2nd Ed., 2007.
3. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008.

Reference Books

1. Vijay K. Grag and Joseph E. Wilkes, Wireless and Personal Communications Systems, 1996.
2. Christian Huitema, Routing in the Internet, Prentice Hall, 1995.
3. Gary. S. Rogers & John Edwards, "An Introduction to Wireless Technology", Pearson Education, 2007

SEMESTER/YEAR : 7TH SEM/ 4TH YEAR

COURSE CODE : 16CS428

TITLE OF THE COURSE : DATA WAREHOUSING AND DATA MINING

L: T/A: P: C : 3 : 0 : 0 : 3

COURSE OBJECTIVES:

1. Be familiar with the concepts of data warehouse and data mining
2. Apply preprocessing statistical methods for any given raw data.
3. Be acquainted with the tools and techniques used for knowledge Discovery in Databases

COURSE OUTCOMES: At the end of the course students will be able to

1. Learn the concepts of database technology evolutionary path which has led to the need for data mining and its applications
2. Explore DWH and OLAP , and devise efficient & cost effective methods for maintaining DWHs
3. Develop practical work of DM techniques and design hypotheses based on the analysis to conceptualize a DM solution to a practical problem.

MODULE 1 - DATA WAREHOUSING:

8Hrs

Data warehousing Components –**Building a Data warehouse** – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

MODULE 2 - BUSINESS ANALYSIS:

9Hrs

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – **Online Analytical Processing (OLAP)** – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.

MODULE 3 - DATA MINING:

9Hrs

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Types of Data-attributes and measurements, types of data sets, Data Quality, Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.

MODULE 4 - **CLUSTERING AND TRENDS IN DATA MINING:**

9Hrs

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications

MODULE 5 - **ASSOCIATION RULE MINING AND CLASSIFICATION:**

10Hrs

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

TEXTBOOKS:

1. Alex Berson and Stephen J. Smith, “ Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint, 2007.
2. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Second Edition, Elsevier, 2007.

REFERENCES:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “ Introduction To Data Mining”, Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay “, Insight into Data mining Theory and Practice”, Easter Economy, Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, “ Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
4. Daniel T. Larose, “Data Mining Methods and Models”, Wile-Interscience, 2006.

SEMESTER/YEAR : 8TH SEM / 4TH YEAR

COURSE CODE : 16CS437

TITLE OF THE COURSE : PARALLEL COMPUTING

L: T/A: P: C : 3 : 0 : 0 : 3

Course Objectives

1. To understand the architectural, hardware, OS and programming aspects in High Performance Computing
2. To understand the distributed memory programming, shared memory programming, and a few parallel applications

Course Outcomes

1. Knowledge and understanding of high performance computing at various levels/layers
2. Design and implement parallel solutions to the given problems

Module 1: 8 Hrs

Introduction to Computer Systems: Processors, Memory, I/O Devices; Cost, timing, and scale (size) models. Program Execution: Process, Virtual Memory, System Calls, Dynamic Memory Allocation.

Module 2: 9 Hrs

Machine-Level View of a Program: typical RISC instruction set and execution, **Pipelining**. Performance issues and Techniques, Cost and Frequency Models for I/O, paging, and caching. Temporal and spatial locality.

Module 3: 10 Hrs

Typical Compiler Optimizations: Identifying program bottlenecks – profiling, tracing. Simple high-level language optimizations – locality enhancement, memory disambiguation. Choosing Appropriate Computing Platforms: benchmarking, cost- performance issues.

Module 4: 10Hrs

Parallel Computing: Introduction to parallel Architectures and Interconnection Networks, communication latencies. Program parallelization: task partitioning and mapping, data distribution, Message passing, synchronization and deadlocks.

Module 5: 9Hrs

Distributed memory programming using MPI/PVM. **Shared memory parallel programming. Multithreading.**

Text Books:

1. Dowd, K., High performance Computing, O'Reilly Series, 1993.
2. Culler, D., and Singh, J.P., Parallel Computer Architecture: A Hardware/Software Approach. Morgan Kaufmann Pub., 1999.

References

1. Gropp, W., Lusk, E., and Skjellum, A., Using MPI: Portable Parallel Programming with the Message-passing Interface, MIT Press, 1997.
2. Grama, Gupta, A., Karypis, G., Kumar, V., Introduction to Parallel Computing, Addison Wesley, 2003. ISBN:0-201-64865-2

SEMESTER/YEAR : 8TH SEM / 4TH YEAR

COURSE CODE : 16CS438

TITLE OF THE COURSE : SOCIAL NETWORKS AND ANALYTICS

L: T/A: P: C : 3 : 0 : 0 : 3

COURSE OBJECTIVES:

1. To understand the Social network concepts and its issues/challenges, various tools of Social network analysis.
2. To know about Social network APIs.
3. To know about mining and classification techniques of Social networks.

COURSE OUTCOMES: At the end of the course students will be able to

1. Understand the Social network concepts and its issues/challenges, various tools of Social network analysis.
2. Understand about Social network APIs.
3. Understand about mining and classification techniques of Social networks.

MODULE 1 - Introduction

8Hrs

Social network concepts – Development of social network and analysis - **Online social networks** – Social Network Data - Issues and challenges

MODULE 2 - Social Network Analysis

9Hrs

Linked-based and structural analysis - Content-based analysis - Static and dynamic analysis
Mathematical Representation of social networks

MODULE 3 - Social networking systems and API

9Hrs

Social networking systems and API - Statistical Analysis of Social Networks- Community Detection in Social Networks - Node Classification in Social Networks -Evolution in Dynamic Social Networks

MODULE 4 - Social Influence Analysis

9Hrs

Social Influence Analysis -Link Prediction in Social Networks -**Data Mining in Social Media Text Mining in Social Networks** - Social Tagging -Building social services

MODULE 5 - **Tools for Social network analysis**

9Hrs

UCINET – PAJEK– NETDRAW – StOCNET - SPlus - R – NodeXL- SIENA and RSIENA - Real-world networks (Facebook graph, Twitter networks,)**Case Studies**

Text Books

1. Christina Prell, Social Network Analysis: History, Theory and Methodology, SAGE Publications Ltd, Publication Year 2011
2. Stanley Wasserman and Katherine Faust, “ Social Network Analysis: Methods and Applications”, Cambridge University Press, 1994

Reference Books

1. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, 2010
2. Carrington and Scott (eds). The SAGE Handbook on Social Network Analysis SAGE, First Edition 2011

SEMESTER/YEAR : III SEM/II YEAR
COURSE CODE : 19CS2304
TITLE OF THE COURSE : DATA STRUCTURES AND APPLICATIONS
L: T: P: S/P : C : 3 : 0 : 2 : 0 : 4

Course Objectives

The objectives of the course are

- To introduce the concept of data structure and its applications
- To introduce C language concepts required for data structures
- To design data structure operations to solve problems
- To introduce applications of data structures
- To introduce non-primitive data structures
- To analyse the complexity of a data structure
- To introduce static and dynamic memory allocation using C language
- To explain linear data structures – stack, queue, linked list
- To explain non-linear data structures – trees and graphs
- To train students to design an application as part of the course mini- project using their choice of data structure using C language.

Course Outcomes

After completing this course, students will be able to

- Outline basic C program design for data structures
- Implement stack & queue data structure and their applications
- Apply concepts of dynamic memory allocation to real-time problems
- Implement tree data structure and its applications
- Implement graph data structure and its applications
- Outline the concepts of file structures

Course Content

Module -1 Introduction to Data structures

Definition, Types, Algorithm Design, C Pointers, C Structure, Array Definition, Representation of Linear Array in Memory, Array Operations (Insertion, Deletion, Search and Traversal), Single Dimensional Arrays, Two Dimensional Arrays, Function Associated with Arrays, Arrays as Parameters, Recursive Functions. 11 Hours

Module-2 Introduction to Stack and Queue

Stack: Definition, Array Representation of Stack, Operations Associated with Stacks- Push & Pop, Applications of Stack: Recursion, Polish expressions, Conversion of Infix to Postfix, Infix to Prefix, Postfix Expression Evaluation, Tower of Hanoi.

Queue: Definition, Representation of Queues, Operations of Queues- QInsert, QDelete, Priority Queues, Circular Queue. 11 Hours

Module-3 Dynamic Data Structure

Linked List: Types, Introduction to Singly Linked lists: Representation of Linked Lists in Memory,

Traversing, Searching, Insertion & Deletion from Linked List. Doubly Linked List, Operations on Doubly Linked List (Insertion, Deletion, Traversal). Applications: Polynomial Representation & Basic Operations, Stack & Queue Implementation using Linked Lists.

11 Hours

Module-4 Trees & Graphs

Trees: Basic Terminology, Binary Trees and their Representation, Complete Binary Trees, Binary Search Trees, Operations on Binary Trees (Insertion, Deletion, Search & Traversal), Application: Expression Evaluation.

Graphs: Terminology and Representations, Graphs & Multigraphs, Directed Graphs, Sequential Representation of Graphs, Adjacency Matrices, Graph Transversal, Connected Components and Spanning Trees.

12 Hours

Module-5 File Structures: Physical storage media, File Organization, Linked Organization of File, Inverted File, Organization Records into Blocks, Sequential Blocks, Indexing & Hashing, Multilevel Indexing, Tree Index, Random File, Primary Indices, Secondary Indices.

11 Hours

Laboratory Experiments

1. To perform arithmetic operations on tables
2. To search element(s) in a multidimensional array
3. To implement stack and queue using array & linked list
4. To implement graph & binary tree traversal techniques
5. To evaluate infix/prefix/postfix expressions

Open-Ended Experiments

6. A man in an automobile searches for another man who is located at some point of a certain road. He starts at a given point and knows in advance the probability that the second man is at any given point of the road. Since the man being sought might be in either direction from the starting point, the searcher will, in general, must turn around many times before finding his target. How does he search to minimize the expected distance travelled? When can this minimum expectation be achieved?
7. The computing resources of a cloud are pooled and allocated according to customer demand. This has led to increased use of energy on the part of the service providers due to the need to maintain the computing infrastructure. What data structure will you use for allocating resources which addresses the issue of energy saving? Why? Design the solution.
8. Mini-Project on applying suitable data structure to a given real-world problem

Textbooks & References:

Textbooks

1. A M Tannenbaum, Y Langsam, M J Augentien “Data Structures using C”, Pearson, 2013
2. R.L. Kruse, B.P. Leary, C.L. Tondo, “Data Structure and Program Design in C” PHI

Reference Books

1. Horowitz Anderson-Freed, and Sahni, “Fundamentals of Data structures in C”, 2nd Edition, Orient Longman, 2008
2. Data Structures and Algorithm analysis in C by Mark Allen Weiss, Published by Addison Wesley (3rd Indian Reprint 2000).
3. D E Knuth, The Art of Computer Programming, Volume 1, Addison-Wesley Publishing, 2013

SEMESTER/YEAR : IV SEM/IIYEAR

COURSE CODE : 19CS2404

TITLE OF THE COURSE : SIGNALS & SYSTEMS

L: T: P: S/P : C : 3 : 0 : 2 : 0: 4

Course Objectives

The objectives of the Course are:

- Understand Continuous and Discrete Signals and Systems
- How to apply Fourier series, Laplace Transforms, Z transforms for signal processing/representation
- Time Invariant System and Convolution its application to Image Processing
- To give the students' knowledge about the most important issues in sampling and reconstruction

Course Outcomes

After undergoing this course, students will be able to:

- Understand Various signals in CTS and DTS
- How to Apply Convolution to Image Processing
- How to use Fourier series for Periodic signal and Fourier Transform and Laplace Transform for Non Periodic signals
- Application of convolution.
- Conversion of Signals from Time domain to Frequency Domain
- How to Convert Analog signals to Digital and Usage of Analog Filters (Lowpass, Highpass, Bandpass)

Module 1: Introduction to Signals and Systems

(08 Hours)

Introduction to Signals and Systems, Continuous-Time and Discrete-Time Signals, Signal Properties, Representation of System, Continuous & Discrete-Time Mathematical Models of Systems, Properties of System, Relation between signals and systems.

Module 2: Behavior of continuous and discrete-time LTI systems

(07 Hours)

Introduction, Discrete-Time LTI Systems: The Convolution Sum, Continuous-Time LTI Systems: The Convolution Integral, Properties of Linear Time-Invariant Systems, Causal LTI Systems Described by Differential and Difference Equations, Singularity Functions.

Module 3: Laplace Transformation (Theory and Matlab implementation) (07 Hours)

Introduction to Laplace Transform, Applications of Laplace Transform, Step functions in Laplace Transform, Properties of Laplace Transform: Linearity, Scaling in Time, Time Shift, "Frequency" or S- Plane Shift, Multiplication by t^n , Integration & Differentiation. Impulse Response, Discrete Time Signals: Sequences, Basic Sequences and Operations, Sinusoidal Sequences, Discrete-Time Systems, Linear Systems, Time-Invariant System, Periodic and Aperiodic Time Sinusoids.

Module 4: Fourier and z- Transforms (Theory and Matlab implementation) (12 Hours)

Introduction to Fourier Series, Fast Fourier-Transformation (FFT) and Discrete Fourier Transform (DFT), Image Transforms, Fourier Series Theorem, Continuous Fourier Transform, Convolution in the frequency domain, Introduction and applications of histograms, Frequency Domain Analysis using Fourier Transform, Filters: Low Pass Filter, High-Pass Filter.

Z-Transformation: Introduction to Z-Transformation, Relationship to Fourier Transform, Region of Convergence, Special Functions, Convolution, Unit Step, Poles & Zeros, Convergence of Finite Sequences, Inverse Z-Transform, Properties of Z-Transform, The Z-Transform for discrete time signals and systems

Module 5: Sampling and Reconstruction (10 Hours)

Introduction, Representation of a Continuous-Time Signal by Its Samples: The Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation, The Effect of Under-sampling: Aliasing, Discrete-Time Processing of Continuous-Time Signals, Sampling of Discrete-Time Signals.

Text/Reference Books:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, 1997.
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2006.
3. H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.
4. S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.
5. A. V. Oppenheim and R. W. Schaffer, "Discrete-Time Signal Processing", Prentice Hall, 2009.
6. M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
7. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009.

SEMESTER/YEAR : IV SEM/II YEAR
COURSE CODE : 19CS2405
TITLE OF THE COURSE : WEB TECHNOLOGIES
L: T: P: S/P : C : 2 : 0 : 2 : 0 : 3

Course Objectives

- Understand the major areas and challenges of web programming.
- To create websites using HTML5, CSS3, JavaScript
- To create dynamic, interactive web pages using JavaScript
- Understand client-side JavaScript libraries and frameworks
- Understand server-side scripting language
- Use the techniques for creating data-driven websites using modern web technologies

Course Outcomes

After undergoing this course, students will be able to:

- Know the fundamentals of web application architecture and front end technologies like HTML5 and CSS3
- Use JavaScript for client-side scripting and add dynamic content to pages.
- Use of XML and JSON for data transfer between client and server
- Use of Nodejs for server side programming
- Use React for web development

Course Content

Module 1 WWW, HTML5 and CSS3 (9 Hours)

INTRODUCTION TO WWW: Overview of HTTP, HTTP request – response

Markup Language (HTML5): Introduction to HTML and HTML5 - Formatting and Fonts - Commenting Code – Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – HTML Forms.

CSS3: Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; Background images, Conflict Resolution, CSS3 features: Box Shadow, Opacity, Rounded corners, Attribute selector.

Module 2 JAVASCRIPT (9 Hours)

Overview of Javascript; Object orientation and Javascript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input. Control statements; Arrays; Functions; Constructor; Pattern matching using regular expressions; DOM Events, Introduction to asynchronous javascript-examples and applications, Introduction to callbacks-understanding callbacks with an example

Introduction to Progressive web apps

Module – 3 XML and JSON (08 Hours)

XML: Syntax; Document structure; Document Type definitions; Namespaces; XML schemas; Displaying raw XML documents; Displaying XML documents with CSS; XSLT style sheets; XML processors;

JSON: JSON syntax, data types, JSON vs XML, JSON parse, JSON file as database

Module –4 Node JS

(08 Hours)

Introduction to Node JS, Setup Dev Environment, Node JS Modules, Node Package Manager, File System, Debugging Node JS Application, Events, Express.JS, Database Connectivity, MVC Architecture In Node Js Applications.

Module –5 React

(08 Hours)

React -- Overview, Environment Setup, JSX, React -- Components, React -- State, Properties Overview, Properties Validation, Component API, Component life cycle, Forms, Events, Refs and Keys. Progressive Web Apps with React

Text Books:

1. Programming the World Wide Web – Robert W. Sebesta, 7th Edition, Pearson Education, 2008.
2. Beginning JSON, BEN SMITH, 2015
3. Kirupa Chinnathambi, “Learning React”, 1 Edition, Addison-Wesley Professional
4. Ethan Brown, First Edition, “Web Development with Node and Express”, O’Reilly Media

Reference Books:

1. Internet & World Wide Web How to Program – M. Deitel, P.J. Deitel, A. B. Goldberg, 3rd Edition, Pearson Education / PHI, 2004.
2. Web Programming Building Internet Applications – Chris Bates, 3rd Edition, Wiley India, 2006.
3. The Web Warrior Guide to Web Programming – Xue Bai et al, Thomson, 2003.
4. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, Third Edition, Tata McGraw Hill, 2013.
5. Mike Mcgrath, “PHP & MySQL in easy Steps”, Tata McGraw Hill, 2012.

SEMESTER/YEAR : IV SEM/II YEAR
COURSE CODE : 19CS2407
TITLE OF THE COURSE : MANAGEMENT SCIENCES
L: T: P: S/P : C : 2 : 0 : 0 : 0 : 2

Course Objectives

The objectives of the Course are:

- Acquire knowledge about the fundamental concepts of organization and management
- Make decision strategies, planning process, tools and techniques
- Inculcate the traits needed to be an effective leader and familiarize with the organizational structures and design
- Gain valuable insights into strategic process, formulation and implementation
- Utilize the intricacies involved in cultural and ethical issues of people
- Utilize the dimensions of the planning-organizing-leading-controlling (P-O-L-C) framework
- Gain knowledge of Micro and Small Enterprises (with the help of case studies) and Know the Institutional Support

Course Outcomes

After undergoing this course, students will be able to:

- Observe and evaluate the various influencing factors on the current practice of organization and management
- Use the techniques and tools of planning and make prudent decisions
- Identify how organizations adapt to uncertain environment, identify techniques managers use to influence and control the internal environment
- Apply and execute management goals and Managing Projects
- Manage people and deal with cultural and ethical issues
- Understand and use the knowledge of Micro and Small Enterprises (with the help of case studies) and know the Institutional Support for setting up Micro and Small Enterprises

Course Content

Module 1: Organization

The Individual and the **Organization**, Management, Primary Functions of Management, Role of management in organisation, Advantages of Managing People Well, Types of Managers, Role of managers, management Thought, Management Roles, Environmental Factors, Internal and External Factors 6 hrs

Module 2: Organisational control

Control in the Business Setting, Motivation, Importance of Employee Motivation, Leadership, Effective Leader, Organising, Purpose of Organization, organisational design, Common Organizational Structures, Factors Impacting Organizational Design, and Contingencies

5 hrs

Module – 3: Project Management

Preparation of project - meaning of project, project identification, project selection, project report, need and significance of project report, contents, formulation, guidelines by planning commission for

project report, Enterprise Resource Planning: Meaning and Importance- Enterprise Resource Planning and Functional areas of Management – Marketing / Sales- Supply Chain Management – Finance and Accounting – Human Resources – Types of reports and methods of report generation
7 hrs

Module 4: People Management

Importance of people, attracting a Quality Workforce, Recruiting process, Employee Diversity, Conflict Management, Organisational Culture, Influences on Organizational Culture, Initiating and Fostering Cultural Change, Putting It Together: Culture and Diversity, Ethics, Cultural Issues.
6 hrs

Module – 5 Micro and Small Enterprises

Micro and Small Enterprises: Definition of micro and small enterprises, characteristics and advantages of micro and small enterprises, steps in establishing micro and small enterprises, Government of India industrial policy 2007 on micro and small enterprises, case study (Microsoft), Case study (Captain G R Gopinath), case study (N R Narayana Murthy & Infosys), Institutional support: MSME-DI, NSIC, SIDBI, KIADB, KSSIDC, TECSOK, KSFC, DIC and District level single window agency, Introduction to IPR.
6 hrs

Text Book

1. Schermerhorn, J.R., Introduction to Management, 13th ed., Wiley; 2017
2. P. C. Tripathi, P. N. Reddy; Principles of Management , Tata McGraw Hill, 4th / 6th Edition, 2010.
3. Harold Koontz, Heinz Weihrich, Essentials of management: An International & Leadership Perspective, 10th ed., Tata McGraw -Hill Education, 2015
5. Poornima M Charantimath, Entrepreneurship Development -Small Business Enterprises – Pearson Education – 2006

Reference Book:

1. Samuel C. Certo, Tervis Certo, Modern management: concepts and skills, 12th ed., Pearson, 2012
2. Charles W. L. Hill, Steven Mcshane, Principles of Management McGraw Hill Education, 2017
3. Stephen Robbins, Mary Coulter, Fundamentals of Management, 9th ed., Pearson Education, 2016

SEMESTER/YEAR : IV SEM/II YEAR
COURSE CODE : 19CS2407
TITLE OF THE COURSE : MANAGEMENT SCIENCES
L: T: P: S/P : C : 2 : 0 : 0 : 0 : 2

Course Objectives

The objectives of the Course are:

- Acquire knowledge about the fundamental concepts of organization and management
- Make decision strategies, planning process, tools and techniques
- Inculcate the traits needed to be an effective leader and familiarize with the organizational structures and design
- Gain valuable insights into strategic process, formulation and implementation
- Utilize the intricacies involved in cultural and ethical issues of people
- Utilize the dimensions of the planning-organizing-leading-controlling (P-O-L-C) framework
- Gain knowledge of Micro and Small Enterprises (with the help of case studies) and Know the Institutional Support

Course Outcomes

After undergoing this course, students will be able to:

- Observe and evaluate the various influencing factors on the current practice of organization and management
- Use the techniques and tools of planning and make prudent decisions
- Identify how organizations adapt to uncertain environment, identify techniques managers use to influence and control the internal environment
- Apply and execute management goals and Managing Projects
- Manage people and deal with cultural and ethical issues
- Understand and use the knowledge of Micro and Small Enterprises (with the help of case studies) and know the Institutional Support for setting up Micro and Small Enterprises

Course Content

Module 1: Organization

The Individual and the Organization, Management, Primary Functions of Management, Role of management in organisation, Advantages of Managing People Well, Types of Managers, Role of managers, management Thought, Management Roles, Environmental Factors, Internal and External Factors 6 hrs

Module 2: Organisational control

Control in the Business Setting, Motivation, Importance of Employee Motivation, Leadership, Effective Leader, Organising, Purpose of Organization, organisational design, Common Organizational Structures, Factors Impacting Organizational Design, and Contingencies

5 hrs

Module – 3: Project Management

Preparation of project - meaning of project, project identification, project selection, project report, need and significance of project report, contents, formulation, guidelines by planning commission for

project report, Enterprise Resource Planning: Meaning and Importance- Enterprise Resource Planning and Functional areas of Management – Marketing / Sales- Supply Chain Management – Finance and Accounting – Human Resources – Types of reports and methods of report generation

7 hrs

Module 4: People Management

Importance of people, attracting a Quality Workforce, Recruiting process, Employee Diversity, Conflict Management, Organisational Culture, Influences on Organizational Culture, Initiating and Fostering Cultural Change, Putting It Together: Culture and Diversity, Ethics, Cultural Issues.

6 hrs

Module – 5 Micro and Small Enterprises

Micro and Small Enterprises: Definition of micro and small enterprises, characteristics and advantages of micro and small enterprises, steps in establishing micro and small enterprises, Government of India industrial policy 2007 on micro and small enterprises, case study (Microsoft), Case study (Captain G R Gopinath), case study (N R Narayana Murthy & Infosys),

Institutional support: MSME-DI, NSIC, SIDBI, KIADB, KSSIDC, TECSOK, KSFC, DIC and District level single window agency, Introduction to IPR.

6 hrs

Text Book

1. Schermerhorn, J.R., Introduction to Management, 13th ed., Wiley; 2017
2. P. C. Tripathi, P. N. Reddy; Principles of Management , Tata McGraw Hill, 4th / 6th Edition, 2010.
3. Harold Koontz, Heinz Weihrich, Essentials of management: An International & Leadership Perspective, 10th ed., Tata McGraw -Hill Education, 2015
5. Poornima M Charantimath, Entrepreneurship Development -Small Business Enterprises – Pearson Education – 2006

Reference Book:

1. Samuel C. Certo, Tervis Certo, Modern management: concepts and skills, 12th ed., Pearson, 2012
2. Charles W. L. Hill, Steven Mcshane, Principles of Management McGraw Hill Education, 2017
3. Stephen Robbins, Mary Coulter, Fundamentals of Management, 9th ed., Pearson Education, 2016

SEMESTER/YEAR : III SEM

COURSE CODE :19CSE5381 TITLE OF THE COURSE : DISSERTATION

L: T/A: P: C : 0: 0: 0: 3

COURSE OBJECTIVES:

1. To develop the work practice in students to apply theoretical and practical tools/techniques
2. To improve the professional competency
3. To improve research aptitude by touching the areas which otherwise not covered by theory or laboratory classes.
4. To solve real life problems related to industry and current research.

COURSE OUTCOMES:

1. Solving of real time problems not necessarily new line of enquiry, but shows that student has mastered research and synthesizing skills in producing a contribution to knowledge.
2. Builds competency and research aptitude.

The thesis shall consist of research work done by the candidate or a comprehensive and critical review of any recent development in the subject of specialization or a detailed report of project work consisting of experimentation/numerical work, design and or development work that the candidate has executed.

SEM/YEAR : I SEM/1st Year
COURSE CODE : 19VI102
TITLE OF THE COURSE : Mathematics-1
L: T/A: P: C : 3: 0: 0: 3

Course objectives : To introduce the students to mathematical tools used in various engineering branches

Course outcomes :

- An ability to apply knowledge of mathematics, science and engineering.
- An ability to identify, formulate and solve engineering problems.
- An ability to use the techniques , skills and engineering tools

Unit 1 (10 hrs)

Linear Equations

Solution to linear equations, Solution to quadratic equations by factorization, Solution to quadratic equations using formula). Linear Algebra: Linear spaces, Subspaces, Linear independence, Bases and Dimensions, Orthogonality, Gram Schmidt Orthogonalization process

Unit 2 (8hrs)

Matrices & Determinants

Matrix Definition, Addition, Subtraction, Multiplication and Transpose of Matrix, Definition of determinant, Properties and its Evaluation, Minors, Co-factors, Determinant of transpose, Linear equation Solution (Cramer's rule)

Unit 3 (9 hrs)

Complex Numbers - Introduction, representation of complex numbers, Representation on graph, Addition, Subtraction and multiplication, Complex conjugate, graph representation, Division of complex numbers, Polar form of complex number, Polar form of complex number, Conversion from polar to rectangular and vice-versa. **Vectors** - Introduction, Unit vector, Multiply vector by a scalar, Adding vectors algebraically and graphically, Magnitude and direction, Vector dot product and length, Vector cross product, Direction (right hand rule), Area of parallelogram, Work done on moving object by a force (dot Product), Torque exerted by force (Cross Product)

Unit 4 (10hrs)

Differential Calculus

Definition and evaluation of limits, Definition of Derivative, Slope of tangent at a point on the curve, Differentiation of constant, e^x , x^n , a^x and $\log x$, Differentiation of trigonometric functions, Differentiation of Sum, difference, product and quotient of functions, Application of differentiation- velocity and acceleration.

Statistics: Mean, Median and mode, Moving average, Grouping of data, Class interval, Range, Standard Deviation & Variance, Histogram, Skewness, Interpretation of skewness, Normal distribution.

Unit 5 (8hrs)

Sequence and series: Sequence, Series, Recursive and explicit formulas.

Set Theory: Definition of Sets, Venn Diagrams, Subset, Power Set, Cardinality and Cartesian

products, Set Operations: AND, OR, NOT, Conditional statements, Univariate, Bi-variate and Multi variate data. **Permutation & Combination:** Multiplication and addition principle of counting, Permutation, Combination, Exercise on permutation and combination.

Text Books:

1. Erwin Kreyzig, Advanced Engineering Mathematics, Wiley, Tenth edition
2. Thomas and Finney, Calculus and Analytic Geometry, Pearson India, Ninth edition

Reference Books:

1. G.F. Simmons and S. Krantz, Differential Equations Theory, Techniques and Practice, Tata McGraw Hill.
2. W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, Ninth Edition, Wiley Student Edition.

SEM/YEAR : I SEM/1st Year

COURSE CODE : 19VI106

TITLE OF THE COURSE : Basics of Electrical & Electronics LAB

L: T/A: P: C : 0: 0: 4: 6

Course Objectives:

- To understand Circuit operation of different types of voltage regulation circuits, including series.
- To explain the construction and characteristics of diodes, bipolar junction transistors and optical devices.

Course outcomes:

- Ability to understand and analyse, linear and digital electronic circuits.

List of experiments:

1. Familiarization of toolkit
2. Soldering Practice
3. Familiarisation of CRO
4. Familiarisation of function Generator
5. Familiarisation of Digital Multi meters
6. Colour coding of the resistor
7. Verification of Ohm's law
8. Verification of KVL and KCL
9. Study of diode data sheet and V.I Characteristics of diodes
10. Study of Zener diode data sheet and V.I Characteristics of Zener diodes
11. Rectifiers - Half-wave and centre-tapped full-wave rectifier
12. Bridge rectifier with capacitor filter
13. Familiarisation of Logic Inverter (TTL)
14. Familiarisation of AND Gate (TTL)
15. Familiarisation of OR Gate (TTL)
16. Familiarisation of NAND Gates (TTL)
17. Familiarisation of NOR Gates (TTL)
18. Familiarisation of EXOR Gates (TTL)
19. Universal Property of NAND and NOR Gates

SEM/YEAR : I SEM/1st Year
COURSE CODE : 19VI107
TITLE OF THE COURSE : Basics of Computer Lab
L: T/A: P: C : 0: 0: 4: 6

Course Objectives:

- To learn about DOS commands
- To increase typing speed and confidence
- To create bio-data with suitable alignments
- To create the presentation& to create the email

Course outcomes:

- Student can able to learn about DOS Commands
- Students are able to increase the typing speed and confidence
- Students are able to create the bio-data, power point presentation and email on their own.

List of experiments:

Exercise 1: **Components of Computer**

1. Input devices and output devices
2. Functional units of computer

Exercise 2: **DOS Commands**

1. Write the syntax and definition of following commands: cls, cd, copy, copy con, Mem, Tree, ver, exit, find, sort, time, edit, erase, date, del, dir, md, rd, type.
2. Write the syntax for appending the content of two files, copy the output of dir command to file, listing of files and directories: dir/b, dir/l, dir/on, dir/w, definition of following commands: dir/ad, dir/oe, dir/p, dir/ar.

Exercise 3: Typing Tutorial

1. Familiarize typing in standard QWERTY keyboards.
2. Touch Typing Course: In this course, Trainee will learn the positions of the letter keys and common punctuation by heart, after completing the course you will be able to type with all ten finger without looking at the keyboard.
3. Speed Building course: This course is designed to increase your typing speed and confidences. The Trainee will focus on the keys for each finger, type longer texts and train with some of the most common English words
4. Numbers, Special marks and 10-key pad.4.1: Numbers Course: This two lesson course teaches how to type numbers on the number row 4.2: Special Marks Course: Extend Trainees skills to cover special marks, including Internet characters.
5. Mathematical symbols and brackets: 10-key Number pad Course: Learn to use the 10-key number pad with touch typing technique.

Exercise 4: **Creating Document**

1. Create the document in word pad with following information Name, qualification, city, date of birth, phone number, and increase the size of font to 24, make it bold ,put the heading as information and align it centre.
2. Create your bio data in note pad with suitable formats.
3. Demonstrate procedure for creating, naming, renaming of a folder in computer and familiarize properties like changing the icon, hiding a folder and changing attributes.

Exercise 5: Applications

1. How to open DOS, NOTEPAD, PAINT, CALCULATOR, and WORDPAD THROUGH RUN.?
2. How to create shortcuts, disappearing the desktop items, auto hide the task bar?
3. What is Status bar, Menu bar, Taskbar, Standard Toolbar, and specify their locations.
4. What is the extension of the following application: WordPad, Notepad, and Paint?

Exercise 6: MS-Office

1. Create your CV (Bio Data) in MS-word with suitable alignments.
2. Create the paint file insert the picture in it by choosing from different place and modify it in WordPad.
3. What is Border and Shading? Write the steps for applying Border & Shading to a Paragraph in WordPad.
4. What is Bullets and Numbering? Write the steps for applying Bullets and Numbering, and its different types in WordPad
5. What is spelling and grammar check. Write the steps for this and different option present in it in WordPad.
6. What is the use of Find and Replace and Go to option? Write the steps for that with example in WordPad.
7. Write the steps for inserting Symbols and special characters and inserting Date and Time, File, Object with example in WordPad.
8. Demonstratethestepstocreateandenterrecords mailmerge
9. Type the invitation for calling your friends on the occasion of your birthday using mail merge, WordArt, select the field names yourself.
10. Write the steps for creating a table. Explain merge cells and split cells options.
11. Open Ms-Excel and insert 10 sheets, apply different backgrounds to different sheets, fill different colours in different cells.
12. Open Ms-Excel insert 4 sheets hide the sheet 2 and 3 and apply different colour to sheet tabs.
13. Demonstrate mathematical function in MS-Excel.
14. How to insert Rows, Columns, Cells and Worksheet in MS-Excel?
15. Create the presentation about you daily activity
16. Create the presentation of your organization company with suitable diagrams.

17. Create the presentation to explain any technology with suitable diagrams.
18. Create the presentation for any educational organization which should consist of hyperlinks, custom animation, slide transition
19. Create the DATABASES for the Company consisting of the tables: EMPLOYEE, DEPARTMENT, DESIGNATION, ACCOUNTS. And the fields are as follows EMP: Name, City, Add, Phno, Place, and Id. DEPARTMENT: Id, Dep Name, and Location. DESIGNATION: Id, Qualification, Experience, Skills. ACCOUNTS: Id, Basics, DA, HRA, PF. (MAKE ID AS PRIMARYKEY) and create the query to select the fields as: EMP=ID, NAME, PHNO, PALCE. DEP=DEPNAME, LOCATION. DESIG=QUALIFOCATION, EXP.ACCOU=TOTAL, BASICS, DA, PF.

Exercise 7: Internet

1. Write the **steps to create the email.**
2. Write the steps to search the details about historical places in internet.
3. Write the steps to create a mail and send it your friend.
4. Write the steps to create a mail which should attach some data and send it to your friend.

SEM/YEAR : II SEM/1st Year
COURSE CODE : 19VI202
TITLE OF THE COURSE : Mathematics II
L: T/A: P: C : 2: 0: 0: 2

Course Objectives:

1. Solve mathematically technical problems and apply the concepts of Mathematics to engineering problems
2. Awareness of correlation and regression.
3. Know the basic concepts of statistics.
4. Understand and use concepts of Integration and Differential Equations and its applications
5. Know the solution of percentage, ratios and proportions.

Course Outcomes:

1. Solve system of Probability and Statistics
2. Solve problem of Analytical Geometry
3. Describe and Develop Correlation and Regression analysis model

Unit 1:

RATIOS, PERCENTAGE AND PROPORTIONS (02 Hrs)

Ratios, proportion and percentage

Unit 2:

ANALYTICAL GEOMETRY (05Hrs)

Rectangles and Squares, Parallelogram, Triangle, Rhombus, Trapezium, Circle, Sector and Arc, Cartesian Co-Ordinates, Equation of axis, Distance, Midpoint, Slope, Condition for Perpendicularity and parallelism, Equation of straight line

Unit 3:

INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS (9Hrs)

Integrals of functions, rules of integration, Integration by parts Definite Integrals Area under plane curves – simple problems Differential equations

Unit 4:

CORRELATION AND REGRESSION (06 Hrs)

Meaning of correlation and Regression, Correlation Analysis, Regression Analysis, Simple Linear Regression

Unit 5:

PROBABILITY AND DISTRIBUTION (8Hrs)

Probability, Sample and Event Space, Conditional Probability, Data Types, Uniform Distribution, Normal Distribution, Binomial Distribution, Poisson distribution.

Text Books:

1. Thomas, Weir and Hass(2009), Thomas's Calculus, Twelfth edition, Pearson, India
2. Goon A.M., Gupta M.K. & Dasgupta B: Fundamentals of Statistics, Vol. 1, The World

Press Pvt. Ltd., Kolkata.

3. Thomas's Calculus, G.B.Thomas, M.Weir, J. Hass, Pearson , 12th edition

SEM/YEAR : II SEM/1st Year

COURSE CODE : 19VI205

TITLE OF THE COURSE : Data Base 1

L: T/A: P: C : 2: 0: 0: 2

Course Objectives:

1. Understand the Database concepts
2. Design the database with planning and coding
3. Normalize the database
4. Administration of data and data base
5. Solve queries related to the database

Course Outcomes:

4. Ability to Install, configure, and interact with a relational database management system
5. Ability to master the basics of SQL and construct queries using SQL
6. Ability to design and develop a large database with optimal query processing

Unit 1: Introduction to Database System (5 Hrs)

File System versus a DBMS, Purpose of Database system, Database Applications, Basic concepts and definitions

Unit 2: **Data Models** (6 Hrs)

Entity-Relationship Model, Object Oriented Model, Network Model, Hierarchical Model, Relational Model. **Normalization:** What is Normalization? First Normal form, Second Normal form, Third Normal form, Boyce-codd Normal Form

Unit 3: **SQL** (8 Hrs)

Introduction to SQL, DDL Commands, DML Commands, DCL Commands, TCL Commands, User defined data type, Where Clause operators, Order By, Group By, Having Clauses, DISTINCT, TOP Keywords, Aggregate functions, Built-in functions-numeric, string and Date Functions

Unit 4: Advance SQL (6 Hrs)

SQL Constraints, Sub Queries, Identity column, SQL Joins, Views, Index, Triggers

Unit 5: Transact-SQL (5 Hrs)

Stored Procedure, Function, Control Structures, Conditional Processing using IF statements, While loop, Exception handling by TRY...CATCH, Error functions used within CATCH block

DATA ADMINISTRATION

Database Administrator, Concurrency control, Database Recovery, Database Security

Reference Books:

1. SQL Server 2008 r2 - Black Book
2. SQL Server – Patrick Paul
3. SQL Server 2008 programming – Robert vieira
4. J. Date, A. Kannan and S. Swamynathan, “An Introduction to Database Systems”, 8thed,

Pearson Education, 2006

5. Raghu Ramakrishnan, “Database Management Systems”, Third Edition, McGraw Hill, 2003

SEM/YEAR : II SEM/1st Year
COURSE CODE : 19VI207
TITLE OF THE COURSE : SQL Lab
L: T/A: P: C : 0: 0: 4: 613

Course Objectives:

1. To provide a sound introduction to the creation of problem statements from real life situations.
2. To give a good formal foundation on the relational model of data and usage of Relational Algebra.
3. To introduce the concepts of basic SQL as a universal Database language.
4. To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.
5. To enable the design of an efficient database using normalization concepts.
6. To enable students to be create indexes for databases for efficient retrieval

Course Outcomes:

1. Construct problem definition statements for real life applications and implement a database for the same.
2. Write queries in SQL to retrieve any type of information from a data base

List of Programs

1. Demo on **Creating Databases**
2. **Demo on Modify Databases**
3. Demo on database and files **Viewing a Database**
4. Demo on Renaming a Database
5. Demo on **Deleting Database**
6. Demo on database and files
7. Demo on database and files groups
8. Creating tables with different Data types
9. Demo on altering the table
10. Creating tables with User Defined Data Types
11. Dropping User Defined Data Types
12. Demo on Data Manipulation Language with different types Inserting values
13. Demo on Data Manipulation Language with different types updating values
14. Demo on Data Manipulation Language with different types Deleting Rows
15. Demo on Truncating a Table, Demo on Deleting a Table
16. Writing a Basic select statement, Writing a Basic select statement using where clause
17. Write a query to perform Arithmetic Operations
18. Write a query to perform Relational operators
19. Write a query to perform Logical operators
20. Write a query to perform Special operators
21. **Generate query using TOP and DISTINCT keywords**

22. Generate query to perform **ORDER BY clause**
23. Generate query to perform **GROUP BY and HAVING clauses**
24. Generate query using String functions, Generate query using Date functions
25. Generate query using Mathematical Functions, Generate query using Aggregate functions
26. Creating tables with different types of Constraints
27. Perform demo on Nested sub queries, Perform demo on Correlated Sub queries
28. Perform demo on sub queries with Operators, Generate a query to create an identity column
29. Perform demo on Cross Join, Perform demo Natural Join

30. Perform demo Equi Join, Perform demo on inner Join
31. Perform demo on outer Join, Write a query to creating Views
32. Write a query to retrieve Results from Views
33. How to Altering Views, Write a query to Dropping Views
34. Write a query to Renaming Views
35. Write a query to Manipulating Data through Views
36. Write a query to Implementing Indexes with different types of indexes
37. Creating Triggers
38. Write programs to declare different types of variables with different data types
39. Write program to Printing Messages
40. Write program to Implementing Stored Procedures
41. Write program on Types of Stored Procedures
42. Write program on Types of Parameters
43. Demo on Altering a Stored Procedure
44. Demo on how to Viewing a Stored Procedure
45. Demo on Deleting a Stored Procedure
46. Write a program to Create a function
47. Demo on IF statement and WHILE loop
48. Demo on exception handling and Demo on Explicit Transaction
49. Demo on Implicit Transactions

Reference Books:

1. SQL Server 2008 r2 - Black Book
2. SQL Server – Patrick Paul
3. SQL Server 2008 programming – Robert vieira

Reference Website:

1. www.msdn.microsoft.com
2. www.tutorialspoint.com
3. www.techonthenet.com

SEM/YEAR : II SEM/1st Year
COURSE CODE : 19VI208
TITLE OF THE COURSE : Java Lab
L: T/A: P: C : 0: 0: 4: 6

Course Objectives:

1. To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions
2. To understand the importance of Classes & objects along with constructors, Arrays and Vectors
3. Discuss the principles of inheritance, interface and packages and demonstrate through problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
4. To understand importance of Multi-threading & different exception handling mechanisms.

Course Outcomes:

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.

List of Programs

1. Write a program to display your Information on the Console.
2. WAP to use the Conditional Statements.
3. WAP to use the Control Statements.
4. WAP to pass Command Line Arguments & display the same on the console.
5. WAP to declare a String Array of with varying Width & display the content of the Array in the same manner in which the data is stored.
6. WAP to demonstrate the use of Operators.
7. WAP to demonstrate Pass By Value & passing the Objects as Parameters.
8. WAP to demonstrate Method Overloading & Method Overriding.
9. WAP to demonstrate **Constructor Overloading**.
10. WAP to use Abstract Classes.
11. **Create a Package & Import the same in the other class.**
12. Demonstrate the use of Access Modifiers with the help of Packages.
13. WAP to **demonstrate Multiple Inheritance** with the help of Interfaces.
14. WAP to **handle the Exceptions**.
15. WAP to use 'finally' & the Nested 'try' block.
16. Demonstrate the use of 'try', 'catch', 'finally', 'throw' & 'throws' in Exception handling.
17. Create your own Exception class & throw the same in the other class.
18. WAP to demonstrate the Life Cycle of Thread.
19. WAP to **Create Multiple Threads** & set the Priorities.
20. WAP to demonstrate Thread Synchronization.
21. WAP to take the Input from the User using Basic IO & display the output.
22. WAP to demonstrate the use of static Methods & static Blocks.

23. Demonstrate the use of transient in Serialization.
24. Usage of String & String Buffer.
25. WAP to create a Process & display the output given by that Process.
26. WAP to set the System Properties.
27. WAP to use Array List, Sort the Elements, retrieve the values & the Keys from the Map.
28. Programs to work with Collection Interfaces & Classes.
29. WAP to retrieve all the File Properties & display the same.
30. WAP to demonstrate the various Input & Output Streams (Character Streams, Byte Streams, Object Streams).
31. WAP for **Serializing the Objects** & to Deserialize the same.
32. WAP to display your information on to the Applet Window.
33. WAP to pass your information to the Applet & display the same on to the Applet Window (Using param tag).
34. Demonstrate various Methods of Graphics class.
35. Create a GUI Form (Applet) using all the possible awt Controls.
36. **Create a GUI Application** form using all the possible awt Controls.
37. Create a Notepad with all the functionalities.
38. WAP to **demonstrate various Events** in Java.
39. WAP using Anonymous classes & Adapter classes.
40. WAP to **Communicate from one System to other, using Networking (TCP/IP)**.
41. WAP to Communicate from one System to other, using Networking (UDP).
42. WAP to call the Method from a **Remote System using RMI**.

Reference books:

1. The complete reference Java 2 - Patrick Naughton
2. Pure Java 2 -Techmedia
3. Java 2 - Sun Microsystems
4. Java 2 - O'Reilly
5. Java Programming - Balaguruswamy

SEM/YEAR : II SEM/1st Year
COURSE CODE : 19VI209
TITLE OF THE COURSE : Python Lab
L: T/A: P: C : 0: 0: 4: 6

Course Objectives:

1. Basics of Python programming
2. Decision Making and Functions in Python
3. Object Oriented Programming using Python
4. Files Handling in Python
5. GUI Programming and Databases operations in Python
6. Network Programming in Python

Course Outcomes:

1. Interpret Object oriented programming in Python
2. Design and develop Client Server network applications using Python
3. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python

SL NO	MAJOR TOPICS
1.0	Introduction to Python
1.1	Write a python program to find the square Root
1.2	Write a python program to calculate the Area of a Triangle
1.3	Write a python program to solve quadratic Equation
1.4	Write a python program to swap Two Variables
2.0	Python Data types and Operators
2.1	Write a python program to sum all the items in a list.
2.2	Write a python program to program to add two matrices
2.2	Write a python program to multiply two matrices
2.3	Write a python program to check Whether a string is palindrome or not
2.4	Write a program to demonstrate operators in python
3.0	Python Program Flow Control
3.1	Write a python program to check if a number is positive, negative or zero
3.2	Write a python program to check prime number
3.3	Write a python program to find the factorial of a number
3.4	Write a python program to display the multiplication Table
3.5	Write a python program to print the Fibonacci series
3.6	Write a python program to check Armstrong number
4.0	Python Functions, Modules And Packages

4.1	Write a python program to find numbers divisible by another number by using functions.
4.2	Write a python program to find factors of number
4.3	Write a python program to find factorial of number using recursion
4.4	Write a python program to display powers of 2 using anonymous function
4.5	Write a python program to find Factors of Number by importing module.
4.6	Write a python program to demonstrate calculator using package
5.0	Python Input ,Output and File operations
5.1	Write a python program to read from one file and copy to another file.
5.2	Write a python program to rename and delete the file.
5.3	Write a python program to demonstrate input and raw_input functions
6.0	Exception Handling
6.1	Write a python program to perform zero division error.
6.2	Write a python program to demonstrate exception handling while opening a file where you do not have write permission.
7.0	Python Object Oriented Programming – Oops
7.1	Write a python program to demonstrate on creating a class, creating instance objects and accessing Attributes
7.2	Write a python program to demonstrate Inheritance.
7.3	Write a python program to demonstrate Overriding
7.4	Write a python program to demonstrate Overloading
8.0	Regular Expressions
8.1	Write a Python program to check that a string contains only a certain set of characters (a-z, A-Z and 0-9).
8.2	Write a Python program that matches a string that has ana followed by zero or more b's and an a followed by three 'b'.
8.3	Write a Python program that matches a word at the beginning of a string.
8.4	Write a Python program to check for a number at the end of a string.
8.5	Write a Python program to remove leading zeros from an IP address.
8.6	Write a Python program to replace all occurrences of space, comma, or dot with a colon.
9.0	CGI Programming
9.1	Write a CGI program to pass values using HTML form and submit button by GET and POST Method
10.0	Databases

10.1	Write a python program to create a database and perform insert operation
10.2	Write a python program to perform update operation on database
10.3	Write a python program to perform delete operation on database
11.0	Networking
11.1	Write a python program to create a socket and demonstrate on socket methods.
12.0	Sending Email
12.1	Write a python program to send an email.
13.0	GUI programming

13.1	Create a GUI window and add different widgets
14.0	Working with Excel Spreadsheets
14.1	Write a python program to demo on retrieve the Worksheet object for a sheet named 'Sheet1'?
14.2	Write a python program to demo on retrieve the Worksheet object for the workbook's active sheet?
14.3	Write a python program to demo on retrieve the value in the cell C5?
14.4	Write a python program to demo on set the value in the cell C5 to "Hello"?
14.5	Write a python program to demo on retrieve the cell's row and column as integers?
14.6	Write a python program to demo on get_highest_column() and get_highest_row() sheet methods return, and what is the data type of these return values?
14.7	Write a python program to demo on function to get the integer index for column 'M'.
14.8	Write a python program to demo on function needed to get the string name for column 14,
14.9	Write a python program to demo on retrieve a tuple of all the Cell objects from A1 to F1?
15.0	Working with PDF and Word Documents
15.1	Write a python program to demo on modes do the File objects for PdfFileReader() and PdfFileWriter() need to be opened in?
15.2	Write a python program to demo on acquire a Page object for page 5 from a PdfFileReader object?
15.3	Write a python program to demo on PdfFileReader variable stores the number of pages in the PDF document?
15.4	Write a python program to demo on methods do you use to rotate a PDF page?
15.5	Write a python program to demo on method returns a Document object for a file named demo.docx
15.6	Write a python program to demo on the difference between a Paragraph object and a Run

	object?
15.7	Write a python program to demo on you obtain a list of Paragraph objects for a Document object that's stored in a variable named doc?
16.0	Web Scraping
16.1	Write a python program to demo on Downloading Files from the Web with the requests Module
16.2	Write a python program to demo on Downloading Files from the Web with the requests Module and save in hard disk
17.0	Working with CSV Filesand JSON Data
17.1	Write a python program to demo on read file from CSV file.
17.2	Write a python program to demo on read file from JSON file

COURSE CODE :9CSE5038

TITLE OF THE COURSE : DATA MINING

L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES:

This course will cover the standard algorithms for data mining techniques. Special emphasis will be given on the recent trends in mining text data, mining graphs, mining spatio-temporal data, etc.

COURSE OUTCOMES:

1. Will be able to analyze the data coming from various sources, analyze and classify them
2. Will be able to apply the techniques and algorithms to real life problems.
3. Introduction to Data Mining, Data Mining Goals, Stages of the Data Mining process, Data Mining Techniques, Knowledge Representation Methods, Application.

MODULE 1:

Data pre-processing, Data cleaning, Data transformation, Dimensional reduction. Introduction to Weka Data mining algorithms.

MODULE 2:

Association rules - Basic idea, item sets, Generating item sets and rules efficiently, Correlation analysis, mining association rules.

MODULE 3:

Classification - Naive Bayes, Random Forests.

Prediction -Instance-based methods (nearest neighbor), Linear models (Regression). Clustering - K-means, expectation maximization (EM), Hierarchical clustering methods.

MODULE 4:

Training and Testing: Estimating classifier accuracy (holdout, cross-validation, and leave-one- out). Combining multiple models (bagging, boosting, and stacking). Cross Validation.

Advanced techniques, Data Mining software and applications.

MODULE 5:

Text mining: extracting attributes (keywords), structural approaches (parsing, soft parsing), Bayesian approach to classifying text.

Web mining: classifying web pages, extracting knowledge from the web.

TEXT BOOKS

1. Jiawei Han, Micheline Kamber and Jian Pei “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.
2. Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten and Eibe Frank, Morgan Kaufmann

REFERENCE BOOK:

1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
- 2 K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
- 3 G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
- 4 Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

COURSE CODE : 19CSE5042

TITLE OF THE COURSE : VIRTUALIZATION & CLOUD COMPUTING

L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES:

1. To understand Virtualization concepts and different types of virtualization.
2. To understand cloud computing concepts, technologies and services.

COURSE OUTCOMES:

1. Conceptual and sound knowledge of virtualization and different types of virtualization.
2. Acquire knowledge of cloud computing, technologies and services.

MODULE 1:

Virtualization: Definition, benefits, Virtualization History, Virtualizing x86 Computer virtualization: MMU Virtualization, CPU Virtualization, IO Virtualization; Types of Virtualization: Binary Translation, Para Virtualization, Hardware Assisted, Networking in virtualized environment, Virtual Machines and Access Control.

MODULE 2:

Storage Virtualization: Introduction and Basic concepts, Storage Interconnect, Abstracting Physical Storage, Virtualization at the host, Virtualization at the Storage Target. **Server Virtualization:** Introduction, Types of Server Virtualization, Server Virtualization Concepts, Planning and other Uses of Server Virtualization, Planning for Deployment, Server Virtualization Platform Differences.

MODULE 3:

Introduction to Cloud Computing: History of Cloud, Cost angle and Usability angle, Capex to Opex, **Cloud Deployment Models (Public, Private, Hybrid), Cloud Service Models (IaaS, PaaS, SaaS)**

MODULE 4:

IaaS Deep Dive: Infrastructure as a service, Understanding of available **IaaS models: AWS, Google Compute Engine, Azure, OpenStack.**

PaaS Deep Dive: Understanding of available **PaaS models: Google App Engine, Elastic Bean Stack, RedHat OpenShift**

MBaaS: Overview, MBaaS-Parse, MBaaS-AWS, Using MBaaS Services from Android. Introduction to Business Processes as a Service (BPaaS) and Analytics as a Service (AaaS)

MODULE 5:

Introduction to developing Cloud Services: Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – **Amazon Ec2 – Google App Engine – IBM Clouds.**

Text Books

1. D. Marshall, W. A. Reynolds, and D. Mc Corry, Advanced Server Virtualization, Aurbech Publications, 2006.
2. T. Clark, *Storage Virtualization: Technologies for Simplifying Data Storage and Management*, Addison-Wesley Professional, 2005.
3. Dan C Marinescu-Cloud Computing Theory and Practice. Elsevier(MK) 2013
4. Rajkumar Buyya , James Broberg, Andrzej Goscinski- Cloud Computing Principles and Paradigms, Willey 2014

COURSE CODE : 19CSE5045

TITLE OF THE COURSE : DATA ANALYTICS & VISUALIZATION

L: T/A: P: C : 3: 0: 2: 4

COURSE OBJECTIVES:

1. This course the fundamentals statistics and probability required in the analysis of data.
2. This course also gives the details of **R** and it's usage in Data Analytics.

COURSE OUTCOMES:

1. To understand the statistical tools and techniques.
2. To be able apply these tools and techniques in data analytics using R.

MODULE 1:

Introduction: Probability Fundamentals - Axioms of probability and equal likelihood, Conditional probabilities, Bayes' formula and independent events, Probability Distributions & Random Variables. Statistics Fundamentals - Mean and Weighted Average, Median, Mode, Standard Deviation, Sampling Distribution and Standard Deviation of the Mean, Gaussian and Poisson Distributions.

MODULE 2:

Statistical Programming: R Fundamentals, Getting started with R, Data Types, Control Structures, Functions, Data files, Inputting data, Removing data sets, Data Structures, Types of Data, Variables within data, Transposing data, Missing values, Naming columns

MODULE 3:

Statistical tests and Distance Metrics: Basic Tests: Mean, Variance, Quantile, Length, T-test: Variance equal/unequal, Paired t-test, T-test Step by Step. Chi Squared: Chi-Squared Step by Step, Goodness of Fit test, Distance Metrics.

MODULE 4:

Correlation and Regression: Inference and Learning, Multiple Regression, Linear and Logistic Regression Models, Regression coefficients, Beta coefficients, R squared, graphing the regression.

MODULE 5:

Topic modeling: Hidden Markov Models, Latent Semantic Indexing, Probabilistic Latent Semantic Indexing, Latent Dirichlet Allocation (LDA), Gibbs Sampling for LDA.

TEXTBOOK

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Springer 2009
2. Richard Cotton, Learning R,Oreilly Publication

SEMESTER/YEAR : I SEM

COURSE CODE : 19CSE5101

TITLE OF THE COURSE : ADVANCED ALGORITHMS

L: T/A: P: C : 3: 1: 0: 4

DEPARTMENTAL CORE COURSES: SEMESTER -1

COURSE OBJECTIVES 1. To understand the design of advanced algorithms and data Structures.

2. To understand the applications of algorithms in different fields such as geometry, number theory, signal processing and linear algebra.

COURSE OUTCOMES 1. Skill of advanced algorithm design.

2. Knowledge of advanced data structures

MODULE 1: MULTI-THREADED ALGORITHMS AND MATRIX OPERATIONS

The basics of dynamic multi-threading; multi-threaded versions of matrix multiplication, solution of linear equations, matrix inversion, and least squared approximation.

MODULE 2: FAST FOURIER TRANSFORMS AND NUMBER THEORETIC ALGORITHMS

Representation of polynomials, DFT and FFT; efficient FFT implementation (sequential and parallel). Elementary number theoretic notions, greatest common divisor, modular arithmetic, solving modular linear equations, Chinese remainder theorem, powers of an element, RSA public crypto system, primality testing, and integer factorization.

MODULE 3: STRING MATCHING ALGORITHMS

Rabin-Karp, Knuth-Morris-Pratt and Boyer-Moore string matching algorithms. Suffix trees and their applications in computational biology.

MODULE 4: COMPUTATIONAL GEOMETRY AND PROBABILISTIC ANALYSIS

Line segment properties, determining whether pair of line segments intersects, finding the convex hull, finding the closest pair of points. Hiring problem, indicator random variables, randomized algorithms; probabilistic analysis and further uses of indicator random variables.

MODULE 5: ADVANCED DATA STRUCTURES AND GRAPH ALGORITHMS

Fibonacci heaps, mergeable heap operations, decreasing a key and deleting a node, bounding the maximum degree. Van emdeboas tree. Data structures for disjoint sets, analysis of union by rank with path compression. Flow networks, Ford-Fulkerson method, maximum bipartite matching.

TEXT BOOKS:

1. Thomas H. Cormen, Charles E Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms. 3rd ed., The MIT Press, 2009.

REFERENCE BOOKS:

1. Donald E Knuth, Art of Computer Programming, Volumes 1-4A, Addison-Wesley, 2011.

SEMESTER/YEAR : I SEM

COURSE CODE : 19CSE5102

TITLE OF THE COURSE : ADVANCED OPERATING SYSTEMS

L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVES 1. To understand the advanced Operating Systems, their design and implementation.

2. To understand the implementation in UNIX/LINUX, Windows and Embedded Oss.

COURSE OUTCOMES 1. Skill of designing OSs

2. Implementations of Design strategies in existing OSs and Distributed Process Management

MODULE 1: INTRODUCTION, REVIEW

Operating Systems Strategies: User' perspectives, technologies and examples of Batch Systems, Timesharing Systems, Personal computer systems, Embedded systems, and small communicating computers; The genesis of modern operating systems.

MODULE 2: USING THE OPERATING SYSTEMS & OPERATING SYSTEMS ORGANIZATION

The programmer's abstract machine; Resources; Processes and threads; Writing concurrent programs. Basic functions; General implementation considerations; Contemporary OSkernels.

MODULE 3: DESIGN STRATEGIES

Design considerations; Device Drivers, Monolithic kernels; Modular organization; Microkernel; Layered organizations; Operating Systems for distributed system.

MODULE 4: DISTRIBUTED SYSTEMS

Networking; The Need for a Protocol Architecture; The TCP/IP Sockets; Linux Networking; Client/Server Computing; Distributed Message Passing; Remote Procedure Calls; Clusters; Windows Vista Cluster Server; Linux Clusters;

MODULE 5: DISTRIBUTED PROCESS MANAGEMENT

Process Migration; Distributed Global States; Distributed Mutual Exclusion; Distributed Deadlock

TEXT BOOKS:

1. Gary Nutt: Operating Systems, 3rd Edition, Pearson, 2004.
2. William Stallings: Operating Systems: Internals and Design Principles, 6th Edition, Prentice Hall, 2008.

REFERENCE BOOKS:

1. Silberschatz, Galvin, Gagne: Operating System Concepts, 8th Edition, Wiley, 2008
2. Andrew S. Tanenbaum, Albert S. Woodhull: Operating Systems, Design and Implementation, 3rd Edition, Prentice Hall, 2006.
3. Pradeep K Sinha: Distribute Operating Systems, Concept and Design, PHI, 2007.

SEMESTER/YEAR : I SEM

COURSE CODE : 19CSE5103

TITLE OF THE COURSE : ADVANCED DATA BASE MANAGEMENT SYSTEMS

L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVES 1. To understand advanced Data base concepts, query Optimization

2. To understand Data Warehouse, ETL and OLAP, Data Base Architecture, OO data bases and document data bases.

COURSE OUTCOMES 1. Understanding advanced concepts in DBMS and query Optimization

2. Understand and develop skills to handle data warehouse, OO data bases and document data bases

MODULE 1: DATABASE CONCEPTS AND SQL

Advanced SQL - Join Operations, Union, Group By, Having clauses, Subqueries, Indexes Stored Procedures and Triggers - Stored Procedures, Stored Functions, Constraints and Triggers.

MODULE 2: CONCURRENCY, RECOVERY AND QUERY OPTIMIZATION:

Transactions and the ACID Property of Transactions, Serializability, Two-Phase Locking, Deadlocks, Multiversion Concurrency Control

Failure Recovery: Roll forward/Rollback

Query Optimization: Stages in Query Processing, Query Processing Algorithms, Query Plan Execution, Cost-Based Query Optimization

MODULE 3: DATA WAREHOUSING:

Definition and Terminology, Characteristics of Data warehouses, Data Modeling for data warehouses, Architectural components, ETL and OLAP

MODULE 4: DATABASE SYSTEM ARCHITECTURES

Centralized and Client-Server Systems, Server-System Architectures, Distributed Databases, Graph databases

MODULE 5: ADVANCES IN DATABASES

Beyond RDBMS, Object-Oriented and Object-Relational Databases, Query Processing in Object-Oriented Databases, Storage Structures for Object-Oriented Databases, Object-Relational Model, Document Databases - XML Databases, BLOB data storage systems, No-

SQL Data stores, Time Series Databases

TEXT BOOKS

1. Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Wisdom, Database Systems: The Complete Book, Prentice Hall
2. Ramez Elmasri and Shamkant Navathe, Database Systems – Models, Languages, Design and Application Programming — Pearson
3. Shashank Tiwari, Professional No-SQL , Publisher: Wiley / Wrox

SEMESTER/YEAR : II SEM

COURSE CODE : 19CSE5201

TITLE OF THE COURSE : HIGH PERFORMANCE COMPUTING L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVES:

1. To understand the architectural, hardware, OS and programming aspects in High Performance Computing.
2. To understand the distributed memory programming, shared memory programming, and a few parallel applications.

COURSE OUTCOMES:

1. Knowledge and understanding of high performance computing at various levels/layers.
2. Design and implement parallel solutions to the given problems.

MODULE 1: INTRODUCTION TO COMPUTER SYSTEMS

Processors, Memory, I/O Devices; Cost, timing, and scale (size) models. Program Execution: Process, Virtual Memory, System Calls, Dynamic Memory Allocation.

MODULE 2: MACHINE-LEVEL VIEW OF A PROGRAM

typical RISC instruction set and execution, Pipelining. Performance issues and Techniques, Cost and Frequency Models for I/O, paging, and caching. Temporal and spatial locality.

MODULE 3: TYPICAL COMPILER OPTIMIZATIONS

Identifying program bottlenecks – profiling, tracing. Simple high-level language optimizations – locality enhancement, memory disambiguation. Choosing Appropriate Computing Platforms: benchmarking, cost-performance issues,

MODULE 4: PARALLEL COMPUTING

Introduction to parallel Architectures and Interconnection Networks, communication latencies. Program parallelization: task partitioning and mapping, data distribution, Message passing, synchronization and deadlocks.

MODULE 5: MEMORY PROGRAMMING

Distributed memory programming using MPI/PVM. Shared memory parallel programming. Multithreading. Parallel applications: Laplace equation, molecular dynamics. Parallel dense linear algebra: Gaussian elimination, iterative methods.

TEXT BOOKS

- Dowd, K., High performance Computing, O'Reilly Series, 1993.
- Culler, D., and Singh, J.P., Parallel Computer Architecture: A Hardware/Software Approach. Morgan Kaufmann Pub., 1999.

REFERENCE BOOKS

- □ Gropp, W., Lusk, E., and Skjellum, A., Using MPI: Portable Parallel Programming with the Message-passing Interface, MIT Press, 1997.
- □ Grama, Gupta, A., Karypis, G., Kumar, V., Introduction to Parallel Computing, Addison Wesley, 2003. ISBN: 0-201-64865-2

SEMESTER/YEAR : II SEM

COURSE CODE : 19CSE5202

TITLE OF THE COURSE : ADVANCED COMPUTER NETWORKS

L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVES:

1. To understand advanced topics such as Intra and Inter Network protocols, TMN, SNMP V3, QOS, Traffic Engineering, MPLS & VPN
2. To understand need of IOT, it's definition and applications in different industry domains.

COURSE OUTCOMES:

1. Design and implementation aspects of Network Management, Inter and Intra network protocols, MPLS, VPN and importance of QOS
2. Understand and appreciate importance of IOT and its applications.

MODULE 1:

TMN and Network Management: Network management Overview, Network Management, SNMP and Network Management, TMN, Network Management Applications, Management of Heterogeneous Network with Intelligent Agents, Network Security Management, Internet Management

MODULE 2:

Routing Protocols, BGP & Traffic Engineering: Intra and inter-domain internet routing, Border Gateway Protocols, QoS and Traffic Engineering.

MPLS & VPN: Role of MPLS, MPLS operations, Labels, FECs, LSPs & Labels, Label Distribution, VPNs.

MODULE 3:

IOT: Introduction to IOT, Putting the Internet of Things Forward to the Next Level, the Internet of Things Today, the Internet of Things Tomorrow, Potential Success Factors.

MODULE 4:

Internet of Things Strategic Research and Innovation Agenda: Internet of Things Vision, Internet of Things Common Definition, IoT Strategic Research and Innovation Directions, IoT Applications and Use Case Scenarios, IoT Functional View

MODULE 5:

Application Areas: IoT Smart-X Applications, Smart Cities, Smart Energy and the Smart Grid, Smart Mobility and Transport, Smart Home, Smart Buildings and Infrastructure, Smart Factory and Smart Manufacturing,

TEXT BOOKS

1. William Stallings, High-Speed Networks and Internets, Performance and Quality of Service, Second Edition, PHI
2. D E Comer, Automated Network Management Systems, Pearson/ Prentice Hall,

SEMESTER/YEAR : II SEM

COURSE CODE : 19CSE5203

TITLE OF THE COURSE : FORMAL METHODS IN SOFTWARE ENGINEERING

L: T/A: P: C : 3: 1: 0: 4

COURSE OBJECTIVES:

1. To understand specification, validation and verification of software systems
2. To understand and learn program specification and verification through Hoare's logic and Dijkstra's weakest preconditions, formal specification and refinement towards implementation
3. To integrate formal methods with existing programming languages and object- oriented approaches, model-based specifications, and comparison of formal techniques.

COURSE OUTCOMES:

1. Understand the basics of Hoare's logic.
2. Write program specifications in terms of pre- and post-conditions.
3. Use formal techniques for verification of programs.
4. Use formal techniques for derivation of programs from their formal specifications.
5. Learn Design by Contract and Object Constraint Language (OCL).
6. Develop basic understanding of Algebraic and Model based specifications

MODULE 1:

Introduction to Formal Methods, Dijkstra's Algorithm, Implications, Some useful Equivalences, Model Building Tools (Logic and Set Theory), Propositional and Predicate Calculus, Logic Problem (Knights and Knaves), Logic and Set Theory, Logic Problem (Gold on Island), Properties of Equivalence, Logic and Proposition, Logic problem (Restaurant), Golden Rule, Introduction to Hoare's Logic, Introduction to Hoare's Logic, Hoare's Logic (Weakest Pre-condition and Loops), Hoare's Logic (Conditional and Control Flow, Invariant Condition),

MODULE 2:

Hoare's Logic with Example (Tower of Hanoi), Hoare's Logic, Verification of Functions, Specification of Functions using Pre and Post-Conditions, Dijkstra's Guarded if Statement, Constructing Conditional Statement, Output Variables, Ghost Variables, Simultaneous Assignment, Example: Max.of Two Numbers, Constructing Loops, The Dutch National Flag Problem, Defensive Programming, Design by Contract, Design by Contract and its Components. Implementation of Design by Contract (jContractor), A Pure Java Implementation - Design by Contract, Object Constraint Language (OCL), The Structure Of an Algebraic Specification, The Structure Of an Algebraic Specification,

MODULE 3:

Implementation of Design by Contract (jContractor), A Pure Java Implementation - Design by Contract, Object Constraint Language (OCL), The Structure Of an Algebraic Specification, Algebraic Specification: Rules and Methods, New_List Specification Methods: Queue Operations, Errors Specification and Boolean Function with Tools and Techniques, Structure of the File System Specification, How to use Specification of Boolean, Pair, List, Quad and

Bimap, Tools for Algebraic Specification (Sub-System Interfaces), Larch Specification Languages, Interface of Algebraic Specification and Larch (Family of Specification) Languages.

MODULE 4: OBJ (Family of Specification), Model Based Specification, VDM: Vienna Development Method, Incubator, Main Operations on Sets, Sequences and Mappings, Z-Specification, Structure and Schema (A Birthday Book), Z-Specification, Refinement and Totalization, Z-Specification, (A Program Refinement, Different Operations Simulation, Lifting, Forward Simulation),

MODULE 5: System Components, Using Z-Specification, Operating System Scheduler, Operations: Delete Start, Middle and End, How to Specify Concurrent and Real Time System, **Introduction to Petri Nets**, Development of Concurrent System (Petri Nets), Conflict, Concurrency and Confusion, Behavioural Properties, Development of Concurrent System (Petri Nets), Behavioural Properties with Examples, Activities, Limitations and Acceptance of Formal Methods, Seven Myths of Formal Methods

TEXT BOOKS:

1. Michael Huth and Mark Ryan, Logic in Computer Science: Modelling and Reasoning about Systems, Cambridge University Press.
2. Roland Backhouse, Program Construction: Calculating Implementation from Specifications, 1st Edition, Wiley
3. B. Cohen, W. T. Harwood and M. I. Jackson, The Specification of Complex Systems, 1st Edition, Addison-Wesley
4. Jim Woodcock and Jim Davies, Using Z: Specification, Refinement, and Proof, 1st Edition, Printice Hall

REFERENCE BOOKS:

1. Jos Warmer and Anneke Kleppe, The Object Constraint Language, precise modeling with UML, 1st Edition, Addison-Wesley
2. Richard Mitchell and Jim McKim, Design by contract, by example, 1st Edition, Addison-Wesley

SEM/YEAR : III SEM
COURSE CODE : 16CS202
TITLE OF THE COURSE : ELECTRONIC CIRCUITS
L: T/A:P: C : 3 : 2 : 0 : 4

Course Objectives

1. Provide students of functional knowledge of analogue electronics to understand the circuitry used in the devices and interface units which they use in systems design
2. Give students sufficient knowledge of circuits which they will come across in different industry domains

Course outcomes

At the end of the course student will be able

1. To understand the functionality of diodes and design simple applications
2. To know the Op-amps and their usage in the design of active filters and data convertors
3. To understand the design of power supply units

Module 1

Overview of Diodes and transistors, Applications of Diodes-Clipper circuits, Parallel Clippers, series clippers, clamper circuits **8 hrs**

Module 2

Biasing of Transistors, Small signal model (Hybrid Model) of transistor, simplified Hybrid Model, Transistor as an amplifier, analysis of CE amplifier with (i) collector to base bias, and with (ii) an emitter resistance.

Feedback amplifiers: transfer gain, transfer function, frequency response and bandwidth.

Operational Amplifiers: Ideal op-amp, equivalent circuit of practical op-amp, power supply rejection ratio and skew rate . Op-amp IC 741: open loop and closed loop configuration, input offset voltage and its measurement, effect of input bias current, applications of op-amps: voltage summer, comparators **11 hrs**

Module 3

Active Filters: Advantage of active filters, frequency response characteristics of filter, Introduction to Bode Plot, first order low pass butter worth filter, high pass butter worth filter, band pass filter **9 hrs**

Module 4

Data Acquisition and Data Convertors : Need for Data Acquisition, conversion, ADC, Different Types of ADCs, DAC, different types of ADCs. **8 hrs**

Module 5

Regulated Power Supply

Oscillators: Sinusoidal Oscillators, The Wien-Bridge Oscillator, The Colpitts Oscillator, voltage regulators, types of voltage regulators, shunt regulators using op-amp, series

regulator using op-amp, three terminal IC regulator, three terminal fixed voltage regulator, boosting regulator output current, three terminal adjustable regulator, SMPS

9 hrs

Text Books

1. A Malvino, D J Bates, Electronics Principles, 7th Edition, McGraw Hill Education India, 2007
2. J. Millman, H. Taub and M Prabhakara Rao, Pulse, Digital and Switching Waveforms, 2nd Edition, Tata Mc-Graw Hill Education, 2007

Reference Books

1. Millmann & Halkias , Integrated Electronics, Tata Mc-Graw Hill Education, 2001
2. A P Godse and U A Bakshi, Electronics Circuits, Technical Publications, 2005

SEM/YEAR : III SEM
COURSE CODE : 16CS203
TITLE OF THE COURSE : DIGITAL CIRCUITS AND LOGIC DESIGN
L: T/A:P: C : 3 : 0 : 0 : 3

Course Objectives

1. This course is designed to provide a comprehensive introduction to digital logic design leading to the ability to understand number system representations, binary codes, binary arithmetic and Boolean algebra, its axioms and theorems, and its relevance to digital logic design.
2. Introduction to combinational circuits (such as Karnaugh maps), synchronous sequential logic and Asynchronous sequential logic.
3. Analyze and design simple systems composed of programmable logic, such as ROMs and PLAs.

Course outcomes

At the end of the course student will be able

1. To analyze and design combinational systems using standard gates and minimization methods (such as Karnaugh maps, Quine-McCluskey Algorithm).
2. To analyze and design combinational systems composed of standard combinational modules, such as multiplexers and decoders.
3. To analyze and design simple systems composed of programmable logic, such as ROMs and PLAs.
4. To analyze the given problems and design sequential Circuits

Module 1

NUMBER SYSTEMS, BOOLEAN ALGEBRA AND LOGIC GATES:

Review of number systems-Binary, octal, Hexadecimal. Introduction to Analog and digital signal. The TTL Parameters and Truth table of Basic Gates: NOT, OR, AND, Universal Logic Gates: NOR, NAND, Positive and Negative Logic, Laws of Boolean algebra, Theorems of Boolean algebra, Boolean/Switching functions and their implementation

SIMPLIFICATION OF BOOLEAN EXPRESSIONS AND FUNCTIONS:

Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions

9hrs

Module 2

SIMPLIFICATION OF BOOLEAN EXPRESSIONS AND FUNCTIONS:

Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine- McClusky Method.

DESIGN OF COMBINATIONAL LOGIC CIRCUITS:

Modular combinational logic elements- Multiplexers and Demultiplexers, Decoders, Encoders, Priority encoders, magnitude comparator – BCD converter, Parity Generators And Checkers.

8hrs

Module 3

DESIGN OF COMBINATIONAL LOGIC CIRCUITS (continued):

Programmable Logic Arrays, Design of Combinational Circuits using Programmable Logic Devices (PLDs): Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PAL) devices

INTRODUCTION TO SEQUENTIAL CIRCUITS:

Combinational Vs sequential circuits, Asynchronous Vs synchronous circuits state table and state diagram **10 hrs**

Module 4

INTRODUCTION TO SEQUENTIAL CIRCUITS (continued):

State assignment – Memory elements and their excitation functions –T flip-flop, D flip- flop, R-S flip-flop. JK flip-flop and their excitation requirements – Design of synchronous sequential circuits like Sequence Detectors and binary counters. **10 hrs**

Module 5

APPLICATION OF LOGIC CIRCUITS SEQUENTIAL CIRCUITS:

Registers-Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In -Parallel Out, Universal Shift Register, Applications of Shift Registers, Asynchronous and Synchronous Counters, Changing the Counter Modulus, Decade counters, Presetable Counters, Counter Design.

10 hrs

Text Book:

1. M. Morris Mano and Michael D. Ciletti, “Digital Design”, IV Edition, Pearson Education,2008.
2. Donald.P. Leach, Albert Paul Malvino & Goutam Saha: Digital Principles and Applications, 7th Edition, Tata McGraw Hill, 2010.

Reference Books

1. R D Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2010.
2. Charles H. Roth:Fundamentals of Logic Design, Jr., 5th Edition,Cengage Learning,2004.

SEM/YEAR : IV SEM

COURSE CODE : 16CS208

TITLE OF THE COURSE : INTRODUCTION TO OPERATING SYSTEMS AND UNIX

L: T/A:P: C : 3 : 0 : 2 : 4

Course Objectives

1. Gives an introduction to Operating systems, different types of them, their functionalities
2. Expose the students to different operating systems UNIX/LINUX, Windows, Android with the help of case studies
3. Introducing the shell programming constructs in UNIX/Linux and awk

Course outcomes

At the end of the course the students will be able to

1. Know the general structure of an operating systems and it's functionalities
2. Understand the UNIX/Linux, Windows and Android operating systems,
3. Know the different constructs of shell programming in UNIX/Linux and use them in programming

Module 1

Operating System Objectives and Functions, The Evolution of Operating Systems developments Leading to Modern Operating Systems, Virtual Machines, OS Design Considerations for Multiprocessor and Multicore architectures, Microsoft Windows Overview, Modern UNIX Systems, Linux, Android. Booting Process of all the above operating systems.

9hrs

Module 2

The Unix Operating System, The UNIX architecture and Command Usage, General Purpose Utilities, **The File System**, Basic File Attributes

The Shell, The Process, Process Status, System Processes, Mechanisms of Process Creation, **Process States and Zombies**, Running jobs in background, Killing processes with Signals, Customizing the environment, File Systems & Inodes, hard links, The directory, umask, and find.

10 hrs

Module 3

Simple filters, Different commands: pr, head, tail, cut, paste, sort, uniq, tr. Filters using Regular expressions grep and sed, Essential Shell Programming: read, exit, the if conditional, case conditional, expr, while loop, for loop, set and shift, trap.

awk – An Advanced Filter and using it in programming, splitting a Line in to fields, variables, expressions, Comparison operators, Number Processing, -f option, arrays, functions, if, for and while.

09 hrs

Module 4

Program Development tools and Essentials of Systems Administration Program

development Tools: Handling multi source C applications, make command, Removing redundancies, cleaning up and backups,

ar command: Building a Library(archive), Maintaining an archive with make Essential Systems Administration: Root: The systems administrator's login, The Administrative privileges, maintaining security, User Management, Start ups and shutdown, Managing disk space, Device files, cpio: a back up program, tar : The Tape archive program

09 hrs

Module 5

UNIX System Administration:

TCP/IP basics, Resolving IP addresses, ping, telnet and ftp, Maintaining Security, Partitions and File Systems, Standard File systems and their types, fdisk : creating partitions, mkfs: creating a file system, Mounting and unmounting file systems, fsck: File system checking, systems start up and init. Shutdown and sync operation, backup

08 hrs

Text Books

1. Sumitabha Das: UNIX – Concepts and Applications, 4th Edition, Tata McGraw Hill, 2006.
2. Silberschatz, Galvin, and Gagne, “Operating System Principles”, Seventh Edition, Wiley India Pvt Ltd, 2007. (Chapters 1 and 2)

Reference Books

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Pearson Education, 2004.
2. Gary Nutt, “Operating Systems”, Third Edition, Pearson Education, 2004.
3. Harvey M. Detail, “Operating Systems”, Third Edition, Pearson Education, 2004.

SEM/YEAR : IV SEM
COURSE CODE : 16CS209
TITLE OF THE COURSE : ANALYSIS AND DESIGN OF ALGORITHMS
L: T/A:P: C : 3 : 0 : 0 : 3

Course Objectives

The designing of algorithm is an important component of computer science. The objective of this course is to make students aware of various techniques used to evaluate the efficiency of a particular algorithm. Students eventually should learn to design efficient algorithm for a particular program

Course Outcomes

1. An ability to design and analyze algorithms, study time complexity and prove correctness
2. An ability to develop various techniques used to evaluate the efficiency of a particular algorithm and solve engineering problems

Module 1 Introduction:

Algorithm Design paradigms - motivation, concept of algorithmic efficiency, run time analysis of algorithms, Asymptotic Notations. Recurrences- substitution method, recursion tree method, master method, generating functions.

9hrs

Module 2

Divide and Conquer and Greedy Algorithms

Structure of divide-and-conquer algorithms: examples; Binary search, quick sort, Merge sort, Strassen Multiplication; Analysis of divide and conquer run time recurrence relations. Greedy Method

Overview of the greedy paradigm examples of exact optimization solution (minimum cost spanning tree), Approximate solution (Knapsack problem),

Single source shortest paths, travelling salesman

10 hrs

Module 3

Dynamic programming

Overview, difference between dynamic programming and divide and conquer, Applications: Shortest path in graph, chain Matrix multiplication, Travelling salesman Problem, longest Common sequence, knapsack problem

08 hrs

Module 4

Graph searching and Traversal

Representation of graphs, strongly connected components, graph matching, network flows Back tracking , Overview, 8-queen problem, and Knapsack problem

Branch and bound, LC Searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem

09 hrs

Module 5

Computational Complexity

Complexity measures, Polynomial vs Non-Polynomial time complexity; NP-hard and NP-complete classes, examples. Intractability

09 hrs

Text Book

1. T. H. Cormen, Leiserson, Rivest and Stein, “Introduction of Computer algorithm,” , 3rd Edition, The MIT Press, 2009

Reference Books

1. E. Horowitz, S. Sahni, and S. Rajsekaran, “ Fundamentals of Computer Algorithms,” Galgotia Publication, 2008
2. Sara Basse, A. V. Gelder, “Computer Algorithms : Introduction Design & Analysis”, 3rd Edition, Addison Wesley
3. J.E Hopcroft, J.D Ullman, “Design and analysis of Computer algorithms”, Pearson Education, 2009
4. D. E. Knuth, “ The Art of Computer Programming , Volume 3” 2nd Edition, Addison Wesley, 2014

SEM/YEAR : III SEM

COURSE CODE : 16CS272

TITLE OF THE COURSE : DIGITAL CIRCUITS AND LOGIC DESIGN LABORATORY

L: T/A:P: C : 0 : 0 : 4 : 2

Course Objectives

1. This course is designed to provide a comprehensive introduction to digital logic design leading to the ability to understand number system representations, binary codes, binary arithmetic and Boolean algebra, its axioms and theorems, and its relevance to digital logic design.
2. Introduction to combinational circuits (such as Karnaugh maps), synchronous sequential logic and Asynchronous sequential logic.
3. Analyze and design simple systems composed of programmable logic, such as ROMs and PLAs.

Course outcomes

At the end of the course student will be able

1. Students will demonstrate knowledge of binary number theory, Boolean algebra and binary codes.
2. Students will analyze and design combinational systems using standard gates and minimization methods (such as Karnaugh maps).
3. Students will analyze and design combinational systems composed of standard combinational modules, such as multiplexers and decoders.
4. Students will analyze and design simple systems composed of programmable logic, such as ROMs and PLAs.

List of experiments:

- a) Checking the ICs and verifying the truth table for ICs
- b) Simplification of switching expressions using Karnaugh Maps and implement circuits using AND, OR and NOT gates
- c) Simplification of switching expressions using Karnaugh Maps and implement circuits using NAND gates
- d) Simplification of switching expressions using Karnaugh Maps and implement circuits using NOR gates
- e) Simplification of switching expressions using Quine-McCluskey algorithms and implement circuits
- f) Designing combinational circuits using MUXes and Decoders
- g) Designing adder/ subtractors and checking for overflow and underflow conditions
- h) Design circuits to implement synchronous counters
- i) Design circuits to implement asynchronous counters

SEM/YEAR : IV SEM
COURSE CODE : 16CS274
TITLE OF THE COURSE : DESIGN AND ANALYSIS OF ALGORITHMS LAB
L: T/A:P: C : 0 : 0 : 4 : 2

Course Objectives

1. This Lab course is to provide students the art of design and analysis of algorithms using different strategies
2. Course introduces complexity of algorithms
3. Lab experiments provide the design and implementation of algorithms and their time analysis .

Course outcomes

At the end of the Lab course student will be able

To understand and design of different algorithms using Divide-and-Conquer, Dynamic Programming, Branch & bound, and Greedy strategies

Lab assignment will be based on the following:

Mini projects based on

- a) Binary search, Quick sort and merge sort using divide and conquer techniques.
- b) Algorithms based on greedy method.
- c) Dynamic programming.
- d) Depth First and Breadth Search traversals of graphs, graph matching and network flows
- e) Algorithms based on backtracking.
- f) Algorithms based on Branch and Bound.

SEM/YEAR : V SEM
COURSE CODE : 16CS332
TITLE OF THE COURSE : NUMERICAL COMPUTING
L: T/A:P: C : 3 : 0 : 0 : 3

Course Objectives

1. Develop the basic understanding of numerical algorithms
2. Develop skills to implement algorithms to solve mathematical problems on the computer

Course outcomes

At the end of the course student will be able

- solve an algebraic or transcendental equation using an appropriate numerical method
- approximate a function using an appropriate numerical method
- solve a differential equation using an appropriate numerical method
- evaluate a derivative at a value using an appropriate numerical method
- solve a linear system of equations using an appropriate numerical method

Module 1

Curve fitting and numerical solution of equations Method of Least Squares – Fitting a straight line – **Fitting a parabola** – Fitting an exponential curve – Fitting a curve of the form $y = ax^b$ – Calculation of the sum of the squares of the residuals.- Newton-Raphson method – Gauss Elimination method – Gauss Jacobi method – Gauss Seidel method.

12 Hrs

Module 2

Finite differences and interpolation First and Higher order differences – Forward differences and backward differences and Central Differences – Differences of a polynomial – Properties of operators – Factorial polynomials – Shifting operator E – Relations between the operators. Interpolation – Newton-Gregory Forward and Backward Interpolation formulae - Divided differences – Newton's Divided difference formula – Lagrange's Interpolation formula – Inverse interpolation.

12 Hrs

Module 3

Numerical Differentiation and Integration: Newton's forward and backward differences formulae to compute first and higher order derivatives – The Trapezoidal rule – Simpson's one third rule and three eighth rule.

12 Hrs

Module 4

Numerical solutions of ordinary differential equations solution by **Taylor's series** – **Euler's method** – Improved and modified Euler method – Runge Kutta methods of fourth order (No proof) – **Milne's Method** - Adam's Bashforth method.

12 Hrs

Module 5

Numerical solutions of partial differential equations classification of Partial differential equations of the second order - Difference quotients – Laplace's equation and its solution

by Liebmann's process – Solution of Poisson's equation – Solutions of Parabolic and Hyperbolic equations.

12 Hrs

Text Books

1. M.K.Jain, SRK Iyengar and R.L.Jain, Numerical Methods for Scientific and Engineering Computation, Wiley Eastern Ltd., 4th edition, 2003.
2. Dr. M.K. Venkataraman, Numerical Methods in Science and Engineering, National Publishing Co., 2005.

Reference Books

1. B.S. Grewal, Numerical Methods in engineering and science, Khanna Publishers, 42nd edition, 2012.
2. S.S. Sastry, Introductory Methods of Numerical Analysis, 4th edition, 2005.
3. E. Balagurusamy, Computer Oriented Statistical and Numerical Methods – Tata McGraw Hill., 2000.
4. M.K.Jain, Numerical Solution of Differential Equations, 2nd edition (Reprint), 2002. 5. P.Kandasamy et al., Numerical Methods, S.Chand & Co., New Delhi, 2003.

EM/YEAR : VI SEM
COURSE CODE : 16CS337
TITLE OF THE COURSE : COMPUTER ARCHITECTURE
L: T/A:P: C : 3 : 0 : 0 : 3

Course Objectives

To understand the micro-architectural design of processors

- Learn about the various techniques used to obtain performance improvement
- Learn Power savings in current

Course outcomes

At the end of the course student will be able

- To describe the principles of computer design and classify instructions set architecture
- Describe the operations of performance such as pipelines, dynamic scheduling branch predictions, caches
- Describe the modern architecture such as RISC, Scalar, VLIW Multi core and multi CPU systems
- Describes instruction and thread level parallelism
- Develop the applications for high performance computing systems

Module 1

FUNDAMENTALS OF COMPUTER DESIGN: Introduction; Classes of computers; Defining computer architecture; Trends in Technology, power in Integrated Circuits and cost; Dependability; Measuring, reporting and summarizing Performance; Quantitative Principles of computer design.

9hrs

Module 2

PIPELINING: Introduction; Pipeline hazards; Implementation of pipeline; what makes pipelining hard to implement? ILP: Concepts and challenges; Basic Compiler Techniques for exposing ILP; Reducing Branch costs with prediction; Overcoming Data hazards with Dynamic scheduling; Hardware-based speculation.

9hrs

Module 3

INSTRUCTION –LEVEL PARALLELISM – 2: Exploiting ILP using multiple issues and static scheduling; Exploiting ILP using dynamic scheduling, multiple issue and speculation; Advanced Techniques for instruction delivery and Speculation; The Intel Pentium 4 as example. **9hrs**

Module 4

MULTIPROCESSORS AND THREAD –LEVEL PARALLELISM: Introduction; Symmetric shared-memory architectures; Performance of symmetric shared–memory multiprocessors; Distributed shared memory and directory-based coherence; Basics of synchronization; Models of Memory Consistency.

Module 5

HARDWARE AND SOFTWARE FOR VLIW AND EPIC: Introduction: Exploiting Instruction-Level Parallelism Statically; Detecting and Enhancing Loop-Level Parallelism; Scheduling and Structuring Code for Parallelism; Hardware Support for Exposing Parallelism: Predicated Instructions; Hardware Support for Compiler Speculation; The Intel IA-64 Architecture and Itanium Processor; Conclusions.

9hrs

Text Books

1. Computer Architecture, A Quantitative Approach – John L. Hennessey and David A. Patterson;, 4 th Edition, Elsevier, 2007.

Reference Books

1. Advanced Computer Architecture Parallelism, Scalability – Kai Hwang: Programmability, Tata Mc Grawhill, 2003.
2. Parallel Computer Architecture, A Hardware / Software Approach – David E. Culler, Jaswinder Pal Singh, Anoop Gupta:, Morgan Kaufman, 1999.
3. Computer Organization and Architecture: Designing for performance, W. Stallings, 4th Ed. PHI, 1996.

SEM/YEAR : VI SEM
COURSE CODE : 16CS344
TITLE OF THE COURSE : SOFT COMPUTING
L: T/A:P: C : 3 : 0: 0 : 3

Course Objectives

The student should be made to:

- Learn the various soft computing frame works.
- Be familiar with design of various neural networks.
- Learn genetic programming.
- Be exposed to hybrid systems.

Course outcomes

At the end of the course the student will be able to:

- Analyze the selected topic, organize the content and communicate to audience in an effective manner.
- Practice the learning by self-study.

Module 1

Introduction of soft computing - soft computing vs. hard computing- various types of soft computing techniques- applications of soft computing. Learning problems: Designing a Learning System, Issues in Machine Learning: The Concept Learning Task- General-to- specific ordering of hypotheses. Overview of Neural Networks: Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning.

9Hrs

Module 2

NEURAL NETWORKS: Issues in Decision tree learning; - Artificial Neural Networks (ANN), ANN training Algorithms-perceptions, Training rules, Delta, **Back Propagation Algorithm**.

9Hrs

Module 3

NEURAL NETWORKS(continued..): Back propagation Algorithm- Convergence, Estimating Hypotheses Accuracy, Basics of sampling Theory. Adaptive Resonance Theory- Architecture-classifications-Implementation and training-Associative Memory.

9Hrs

Module 4

GENETIC ALGORITHM: Basic concept of Genetic algorithm and detail algorithmic steps- adjustment of free Parameters- Solution of typical control problems using genetic algorithm. Genetic Programming– multilevel optimization – real life problem- advances in GA for solving optimization problems.

Module 5

SOFT COMPUTING TECHNIQUES & APPLICATIONS: Learning first order rules-sequential covering algorithms. A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

9Hrs

Text Books

1. J.S.R.Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI / Pearson Education 2004.
2. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.

Reference Books

1. George J. Klir, Ute St. Clair, Bo Yuan, "Fuzzy Set Theory: Foundations and Applications" Prentice Hall, 1997.
2. David E. Goldberg, "Genetic Algorithm in Search Optimization and Machine Learning" Pearson Education India, 2013.
3. James A. Freeman, David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India, 1991.

SEM/YEAR : V SEM
COURSE CODE : 16CS331
TITLE OF THE COURSE : RANDOMIZED & APPROXIMATE ALGORITHMS
L: T/A:P: C : 3 : 0 : 0 : 3

Course Objectives

- i. To introduce the concept of randomized algorithms
- ii. To apply the concepts of probabilistic analysis of algorithms

Course outcomes

- i. Ability to apply basics of probability theory in the analysis of algorithms
- ii. Ability to comprehend randomized algorithms and its advantages to traditional algorithm
- iii. Ability to design and implement randomized techniques in solving real world problems

Module 1

Elements of probability theory, Verification of polynomial identities, matrix multiplication. Las Vegas and Monte Carlo algorithms, Random Variables and Expectations. **9hrs**

Module 2

Jensen's Inequality, Bernoulli and Binomial RV, Conditional Expectation, Geometric distribution, Coupon collector's problem. **9hrs**

Module 3

Game Tree evaluation, The Minimax Principle, Randomness and Non Uniformity, Markov's Inequality, Variance and Moments of a RV, Chebyshev's inequality. **9hrs**

Module 4

Randomized Quick Sort, Coupon Collector's problem and Randomized Median Finding. **9hrs**

Module 5

Sum of Poisson Trials, Coin flips, Set balancing, Packet Routing in Sparse Networks, Bucket Sort, **Hashing**, Hamiltonian Cycles in Random Graphs, Finding a large cut, Maximum satisfiability, **Graphs with large girth**. **9hrs**

Text Books

1. M. Mitzenmacher and E. Upfal, "Probability and computing: Randomized algorithms and Probabilistic analysis", Cambridge, 2005
2. D. Dubhashi and A. Panconesi, "Concentration of measure for the analysis of randomized algorithms", Cambridge, 2009.
3. R. Motwani and P. Raghavan, "Randomized Algorithms", Cambridge Press, 1995.

Reference Books

2. J. Hromkovic, "Design and analysis of randomized algorithms", Springer Verlag, 2005.
3. K. Mulmuley, "Computational Geometry, an introduction through randomized algorithms", Prentice Hall, 1994.

SEM/YEAR : IV SEM

COURSE CODE : 16CS208

TITLE OF THE COURSE : INTRODUCTION TO OPERATING SYSTEMS AND UNIX

L: T/A:P: C : 3 : 0 : 2 : 4

Course Objectives

4. Gives an introduction to Operating systems, different types of them, their functionalities
5. Expose the students to different operating systems UNIX/LINUX, Windows, Android with the help of case studies
6. Introducing the shell programming constructs in UNIX/Linux and awk

Course outcomes

At the end of the course the students will be able to

1. Know the general structure of an operating systems and it's functionalities
2. Understand the UNIX/Linux, Windows and Android operating systems,
3. Know the different constructs of shell programming in UNIX/Linux and use them in programming

Module 1

Operating System Objectives and Functions, The Evolution of Operating Systems developments Leading to Modern Operating Systems, Virtual Machines, OS Design Considerations for Multiprocessor and Multicore architectures, Microsoft Windows Overview, Modern UNIX Systems, Linux, Android. Booting Process of all the above operating systems.

9hrs

Module 2

The Unix Operating System, The UNIX architecture and Command Usage, General Purpose Utilities, The File System, Basic File Attributes

The Shell, **The Process**, Process Status, System Processes, **Mechanisms of Process Creation**, **Process States and Zombies**, Running jobs in background, Killing processes with Signals, Customizing the environment, File Systems & Inodes, hard links, The directory, umask, and find.

10 hrs

Module 3

Simple filters, Different commands: pr, head, tail, cut, paste, sort, uniq, tr. Filters using Regular expressions grep and sed,

Essential Shell Programming: read, exit, the if conditional, case conditional, expr, while loop, for loop, set and shift, trap.

awk – An Advanced Filter and using it in programming, splitting a Line in to fields, variables, expressions, Comparison operators, Number Processing, -f option, arrays, functions, if, for and while.

09 hrs

Module 4

Program Development tools and Essentials of Systems Administration Program

development Tools: Handling multi source C applications, make command, Removing redundancies, cleaning up and backups,

ar command: Building a Library(archive), Maintaining an archive with make Essential Systems Administration: Root: The systems administrator's login, The Administrative privileges, maintaining security, User Management, Start ups and shutdown, Managing disk space, Device

files, cpio: a back up program, tar : The Tape archive program

09 hrs

Module 5

UNIX System Administration:

TCP/IP basics, Resolving IP addresses, ping, telnet and ftp, Maintaining Security, Partitions and File Systems, Standard File systems and their types, fdisk : creating partitions, mkfs: creating a file system, Mounting and unmounting file systems, fsck: File system checking, systems start up and init. Shutdown and sync operation, backup

08 hrs

Text Books

3. Sumitabha Das: UNIX – Concepts and Applications, 4th Edition, Tata McGraw Hill, 2006.
4. Silberschatz, Galvin, and Gagne, “Operating System Principles”, Seventh Edition, Wiley India Pvt Ltd, 2007. (Chapters 1 and 2)

Reference Books

4. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Pearson Education, 2004.
5. Gary Nutt, “Operating Systems”, Third Edition, Pearson Education, 2004.
6. Harvey M. Detail, “Operating Systems”, Third Edition, Pearson Education, 2004.

SEM/YEAR : III SEM
COURSE CODE : 16CS271
TITLE OF THE COURSE : DATA STRUCTURES AND APPLICATIONS LAB
L: T/A:P: C : 0 : 0 : 4 : 2

Course Objectives

2. This Lab course is designed to provide a comprehensive introduction designing algorithms by appropriate selection of Data Structures
3. Code the above algorithms and thus implement various data structures

Course outcomes

At the end of the course student will be able

1. Students will demonstrate knowledge of binary number theory, Boolean algebra and binary codes.
2. Students will analyze and design combinational systems using standard gates and minimization methods (such as Karnaugh maps).
3. Students will analyze and design combinational systems composed of standard combinational modules, such as multiplexers and decoders.
4. Students will analyze and design simple systems composed of programmable logic, such as ROMs and PLAs.

Software Required: ANSI C

List of **applications/Expts** based on the following programs/techniques:

1. Design a problem to search an element in two dimensional array.
2. Design a problem to perform following operations on tables using function only addition, Subtraction, Multiplication.
3. Design a program for performing various Basic elementary Operations (Push , Pop , Peek , isfull , isempty) using ARRAY on stack .
4. Design a program for performing various Basic elementary Operations (Enqueue , Dequeue , Peek etc.) using ARRAY on Queue.
5. Write a program using iteration and recursion concept for Quicksort.
6. Design a problem for Linked list creation and perform operations such as insert, delete ,update and reverse on it.
7. Design a problem to simulate following sorting algorithm. a)Merge sort, b)Insertion Sort, c) Bubble Sort
8. Design a solution for following Search Techniques. a)Linear Search, b)Binary Search
9. Design a Program for various Graph traversal techniques
- 10.Design a program for various tree traversal techniques.
- 11.Design a program for Binary Tree and Perform the following operations: Creation, Insertion & Traversal on the tree.
12. Implement Circular Linked list.
- 13.Design a program for performing various Basic elementary Operations (Push, Pop , Peek , isfull, isempty) using Linked List on Stack .
- 14.Design a program for performing various Basic elementary Operations (Enqueue , Dequeue, Peek etc.) using Linked List on Queue.
- 15.Design a Problem to Evaluate Prefix expression.

SEM/YEAR : III SEM

COURSE CODE : 16CS272

TITLE OF THE COURSE : DIGITAL CIRCUITS AND LOGIC DESIGN LABORATORY

L: T/A:P: C : 0 : 0 : 4 : 2

Course Objectives

1. This course is designed to provide a comprehensive introduction to digital logic design leading to the ability to understand number system representations, binary codes, binary arithmetic and Boolean algebra, its axioms and theorems, and its relevance to digital logic design.
2. Introduction to combinational circuits (such as Karnaugh maps), synchronous sequential logic and Asynchronous sequential logic.
3. Analyze and design simple systems composed of programmable logic, such as ROMs and PLAs.

Course outcomes

At the end of the course student will be able

5. Students will demonstrate knowledge of binary number theory, Boolean algebra and binary codes.
6. Students will analyze and design combinational systems using standard gates and minimization methods (such as Karnaugh maps).
7. Students will analyze and design combinational systems composed of standard combinational modules, such as multiplexers and decoders.
8. Students will analyze and design simple systems composed of programmable logic, such as ROMs and PLAs.

List of experiments:

- j) Checking the ICs and verifying the truth table for ICs
- k) Simplification of switching expressions using Karnaugh Maps and implement circuits using AND, OR and NOT gates
- l) Simplification of switching expressions using Karnaugh Maps and implement circuits using NAND gates
- m) Simplification of switching expressions using Karnaugh Maps and implement circuits using NOR gates
- n) Simplification of switching expressions using Quine-McCluskey algorithms and implement circuits
- o) Designing combinational circuits using MUXes and Decoders
- p) Designing adder/ subtractors and checking for overflow and underflow conditions
- q) Design circuits to implement synchronous counters
- r) Design circuits to implement asynchronous counters

SEM/YEAR : IV SEM
COURSE CODE : 16CS273
TITLE OF THE COURSE : MICROPROCESSOR AND APPLICATIONS LAB
L: T/A:P: C : 0 : 0 : 4 : 2

Course Objectives

1. To introduce microprocessors and basics of system design using microprocessors.
2. To introduce h/w architecture, instruction set and programming of 8086 microprocessor
3. To introduce the peripheral interfacing of microprocessors.
4. To introduce the h/w architecture, instruction set, programming and interfacing of 8051 microcontroller

Course outcomes

At the end of the course student will be able

1. To Know the basics of system design using microprocessors.
2. To implement the h/w architecture, instruction set and programming of 8086 microprocessor
3. To implement peripheral interfacing of microprocessors.
4. To know the h/w architecture, instruction set, programming and interfacing of 8051 microcontroller

Lab experiments based on the following:

- a) Programming experiments to implement software programs using stacks, and queues,
- b) Programming experiments to implement software programs using linked lists
- c) Programming experiments to implement software programs on bit operations
- d) Programming experiments to implement software programs using arithmetic operations
- e) Programming experiments to implement software programs - searching and sorting
- f) Interface ADC to microprocessor kit
- g) Interface DAC to microprocessor kit
- h) Interface Logic Controller to microprocessor kit
- i) Interface Stepper motor to microprocessor kit
- j) Interface Additional Keyboard and display units to microprocessor kit
- k) Interface 2 compatible devices

SEM/YEAR : IV SEM

COURSE CODE : 16CS274

TITLE OF THE COURSE : DESIGN AND ANALYSIS OF ALGORITHMS LAB

L: T/A:P: C : 0 : 0 : 4 : 2

Course Objectives

1. This Lab course is to provide students the art of design and analysis of algorithms using different strategies
2. Course introduces complexity of algorithms
3. Lab experiments provide the design and implementation of algorithms and their time analysis

Course outcomes

At the end of the Lab course student will be able

To understand and design of different algorithms using Divide-and-Conquer, Dynamic Programming, Branch & bound, and Greedy strategies

Lab assignment will be based on the following:

Mini projects based on

- g) Binary search, Quick sort and merge sort using divide and conquer techniques.
- h) Algorithms based on greedy method.
- i) Dynamic programming.
- j) Depth First and Breadth Search traversals of graphs, graph matching and network flows
- k) Algorithms based on backtracking.
- l) Algorithms based on Branch and Bound.

SEMESTER/YEAR : I SEM

COURSE CODE : 16CSE501

TITLE OF THE COURSE : ADVANCED ALGORITHMS

L: T/A: P: C : 3: 2: 0: 4

DEPARTMENTAL CORE COURSES: SEMESTER -1

COURSE OBJECTIVES 1. To understand the design of advanced algorithms and data structures.

2. To understand the applications of algorithms in different fields such as geometry, number theory, signal processing and linear algebra.

COURSE OUTCOMES

1. Skill of advanced algorithm design.
2. Knowledge of advanced data structures

MULTI-THREADED ALGORITHMS AND MATRIX OPERATIONS:

The basics of dynamic multi-threading; multi-threaded versions of matrix multiplication, solution of linear equations, matrix inversion, and least squared approximation.

FAST FOURIER TRANSFORMS AND NUMBER THEORETIC ALGORITHMS:

Representation of polynomials, DFT and FFT; efficient FFT implementation (sequential and parallel). Elementary number theoretic notions, greatest common divisor, modular arithmetic, solving modular linear equations, Chinese remainder theorem, powers of an element, RSA public crypto system, primality testing, and integer factorization.

STRING MATCHING ALGORITHMS:

Rabin-Karp, Knuth-Morris-Pratt and Boyer-Moore string matching algorithms. Suffix trees and their applications in computational biology.

COMPUTATIONAL GEOMETRY AND PROBABILISTIC ANALYSIS:

Line segment properties, determining whether pair of line segments intersects, finding the convex hull, finding the closest pair of points. Hiring problem, indicator random variables, randomized algorithms; probabilistic analysis and further uses of indicator random variables.

ADVANCED DATA STRUCTURES AND GRAPH ALGORITHMS:

Fibonacci heaps, mergeable heap operations, decreasing a key and deleting a node, bounding the maximum degree. Van emdeboas tree. Data structures for disjoint sets, analysis of union by rank with path compression. Flow networks, Ford-Fulkerson method, maximum bipartite matching.

TEXT BOOK:

1. Thomas H. Cormen, Charles E Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms. 3rd ed., The MIT Press, 2009.

REFERENCES:

1. Donald E Knuth, Art of Computer Programming, Volumes 1-4A, Addison-Wesley, 2011.

COURSE CODE : 16IE651

TITLE OF THE COURSE : DIGITAL MARKETING

L: T/A: P: C : 3: 0: 0: 3

COURSE OBJECTIVE:

To learn how to do marketing online- Boost website traffic, generate potential leads & increase sales revenue with better brand awareness using internet platforms like Social Media, Email Marketing, Mobile Marketing, Ecommerce Marketing and Affiliate marketing.

COURSE OUTCOME:

After completion of the program the students will be able to plan, conceptualize and implement Digital Marketing strategy for client requirements.

UNIT-1

Digital Marketing Overview

7 hrs

Introduction, Key terms and concepts, what is marketing? What is digital marketing? Why Digital Marketing wins over traditional Marketing, Understanding marketing strategy, the building blocks of marketing, Understanding Digital Marketing Process: Increasing Visibility, Visitors engagement.

UNIT-2

Search Engine Optimization and Search Markets

10 hrs

Stakeholders in Search, Customer Insights, On & off-page Optimization, Meta Tags, Layout, Content Updates, Inbound Links & Link Building, Goal Configuration & Funnels, Intelligence Reporting, Conversions, Bounce Rate, Traffic Sources, Scheduling etc.

UNIT-3

Social Media

10 hrs

What is Social Media Marketing? Overview of Facebook, Twitter, LinkedIn, Blogging, Youtube and Flickr, building Brand Awareness Using Social Media, Social Media Management, Insights and Analytics, Best Practice Examples & case studies

UNIT-4

Website Analytics

9 hrs

Goal Configuration & Funnels, Intelligence Reporting, Conversions, Bounce Rate, Traffic Sources, Scheduling etc

UNIT-5

Email and Mobile Marketing

8 hrs

User Behaviour, Segmentation, Key Metrics, Best Practice Case Studies, Split Testing, Campaign Process Optimisation, SMS Strategy, Mobile Advertising, Mobile Optimized Websites, 7 Step Process for Mobile Apps, Proximity Marketing, Strategic Steps, Review & Testing

TEXT BOOKS:

1. Digital Marketing, Vandana Ahuja, Oxford University Press
2. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, Ian Dodson, Wiley

SEMESTER	III					
YEAR	II					
COURSE CODE	16CT271					
TITLE OF THE COURSE	DATA STRUCTURES APPLICATIONS LAB					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	-	-	2	-	30	1

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
*	**	**	***

COURSE OBJECTIVES:

- To introduce C language concepts required for data structures
- To design data structure operations to solve problems
- To introduce applications of data structures
- To implement linear data structures – stack, queue, linked list
- To implement non-linear data structures – trees and graphs

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Design and develop the programs in C to understand the different concepts of data structures.	L 3
CO2	Implement stack & queue data structure and their applications, Analyse the output based on the given input data.	L 3
CO3	Implement Conversions of Polish and reverse polish expressions and Record Experimental process and results	L 4
CO4	Apply and implement concepts of dynamic memory allocation	L 3
CO5	Use the concepts of file structures and communicate results effectively	L 3

List of Laboratory/Practical Experiments activities to be conducted
Writing C programs: 1. To perform arithmetic storage/operations using arrays 2. To Implement C programs with concepts of pointers, structures 3. To implement multidimensional array Matrix Multiplication 4. To search element(s) in a multidimensional array 5. To search elements in data structure with different search methods 6. To implement stack , queue and their variations using arrays 7. To implement stack, queue and their variations using linked lists

8. To Implement Linked Lists and variations and use them to store data.
9. To implement graph & binary tree traversal techniques
10. To evaluate/convert infix/prefix/postfix expressions
11. To perform basic file operations

Open-Ended Experiments

1. A man in an automobile search for another man who is located at some point of a certain road. He starts at a given point and knows in advance the probability that the second man is at any given point of the road. Since the man being sought might be in either direction from the starting point, the searcher will, in general, must turnaround many times before finding his target. How does he search to minimize the expected distance travelled? When can this minimum expectation be achieved?
2. The computing resources of a cloud are pooled and allocated according to customer demand. This has led to increased use of energy on the part of the service providers due to the need to maintain the computing infrastructure. What data structure will you use for allocating resources which addresses the issue of energy saving? Why? Design the solution.
3. Mini-Project on applying suitable data structure to a given real-world problem

Textbooks

1. A M Tannenbaum, Y Langsam, M J Augentien "Data Structures using C", Pearson, 2013
2. R.L. Kruse, B.P. Leary, C.L. Tondo, "Data Structure and Program Design in C" PHI

Reference Books

1. Horowitz Anderson-Freed, and Sahni, "Fundamentals of Data structures in C", 2nd Edition, OrientLongman, 2008
2. Data Structures and Algorithm analysis in C by Mark Allen Weiss, Published by Addison Wesley(3rd Indian Reprint 2000).
3. D E Knuth, The Art of Computer Programming, Volume 1, Addison-Wesley Publishing, 2013

SEMESTER	III					
YEAR	II					
COURSE CODE	20CT2301					
TITLE OF THE COURSE	DESIGN TECHNOLOGY					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	-	-	-	02	26	2

Perquisite Courses (if any)

#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES:

- Learn to use Fusion 360 and sketch designs.
- Understand the functioning of 3D printers.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Explain the functionalities of Fusion 360	L1
CO2	Convert 2D Sketches into 3D Model	L3

COURSE CONTENT:

MODULE 1		05 Hrs
Fusion 360 – Introduction, Applications, Basics and Advanced Sketching Functionalities of Fusion 360		
MODULE 2		05 Hrs
Part Modelling - Converting the 2D Sketches to 3D Parts, 3D Part Modelling tools, Edit the Features of Existing Parts		
MODULE 3		05 Hrs

Assembling Various Parts and Defining Relationships, Generate Drafts or Drawings of an Assembly for Manufacturing	
MODULE 4	06 Hrs
Practice 1 – Animation Environment - Introduction to Animation Environment, Creating Animations on Existing Assemblies, Finite Element Analysis, Simulation Environment, Rendering Tools, Photorealistic Renders	
MODULE 5	05 Hrs
Practice 2 – Prototyping & Rapid Manufacturing - Converting the Design to a Real-World Prototype, Additive Manufacturing, 3D Printing	

List of Laboratory/Practical Experiments activities to be conducted (if any) :

Based on choice of problem statement, students are required to design a solution for the chosen problem statement. They must use available resources to convert designs to prototypes.

TEXT BOOKS :

1. Gaurav Verma, Autodesk Fusion 360, 2nd Edition, CADAMCAE Works, 2018.
2. Autodesk Design Academy, Autodesk Fusion 360 Training: The Future of Making Things

SEMESTER	III					
YEAR	II					
COURSE CODE	20CT2302					
TITLE OF THE COURSE	INNOVATIVE BUSINESSES & BREAKTHROUGH TECHNOLOGIES					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	-	-	-	02	26	2

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

Course Details

Course Aim & Summary

Firms must develop major innovations to prosper, but they do not know how to. However, recent research into the innovation process has made it possible to develop breakthroughs systematically. This course explores several practical ideageneration development methods.

Course Objectives

The objectives of the course are.

- Briefly explain a chosen topic that interests you from the prescribed books.
- Expand the topic in your direction of interest.

Course Outcomes

After undergoing this course, students will be able to

Course Outcome No.	Course Outcomes	Bloom's Taxonomy Level
CO1	Evaluation topics from the listed reference books that especially interests you	Evaluate
CO2	Briefly explain the pros and cons of the topic	Analyze
CO3	Expand the topic in your direction of interest	Apply

Course Content

The User Innovation Paradigm, Going for User Solutions Instead of User Needs – the Lead User Method, How Patents Discourage Innovation
User Innovation Communities, Exploring New Combinations of Customer Needs, Determine Users' Needs Ethnographically and Develop Solutions MIT Media Lab Approach, Design and Manufacture of Mass Customized Products with Toolkits/Platforms for User Innovation

Hands-on Component

1. Brainstorming as a Concept Generation Method
2. Case Studies on Problem-Solving about Analogical Thinking

References

1. Eric Von Hippel, Democratizing Innovation, The MIT Press, February 2006
2. Eric Von Hippel, Stefan Thomke and Mary Sonnack, Creating Breakthroughs at 3M, Harvard Business Review
3. Glen L. Urban, John R. Hauser, "Listening In" to Find & Explore New Combinations of Customer

Needs, Journal of Marketing, Sage Journals, 2004

4. MIT Open Course Ware – How to Develop Breakthrough Products and Services

SEMESTER	IV					
YEAR	II					
COURSE CODE	20CT2401					
TITLE OF THE COURSE	SMALL E-BUSINESS LAUNCH					
	Lecture	Tutorial	Practical	Seminar/ Project	Total Hours	Credits
	-	-	-	04	04	02

Course Objectives:

- Experience with a set of tools and methods for setting up an online service
- Knowledge of the role of multiple functions in creating a small business
- Ability to coordinate multiple, interdisciplinary tasks to achieve a common objective
- Emphasis of specific knowledge from other courses through practice and reflection in an action-oriented setting

Course Outcomes

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Identify customer needs and pain points	L1
CO2	Generate concept & validate idea	L3
CO3	Use design thinking to create a wireframe of your online service	L3
CO4	Launch your App/Website	L3
CO5	Register your small business	L2

Course Content	
Module 1	09 Hrs
Introduction, Identifying Customer Needs, Opportunity Identification & Planning, Idea Generation and Validation, Entrepreneurial Culture, Digital Business Opportunity	
Module 2	10 Hrs
Business Plan & its Components, Business Model and Strategies, Selection of Appropriate Business Model, Business Model Canvas, Feasibility Study	
Module 3	09 Hrs
Lean Thinking, Specifications, Wireframe Generation & Validation	
Module 4	08 Hrs
Service-Market Fit, legal Aspects & Entrepreneurial Law, Logistics of goods delivery, Virtual Trade Shows	

PROJECT DELIVERABLES

1. Proposal Handout & Presentation
 - a. The Problem
 - b. Need

- c. Existing Alternatives
 - d. Potential Market
- 2. Wireframe Sketches, Target Specifications

- a. List Critical Customer Needs
- b. For a., Prepare a List of Target Specifications
- c. Prepare Wireframe

TEXTBOOKS

1. Fisher, Steven, Duane, Ja-Nae (2016). Start-up Equation – A Visual Guidebook for Building your Start-up, New Delhi: Tata McGraw-Hill
2. Ulrich, K. T. (2019). *Product design and development*. Tata McGraw-Hill Education, 7th edition

REFERENCE BOOKS

1. Holt H., David (2017). Entrepreneurship: New Venture Creation, New Delhi: Pearson Education
2. Zimmerer, W. Thomas and Scarborough, M. Norman and Doug Wilson (2009). Essentials of Entrepreneurship and Small Business Management, 5/e; New Delhi: Prentice Hall India

SEMESTER	V					
YEAR	III					
COURSE CODE	19CT3611					
TITLE OF THE COURSE	MACHINE LEARNING					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	2	45	4

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
*	***	***	****

COURSE OBJECTIVES:

- To introduce and implement various techniques for Data Processing
- To learn and analysis the fundamental concepts in machine learning.
- To learn the most popular supervised and unsupervised learning algorithms and classificationalgorithms.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Outline the overview of Machine Algorithms	L1
CO2	Understand the different Machine Learning Algorithmic Design strategies	L2
CO3	Apply the design principles and concepts to Machine Learning Algorithmic	L3
CO4	Describe Machine Learning Algorithms for various application	L6
CO5	Analyse the efficiency of Various Machine Learning Algorithms	L4
CO6	Implement the efficient Machine Learning Algorithms	L3

COURSE CONTENT:	
Module-1: Introduction to Machine Learning	8 Hrs
Well posed learning problems, Designing a Learning system. Introduction to AI, Machine learning and Deep learning with applications. Types of learning: supervised, unsupervised and reinforcement learning. Perspective and Issues in Machine Learning.	
Module-2: Mathematics for Machine Learning	9 Hrs
Introduction to Statics Probability (joint probability, conditional probability, Bayes theorem, different distributions, univariate and multivariate Gaussian distribution, PDF, MLE),	

Motivation, estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms.	
Module-3: Supervised Learning	9 Hrs
Introduction to Supervised Learning, Regression and Classification, Linear regression and Non-linear regression Introduction to logistic regression for classification, Naive Bayes, SVM, kernel function, soft SVM, KNN, decision trees and random forest, introduction to ensemble machine learning algorithms, bagging and boosting.	
Module-4: Unsupervised Learning	9 Hrs
Introduction to Unsupervised Learning, Clustering (hard and soft clustering) Hierarchical clustering: K-means, FCM, GMM, EM algorithm, feature Engineering in ML, Dimensionality reduction, LDA and PCA.	
Module-5: Machine Learning Validation and Model Selection	10 Hrs
Machine Learning model validation - Confusion Matrix, Accuracy, Precision, F score, Cost function, ML optimization algorithms: Gradient descent, stochastic GD. Regularization: Normalization and Standardization overfitting, underfitting, optimal fit, bias, variance, cross-validation.	
Practical sessions: The objective is to learn how to increase the performance of the ML algorithms. 1. Implementation of linear and logistic regression 2. Implementation of SVM, KNN, Naïve Bayes ML algorithms 3. Implementation of Decision trees, Random Forest classifiers 4. Implement ensemble algorithms. 5. Implementation of different clustering algorithms and PCA Implementation of different neural networks Capstone project in any domain BFSI, Telecom, Transportation	

TEXT BOOKS:

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Pressbook in preparation. (2015).
2. Thomas M. Mitchell, Machine Learning, McGraw- Hill, Inc. New York, ISBN: 00704280779780070428072
3. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and MachineLearning series), The MIT Press; second edition, 2009.

SEMESTER	V					
YEAR	III					
COURSE CODE	19CT3502					
TITLE OF THE COURSE	PRODUCT ENGINEERING & ENTREPRENEURSHIP					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	02	--	--	02	26	02

COURSE OBJECTIVES:

- Experience with a set of tools and methods for product engineering
- Knowledge of the role of multiple functions in creating a new product
- Ability to coordinate multiple, interdisciplinary tasks to achieve a common objective
- Emphasis of specific knowledge from other courses through practice and reflection in an action-oriented setting

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
C01	Identify customer needs and pain points	L1
C02	Generate concept & validate idea	L3
C03	Use design thinking to architect a product	L3
C04	Create a new product/prototype	L3
C05	Pitch the product to Incubation Centres @ DSU	L2

COURSE CONTENT:	
Module-1:	6 Hrs
Introduction, Product Development Process and Organization , Opportunity Identification, Product Planning, Identifying Customer Needs	
Module-2:	6 Hrs
Product Specifications , Concept Generation, Lean Thinking, Concept Selection, Concept Testing, Value on Product Development, Waste in Product Development	
Module-3:	6 Hrs

Product Architecture, Industrial Design, Design for Environment, Design for Manufacturing and Supply Chain	
Module-4:	4 Hrs
Prototyping, Robust Design, Patents and Intellectual Property, Service Design, Product Development Economies, Product Management	
Module-5:	4 Hrs
Business Plan, Business Model Canva	

PROJECT DELIVERABLES

1. Proposal Handout & Presentation
 - a. The Problem
 - b. Need
 - c. Existing Alternatives
 - d. Potential Market
2. Wireframe Sketches, Target Specifications
 - a. List Critical Customer Needs
 - b. For a., Prepare a List of Target Specifications
 - c. Prepare Wireframe
3. Create App/Website
4. Business Model
5. Register your business

TEXT BOOKS:

1. Ulrich Karl T, Eppinger Steve D., and Yang, Maria C., Product Design and Development, 7th Edition, McGraw-Hill Education 2020
2. Robin McKenzie, Design Theory: An Introduction for Product Design and Engineering, 1st Edition, July 2014

REFERENCE BOOKS

1. Pessoa, Marcus, Trabasso, Luis Gonzaga, The Lean Product Design and Development Journey – A Practical View, Springer International Publishing, 2017
2. Ali Jamnia, Introduction to Product Design and Development for Engineers, 1st Edition, CRC Press, June 2018
3. Product Design and Development, MIT Open Courseware - <https://ocw.mit.edu/courses/sloanschool-of-management/15-783j-product-design-and-development-spring-2006/index.htm>

SEMESTER	V					
YEAR	III					
COURSE CODE	15CT371					
TITLE OF THE COURSE	OPERATING SYSTEMS LAB					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	-	-	2	-	-	1

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
*	**	***	*****

COURSE OBJECTIVES:

- To learn creating process and Threads
- To implement various CPU Scheduling Algorithms
- To implement Process Creation and Inter Process Communication.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To implement Page Replacement Algorithms
- To implement File Organization and File Allocation Strategies

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Implement System Calls	L2
CO2	Compare the performance of various CPU Scheduling Algorithms	L3
CO3	Analyze Deadlock avoidance and Detection Algorithms	L3
CO4	Imple	
CO5	Create processes and implement IPC	L2
CO6	Analyze the performance of the various Page Replacement Algorithms	L3
CO7	Implement File Organization and File Allocation Strategies	L2

List of Laboratory/Practical Experiments activities to be conducted		
Exp. No	Division of Experiments	List of Experiments
1	System Calls	Write a C program to create a new process that exec a new program using system calls fork(), execlp() & wait()
2		Write a C program to display PID and PPID using system calls getpid () & getppid ()
3		Write a C program using I/O system calls open(), read() & write() to copy contents of one file to another file
4	Process Management	Write a C program to implement multithreaded program using pthreads
5		Write C program to simulate the following CPU scheduling algorithms a) FCFS b) SJF c) Priority d) Round Robin
6	Process synchronization	Write a C program to simulate producer-consumer problem using semaphores
7	Deadlock	Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.
8		Write a C program to simulate deadlock detection.
9	Memory Management	Write a C program to simulate paging technique of memory management
10		Write a C program to simulate page replacement algorithms a) FIFO b) LRU c) LFU
11	I/O System	Write a C program to simulate the following file organization techniques a) Single level directory b) Two level directory
12		Write a C program to simulate the following file allocation strategies. a) Sequential b) Indexed

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 8th edition, Wiley-India, 2010

REFERENCES:

1. Operating Systems-Internals and Design Principles, William Stallings, 6th Edition, Pearson Education, 2009.
2. Operating Systems: A Modern Perspective, Gary J. Nutt, Addison-Wesley, 1997

SEMESTER	V					
YEAR	III					
COURSE CODE	19CT3501					
TITLE OF THE COURSE	IDEA GENERATION & VALIDATION					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	01	--	--	03	16	01

COURSE OBJECTIVES:

- Generate, develop, and pitch innovative new venture ideas
- Evaluate the attractiveness and feasibility of new venture opportunities
- Analyze industries, markets, and competitors

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Generate, develop, and pitch innovative newventure ideas	L3
CO2	Analyze industries, markets, and competitors	L3
CO3	Evaluate the attractiveness and feasibility of newventure opportunities	L3

COURSE CONTENT:

Process of Idea Generation; Problem Identification, Idea formation, Idea Generation Techniques: Brainstorming, Mind Mapping, Story Boarding, Attribute Listing, Idea Validation and Risk Assessment

List of Laboratory/Practical Experiments activities to be conducted (if any) :

Get out of the Building Exercise – Meet at least 20 persons in your targeted segment and understand their pain points and propose ideas that may solve their problems.
Discuss with mentors and zero in on one idea.
Make a hand drawn functional sketch of the proposed solution
Idea Validation with potential customers - Meet at least 20 customers and validate the proposed idea with them.
Prepare a comprehensive report, highlighting the learnings and the implications on the proposed solution and pivots (if any).

TEXT BOOKS :

1. Kotter, J.P. and Whitehead, L.A. (2010). Buy-In: Saving Your Good Idea from

GettingShot Down.

2. Belsky, S. (2010). Making Ideas Happen: Overcoming the Obstacles between Visionand Reality.

SEMESTER	V					
YEAR	III					
COURSE CODE	19CT3512					
TITLE OF THE COURSE	CREATIVE CODING					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	02	--	02	--	39	02

COURSE OBJECTIVES:

- The fundamentals of computational thinking applied through p5.js
- Best practices for designing software within an event-driven, object-oriented, real-timeframework
- How to ideate, conceptualize, and design original creative works in the medium ofsoftware

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's TaxonomyLevel
CO1	Examine fundamentals of computational thinking	L2
CO2	Write scripts using p5.js	L3
CO3	Ideate, conceptualize, and design original creative works	L3

COURSE CONTENT:	
MODULE 1	
7 Hrs	
Computational Thinking: Overview, Stages, Cornerstones, Pillars, Expressing and Analyzing Algorithms, Concepts of Computational Thinking, Techniques Associated withComputational Thinking, Computational Thinking in a Classroom	
MODULE 2	
7 Hrs	
p5.js: Overview, Creative Graphics & Interactive Experiences, p5.js Web Editor, p5.js and Processing, Using a Local Server, First Sketch, Color, Constants, DOM, Data, Environment, Events, Foundation, I/O, Image, Lights, Camera, Math, Rendering, Shape	
MODULE 3	
8 Hrs	

p5.js-contd: node.js and socket.io, 3D/WebGL, Coordinate System and Shapes, Structure, Transform, Typography, Anatomy of Functions, Built-in p5.js Functions, Touch, UnitTesting and Test-Driven Development	
MODULE 4	8 Hrs

p5.js – Advanced Data, Sound, Mobile – Acceleration Ball Bounce, Simple Draw, Acceleration Color, Shake Ball Bounce, Titled 3D Box, p5.js libraries, Linking p5.js toHTML file
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MODULE 5	9 Hrs
p5.ble.js – Overview, Introduction to Arduino and Bluetooth, Usage, p5.ble.js usingArduino, Bluetooth Le and p5.ble	
p5.bots – Overview, APIs, Servers, Functions	
p5.clickable – Overview, Creating, Moving & Resizing a Clickable, Clickable Events	

List of Laboratory/Practical Experiments activities to be conducted (if any) :
Download and install sketch.js and setup a sketch to handle mouse/touch input.
Setup a sketch to spawn particles with your mouse.
Use three.js to setup a screen with a spinning cube.
Create a web-based VR application made with three.js
How do you update an object's transformation using three.js?
Design an animation system using three.js

TEXT BOOKS:	
1.	Lauren McCarthy, Casey Reas, Ben Fry, Getting Started with p5.js: Making Interactive Graphics in JavaScript and Processing, Maker Media Inc.
2.	Karl Beecher, Computational Thinking: A Beginner's Guide to Problem Solving and Programming, The Chartered Institute for IT

REFERENCES:

- 1 Creative Coding and Data Visualization with p5.js”, Scott Muray, O’Reilly (13 January2017)
- 2 “Processing: Creative Coding and Computational Art”, Ira Greenberg Apress; 2ndPrinting Edition (June 1, 2007)

SEMESTER	VI					
YEAR	III					
COURSE CODE	19CT3601					
TITLE OF THE COURSE	LEAN STARTUP METHODOLOGY					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Project sHours	Total Hours	Credits
	--	--	03	03	36	02

COURSE OBJECTIVES:

- Use the Business Model Canvas innovation tool to approach either a personal or corporate challenge or opportunity.
- Identify and communicate the nine key elements of a business model.
- Explain how to develop a strategic business plan

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
C01	Communicate nine key elements of a Business Model	L1
C02	Use Business Model Canvas Tool	L3
C03	Develop Strategic Business Plan	L3

COURSE CONTENT:

List of Laboratory/Practical Experiments activities to be conducted (if any) :

Build the various elements of the lean model canvas to your business proposition with inputs and data from field survey

Develop key hypothesis for your proposed solution

Work with founders to finalize the business model

TEXT BOOKS:

1.	Timmons, Jeffry A. and Spinelli, Stephen Jr. (2009). New Venture Creation: Entrepreneurship for the 21st Century, 8th edition. McGraw-Hill Irwin, Boston. Chapter 3
2.	Lindsay, Noel (2010). Business Plan Template

SEMESTER	VI					
YEAR	III					
COURSE CODE	19CT3511					
TITLE OF THE COURSE	DATA DRIVEN DECISION MAKING					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	--	--	02	02	30	02

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
1	III/II	19CS2302	COMPUTATIONAL THINKING WITH PYTHON

COURSE OBJECTIVES :

- To perform data cleaning & pre-processing on real-time datasets
- To work on live projects on modelling data
- To visualize data

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
C01	Write programs to clean and pre-process data	L3
C02	Write programs to process and model data	L3
C03	Derive insights from data through data visualization and storyboarding	L3

COURSE CONTENT:	
MODULE 1	
Overview, Data Science Lifecycle and Process , Types of Analytics, Making Business-Defined Decisions using Data Analytics, Steps to Clean and Pre-process Data, Data Processing Techniques, Data Modelling, Ensemble Models	6 Hrs
MODULE 2	
	6 Hrs

Cleaning and Data Pre-processing

Scrapy – Linear Algebra, Integration, Calculus, Ordinary Differential Equations, SignalProcessing

NumPy – Basic Array Operations (Multiply Slice, Flatten, Reshape, Index Arrays), Advanced Array Operations (Stack, Split, Broadcast), Linear Algebra Pandas – Indexing, Manipulating, Renaming, Sorting, Merging Data Frame, Impute Missing Files, Handle Missing Data

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MODULE 3	6 Hrs
Data Processing - Statsmodels – Linear Regression, Correlation, Ordinary Least Squares,	

Survival Analysis, Generalized Linear Models, Bayesian Models, Univariate and Bi-variate Analysis, Hypothesis Testing

MODULE 4	6 Hrs
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Modelling
Scikit-Learn – Classification (Spam Detection, Image Recognition), Clustering (DrugResponse, Stock Price), Regression (Customer Segmentation, Grouping Experiment Outcomes), Decision Tree, K-NN and Naïve Bayes

MODULE 5	6 Hrs
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Data Visualization
Matplotlib – Line Plots, Scatter Plots, Area Plots, Bar Charts & Histograms, Pie Charts, Stem Plots, Contour plots, Quiver Plots, Spectrograms
Seaborn – Correlation, Aggregate Statistics, Uni-Variate & Bi-Variate Distributions, Linear Regression Models, Multi-Plot Grids

List of Laboratory/Practical Experiments activities to be conducted (if any) :
Considering any data set apply the functionalities of pandas like merging sorting, indexing, and manipulating.
Consider any data set and apply data pre-processing methods like identifying missing data and filling missing data.
Write a program for Sales prediction using linear regression analysis. Dataset.
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 anew sample.
Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Calculate the accuracy, precision, and recall for your data set.
Write a program to implement k-means clustering algorithm to predict iris flower species.

TEXT BOOKS :

1. Cathy O'Neil and Rachel Schutt, Doing Data Science, O'Reilly Publications, 2014.
2. Han, Kambar and Pei, Data Mining Concepts and Techniques, MK Publications, 3rd Edition.

REFERENCES :

- 1 Data Pre-Processing <https://scikit-learn.org/stable/modules/preprocessing.html>
- 2 Python Data Science Handbook:

<https://tanthiamhuat.files.wordpress.com/2018/04/pythondatasciencehandbook.pdf>

SEMESTER	VI					
YEAR	III					
COURSE CODE	19CT3612					
TITLE OF THE COURSE	HUMAN COMPUTER INTERACTION					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	--	--	02	02	30	02

COURSE OBJECTIVES:

- Illustrate overall goals of human-computer interaction.
- Map relationship between HCI, user experience design, human factors engineering, and psychology.
- Discuss trends in HCI technology including virtual reality, augmented reality, and robotics.
- Elaborate the role of design principles and heuristics in user interface design.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
C01	Map relationship between HCI, user experience design, human factors engineering, and psychology.	L2
C02	Analyze the use of HCI to domains like healthcare, education, and cybersecurity.	L3
C03	Discuss trends in HCI technology including virtual reality, augmented reality, and robotics.	L3
C04	Explore emerging ideas in HCI research, such as context-sensitive computing, gesture-based interaction, and social computing.	L3

COURSE CONTENT:

MODULE 1		6 Hrs
Introduction, Design Principles and Feedback Cycles, Direct Manipulation & Invisible Interfaces, Human Abilities, Design Principles and Heuristics		
MODULE 2		6 Hrs
Characteristics of Interaction Design, Digital Materials and Interaction Design, Contextual Design – Overview, Key Principles, Process, Task-Artifact Cycle, GOMS Model		
MODULE 3		6 Hrs

Unity 3D – Basics of C#, Variables, Functions, Logic & Operators, Inheritance, Class Constructors, Arrays, Overview, Unity 3D for HCI, Asset Workflow, Creating Gameplay, Importing Models, Input – Input Manager, Mobile Device Input, Unity XR Input	
MODULE 4	6 Hrs
Graphics – Render Pipeline, Visual Effects Components, Optimizing Graphics Interfaces – Unity UI, Immediate Mode GUI, Navigation and Pathfinding, 3D Physics for Object-Oriented Projects	
MODULE 5	6 Hrs
Overview of JavaScript for Unity, Starting with Coding Physics, Using Advanced Physics Concepts, Particle Emitters and Special Effects, Enhancing User Experience: GUI & Sound	

TEXT BOOKS:	
1.	Andrew Monk, Fundamentals of Human-Computer Interaction, 1st Edition, , Academic Press, 28th January 1985
2.	Alan DIX, Janet Finlay, Gregory D. Abowd, Russell Beale, Human-Computer Interaction

REFERENCES:	
1	Learning C# Programming with Unity 3D, Alex Okita, 1st Edition, CRC Press, Routledge; 1 Edition
2	Learning Unity 3D Programming with Unity Script: Unity's JavaScript for Beginners, Janine Suvak, Technology in Action, Apress; 1st ed. edition

SEMESTER/YEAR	SEMESTER/YEAR : IV SEM
COURSE CODE	: 16CT272
TITLE OF THE COURSE	: MICROPROCESSOR AND APPLICATIONS LAB
L: T/A:P: C	: 0 : 0: 4 :2

Course Objectives

1. To introduce microprocessors and basics of system design using microprocessors.
2. To introduce h/w architecture, instruction set and programming of 8086microprocessor
3. To introduce the peripheral interfacing of microprocessors.
4. To introduce the h/w architecture, instruction set, programming and interfacing of8051 microcontroller

Course outcomes

At the end of the course student will be able

1. To Know the basics of system design using microprocessors.
2. To implement the h/w architecture, instruction set and programming of 8086microprocessor.
3. To implement peripheral interfacing of microprocessors.
4. To know the h/w architecture, instruction set, programming and interfacing of8051and ARM 9microcontrollers

Lab experiments based on the following:

- a) Programming experiments to implement software programs using stacks and queues.
- b) Programming experiments to implement software programs using linked lists
- c) Programming experiments to implement software programs on bit operations
- d) Programming experiments to implement software programs using arithmetic operations
- e) Programming experiments to implement software programs - searching and sorting
- f) Interface ADC to microprocessor kit
- g) Interface DAC to microprocessor kit
- h) Interface Logic Controller to microprocessor kit
- i) Interface Stepper motor to microprocessor kit
- j) Interface Additional Keyboard and display units to microprocessor kit
- k) Interface 2 compatible devices

Note: Along with the normal experiments students will also work on an end-to-end experiment group wise and demonstrate the same.

SEMESTER/YEAR : IV SEM
COURSE CODE : 16CT282
TITLE OF THE COURSE : MINI PROJECT
L: T/A:P: C : 0 : 0: 4:2

Course Objectives

1. This Project course is designed to provide a platform for the students to convert their business idea into a business plan.
2. Students will work on the parts/components of their individual projects on the advice of their respective mentors.

Course outcomes

Implementation of selected parts/components of the project.

SEMESTER/YEAR : V SEM
COURSE CODE : 16CT301
TITLE OF THE COURSE : OPERATIONSRESEARCH
L:T/A:P:C : 3 : 2: 0 :4

Course objectives

1. Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry;
2. Skills in the use of Operations Research approaches and computer tools in solving real problems in industry;
3. Mathematical models for analysis of real problems in Operations Research.

Course outcomes

1. Recognize the importance and value of Operations Research and mathematical modeling in solving practical problems in industry;
2. Formulate a managerial decision problem into a mathematical model;
3. Understand Operations Research models and apply them to real-life problems;
4. Use computer tools to solve a mathematical model for a practical problem.

Module 1

OVERVIEW OF OPERATIONS RESEARCH: OR MODELS – (8 hours)

OR TECHNIQUES.

Linear Programming: Introduction – Graphical solution; Graphical sensitivity analysis – The standard form of linear programming problems – Basic feasible solutions - unrestricted variables – simplex algorithm – artificial variables – Big M and two phase method – Degeneracy - alternative optima – unbounded solutions – infeasible solutions.

Module 2

DUAL PROBLEMS (10 hours)

Relation between primal and dual problems – Dual simplex method
Transportation model – starting solutions. North West corner Rule - lowest cost method
–Vogel's approximation method – Transportation algorithms – Assignment problem – Hungarian Method.

Module 3

NETWORK MODELS AND INTEGER PROGRAMMING (8 hours)

Network Models : Definitions – CPM and PERT – Their Algorithms.
Integer Programming : Branch and Bound Algorithms cutting plane algorithm.

Module 4

DYNAMIC PROGRAMMING (10 hours)

Recursive nature of dynamic programming – Forward and Backward Recursion,

Module 5

DETERMINISTIC INVENTORY MODELS (10 hours)

Deterministic Inventory Models : Static EOQ Models – Dynamic EOQ models.

Game theory: Two person Zero Sum Games – Mixed strategy games and their Algorithms.

Text Books:

1. Taha, Hamdy A. Operations Research: An Introduction. Pearson Education India, 1982.
2. Introduction to Operations Research by HILLIER/LIEBERMAN, Tata McGraw Hill

Reference Books:

1. Operations Research by R Panneerselvan, Prentice Hall of India.
2. Winston, Wayne L., and Jeffrey B. Goldberg. Operations research: applications and algorithms. Vol. 3. Belmont, CA: Duxbury press, 2004.

SEMESTER/YEAR : V SEM
COURSE CODE : 16CT304
TITLE OF THE COURSE : PROFESSIONAL AND BUSINESS ETHICS
L: T/A:P: C : 3 : 2: 0 : 4

Course objectives

1. To make students understand the meaning of good ethics, doing things right and the obstacles to making good ethical decisions
2. To enable students to identify and critically assess the principles and values they personally embrace and use in addressing the ethical issues which arise in their working lives.
3. To acquaint students with some of the major kinds of ethical problems encountered while performing work assignments and some possible ways of responding to them

Course outcomes

1. Reflect on ethical and sustainable business practices
2. Understand the role of ethics in all function areas of business including management, marketing, international business, human resources, finance, and accounting
3. Discuss the most pressing issues confronting business leaders today

Module 1

Ethics in general

(8 hours)

Introduction, Needs, Principles, Laws & Ethics; Development of Personal Ethics, Workplace Ethics for Employees-Ethical behavior in workplace- Ethical violations by employees, Employee Attitude and Ethics, Employee Etiquettes. Benefits of ethics - employee commitment, investor loyalty, customer satisfaction, profits
Case study.

Module 2

Professionalism

(10 hours)

Unethical Conduct for employees and employers. Factors leading to Unethical Behaviors'. Different unethical behaviors. Measures to control unethical behaviours. Rewarding ethical behavior
Case study.

Module 3

Business Ethics and Corporate Governance

(8 hours)

Overview of Business Ethics, Corporate Governance, Ethical issues in human resource management- The principal of ethical hiring, Firing, worker safety, whistle blowing, Equality of opportunity, Discrimination, Ethics and remuneration, Ethics in retrenchment. Ethical Dilemmas at workplace, Ethical issues in global business, corporate responsibility of employers. Introduction to SEBI corporation and role of government.
Case study.

Module 4

Workplace Privacy & Ethics

(10 hours)

Watching what you say and what you do in the workplace, Hardware, Software and Spyware, Plagiarism and Computer Crimes, Convenience and Death of Privacy, Defense of employee privacy rights.

Case study.

Module 5

Teamwork in the Workplace & Ethics

(10 hours)

Teams, Elements of team, Stages of team development, team meetings, team dynamics, team rules, and teams work and professional responsibility, rules of professional responsibility, ASME code of ethics.

Case study.

Text Books:

1. Ethical Theory and Business, 8th Edition, Tom L. Beauchamp, Norman E. Bowie and Denis Arnold
2. Business Ethics, 9th Edition, O.C. Ferrell, John Fraedrich, and Linda Ferrell, Cengage Learning.

Reference Books:

1. How technology is compromising Workplace Privacy, Fredrick S Lane 111, AMACOM Div American Mgmt Assn, 2003
2. Ethics in the Workplace, Dean Bredeson, Keith Goree, Cengage Learning, 2011.
3. Ethics in 21st Century, Mary Alice Trent, Oral Roberts University, Longman.
4. Ethics in workplace, Elizabeth P Tierney, Oak tree press
5. Ethics in Workplace: System Perspective, William F Roth, Pearson, 2014.

SEMESTER/YEAR : V SEM
COURSE CODE : 16CT321
TITLE OF THE COURSE : CRYPTOGRAPHY
L:T/A:P:C : 3 : 0: 0 : 3

Course objectives

1. To provide solid foundation of the principal of cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithm.
2. To provide an awareness of network security issues involving standalone computers, locally networked computers and remotely networked computers.
3. Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.

Course outcomes

1. Identify common network security vulnerabilities/attacks
2. Apply effective cryptographic techniques for information security.
3. Critically evaluate the risks and threats to networked computers.
4. Identify the appropriate procedures required to secure networks.

Module 1

INTRODUCTION

(8 hours)

Introduction: Computer Security concepts, The OSI Security Architecture, Security Services, Mechanisms and Attacks, A Model of Network Security.

SYMMETRIC CIPHERS: Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor machine, Steganography. Block Cipher and the Data Encryption Standard: Block Cipher Principles, The Data Encryption Standard, **DES Example**, Strength of DES, Differential and Linear Cryptanalysis.

Module 2

SYMMETRIC CIPHERS

(10 hours)

Block Cipher Operation: Multiple Encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback Mode, Output feedback Mode, Counter Mode.

Pseudorandom Number Generation and stream ciphers: Principles of Pseudorandom Number Generation, Pseudorandom Number Generators, Pseudorandom Number Generation using a block cipher, Stream cipher, RC4.

Module 3

NUMBER THEORY

(8 hours)

Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality.

PUBLIC-KEY CRYPTOGRAPHY AND RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm. Diffie-Hellman Key Exchange.

CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS: Cryptographic Hash Functions: Applications of Cryptographic hash functions, Two simple hash Functions, Secure Hash Algorithm.

Module 4

MESSAGE AUTHENTICATION

(10 hours)

Authentication Requirements, Authentication Functions, Message Authentication Codes, Security of MACs, MACs based on Hash Functions: HMAC.

DIGITAL SIGNATURES: Digital Signatures, Digital Signature Standard.

KEY MANAGEMENT:

KEY MANAGEMENT AND DISTRIBUTION: Symmetric Key distribution using symmetric encryption, Symmetric Key distribution using Asymmetric encryption, Distribution of public keys, X.509 certificates, Kerberos.

Module 5

TRANSPORT-LEVEL AND INTERNET SECURITY

(10 hours)

Transport level security: Web Security considerations, Secure Sockets Layer and Transport Layer Security. Transport Layer Security. HTTPS, Secure Shell.

Internet security: Electronic Mail Security: Pretty Good Privacy,

S/MIME. IP Security: Overview, IP Security Policy.

Text books:

1. William Stallings, Cryptography and Network Security, Fifth Edition, Prentice Hall of India, 2005
2. Behrouz Ferouzan, Cryptography and Network Security, Tata Mc Graw Hill, 2007.

Reference Books:

1. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in a Public World, Second Edition, Pearson Education Asia, 2002.
2. Atul Kahate, Cryptography and Network Security, Tata Mc Graw Hill, 2003.

SEMESTER/YEAR : VI SEM
COURSE CODE : 16CT306
TITLE OF THE COURSE : AUTOMATA, LANGUAGES & APPLICATIONS
L:T/A:P:C : 3 : 2: 0 : 4

Course objectives

1. Understand basic properties of formal languages and formal grammars
2. Understand basic properties of deterministic and nondeterministic finite automata
3. Understand the relation between types of languages and types of finite automata
4. Understand basic properties of Turing machines and computing with Turing machines

Course outcomes

1. Explain the concepts of automata theory and formal languages, Design the finite automata, show the equivalence and minimization of the automata by applying the appropriate method.
2. Explain regular expressions, state and show its properties, apply the pumping lemma property to prove a language is not regular, Design the regular expression and show the equivalence with finite automata.
3. Explain and design Context Free Grammars (CFG) and apply the concept of parse trees to show the ambiguity of CFGs. Analyze and modify the CFGs to normal forms.
4. Explain, Design and show the working of Push Down Automata (PDA), equivalence of PDAs and its variants and PDAs with CFGs by applying proper method, State and show the closure properties of Context Free Languages.
5. Explain, Design and show the working of Turing Machine and its variants, Explain the hierarchy of formal languages and automata.

Module 1

Introduction to Finite Automata (8 hours)

The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata; An Application : Text search; Finite automata with Epsilon-transitions; Equivalence and Minimization of Automata- Testing equivalence of states, Testing equivalence of regular languages, Minimization of DFA's.

Module 2

Regular expressions (10 hours)

Finite Automata and Regular Expressions- From DFA's to Regular Expressions, Converting DFA's to Regular expressions by eliminating states, Converting regular expressions to automata; Application of Regular Expressions, Properties of Regular languages- Proving languages not to be regular languages; Closure properties of regular languages- Boolean operations, reversal, homomorphisms.

Module 3

Context-Free Grammars and Languages

(8 hours)

Context –free grammars; Parse trees- Constructing Parse Trees, The yield of a parse tree; Applications of Context Free Grammars, Ambiguity in grammars and languages- Ambiguous grammars, Leftmost derivation as a way to express ambiguity, Inherent ambiguity. Simplification of CFG's and Normal forms. Nature language processing.

Module 4

Pushdown Automata and Properties of Context-Free Languages

(10 hours)

Pushdown Automata: Definition of the Pushdown automata; The languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata- Definition of a DPDA.

Properties of Context-Free Languages: The pumping lemma for CFLs; Closure of CFLs.

Module 5

Introduction To Turing Machine

(10 hours)

The Turing Machine: Notation for the TM, Instantaneous Descriptions for the TM, Transition diagrams for the TM, The Language of a TM, TM and Halting; A hierarchy of Formal Languages and Automata- Definitions of Recursive and Recursively Enumerable Languages, Definition of Unrestricted Grammars, Definition of Context Sensitive Grammars and Languages, Chomsky hierarchy.

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson education, 2007
2. Peter Linz, An Introduction to Formal Languages and Automata, 4th edition, Narosa publication

Reference Books:

1. John C Martin, Introduction to Languages and Automata Theory, 3rd Edition, Tata McGraw-Hill, 2007

SEMESTER/YEAR	: VI SEM
COURSE CODE	: 16CT372
TITLE OF THE COURSE	: COMPUTER NETWORKS LAB
L: T/A:P:C	: 0 : 0 : 4 : 2

Software Required: NS2 simulator, Wireshark and ANSI C

List of **Applications/Experiments based on** the following programs/techniques:

Part 1 NS2

1. Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate a four node point-to-point network with the link connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1 n3. Apply relevant application over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.
3. Simulate the different types of Internet traffic such as FTP and TELNET over a network and analyze the throughput.
4. Simulate an Ethernet LAN using n nodes (6-10), change error rate and data rate and compare the throughput.
5. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and determine the collision across different nodes.

Part 2 Wireshark

- i. Identify the first 2 packets (i.e. their packet numbers) containing HTTP GET request.
- ii. List the source and destination ports of the packets travelling from the client to the server in the above packets?
- iii. In the HTTP server's response, look at the information sent about the server. What server software was used?
- iv. What are the IP addresses of the server?
- v. What are the MAC addresses of the client and server?
- vi. What is the time difference between first HTTP GET and the first HTTP response (OK)?
- vii. Count the total number of HTTP GET requests.
- viii. What is the time difference between the first and last HTTP GET requests?

Part 3 Using C

1. Write a program for error detecting code using CRC-CCITT (16-bits).
2. Write a program for distance vector algorithm to find suitable path for transmission.
3. Write a program for congestion control using Leaky bucket algorithm.
4. Write a program for simple RSA algorithm to encrypt and decrypt the data.
5. Using TCP/IP sockets, write a client-server program to make client sending the filename and the server to send back the contents of the requested file if present.

SEMESTER/YEAR : VI SEM
COURSE CODE : 16CT382
TITLE OF THE COURSE : MINIPROJECT
L: T/A:P: C : 0 : 0 : 4 : 2

Course Objectives

1. This Project course is designed to provide a platform for the students to convert their business idea into a business plan.
2. Students will work on their individual ideas and come up with the business plan for the given area of interest with the help of their mentor and implement a part/component of the project as advised by the mentor.

Course outcomes

Business plan and a part/component of the project work.

SEMESTER/YEAR : 7TH SEM
COURSE CODE : 16CT471
TITLE OF THE COURSE : CLOUD COMPUTING & APPLICATIONS
L: T/A: P: C : 3:2:0:4

COURSE OBJECTIVES:

1. Understand various basic concepts related to cloud computing technologies
2. Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS
3. Understand the applications of Cloud Computing

COURSE OUTCOMES:

1. Define Cloud computing and characteristics
2. Describe benefits and drawbacks of Cloud computing
3. Explain various types of virtualization and capacity planning metrics
4. Discuss various types of cloud services
5. Discuss Cloud Security and various challenges

MODULE1- INTRODUCTION

10Hrs

Basics of cloud computing, Cloud Computing Models (PaaS, SaaS, IaaS), Understanding Public Clouds, Private Clouds, Community Cloud and Hybrid Clouds, Cloud Computing Benefits and risks, Cloud Computing Challenges, Cloud Computing Architecture and Virtualization.

Overview of Cloud Computing techniques (Grid Computing, Cloud Computing, Utility Computing, Fog Computing).

MODULE 2 – CLOUD VIRTUALIZATION TECHNOLOGY

8Hrs

Introduction, why virtualization, virtualization benefits, application virtualization, virtual machine, desktop virtualization, server virtualization, storage virtualization, implementing virtualization, Hypervisor.

MODULE 3 – ACCESSING THE CLOUD AND MIGRATING TO THE CLOUD

8Hrs

Accessing the Cloud: Platforms, web applications framework, web hosting service, web APIs, web browsers.

Migrating to the Cloud: Broad approaches to migrating into the cloud, the seven-step model of migration into a cloud.

MODULE 4-CLOUD ISSUES

8Hrs

Stability, quality, longevity, business continuity, service level agreements, security in the cloud, cloud authentication, cloud filtering, regulatory issues and accountability.

MODULE 5- CLOUD APPLICATIONS

8Hrs

Cloud Platforms in Industry: Amazon Web Services, Google AppEngine, Microsoft Azure. Cloud Applications: Scientific Applications (Healthcare: ECG Analysis in the Cloud) and Business and Consumer Applications (Social Networking, Media Applications)

Text Books

Module 1 & 5:

Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud.
Computing McGraw Hill Education

Module 2:

- Cloud Computing, Dr. Kumar Saurabh, Wiley Publications, 2012
- Guide to Cloud Computing, Richard hill, Springer Publications,

2013 Module 3:

- Cloud Computing A Practical Approach, Anthony T Velte et.al, MC Graw Hill publications, 2014
- Cloud Computing Principles and Paradigms, Rajkumar Buyya et.al, Wiley Publications, 2015

Module 4:

- Cloud Computing Technologies and Strategies of the Ubiquitous data center, Brain J.S et.al, CRC Press, 2014

SEMESTER/YEAR : 7TH SEM
COURSE CODE : 16CT402
TITLE OF THE COURSE : PRODUCT AND BRAND MANAGEMENT
L: T/A: P: C : 3:0:0:3

COURSE OBJECTIVES:

1. Understand Product management framework and its life cycle
2. Understand the purpose of branding and its rationale for the application
3. Understand the process and methods of brand management
4. Formulate effective branding strategies for both consumer and business products/services

COURSE OUTCOMES:

1. Acquire knowledge of Product Life cycle
2. Key principles of branding
3. Branding concepts and ideas
4. Understand and conduct the measurement of brand equity and brand performance
5. Practically develop a brand, including positioning and communication

MODULE 1 - PRODUCT MANAGEMENT FRAMEWORK 9Hrs

Product Marketing and Economy: Marketing and Society, The Creative Art, Trends and Indications.

Customer Purchase Process: Market Segmentation, Socio-cultural Segmentation, Organisational Buying Behaviour, Consumer Behaviour-Postivism and Intrepretivism.

MODULE 2 - PRODUCT LIFE CYCLE 9Hrs

Introduction New Products and Product Life cycle. New products, products positioning, managing across the product Life cycle(PLC), Strategies for the Maturity Stage of product, Life Cycle, GE Model

Product Plans: Introduction, Product Related Analysis, Competitive Analysis, Product Innovations and Product, Marketing Planning Process, Competition and Product Development process, Segmentation and positioning, product life cycle, total customer management

MODULE 3 - BRANDING PROCESS 9Hrs

Importance of creating powerful brands: importance of brand, building successful brand, Branding process: concepts of brand, characteristics of brands, brands as relationship builders, historical evolution of brands, brand evolution, brand categorization, value of brands to manufacturers, distributors and consumers. Importance of brand planning, the issues influencing brand potential.

MODULE 4 - BRAND MANAGEMENT 10Hrs

Business to business branding; who buys brands, the organizational buying process, brand values in industrial branding, brands as relationship builders, factors influencing brand selection, providing organizational buyers with brand information, the company as a brand.

Service brands: the importance of services, the challenges of services branding, moving beyond the fast-moving consumer goods model, the process of building and sustaining

powerful services brands, the distinctive nature of services, branding to make tangible the intangible, building service brand equity.

MODULE 5 -WINNING THE BRANDS BATTLE

9Hrs

HOW POWERFUL BRANDS BEAT COMPETITORS: Brands as strategic devices, cost driven or value added brands, identifying and focusing brands competitive advantage, anticipating a competitor response, brand share, striving for profitable brands, characterizing successful brands, should a company build brands or buy brands?, extending brands.

Case studies

Text Book

Module 1, 2

1. UC Mathur, PRODUCT AND BRAND MANAGEMENT, Excel books New Delhi. 2007

Module 3, 4, 5

2. Leslie de Chernatony & Malcolm McDonald, Creating Powerful Brands, Elsevier publications,

Case studies

3. Philip Kotler, Ingredient Branding making the invisible visible, Springer publications, 2010
4. UC Mathur, PRODUCT AND BRAND MANAGEMENT, Excel books New Delhi. 2007

Reference Books

1. Philip Kotler, B2B brand management, Springer, New Delhi, 2006
2. A.K. Chitale and Ravi Gupta, PRODUCT POLICY AND BRAND MANAGEMENT, PHI Learning, 2013

SEMESTER/YEAR	: VII SEM
COURSE CODE	: 19CT3611
TITLE OF THE COURSE	: MACHINE LEARNING
L: T/A: P: C	: 3 :0: 2 :4

COURSE OBJECTIVES:

1. To know about basic concepts of Machine Learning
2. To obtain a thorough knowledge of various Machine learning techniques and their representation schemes
3. To study about Evaluating Hypothesis
4. To have an overview of various Machine Learning applications

COURSE OUTCOMES:

1. Technical knowhow of Machine Learning applications, heuristics, Knowledge representation Systems,
2. To Acquire knowledge of various Machine Learning techniques

MODULE1 - Introduction and Concept Learning 6 hrs

Introduction: Well Posed Learning Problems, Designing a Learning System, Perspectives and Issues in Machine Learning.

Concepts Learning and the General-to-Specific Ordering: Concept Learning Task, Concept Learning as Search, Find-S, Version Spaces and the CANDIDATE ELIMINATION Algorithm and Remarks, Inductive Bias.

MODULE 2 - Decision Tree Learning and Artificial Neural Networks 10hrs

Decision Tree Learning: Representations, Appropriate Problems for Decision Tree Learning, Basic Decision Tree Learning, Hypothesis Space Search, Inductive Bias and Issues in Decision Tree Learning.

Artificial Neural Networks: Introduction, Representations, Appropriate Problems for Artificial Neural Networks, Perceptrons, Multilayer Networks and the BACKPROPAGATION Algorithm and Remarks. Illustrative Example: Face Recognition, Advanced topics in Artificial Neural Networks.

MODULE 3 - Evaluating Hypothesis and Bayesian Learning 9hrs

Evaluating Hypothesis: Estimating Hypothesis Accuracy, Basics of Sampling General Approach for Deriving Confidence Intervals, Difference in Errors of Two Hypothesis, Comparing Learning Algorithms.

Bayesian Learning: Bayes Theorem and Concept Learning, Maximum Likelihood and Least Squared Error Hypothesis, Maximum Likelihood Hypothesis for Predicting Probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier.

MODULE 4 - Instance Based Learning and Genetic Algorithms 9hrs

Instance Based Learning: K-NEAREST NEIGHBOR Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning.

Genetic Algorithms: Motivation, Genetic Algorithms, Hypothesis Search Space, Genetic Programming, Models of Evolution and Learning, Parallel Genetic Algorithm.

MODULE 5 - Learning Set of Rules and Analytical Learning

9hrs

Learning Set of Rules: Sequential Covering Algorithms, Learning Rule Sets, Learning First Order Rules, FOIL, Induction as Inverted Deduction, Inverting Resolution.

Analytical Learning: Introduction, Learning with Perfect Domain Theories, Remarks Explanation Based Learning, Explanation Based Learning of Search Control

Text Books

1. Thomas M. Mitchell, Machine Learning, McGraw-Hill, Inc. New York, ISBN:0070428077 9780070428072

Reference Books

1. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; second edition, 2009

SEMESTER/YEAR : 7TH SEM
COURSE CODE : 16CT446
TITLE OF THE COURSE : TEAM DEVELOPMENT & LEADERSHIP
L: T/A: P: C : 3:0:0:3

Course Objectives

The Syllabus covers the following ideas and concepts of importance that are required in the day to day work of Engineers.

1. To provide basic understanding the concepts of team, team work, group dynamics in accomplishing organizational goals.
2. To brief the importance of virtual teams in the context of globalization.
3. Precise the various leadership theories by Stephen Covey, Robin Sharma, Max Landsberg, Warren Bennis and Burt Nanus.
4. Propagate the ideas to Enlightens students with the challenges of leadership in the corporate world.
5. To discover the emerging issues in leadership including strategic leadership, leaders of public well being, leaders in recession and downturn and leaders in social enterprise. Express ideas with confidence and clarity, supporting persuasive and logical arguments.

Course Outcomes

1. Gain practical knowledge on the importance of team and group dynamics.
2. Better understanding on the operation of virtual teams and challenges of supervision in virtual teams.
3. An in-depth understanding of various theories of leadership.
4. Critical analysis of the role of leader in 21st century.
5. Analyzing the emerging issues of leadership in the globalization era.

MODULE 1- Introduction to Team Work

10 hrs

Meaning of team and Group. Difference between the Team and the Group. Classification of teams. Advantages and Disadvantages of Team work. Shared purpose and Common Goals of Teams. Stages of Team Formation and Team Dissolution. Feedback in Teams. Team Performance curves. Group dynamics and group politics.

MODULE 2 - Operation of teams and Emotional Intelligence

10 hrs

Self Managed Work Teams (SMWT) – meaning, scope, objectives, advantages and disadvantages. Virtual Teams - meaning, scope, objectives, advantages and disadvantages. Challenges of supervision in Virtual Teams. Emotional Intelligence (EI) – meaning, emotional problems in Team Building and how to manage Emotional Intelligence. Daniel Goleman's Theory of Emotional Intelligence and its relevance in Team Building.

MODULE 3- Leadership:**5 hrs**

Meaning, definition, role, significance of leadership in organization.
Differences between Leading, Managing and Entrepreneurship.

MODULE 4 - Leadership theories**10hrs**

The managerial grid, path – goal theory, Leadership Theories propounded by Daniel Goleman, John Adair, Warren Bennis and Burt Nanus, and Stephen Covey. Seven Habits of highly effective people by Stephen Covey. Transactional and Transformational Leadership.

MODULE 5 - Leadership in the 21st Century**4Hrs**

The challenges of leadership in the corporate world Teaching leadership. Differences between leaders and followers. Strategic Leadership and Leadership succession. Change Management and Leadership differences. Leader as a change agent.

Text Books

1. Andrew Dubrin, Leadership, Cengage Learning, 7th Edition, 2012.
2. Dr.B. Ratan Reddy, Team Development & Leadership, Jaico Publishing, Latest Edition

Reference Books

1. Jon R Katzenbach & Douglas K Smith, The Wisdom of Teams, Harper Business, 2003.
2. Hersey Paul & Kenneth Blanchard, Management of Organizational Behaviour, PHI, 10th Edition, 2012.
3. Gary Yukl, Leadership in Organizations, Pearson Education, 8th Edition.
4. Richard L Daft, The Leadership Experience, Cengage Learning, 5th Edition, 2010.
5. Craig Watson, Dynamics of Leadership, Jaico Publishing, 1995.
6. Leadership Through People Skills, TMH.
7. Stephen Robbins, Organizational Behaviour, Pearson Education, 15th Edition, 2013.
8. Fred Luthans, Organizational Behaviour, TMH, 12th Edition, 2012.
9. Mike Woodcock, Team Development Manual, Productivity Press, Chennai
10. Robert Blake & Jane Mouton, Spectacular Team Work, Suchendra Publications, Mumbai, 2003.

SEMESTER/YEAR : 8TH SEM
COURSE CODE : 16CT449
TITLE OF THE COURSE : ADVANCED ORGANIZATIONAL BEHAVIOR
L: T/A: P: C : 3:0:0:3

Course Objectives:

To understand the principles, practices and perspectives in applying the Organizational Behaviour concepts.

Course Outcomes:

To accomplish the course objective by understanding the people – organization relationship.

Module 1 Personality and Motivation: 15 hrs

Concept to Applications – Personality, definition, concept, theories of Gordon Allport, Raymond Cattell & Hans Eysenck; Motivation – definition, concept, X & Y, McClelland, Albert Bandura, Ouchi & Victor Vroom theories.

Module 2 The Perception Processes 8hrs

Nature and importance, definition, Individual Decision Making, Implications in the Organizational Context.

Module 3 Foundations of Group Behaviour 8hrs

Foundations of Group Behaviour: Nature, types, stages, Organizational Context and Decision-making.

Module 4 Conflict 10hrs

Levels-individual, interpersonal, intergroup, organizational. Conflict Resolution
Approaches at various levels, Functional/Dysfunctional skills, including negotiations.

Module 5 Contemporary issues in Organisational Behaviour: 11 hrs

Managing Diversity, Multicultural Organizations, Gender sensitisation, Employee engagement, Stress & Stress Management, Work Life Balance and Employee Assistance Programmes.

Text Books:

1. Stephen P Robbins, Organizational Behaviour, Pearson Education, 15 th Edition, 2013.
2. Fred Luthans, Organizational Behaviour, TMH, 12 th Edition, 2013.

Reference Books:

1. Duane P. Schultz, Psychology and Work Today, Pearson Education, 10th Edition, 2009.
2. Hellerigel et.al. Organizational Behaviour, Cengage Learning, 13th Edition, 2011.
3. Udai Pareek, Understanding Organisational Behaviour, Oxford University Press, 3rd Edition, 2011.
4. Shermerhorn Hunt, Osborn, Organizational Behaviour, John Wiley & Co., 12th Edition, 2013.
5. Gregory Moorehead & Ricky W Griffin, Organizational Behaviour – Managing People and Organizations, Cengage Learning, 9th Edition, 2009.
6. Negotiation Hand book. PHI, 2010.
7. Essentials of Negotiation, HBS, 2003.
8. Hersey Paul and Kenneth Blanchard H, Management of Organizational Behaviour – Utilizing Human Resources, Prentice Hall, 10th Edition, 2012.
9. Seema Sanghi, The Handbook of Competency Mapping, Response Books, 2004.

SEMESTER/YEAR : III SEM
COURSE CODE : 16CT202
TITLE OF THE COURSE : ELECTRONICS CIRCUITS
L: T/A:P: C : 3 : 2 : 0 : 4

Course Objectives

1. Provide students of functional knowledge of analogue electronics to understand the circuitry used in the devices and interface units which they use in systems design.
2. Give students sufficient knowledge of circuits which they will come across in different industry domains.

Course outcomes

At the end of the course student will be able

1. To understand the functionality of diodes and design simple applications.
2. To know the Op-amps and their usage in the design of active filters and data converters.
3. To understand the design of power supply units.

Module 1

Overview of Diodes and transistors, Applications of Diodes-Clipper circuits, Parallel Clippers, series clippers, clamper circuits. **8 hours**

Module 2

Biasing of Transistors, Small signal model (Hybrid Model) of transistor, simplified Hybrid Model, Transistor as an amplifier, analysis of CE amplifier with (i) collector to base bias, and with (ii) an emitter resistance. Feedback amplifiers and transfer gain, transfer function, frequency response and bandwidth. Operational Amplifiers: properties. Op-amp IC 741: **different configurations and applications of op-amps**: voltage summer, comparators. **11 hours**

Module 3

Active Filters: Advantage of active filters, frequency response characteristics of filter, Introduction to Bode Plot, first order low pass Butterworth filter, high pass Butterworth filter, band pass filter. **9 hours**

Module 4

Data Acquisition and Data Converters: Need for Data Acquisition, conversion, ADC, Different Types of ADCs, DAC, different types of ADCs. **8 hours**

Module 5

Regulated Power Supply: Oscillators: Sinusoidal Oscillators, The Wien-Bridge Oscillator, The Colpitts Oscillator, voltage regulators, types of voltage regulators, shunt regulators using op-amp, series regulator using op-amp, three terminal IC regulator, three terminal fixed voltage regulator, boosting regulator output current, three terminal adjustable regulator, SMPS. **9 hours**

Text Books

1. A Malvino, D J Bates, Electronics Principles, 7th Edition, McGraw Hill Education India, 2007.
2. J. Millman, H. Taub and M Prabhakara Rao, Pulse, Digital and Switching Waveforms, 2nd Edition, Tata Mc-Graw Hill Education, 2007.

Reference Books

1. Millmann & Halkias, Integrated Electronics, Tata Mc-Graw Hill Education, 2001.
2. A P Godse and U A Bakshi, Electronics Circuits, Technical Publications, 2005.

SEMESTER/YEAR : III SEM
COURSE CODE : 16CT204
TITLE OF THE COURSE : ENTREPRENEURSHIP MANAGEMENT
L:T/A:P:C : 2 : 2 : 0 : 3

Course Objectives

1. This course is designed to provide a comprehensive introduction to Entrepreneurship, entrepreneurship mind set, entrepreneurial strategy
2. Course introduces students to idea to Introduction to business opportunity to business plan to funding the venture to Funding the Venture to Launching, Growing, and Ending the New Venture

Course outcomes

At the end of the course student will be able to

1. Understand the terminologies entrepreneurship, entrepreneurship mind set, and entrepreneurial strategy.
2. Identifying opportunities from the idea.
3. Preparing the business plan, marketing, organizational and financial plans.
4. Various means of funding the venture.

Module 1

The Entrepreneurial perspective

- a) Entrepreneurship and The Entrepreneurial mind-set
 - b) Corporate Entrepreneurship
 - c) Entrepreneurial Strategy: Generating and Exploiting New Entry Opportunities
- 09 hours**

Module 2

From Idea to the Opportunity

- a) Creativity and the Business Idea
 - b) Identifying and Analyzing Domestic and International Opportunities
 - c) Protecting the Idea and Other Legal Issues for the Entrepreneur
- 08 hours**

Module 3

From the Opportunity to the Business

- a) The Business Plan Creating and Starting the venture
 - b) The Marketing Plan
 - c) The Organizational Plan
 - d) The Financial Plan
- 10 hours**

Module 4

From Business Plan to Funding the Venture

- a) Sources of Capital
- b) Informal Risk Capital, Venture Capital, and Going Public

08 hours

Module 5

From Funding the Venture to Launching, Growing, and Ending the New Venture

- a) Strategies for Growth and Managing the Implications of Growth
- b) Accessing Resources for Growth from External Sources
- c) Succession Planning and Strategies for Harvesting and Ending the Venture

10 hours

Text Book:

1. Robert D. Hesrich, Mathew J. Manimala, Michael P Peters, Dean A. Shepherd,
2. Entrepreneurship, 7th Edition, MGH Education, 2014

Reference Books

1. Joe Abraham, Entrepreneurial DNA, MGH, 2011

Note : The course will have case studies which faculty will take up in the class. Further, the students will work on a business plan as part of their idea under the guidance of their respective mentors

SEMESTER/YEAR : III SEM
COURSE CODE : 16CT205
TITLE OF THE COURSE : DIGITAL SYSTEMS AND LOGIC DESIGN
L: T/A:P: C : 3 : 2 : 0 : 4

Course Objectives

1. This course is designed to provide a comprehensive introduction to digital logic design leading to the ability to understand number system representations, binary codes, binary arithmetic and Boolean algebra, its axioms and theorems, and its relevance to digital logic design.
2. Introduction to combinational circuits (such as Karnaugh maps), synchronous sequential logic and Asynchronous sequential logic.
3. Analyze and design simple systems composed of programmable logic, such as ROMs and PLAs.

Course outcomes

At the end of the course student will be able

1. To demonstrate knowledge of binary number theory, Boolean algebra and binary codes.
2. To analyze and design combinational systems using standard gates and minimization methods (such as Karnaugh maps, Quine-McCluskey Algorithm).
3. To analyze and design combinational systems composed of Standard combinational modules, such as multiplexers and decoders.
4. To analyze and design simple systems composed of programmable logic, such as ROMs and PLAs.
5. To analyze the given problems and design sequential Circuits

Module 1

NUMBER SYSTEMS, BOOLEAN ALGEBRA AND LOGIC GATES:

Review of number systems-Binary, octal, Hexadecimal. Introduction to Analog and digital signal. **The TTL Parameters and Truth table of Basic Gates:** NOT, OR, AND, Universal Logic Gates: NOR, NAND, Positive and Negative Logic, Laws of Boolean algebra, Theorems of Boolean algebra, Boolean/Switching functions and their implementation **SIMPLIFICATION OF BOOLEAN EXPRESSIONS AND FUNCTIONS:** Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions

9Hours

Module 2

SIMPLIFICATION OF BOOLEAN EXPRESSIONS AND FUNCTIONS:

Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine-McCluskey Method.

DESIGN OF COMBINATIONAL LOGIC CIRCUITS:

Modular combinational logic elements- Multiplexers and Demultiplexers, Decoders, Encoders, Priority encoders, magnitude comparator – BCD converter, Parity Generators and Checkers.

8Hours

Module 3

DESIGN OF COMBINATIONAL LOGIC CIRCUITS (continued):

Programmable Logic Arrays, Design of Combinational Circuits using Programmable Logic Devices (PLDs): Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PAL) devices

INTRODUCTION TO SEQUENTIAL CIRCUITS:

Combinational Vs sequential circuits, Asynchronous Vs synchronous circuits state table and state diagram

10 Hours

Module 4

INTRODUCTION TO SEQUENTIAL CIRCUITS (continued):

State assignment – Memory elements and their excitation functions – T flip-flop, D flip-flop, R-S flip-flop, JK flip-flop and their excitation requirements – Design of synchronous sequential circuits like Sequence Detectors and binary counters.

10 Hours

Module 5

APPLICATION OF LOGIC CIRCUITS SEQUENTIAL CIRCUITS:

Registers-Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In -Parallel Out, Universal Shift Register, Applications of Shift Registers, Asynchronous and Synchronous Counters, Changing the Counter Modulus, Decade Counters, Presetable Counters, Counter Design.

10 Hours

Text Books:

1. Morris Mano and Michael D. Ciletti, "Digital Design", IV Edition, Pearson Education, 2008.
2. Donald.P. Leach, Albert Paul Malvino & Goutam Saha: Digital Principles and Applications, 7th Edition, Tata McGrawHill, 2010.

Reference Books

1. R D Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2010.
2. Charles H. Roth: Fundamentals of Logic Design, Jr., 5th Edition, Cengage Learning, 2004.

SEMESTER/YEAR : IV SEM
COURSE CODE : 16CT207
TITLE OF THE COURSE : OBJECT ORIENTED PROGRAMMING & JAVA
L:T/A:P:C : 3 : 0: 2:4

Course Objectives

1. This course is intended for giving an exposure of Object Oriented programming and its applications in designing a program to solve the given problem.
2. This course also introduces Java to students as an OOP languages and prepares them to implement programs using object oriented concepts.

Course outcomes

At the end of the course student will be able

1. To identify the objects, classes from the given problem statement and write down the attributes and the methods for every class defined.
2. To understand the programming in Java and use them effectively in designing a program to solve the given problem.

Module 1

Need for oop paradigm, A way of viewing world – Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overriding and exceptions, summary of oop concepts, coping with complexity, abstraction mechanisms. **9 hours**

Module 2

Java Basics, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, exploring string class. **10 hours**

Module 3

Inheritance, Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. **9 hours**

Module 4

Packages and Interfaces, Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io. **9 hours**

Module 5

Exception handling, Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, Creating own exception sub classes. String handling, Exploring java.util **8 hours**

Text Book:

1. Java; the complete reference, 7th edition, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.

Reference Books :

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson Education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
4. An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.

Note : Students will work on normal Java Programs. Further, they will work on programs in groups wherein they will a. go thru the problem statement, identify the objects and classes, b. identify the relationship between the classes, c. identify the attributes and methods in each class, and hence develop programs and demonstrate.

SEMESTER/YEAR : IV SEM
COURSE CODE : 16CT208
TITLE OF THE COURSE : INNOVATION & ENTREPRENEURSHIP
L:T/A:P:C : 3 : 0 : 0 : 3

Course Objectives

1. This course introduces student's innovation.
2. Types of innovation, seven sources of innovation opportunity, the practice of innovation, the practice of Entrepreneurship and
3. Entrepreneurial strategies.

Course outcomes

At the end of the course the students will be able to

1. Know about innovation , different types of innovation.
2. Understand different sources where innovation can happen,
3. Know about the strategies to convert the innovation into a business.

Module 1:

Introduction: What is innovation, What are the skills of innovators? Can innovation skills be learnt? How is the Innovation generation different? How do we develop young people to become innovators, Portrait of the young Innovator as a Young man, STEM Innovators

10 Hours

Module 2

Practice of Innovation: Systematic Entrepreneurship; Purposeful Innovation and the seven sources for Innovation Opportunity; source: The Unexpected; source: Incongruities, source: Process Need;

10 Hours

Module 3

The Practice of Innovation (Continued): Source: Industry and Market Structures; source: Demographics; source: The Changes in Perception; source: New Knowledge ;The Bright Idea; Principles Of Innovation;

09 Hours

Module 4

The Practice of Entrepreneurship Entrepreneurial Management; the entrepreneurial Business; Entrepreneurship in the Services Institution; the New Venture. **09 Hours**

Module 5

Entrepreneurial Strategies: 'Fastest with the Mostest'; 'Hit Them Where They Ain't'; Ecological Niches; Changing Values and Characteristics **08 Hours**

Text Books

1. Peter F. Drucker, Innovation and Entrepreneurship, Routledge Taylor & Francis Group, 2007.

2. Creating Innovators, Tony Wagner , Scribner Publications, 2015

Reference Books

1. Heike Mayer, Entrepreneurship and Innovation in Second Tier Regions, Edward Elgar, 2011.
2. Clayton M. Christensen, The Innovator's Dilemma, Harvard Business School Press, 1997.

Note : Faculty will ask students to take up case studies and present. Text Book 2 has some case studies.

SEMESTER/YEAR : IV SEM
COURSE CODE : 16CT209
TITLE OF THE COURSE : MICROPROCESSORS AND APPLICATIONS
L: T/A:P: C : 3 : 0: 0:3

Course Objectives

1. To introduce microprocessors and basics of system design using
2. Microprocessors.
3. To introduce h/w architecture, instruction set and programming of 8086microprocessor
4. To introduce the peripheral interfacing of microprocessors.
5. To introduce the h/w architecture, instruction set, programming and interfacing of 8051 microcontroller

Course outcomes

At the end of the course student will be able

1. To know the basics of system design using microprocessors.
2. To implement the h/w architecture, instruction set and programming of 8086microprocessor.
3. To implement peripheral interfacing of microprocessors.
4. To know the h/w architecture, instruction set, programming and interfacing of 8051microcontroller

Module 1

INTRODUCTION TO MICROPROCESSOR: Introduction-Evolution of Microprocessor, The Microprocessor-Based Personal Computer Systems, The Microprocessor and its Architecture: Introduction and difference between 8085 and 8086 microprocessor. 8086 pin diagram, Minimum mode maximum mode. **9 Hours**

Module 2

8086 ARCHITECTURE-Internal Architecture of 8086, Registers, Addressing Modes- Immediate addressing, Register addressing, direct addressing, indirect addressing, relative addressing, Memory Paging, Flat Mode Memory Addressing Modes. **08 Hours**

Module 3

PROGRAMMING 8086-Data Movement Instructions: MOV Revisited, PUSH/POP, Load-Effective Address, String Data Transfers, Miscellaneous Data Transfer Instructions, Arithmetic and Logic Instructions: Addition, Subtraction and Comparison, Multiplication and Division, BCD and ASCII Arithmetic, Basic Logic Instructions, Shift and Rotate, String Comparisons. Program Control Instructions: The Jump Group, Controlling the Flow of the Program, Bit manipulation instruction. **10 Hours**

Module 4

I/O INTERFACING- Memory Interfacing and I/O interfacing -8255 pin diagram, Parallel communication interface – Serial communication interface – Timer – Keyboard /display controller – Interrupt controller – DMA controller –Applications.
9Hours

Module 5

MICROCONTROLLERS - Architecture of 8051, ARM 9 Microcontrollers – Pin Diagrams,Operational features – Memory and I/O addressing – Interrupts – Instruction set – Applications.
9Hours

Text Books

1. Douglas V Hall, “MICROPROCESSORS AND INTERFACING, PROGRAMMING AND HARDWARE” TMH, 2006.
2. Barry B Brey: The Intel Microprocessors, 8th Edition, Pearson Education, 2009

Reference Books

1. Krishna Kant, “MICROPROCESSORS AND MICROCONTROLLERS Architecture, programming and system design using 8085, 8086, 8051 and 8096”. PHI 2007.
2. Mohammed Rafiquzzaman, Microprocessors and Microprocessor Based Systems,2nd Edition CRC Press,2000
3. Muhammad Ali Mazidi, Janice GillispieMazidi, RolinD.MCKinlay The 8051 Microcontroller and Embedded Systems, Second Edition, Pearson Education 2008.
4. Kenneth J. Ayala, “The 8086 Microprocessor: Programming & Interfacing ThePC”,Delmar Publishers, 2007.

SEMESTER/YEAR	: IV SEM
COURSE CODE	: 16CT210
TITLE OF THE COURSE	: ALGORITHMS DESIGN AND APPLICATIONS
L:T/A:P: C	: 3 : 0: 2:4

Course Objectives

1. This course introduce designing of algorithm is an important component of computerscience.
2. The objective of this course is to make students aware of various techniques used toevaluate the efficiency of a particular algorithm.
3. Students eventually should learn to design efficient algorithm for a particularprogram

Course Outcomes

1. An ability to design and analyse algorithms, study time complexity and prove correctness
2. An ability to develop varioustechniquesused to evaluate theefficiency ofaparticularalgorithm and solve engineering problems

Module 1

Introduction: Algorithm Design paradigms motivation, concept of algorithmic efficiency, runtimeanalysisofalgorithms,AsymptoticNotations.Recurrences-substitutionmethod, recursion tree method, master method, generating functions.

9 Hours

Module 2

Divide and Conquer and Greedy Algorithms: Structure of divide-and-conquer algorithms: examples; Binary search, quick sort, Merge sort, Strassen Multiplication; Analysis of divide and conquer run time recurrence relations.

Greedy Method: Overview of the greedy paradigm examples of exact optimization solution (minimum cost spanning tree), Approximate solution (Knapsack problem), Single source shortest paths, travelling salesman. **10 Hours**

Module 3

Dynamic programming: Overview, difference between dynamic programming and divide and conquer, Applications: Shortest path in graph, chain Matrix multiplication, Travelling salesman Problem, longest Common sequence, knapsack problem. **08 Hours**

Module 4

Graph searching and Traversal: Representation of graphs, strongly connectedcomponents, graph matching, network flows.

Back tracking: Overview, 8-queen problem, and Knapsack problem.

Branch and bound: LC Searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem. **09 Hours**

Module 5

Computational Complexity **Complexity measures**, Polynomial vs Non-Polynomial time complexity; NP-hard and NP-complete classes,examples. Intractability.

09 Hours

TextBook

1. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer algorithm," ,3rd Edition, The MIT Press, 2009

Reference Books

1. E. Horowitz, S. Sahni, and S. Rajsekaran, " Fundamentals of Computer Algorithms,"Galgotia Publication, 2008
2. Sara Basse, A. V. Gelder, "Computer Algorithms : Introduction Design & Analysis", 3rdEdition,Addison Wesley
3. J.E Hopcroft, J.D Ullman, "Design and analysis of Computer algorithms", PearsonEducation, 2009.
4. D. E. Knuth, " The Art of Computer Programming" , Volume 3,2nd Edition, AddisonWesley, 2014.

Note: Studentswilltakeupapplicationareas in groupsand develop algorithms, implement and demonstrate.

SEMESTER/YEAR : IV SEM
COURSE CODE : 16CT481
TITLE OF THE COURSE : MINI PROJECT
L: T/A:P: C : 0 : 0: 4:2

Course Objectives

1. This Project course is designed to provide a platform for the students to convert their business idea into a business plan.
2. Students will work on the parts/components of their individual projects on the advice of their respective mentors.

Course outcomes

Implementation of selected parts/components of the project.

SEMESTER/YEAR : V SEM
COURSE CODE : 16CT304
TITLE OF THE COURSE : PROFESSIONAL AND BUSINESS ETHICS
L: T/A:P: C : 3 : 2: 0 : 4

Course objectives

1. To make students understand the meaning of good ethics, doing things right and the obstacles to making good ethical decisions
2. To enable students to identify and critically assess the principles and values they personally embrace and use in addressing the ethical issues which arise in their working lives.
3. To acquaint students with some of the major kinds of ethical problems encountered while performing work assignments and some possible ways of responding to them

Course outcomes

1. Reflect on ethical and sustainable business practices
2. Understand the role of ethics in all function areas of business including management, marketing, international business, human resources, finance, and accounting
3. Discuss the most pressing issues confronting business leaders today

Module 1

Ethics in general

(8 hours)

Introduction, Needs, Principles, **Laws & Ethics**; Development of Personal Ethics, Workplace Ethics for Employees-Ethical behavior in workplace- Ethical violations by employees, Employee Attitude and Ethics, Employee Etiquettes. Benefits of ethics - employee commitment, investor loyalty, customer satisfaction, profits
Case study.

Module 2

Professionalism

(10 hours)

Unethical Conduct for employees and employers. **Factors leading to Unethical Behaviors**. Different unethical behaviors. Measures to control unethical behaviours. Rewarding ethical behavior
Case study.

Module 3

Business Ethics and Corporate Governance

(8 hours)

Overview of **Business Ethics, Corporate Governance**, Ethical issues in human resource management- The principle of ethical hiring, Firing, worker safety, whistle blowing, Equality of opportunity, Discrimination, Ethics and remuneration, Ethics in retrenchment. Ethical Dilemmas at workplace, Ethical issues in global business, corporate responsibility of employers. Introduction to SEBI corporation and role of government.
Case study.

Module 4

Workplace Privacy & Ethics

(10 hours)

Watching what you say and what you do in the workplace, Hardware, Software and Spyware, Plagiarism and Computer Crimes, Convenience and Death of Privacy, Defense of employee privacy rights.

Case study.

Module 5

Teamwork in the Workplace & Ethics

(10 hours)

Teams, Elements of team, Stages of team development, team meetings, team dynamics, team rules, and teams work and professional responsibility, rules of professional responsibility, ASME code of ethics.

Case study.

Text Books:

1. Ethical Theory and Business, 8th Edition, Tom L. Beauchamp, Norman E. Bowie and Denis Arnold
2. Business Ethics, 9th Edition, O.C. Ferrell, John Fraedrich, and Linda Ferrell, Cengage Learning.

Reference Books:

1. How technology is compromising Workplace Privacy, Fredrick S Lane 111, AMACOM Div American Mgmt Assn, 2003
2. Ethics in the Workplace, Dean Bredeson, Keith Goree, Cengage Learning, 2011.
3. Ethics in 21st Century, Mary Alice Trent, Oral Roberts University, Longman.
4. Ethics in workplace, Elizabeth P Tierney, Oak tree press
5. Ethics in Workplace: System Perspective, William F Roth, Pearson, 2014.

SEMESTER/YEAR : V SEM
COURSE CODE : 16CT336
TITLE OF THE COURSE : SUPPLY CHAIN MANAGEMENT & OPERATIONS
L: T/A: P: C : 3 : 0 : 0 : 3

Course objectives

1. To introduce various concepts related to the supply chain management.
2. To educate the importance of supply chain decision such as design, planning, and operations of a firm.
3. To give the students an understanding of the analytical tools necessary to solve supply chain problems.
4. To showcase the ways by which the companies use different supply chain drivers to improve their performance.

Course outcomes

1. The students would have learned about various concepts related to the supply chain management.
2. The students would have got educated about the strategic importance of supply chain design, planning and operational decisions.
3. Understanding and applications of the analytical tools to solve supply chain problems would have taken place.
4. Various case studies and illustrations would have inculcated the importance of supply chain drivers in improving the performance of an organization.

Module 1

INTRODUCTION TO SUPPLY CHAIN MANAGEMENT 8Hrs

Supply chain – historical perspective - objectives – importance – decision phases – process view – impellers of supply chain – financial measures of performance – drivers of supply chain performance – framework for structuring drivers – facilities – inventory – transportation – information – sourcing – pricing.

Module 2

DESIGNING DISTRIBUTION NETWORKS AND NETWORK DESIGN (10 hours)

Role of distribution – factors influencing distribution network design – design options for a distribution network – online sales and the distribution network – Distribution channels in Indian agricultural, FMCG and commodity sectors – Role of network design – factors influencing network design decisions – framework for network design decisions.

Module 3

DEMAND FORECASTING AND MANAGING UNCERTAINTY (8 hours)

Demand Forecasting: Role – characteristics – components – approach – time series methods – measures of forecast error – role of IT.

Managing uncertainty: Safety inventory and its appropriate level – impact of supply uncertainty, aggregation and replenishment policies.

Module 4

COORDINATION IN A SUPPLY CHAIN

(10 hours)

Lack of supply chain coordination and the Bullwhip effect – Effect on performance – obstacles to coordination – managerial levers – continuous replenishment and vendor- managed inventories – collaborative planning, forecasting and replenishment – Indian experience.

Module 5

TRANSPORTATION AND SOURCING

(10 hours)

Role of transportation – modes and their performance – design options and their trade-offs – Tailored transportation. Sourcing – In-house or Outsource – 3rd and 4th PLs – Scoring and assessing suppliers.

Case studies in SCM

Text books:

2. Sunil Chopra, Peter Meindl and Kalra D V, Supply Chain Management– Strategy, Planning and Operation, Pearson, 5th Edition, 2013.
2. Janat Shah, Supply Chain Management : Text and Cases, Pearson, 1st Edition, 2009.

Reference Books:

3. Donald J Bowersox, David J Closs, Bixby Cooper M, Supply Chain Logistics Management, Tata McGraw Hill, 2nd Edition, 2008.
2. Sople V V, Supply Chain Management – Text and Cases, Pearson Education, 2012.
3. Jeremy F Shapiro, Modeling the Supply Chain, Cengage Learning, 2nd Edition, 2007.
4. Coyle, Bardi, Longley, The management of Business Logistics–A supply Chain Perspective, Thomson Press, 7th Edition, 2006.

SEMESTER/YEAR : 7TH SEM OR 8TH / 4TH YEAR
COURSE CODE : 15CT343
TITLE OF THE COURSE : DIGITAL MARKETING
L: T/A: P: C : 3 : 0 : 0 : 3

Course objectives

To learn how to do marketing online- Boost website traffic, generate potential leads & increase sales revenue with better brand awareness using internet platforms like Social Media, Email Marketing, Mobile Marketing, Ecommerce Marketing and AffiliateMarketing.

Course outcomes

1. Appreciate the challenges required for effective Marketing Management
2. Understand and apply the tools and techniques used in Marketing management
3. Anticipate Marketing and Sales problems and issues common in the modern workplace
4. implement Digital Marketing strategy for client requirements

UNIT-1

Digital Marketing Overview (7Hours)

Introduction, Key terms and concepts, What is marketing?, What is digital marketing? Why Digital Marketing wins over traditional Marketing, Understanding marketing strategy, The building blocks of marketing,

Understanding Digital Marketing Process: Increasing Visibility, Visitors engagement

UNIT-2

Cryptography (10 Hours)

Stakeholders in Search, Customer Insights, On & off-page Optimization, Meta Tags, Layout, Content Updates, Inbound Links & Link Building, Goal Configuration & Funnels, Intelligence Reporting, Conversions, Bounce Rate, Traffic Sources, Scheduling etc.

UNIT-3

Social Media (10 Hours)

What is **Social Media Marketing**? Overview of Facebook, Twitter, LinkedIn, Blogging, Youtube and Flickr, building Brand Awareness Using Social Media, Social Media Management, Insights and Analytics, Best Practice Examples & case Studies

UNIT-4 Website Analytics (9 Hours)

Goal Configuration & Funnels, Intelligence Reporting, Conversions, Bounce Rate, Traffic Sources, Scheduling etc

UNIT-5 Email and Mobile Marketing

(8 Hours)

User Behaviour, Segmentation, Key Metrics, Best Practice Case Studies, Split Testing, Campaign Process Optimization, SMS Strategy, Mobile Advertising, Mobile Optimized Websites, 7 Step Process for Mobile Apps, Proximity Marketing, Strategic Steps, Review & Testing

Text Books:

1. Digital Marketing, Vandana Ahuja, Oxford University Press
2. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, Ian Dodson, Wiley 2016

SEMESTER	VI					
YEAR	III					
COURSE CODE	19CT3613					
TITLE OF THE COURSE	CLOUD SECURITY SERVICES					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	--	--	02	02	52	04

COURSE OBJECTIVES:

- Explain basics concepts of Cloud Computing.
- Evaluate security issues with cloud infrastructure
- Implement cloud features to secure and harden the infrastructure
- Use tools to analyze system logs to detect possible security or performance problems

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Evaluate security issues with cloud infrastructure	L2
CO2	Implement cloud features to secure and harden the infrastructure	L3
CO3	Use tools to analyze system logs to detect possible security or performance problems	L3

COURSE CONTENT:	
MODULE 1	
Basics of Cloud Computing – Foundations and Models, Types, Designing a Cloud Computing Infrastructure or Service, Deployment and Configuration, Insuring Cloud Security and Mitigating Risks	10 Hrs
MODULE 2	
Shared Responsibility Model, Security Compliance, Identify and Access Services, Directory Services, Network Isolation-Fort and Beehive	10 Hrs
MODULE 3	
Network Isolation VPC, VPC Endpoints and Private Link, Detective Controls, Auditing, CloudWatch and CloudWatch Logs, Guard Duty	11 Hrs
MODULE 4	
	11 Hrs

Security Hub, Encryption in Transit, Encryption at Rest, Database Encryption, Protecting Compute Resources, Protecting & Securing Endpoints	
MODULE 5	10 Hrs

Cloud Security Managed Services, Security Strategy, Intelligent Log Management, SecurityIntelligence, Operations Consulting, Threat Insights
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TEXT BOOKS:

- | | |
|----|---|
| 1. | Ronald L. Krutz , Cloud Security: A Comprehensive Guide to Secure Cloud Computing, 30 July 2010 |
| 2. | John R. Vacca, Cloud Computing Security: Foundations and Challenges, 30 August 2016 |
| 3. | Chris Dotson, Practical Cloud Security: A Guide for Secure Design and Deployment, 31 March 2019 |

REFERENCES:

- | | |
|---|--|
| 1 | Vic (J.R.) Winkler, Securing the Cloud: Cloud Computer Security Techniques and Tactics Paperback – 1 June 2011 |
| 2 | Adrian Pruteanu and Zeal Vora, Enterprise Cloud Security and Governance: Efficiently set data protection and privacy principles Paperback – Import, 29 December 2017 |
| 3 | Routavaara, Ilkka. "Security monitoring in AWS public cloud." (2020) |
| 4 | NIST Special Publication 500-292, NIST Cloud Computing Reference Architecture, September 2011 |

SEMESTER	V					
YEAR	III					
COURSE CODE	19CT3513					
TITLE OF THE COURSE	CRYPTOGRAPHY & CYBER SECURITY					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	--	--	02	02	39	02

COURSE OBJECTIVES:

- Protect data with encryption and hashing
- Make hashes, crack them, and understand why they are so different
- Understand common errors in encryption, various encryption methods and how to exploit them
- Learn how to use three NIST-recommended systems: AES, SHA, and RSA
- Explore the threat landscape and practical skillset in defeating basic online threats

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Protect data with encryption and hashing	L2
CO2	Make hashes, crack them, and understand why they are so different	L3
CO3	Compare various encryption methods	L3
CO4	Use three NIST-recommended systems: AES, SHA, and RSA in their project work	L3
CO5	Defeat basic online threats and explore threat landscape	L3

COURSE CONTENT:	
MODULE 1	
	7 Hrs
Introduction, Caesar Cipher, Other Shift Values and Modular Arithmetic, ROT13, Base64 & ASCII, Encoding, Binary Data and Encoding, XOR Truth Tables, XOR for Bytes, Single-Byte and Multi-Byte XOR along with Looping	
MODULE 2	
	7 Hrs
Strong Encryption – AES and Private-Key Encryption, Key and Block Size, Confusion and Diffusion, ECB and CBC Modes, AES-CBC, Padding Oracle Attack, Public Key Encryption	

MODULE 3	8 Hrs
RSA Algorithm, Security, Vulnerabilities, Threats and Adversaries, Security Attributes, Threat Modelling and Risk Assessments, Zero Trust Model, Malware, Viruses, Rootkits, RATs	

MODULE 4	8 Hrs
Hashing – MD5 and SHA-1/2/3 Hashes, MD4 and Unicode, Getting Hashes with Cain, Cracking Hashes with Google and with Wordlists, Salting and Stretching Hashes, Hashing Algorithms	
MODULE 5	9 Hrs
Malwares – Spyware, Adware, Scareware, PUPs and Browser Hijacking, Darknets and Dark Markets, Social Engineering – Scams, Cons, Tricks and Fraud	

List of Laboratory/Practical Experiments activities to be conducted (if any) :
Symmetric encryption – Usage of AES pip install pyaes pip install pbkdf2 import pyaes, pbkdf2, binascii, os, secrets https://cryptobook.nakov.com/symmetric-key-ciphers/aes-encrypt-decrypt-examples
Asymmetric encryption- Usage of RSA pip install pycryptodome from Crypto.PublicKey import RSA from Crypto.Cipher import PKCS1_OAEP import binascii https://cryptobook.nakov.com/asymmetric-key-ciphers/rsa-encrypt-decrypt-examples
Hashing Techniques import hashlib, binascii https://cryptobook.nakov.com/cryptographic-hash-functions/hash-functions-examples

TEXT BOOKS:	
1.	Samuel Bowne, Hands-On Cryptography with Python: Leverage the Power of Python to Encrypt and Decrypt Data, June 29, 2018
2.	Nielson, Seth James, and Christopher K. Monson, Practical Cryptography in Python: Learning Correct Cryptography by Example, Apress, 2019

REFERENCES:	
1	Modern Cryptography Theory and Practice, Wenbo Mao, Pearson Education 2008
2	Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH

SEMESTER/YEAR : IV SEM
COURSE CODE : 20CT2402
TITLE OF THE COURSE: Free Elective – I
T/A:P: C: 0 : 0: 4:2

Course Objectives

Skill Development -Introduction, Identifying Customer Needs, Opportunity Identification & Planning, Idea Generation and Validation, Entrepreneurial Culture, Digital Business Opportunity Business Plan & its Components, Business Model and Strategies, Selection of Appropriate Business Model, Business Model Canvas, Feasibility Study, Business model Canvas and Business Plan

SEMESTER/YEAR : VI SEM

COURSE CODE : 19CT3603

TITLE OF THE COURSE: Career Success Strategies

T/A:P: C: 0 : 0: 4:2

Course Objectives

Skill Development - Personality development, career strategies

SEMESTER/YEAR : 7TH SEM / 4TH YEAR
COURSE CODE : 16CS471
TITLE OF THE COURSE :WEB PROGRAMMING LAB
L: T/A: P: C : 0 : 1 : 3 : 2

COURSE OBJECTIVES:

1. Students will select mini projects in teams with the help of the faculty in-charge.
2. JAVA and PYTHON will be used to implement the mini projects

COURSE OUTCOMES: At the end of the course students will be able to:

1. Know how to use effectively JAVA and PYTHON languages to implement projects to solve the real life problems

SEM/YEAR: 7/4

COURSE CODE: 16CS474

TITLE OF THE COURSE: Natural Language Processing

L: T/A: P: C: 3:0:0:3

Course Objectives:

1. To understand the algorithms available for the processing of linguistic information and computational properties of natural languages
2. To conceive basic knowledge on various morphological, syntactic and semantic NLP task
3. To understand machine learning techniques used in NLP,
4. To write programs in Python to carry out natural language processing

Course Outcomes:

1. Extract information from text automatically using concepts and methods from natural language processing (NLP) including stemming, n-grams
2. Apply RNNs to Character-level Language Modeling
3. Critically appraise existing Natural Language Processing (NLP) applications
4. Apply machine learning algorithms to natural language processing.
5. Create scripts and applications in Python to carry out natural language processing

Module-1 Introduction

07 hrs

Past, present and future of NLP; Classical problems on text processing; **Necessary Math concepts for NLP**; **Regular expressions in NLP**; **Basic text processing**: lemmatization, stop word, tokenisation, stemming etc; Spelling errors corrections– Minimum edit distance, Bayesian method;

Module- 2: Words & Sentences

09 hrs

N-grams: Simple unsmoothed n-grams; smoothing, backoff, spelling correction using N-grams, Metrics to evaluate N-grams;
Parts of Speech tagging: Word classes, POST using Brill's Tagger and HMMs;
Information Extraction: Introduction to Named Entity Recognition and Relation Extraction
WordNet and WordNet based similarity measures, Concept Mining using Latent Semantic Analysis

Module-3: Sequence to sequence & Language Modelling

09 hrs

Word embedding: skip-gram model, CBOW, GloVe, BERT; Sequence to sequence theory and applications, Attention theory and teacher forcing;
Language Modelling: Basic ideas, smoothing techniques, Language modelling with RNN and LSTM;

Module-4: **ML for NLP**

9 hrs

Classification– binary and multiclass, clustering, regression for text data processing;
Machine translation: rule-based techniques, Statistical Machine Translation (SMT);

Spam detection, consumer complaint classification, Semantic Analyser, Dialogue processing (Chatbots), Text summarisation

Module 5: Advanced Topics and Hands on Practices

08 hrs

Natural Language Understanding - Natural Language Generation: the potential of using ML for NLG, Natural Language Inference, Topic Modelling; AWS, Azure and IBM Watson for NLP;

Self Learn & Hands on practice:

Python libraries supporting NLP; Hands on Data collection - from social network platforms, pdfs, wordfiles, json, html, Parsing text using regular expression; scraping data from web; Text processing: convert to lowercase, remove punctuation, remove stop words, standardising text, tokenising, stemming, lemmatising.

Text Books:

1. Daniel Jurafsky and James H. Martin. 2009. Speech and Language Processing: An Introduction to Natural Language Processing, Speech Recognition, and Computational Linguistics. 2nd edition. Prentice-Hall.
2. Christopher D. Manning and Hinrich Schütze. 1999. Foundations of Statistical Natural Language Processing. MIT Press.

Reference Books:

1. Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola, Dive into Deep Learning, Release 0.16.0, Jan 2021
2. Ian Goodfellow and Yoshua Bengio and Aaron Courville, Deep Learning, MIT press, 2016. (deeplearningbook.org)
3. Lecture Notes | Advanced Natural Language Processing | Electrical Engineering and computer Science | MIT OpenCourseWare
4. Akshay Kulkarni, Adarsha Shivananda, "Natural Language processing Recipes - Unlocking Text Data with Machine Learning and Deep Learning using Python". ISBN-13 (pbk): 978-1-4842-4266-7 ISBN-13 (electronic): 978-1-4842-4267-4 <https://doi.org/10.1007/978-1-4842-4267-4>
5. Palash Goyal, Sumit Pandey, Karan Jain, Deep Learning for Natural Language Processing - Creating Neural Networks with Python. ISBN-13 (pbk): 978-1-4842-3684-0 ISBN-13 (electronic): 978-1-4842-3685-7, <https://doi.org/10.1007/978-1-4842-3685-7>

Sem/Year: 7/4

Course Code: 16CS477

Course Title: Full Stack Development

L: T/A: P: C: 3:0:0:3

Course Objectives:

- Understand the major areas and challenges of web programming..
- To create websites using HTML5, CSS3, JavaScript
- Front end framework for developing Interactive WebApp using ReactJS
- Understand server-side scripting language-Node.JS
- Latest Framework for fast API development using GraphQL

Course Outcomes: After undergoing this course, students will be able to:

- Know the fundamentals of front end web technologies like HTML5 and CSS3.
- Use of ReactJS a javascript library to build UI components
- Building real world application using Node.Js,Express
- Develop a fully functioning website and deploy on a web server.

Module 1 Markup Language (HTML5), CSS3

(8 Hours)

Introduction to HTML and HTML5 - Formatting and Fonts -Commenting Code – Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – HTML Forms, Video & Audio tag

CSS3: Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; Background images, Conflict Resolution, CSS box model,CSS3 features: Box Shadow, Opacity, Rounded corners, Attribute selector

Module 2 Client-Side Scripting:JavaScript , JSON

(9 Hours)

JavaScript Basics –Arrays- Functions - JavaScript objects – HTML DOM - DOM methods – Events- Regular Expressions , JSON

Module –3 Node JS

(9 Hours)

Introduction to Node JS, Setup Dev Environment, Node JS Modules, Node Package Manager, File System, Debugging Node JS Application, Events, Express.JS, Database Connectivity, MVC Architecture In Node Js Applications.

Module 4 React JS**(10 Hours)**

React.JS: Introducing React ,Main Principles of React, Building your first react app, Components in React, Transferring properties, Dealing with State, The Component life cycle,Virtual DOM, JSX,

Module 5 GraphQL**(9 hours)**

Introduction to GraphQL, GraphQL Vs. REST, GraphQL Vs. SQL, Your First GraphQL Query, Complex Types – Unions, Fragments, Interfaces, Graph Nodes, GraphQL with JavaScript, GraphQL with React, GraphQL Server-Exercise Problems

Text Books:

1. Robert W. Sebesta, Programming the World Wide Web ,7th Edition, Pearson Education, 2008.
2. Basarat Ali Syed - Beginning Node.js-Apress ,2014.
3. Anthony Accomazzo, Ari Lerner, Clay Allsopp, David Guttman, Tyler McGinnis, Nate Murray, FullStack React – The Complete Guide to ReactJS & Friends, Fullstack.io, 2017

References :

1. Lionel Lopez,React Quickstart Step-by-Step Guide to Learning React Javascript Library
2. Kirupa Chinnathambi, JavaScript Absolute Beginner's Guide, 1st Edition, 2017.
3. Robert W Sebesta, Pearson, Programming the World Wide Web, 7th Edition, 2013.
4. Kirupa Chinnathambi, Learning React, 1 Edition, Addison-Wesley Professional
5. Mark Pilgrim,HTML5Up and Running,O'Reilly, 1st Edition, 2012.
 - <https://reacthandbook.com/>

SEM/YEAR : VII SEM

COURSE CODE : 16CS481

TITLE OF THE COURSE : Project

L: T/A:P: C : 0 : 0 : 4 : 2

Course outcomes

1. Identify a issue and derive problem related to society, environment, economics, energy and technology
2. Formulate and Analyze the problem and determine the scope of the solution chosen
3. Determine , dissect, and estimate the parameters, required in the solution.
4. Evaluate the solution by considering the standard data / Objective function and by using appropriate performance metrics.
5. Compile the report and take part in present / publishing the finding in a reputed conference / publications
6. Attempt to obtain ownership of the solution / product developed.

Course Content

Project: Carried out at the Institution or at an Industry.

Project work shall preferably be batch wise, the strength of each batch shall not exceed maximum of four students, Viva-voce examination in project work shall be conducted batch-wise.

SEM/YEAR : VIII SEM

COURSE CODE : 16CS482

TITLE OF THE COURSE : Seminar

L: T/A:P: C : 0 : 0 : 2 : 1

Course outcomes

1. Survey the changes in the technologies relevant to the topic selected
2. Discuss the technology and interpret the impact on the society, environment and domain.
3. Compile report of the study and present to the audience, following the ethics

Course Content

Seminar: Deliverable at the Institution under the supervision of a Faculty.

Seminar is one of the head of passing. i) Each candidate shall deliver seminar as per the Scheme of Teaching and Examination on the **topics chosen from the relevant fields** for about 30 minutes

SEMESTER/YEAR : 7TH SEM / 4TH YEAR
COURSE CODE : 16CS401
TITLE OF THE COURSE : MACHINE LEARNING
L: T/A: P: C : 3 : 0: 0 : 3

COURSE OBJECTIVES:

1. To know about basic concepts of Machine Learning
2. To obtain a thorough knowledge of various Machine learning techniques and their representation schemes
3. To study about Evaluating Hypothesis
4. To have an overview of various Machine Learning applications

COURSE OUTCOMES: At the end of the course students will be able to:

1. Technical knowhow of Machine Learning applications, heuristics, Knowledge representation Systems,
2. To Acquire knowledge of various Machine Learning techniques

MODULE 1 - Introduction: Basic definitions **Statistical Learning:** Estimate F, Supervised Versus Unsupervised Learning, Regression Versus Classification Problems

Assessing Model Accuracy: Quality of fit, Bias –Variance trade-off, Classification Setting.

MODULE 2 - Linear Regression: Simple Linear Regression, Multiple Linear Regression **Classification:** Logistic Regression, Linear Discriminant Analysis: Baye's Theorem for classification, Quadratic Discriminant Analysis, KNN Method, Comparison of classification methods .

MODULE 3 - Resampling Methods: Cross Validation: Leave-One-Out Cross-Validation, k-fold cross validation, Bootstrap.

Tree based methods: The Basics of Decision Tree: Regression tree method, Classification trees, Trees Versus Linear Models, Advantages and Disadvantages of Trees, Bagging ,Random forest, boosting.

MODULE 4 - Support Vector Machines: Maximal Margin classifier, Support Vector classifier, Classification with non-linear decision boundaries, SVM with more than two classes.

Unsupervised Learning: Challenges, Principal component Analysis Clustering –K-Means clustering, Hierarchical clustering.

MODULE 5 - Deep Learning: Artificial Neural Networks: Universal Approximation Theorem, Feedforward Neural networks. Gradient descent and the Backpropagation Algorithm.

Convolutional Neural Networks : Architectures, convolution / pooling layers

Recurrent Neural Networks : LSTM, GRU, Encoder Decoder architectures A Case Study -Computer Vision

Text Books

1. James, G., Witten, D., Hastie, T., Tibshirani, R. An Introduction to Statistical Learning with Applications in R, Springer Texts in Statistics.

Reference Books

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation. (2015).
2. Thomas M. Mitchell, Machine Learning, McGraw-Hill, Inc. New York, ISBN:0070428077 9780070428072
3. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; second edition, 2009

SEM/YEAR : 1 / 1

COURSE CODE : 20CSE5104

TITLE OF THE COURSE : Special Topics-1

L: T/A:P: C : 0 : 0 : 2 : 1

Course outcomes

1. To develop problem solving abilities
2. To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
3. To train students in professional skills related to Software Industry
4. To prepare necessary knowledge base for research and development in Computer Science

Course Content

Following are some of the ways (but not limited to) of delivering the "Special Topics":

- (i) **Engaging Students in Small Batches (maximum 3/batch) in Projects**: DSU Faculty will define and supervise a project which has a well defined scope. Students will work from requirements to delivering a prototype.
- (ii) **Delivery from an Industry Expert**: An industry Expert can offer a project for around 20-25 students, clearly defining the scope. The project will have 4-5 sub-modules. Each student group will work on one sub-module from requirements gathering and analysis all the way to a working module. The sub-teams will integrate the modules and will together deliver a working prototype. The industry expert will engage all the teams on one afternoon face to face. One or two SOE faculty will also co-supervise the project.
- (iii) **A Start-up company** might have a few project ideas to try out and they would engage a team of 20-25 students (in 4-5 batches) to work on these project ideas from concept to a prototype, with a close supervision from the start-up company technologist together with DSU faculty.
- (iv) **Testing a new Product**: A Company has come up with a new product and they require a team of 30-40 students to thoroughly test all the features of the product and come up with a validation of the features of the product, a summary of features that fail to work and also a recommendation on a set of features that may have to be added to the product.
- (v) A professor from an elite university from within India or abroad, offering a **short course** on a domain which is very current and state of art. The content has a built in project component.
- (vi) A student undergoes a **on-line certification course** (such as coursera, Edx founded by Harvard and MIT, MOOC, NPTEL, SWAYAM etc). Student obtains a certificate and an 'End of the Semester' exam will be conducted by the respective department.

(vii) An expert from a company offers a **3 or 4 day workshop** (on-campus or outside the campus) involving mostly hands-on and a project component and a group of students successfully complete the workshop, with well defined learning components and deliverables.

(viii) Students participate and successfully complete a **Hackathon** (of Minimum two days), conducted by a reputed institution/organization. The deliverables include the pre-hackathon components, work done during Hackathon and post-Hackathon work (if applicable).

(ix) **Industry Project** : Students in a small team of 4-5 work on a project defined by an industry (including DERBI and AIC) during a semester and successfully complete the project.

(x) **Summer Internship**: A group of students take up Summer Internship at DSU or outside, successfully complete the internship. If done within DSU, a project exhibition will also form a part of evaluation.

(xi) **Visit to a University Abroad** : A group of students participate in a well structured program in a University abroad and complete all the requirements of the university.

(xii) **Working under a Research professor** within DSU or from premium institutes such as IISc, IIT, IIIT etc on a specific project/task.

SEM/YEAR : III SEM/II

COURSE CODE : 20CSE5401

TITLE OF THE COURSE : DISSERTATION-I

L: T/A:P: C : 0 : 0 : 24 : 12

Course Objectives:

- To undertake research in an area related to the program of study so as to make significant or at least decent contribution to research. Thesis work may be an expansion on past work in the field or an improvement to the existing state-of-the-art. It might also reaffirm the results of previous work or solve new problems, or develop new theories. In short, thesis is to contribute something new to the field with proper proof and analysis

Course outcomes

- The student shall be capable of identifying a problem related to the program of study
- To carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.
- Implementing the solution proposed in Dissertation-I in 3rd semester idea and getting results.
- To improve the existing ones or solve chosen problem efficiently
- Analyze and validate solution and show why your approach works, and in what cases it works and where/when it won't!

Guidelines:

M.Tech dissertation should be socially relevant and research oriented ones. Each student is expected to do an individual project. The project work is carried out in two phases – Phase I in III semester and Phase II in IV semester. Phase II of the project work shall be in continuation of Phase I only.

The Student should carry out the following:

- In depth study of the topic assigned
- Review and finalization of the Approach to the Problem relating to the assigned topic
- Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed
- Preparing a paper for Conference presentation/Publication in Journals, if possible;
- Preparing a Dissertation in the standard format for being evaluated by the Department.
- Final Seminar Presentation before a Departmental Committee

SEM/YEAR : IV SEM

COURSE CODE : 20CSE5401

TITLE OF THE COURSE : DISSERTATION-II

L: T/A:P: C : 0 : 0 : 24 : 12

Course Objectives:

- To undertake research in an area related to the program of study so as to make significant or at least decent contribution to research. Thesis work may be an expansion on past work in the field or an improvement to the existing state-of-the-art. It might also reaffirm the results of previous work or solve new problems, or develop new theories. In short, thesis is to contribute something new to the field with proper proof and analysis

Course outcomes

- Implementing the solution proposed in Dissertation-I in 3rd semester idea and getting results.
- Ability to present the findings of their technical solution in a written report.
- Presenting the work in International/National conference or reputed journals.

Guidelines:

Student is expected to **exert on design, development and testing of the proposed work** as per the schedule. **Accomplished results/contributions/innovations** should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.

A dissertation report as per the specified format, developed system in the form of hardware and/or software, A record of continuous progress.

1st Semester Syllabus

SEM/YEAR	: I SEM/1 st Year
COURSE CODE	: 21VI101
TITLE OF THE COURSE	: Mathematics-1
L: T/A: P: C	: 3: 0: 0: 3

Course objectives : To introduce the students to mathematical tools used in various engineering branches

Course outcomes :

- An ability to apply knowledge of mathematics, science and engineering.
- An ability to identify, formulate and solve engineering problems.
- An ability to use the techniques, skills and engineering tools

Unit 1

(10 hrs)

Linear Equations

Solution to linear equations, Solution to quadratic equations by factorization, Solution to quadratic equations using formula). **Linear Algebra:** Linear spaces, Subspaces, Linear independence, Bases and Dimensions, Orthogonality, Gram Schmidt Orthogonalization process

Unit 2

(8hrs)

Matrices & Determinants

Matrix Definition, Addition, Subtraction, Multiplication and Transpose of Matrix, Definition of determinant, Properties and its Evaluation, Minors, Co-factors, Determinant of transpose, Linear equation Solution (Cramer's rule)

Unit 3

(9 hrs)

Complex Numbers - Introduction, representation of complex numbers, Representation on graph, Addition, Subtraction and multiplication, Complex conjugate, graph representation, Division of complex numbers, Polar form of complex number, Polar form of complex number, Conversion from polar to rectangular and vice-versa. **Vectors** - Introduction, Unit vector, Multiply vector by a scalar, Adding vectors algebraically and graphically, Magnitude and direction, Vector dot product and length, Vector cross product, Direction (right hand rule), Area of parallelogram, Work done on moving object by a force (dot Product), Torque exerted by force (Cross Product)

Unit 4

(10hrs)

Differential Calculus

Definition and evaluation of limits, Definition of Derivative, Slope of tangent at a point on the curve, Differentiation of constant, e^x , x^n , a^x and $\log x$, Differentiation of trigonometric functions, Differentiation of Sum, difference, product and quotient of functions, Application of differentiation-velocity and acceleration.

Statistics: Mean, Median and mode, Moving average, Grouping of data, Class interval, Range, Standard Deviation & Variance, Histogram, Skewness, Interpretation of skewness, Normal distribution.

Unit 5

(8hrs)

Sequence and series: Sequence, Series, Recursive and explicit formulas.

Set Theory: Definition of Sets, Venn Diagrams, Subset, Power Set, Cardinality and Cartesian products, Set Operations: AND, OR, NOT, Conditional statements, Univariate, Bi-variate and Multi variate data.

Permutation & Combination: Multiplication and addition principle of counting, Permutation, Combination, Exercise on permutation and combination

Text Books:

1. Erwin Kreyzig, Advanced Engineering Mathematics, Wiley, Tenth edition
2. Thomas and Finney, Calculus and Analytic Geometry, Pearson India, Ninth edition

Reference Books:

1. G.F.Simmons and S. Krantz, Differential Equations Theory, Techniques and Practice, Tata McGraw Hill.
2. W.E.Boyce and R.C.DiPrima, Elementary Differential Equations and Boundary Value Problems, Ninth Edition, Wiley Student Edition.

SEM/YEAR	: I SEM/1st Year
COURSE CODE	: 21VI102
TITLE OF THE COURSE	: English
L: T/A: P: C	: 2: 0: 0: 2

Course objectives

- To Speak fluently
- To Make simple technical presentations
- To Develop Communication skills for academic and social interaction.
- To comprehend technical literature by listening.
- To write technical documents in correct English.
- To have a better interactive skill.

Course outcomes

- Students achieve proficiency in English
- Develop their professional communication skills
- Acquire skills for placement

UNIT 1: **Parts of Speech**

(8 hours)

Noun- Different kind of nouns, Numbers, Articles, Pronoun- Different kind of pronouns, Adjectives- Degrees of comparison, Verbs- Verb forms (V1,V2,V3), Active and Passive voice, Adverbs, Preposition, Conjunctions, Interjection.

UNIT 2: **VERBTENSES**

(5 hours)

Main divisions, Subdivisions

UNIT 3: **LANGUAGE SKILLS DEVELOPMENT EXERCISES**

(6 hours)

Reading and Listening Exercises- Comprehension Passages, Stories, Newspaper Reading, Spoken English exercises- Self-Introduction, Story Telling, Announcements, Talk on given situations/topics

UNIT 4: **WRITING SKILL and SENTENCES**

(5 hours)

Letter writing (Leave Letter/Apology Letter), Types of Sentences, Question Tags, Direct and Indirect Speech

UNIT 5: **LANGUAGE SKILLS DEVELOPMENT**

(6 hours)

Arranging a set of information in proper order, Story development from bare outlines, Role plays Practice on giving directions, Question & Answer sessions

Text Books:

1. High School English Grammar by Wren & Martin - S.Chand & Co. Ltd
2. English Communication for Polytechnics by S.Chandrasekhara & Others – Orient Black Swan
3. English Grammar at Glance by M. Gnanamurali - S.Chand & Co. Ltd

SEM/YEAR	: I SEM/1 st Year
COURSE CODE	: 21VI103
TITLE OF THE COURSE	: Applied Science
L: T/A: P: C	: 2: 0: 0: 2

Course objectives :

- To create awareness of correct usages of SI units.
- To understand the relationship between laws and specific phenomena.
- To understand the method of composition and resolution of forces Study the condition of equilibrium of a system of forces Recognize moment as one, which gives rotation effect.
- To identify the acidic, basic or neutral nature of solution
- To understand about solar energy and its applications
- To understand the general properties and uses of certain organic compound
- To create awareness of phenomenon Modern Physics & on wave motion
- To get exposure on laser

Course outcomes :

- Students can understand the importance of force and energy
- Moments and its applications are learnt
- Students are able to understand properties of solid and fluids
- Students are able to identify the acid and basic nature of solution
- Students got exposure on laser

UNIT 1

(08 hours)

PHYSICAL WORLD, FORCE & MOTION ENERGY

Physical Quantities Types of systems of units, Fundamentals of derived quantities, SI units Dimension Linear motion Displacement, velocity, acceleration. Equations of motion Problems Newton's laws of motion. Momentum (Linear) Law of conservation of momentum Force Inertia. Work power, Energy Law of conservation of energy.

UNIT 2

(06 hours)

Composition and resolution of forces: Definition, law of parallelogram of forces, triangle law of forces, polygon law of forces.

EQUILIBRIUM OF FORCES: Introduction. System of forces Principle of equilibrium Lami's Theorem Problems Moments and its applications. Couple.

UNIT 3

(05 hours)

PROPERTIES OF SOLIDS AND FLUIDS

Physical properties, chemical properties, mechanical properties, electrical properties, Optical properties. **Lubrication and lubricants:** Basics of lubrication, Types of lubricants, Selection of lubricant

UNIT 4

(05 hours)

HEAT

Definition of heat Thermometry, Platinum resistance thermometer, Thermocouple, Pyrometer Calorimetry Specific heat capacity Heat Transfer **Optical fiber:** Optical fiber, types, working principle, application

UNIT 5

(06 hours)

Laser

Introduction and properties of laser, types and application

Renewable energy

PV panels, specifications, Mppt, Wind turbine types, working of wind turbine, Types of batteries, PV system requirement calculations,

Text Books:

1. Principle of physics for class XI and XII by V.K. Mehta and Rohit Mehta, as per Karnataka state PUC syllabus S.Chand and Company, New Delhi
2. Engineering chemistry for Diploma by Ranjan Kumar Mahapatra (PHI Learning Pvt. Ltd., New Delhi)
3. Basic Physics by Kongbam Chandramani Singh (PHI Learning Pvt. Ltd., New Delhi)
4. Principle of physics by P.V.Naik (PHI Learning Pvt. Ltd. New Delhi)

SEM/YEAR	: I SEM/1 st Year
COURSE CODE	: 21VI104
TITLE OF THE COURSE	: Algorithm-Problem Solving Techniques & Flow Charts
L: T/A: P: C	: 2: 0: 0: 2

Course objectives:

- To understand the basic computers and component of computer
- To understand about various classes of computers, speed and memory
- To gain knowledge about input and output devices
- To learn about data storage devices.

Course outcomes:

- Students are able to learn about components of computer
- Students are able to identify the various data storage devices and its applications
- Acquire the skills about Operating systems and GUI

UNIT 1 (6 hours)

Introduction to Algorithm

What is an algorithm? Characteristics of an Algorithm

UNIT 2 (6 hours)

Method for Developing an Algorithm

Sequence structure, Selection structure, repetition structure, Flowcharts, Flowchart Constructs, flowchart Example

UNIT 3 (6 hours)

Pseudocode(or Program Design Language)

Pseudocode Language Constructs, Computation/Assignment, Input/Output, Selection, Repetition, Pseudocode Example

UNIT 4 (6 hours)

Programming using C

How to develop a program using C language, Simple program examples

UNIT 5 (6 hours)

Problem solving

Introducing Computational Thinking, What is CT? Exploring Algorithms, Computational Thinking is a problem-solving process that includes the following characteristics. Finding Patterns, Developing

Algorithms, Decomposition, Abstraction, Pattern Recognition, Designing algorithms, Computer Hardware vs Computer Software, Final Project: Applying Computational Thinking,

Text Books:

- i) Computer Fundamentals – by P.K.Sinha, BPB Publications

Reference Books:

- i) Computer Programming – by P.Kumar Wiley publication
- ii) “Computer Fundamentals and Programming in C”, - by Reema Thareja, Oxford Press, 2014

SEM/YEAR	: I SEM/1 st Year
COURSE CODE	: 21VI105
TITLE OF THE COURSE	: Basics of Electrical & Electronics
L: T/A: P: C	: 2: 0: 0: 2

Course objectives :

- To effectively use digital multi-meter, function generator and oscilloscope.
- To analyse the working of a diode and its characteristics
- To understand the characteristics of different electronic devices.
- To understand the types of rectifiers and their working

Course outcomes :

- Students are able to understand the
- Students are able to identify the types of rectifier.

UNIT 1

(6 hours)

Atomic Structure and Introduction to electron current

Atom-Electron orbit & Energy levels, Concept of electric friction (resistance), current and voltage with definition(s) Unit, Ohm's Law, a) Temperature effect on resistance, (b) Ideal V_g source and current source, Power, Energy, and energy in Kilo watt hour i.e., Unit with examples,

Resistors and Kirchhoff's law

Resistance in series, Resistance in Parallel and related problems, Open circuit and short circuits, Kirchhoff's voltage law with problems, Kirchhoff's current law with problems,

UNIT 2

(6 hours)

Capacitors & Fundamentals of AC

Capacitance of a Capacitor, Principle of Capacitance, Dielectric strength, effect of dielectric material on capacitance of a capacitor and types, Capacitors in series and Parallel Combination, Different Waveforms, cycle, frequency, Time period, Instantaneous value, rms value, peak value, peak to peak value, amplitude

Basic Semiconductor and P.N. junction Theory

Energy bands in conductors, semiconductor and insulators, Conduction in conductors and semiconductors, P-Type & N-type Semiconductor, PN junction—Unbiased and biased PN junction Forward Biasing and Reverse Biasing

UNIT 3**(6 hours)****Semiconductor Diodes, Zener Diodes and LED**

Introduction to P.N.-junction diodes, Diode characteristics & Description of diode equation, Zener diodes characteristics & parameters, Light emitting diodes, its working principle characteristics & Application, Half wave rectifier, Full wave rectifier, Full wave bridge rectifier,

UNIT 4**(7 hours)****Digital Basics**

Introduction to digital system, Difference between digital and analog signals, Number system – different types, Conversion of Decimal to Binary and vice versa, Conversion of Decimal to hexadecimal and vice versa, Conversion of binary to hexa decimal and vice versa, Binary coded decimal, ASCII, EBCDIC, Complement arithmetic [1's, 2's], Binary addition

UNIT 5**(05 hours)****Logic Gates**

Introduction of logic gates, Inverter- OR-AND-NOR– NAND symbol and truth table, XOR -XNOR gates, Construction of logic circuits using gates

Text Books:

1. Electronic Circuits: Fundamentals and Applications by Michael Tooley BA Elsevier Ltd., Third Edition, 2006
2. Electronic Devices and Circuits, Allan Motter shed, PHI.

Reference Books:

1. Robert. L. Boylestad and L. Nashelsky, Electronic Devices and circuit Theory, Pearson Education, 9th edition, 2005
2. David A Bell, Electronic Devices and Circuits, PHI, 5th edition, 2007
3. Millman & Halkias, Electronics Devices and Circuits, McGraw Hill.

SEM/YEAR : I SEM/1st Year
COURSE CODE : 21VI106
TITLE OF THE COURSE : Computing Systems
L: T/A: P: C : 1: 0: 0: 1

Course objectives

- Understand linear system of equations
- Understand the structure of Matrices and Determinants
- Infer different co-ordinate systems and applications of vectors.

Unit 1

3hrs

Introduction to Computer Systems: Types of computer: Personal, mini, mainframe, mobile, Network, supercomputer, multiprocessor

History of modern computers: Environments, Functions of components

Computing Environments: - Home, business, computer gaming, networking, real-time, communication

Von Neumann architecture:- Example processors,- Fetch execute cycle

Unit 2

3hrs

Hardware : Standard architecture - CPU, main memory (RAM, ROM), Backing storage, I/O, Current implementation of standard architecture, CPU, motherboard, Power supply, cooling, backing store(hard disk, optical disks), memory types, interfaces (PCI,AGP, PCI Express), NIC, graphics card, sound.

Peripherals and System Building: Printers, & plotters, cameras & scanners; keyboard, mouse, touch screen/pad; monitors, display adapters; multimedia, devices; storage media; networking; portable drives, plug and play components; performance factors

Unit 3

3hrs

Software, Installation and Configuration : Systems software, Operating systems, Utility programs, Library programs, Translator programs, Applications software Standard packages, Customized packages, Special purpose software, Bespoke software, Alternative Operating Systems, Alternative operating systems, UNIX/Linux, OS X, Android

Unit 4

3hrs

System Testing: Test plan, Test documentation, Fault detection, diagnostics, troubleshooting, Software, Maintenance, Software problems, Automatic updates & Upgrades, Utility software & security software

Unit 5

3hrs

Hardware Maintenance : Preventative maintenance, Upgrade v replace, File Management, File systems operation and organization - FAT, NTFS, ext, Directories/folders, Security, sharing and access rights, Data Protection, Backup, File/folder, organization

References

1. Advances in Computing Systems and Applications Proceedings of the 3rd Conference on Computing Systems and Applications
2. Editors: **Demigha**, Oualid, **Djamaa**, Badis, **Amamra**, Abdenour (Eds.)

SEM/YEAR	: I SEM/1 st Year
COURSE CODE	: 21VI107
TITLE OF THE COURSE	: Basics of Electrical & Electronics LAB
L: T/A: P: C	: 0: 0: 4: 4

Course Objectives:

- To understand Circuit operation of different types of voltage regulation circuits, including series.
- To explain the construction and characteristics of diodes, bipolar junction transistors and optical devices.

Course outcomes:

- Ability to understand and analyse, linear and digital electronic circuits.

List of experiments:

1. Familiarization of toolkit
2. Soldering Practice
3. Familiarisation of CRO
4. Familiarisation of function Generator
5. Familiarisation of Digital Multi meters
6. Colour coding of the resistor
7. Verification of Ohm's law
8. Verification of KVL and KCL
9. Study of diode data sheet and V.I Characteristics of diodes
10. Study of Zener data sheet and V.I Characteristics of Zener diodes
11. Rectifiers- Half-wave and centre-tapped full-wave rectifier
12. Bridge rectifier with capacitor filter
13. Familiarisation of Logic Inverter (TTL)
14. Familiarisation of AND Gate (TTL)
15. Familiarisation of OR Gate (TTL)
16. Familiarisation of NAND Gates (TTL)
17. Familiarisation of NOR Gates (TTL)
18. Familiarisation of EXOR Gates (TTL)
19. Universal Property of NAND and NOR Gates

SEM/YEAR	: I SEM/1st Year
COURSE CODE	: 21VI109
TITLE OF THE COURSE	: Web Programming lab
L: T/A: P: C	: 0: 0: 5: 5

Course Objectives:

- Define the basics and principles of Web page design
- Visualize the basic concept of HTML
- Develop the concept of web publishing
- Introduce basics concept of CSS.

Course outcomes:

- Ability to understand and develop the website.

List of experiments:

1. Write a program in C language to display 'hello world'. Analyze Submain(), Compilation and execution process of a C program.
2. Write a program in C language to perform arithmetic operation like +, -, X, / and %. And display the result. (i) by declaring in to type variables. (ii) by declaring float type variables. (iii) by declaring double type variables. (iv) by declaring long int type variables. (v) by declaring unsigned int type variables
3. Write a program in C language to calculate the area of the circle. Formula for Calculating area is where r is the radius and is a constant.
4. Write a program in C language to find whether an input number is even or odd.
5. Write a program in C language to find whether an input number is positive or Negative
6. Write a program in C language to find the greatest among three input numbers.
7. Write a program in C language to check whether an entered alphabet is vowel, consonant, digit or special character.
8. Write a program in C language to interchange the values of two numeric variables Without using a third variable.
9. Write a program in C language to print counting numbers from 1 to 100 using 'for loop'.
10. Write a program in C language to print all odd numbers less than 100 using 'while loop'.
11. Write a program in C language to print all even numbers less than 100 using 'while loop'.
12. Write a program to print all the ASCII values and their equivalent characters

Using a while loop.

13. Write a program in C language to find the sum of digits of an input number less than 99999.
 14. Write a program in C language to find the sum of first and last digit of any input number less than 99999.
 15. Write a program in C language to reverse any input number less than 99999.
 16. Write a program in C to generate Fibonacci series 0,1,1,2,3,5,8,...<1000.
 17. Write a program in C language to find sum of series $(1^2) + (2^2) + \dots + (n^2)$, where $n < 25$.
 18. Write a program in C language to display the output as given below using proper loops
- 1234
- 234
- 34
- 4
19. Write a program in C language to find all the factors of an input number less than 1000.

20. Write a program in C language to find whether an input number is prime or composite.

21. Write a program in C language to display a menu as given below and Execute Arithmetic operations. Use switch case. Menu

Addition 1

Subtraction.....2

Multiplication.....3

Division.....4

Modulo Division...5

Enter your choice...(0/1/2/3/4)

22. Write a program to print the prime numbers up to a given limit. Also print the number of prime numbers present in the given limit (Use nested loops, break and continue).
23. Write a program to enter the number till the user wants and at the end it should display the count of positive, negative and zeros entered.

HTML

24. Create a HTML document using the following tags <html>, <head>, <title>, <body>
25. Create a HTML document which contains the following properties: Headings, paragraphs and breaks, divisions and centering quotations, preformatted

text, inserted and deleted text, character entities, comments, block level elements- block quote tag, text-level elements, font tags.

26. Create a HTML document for creating lists-ordered list, unordered list and definition list.
27. Create a HTML document to implement nested list
28. Create 6 HTML pages, make one as main and make other 5 as sub pages. Create links in main page to link to all subpages and create link in all subpages for moving throughout the pages and to come back to main page
29. Create a html document containing images by using tag.
30. Create an HTML document to implement Image map.
31. Create a HTML document and give different colors for text, set back ground color, background image.
32. Create an HTML document to create the following tables (Table with caption, Headings, Row span, Col span, Cell padding, Cell spacing, Add background color, back ground image in a table, Border properties)
33. Create an HTML document and divide the page into frames use vertical frame and horizontal frame, include pages in all the frames, give links in the page and open the link in the frame, use target
34. Create an HTML document to implement inline frame
35. Create an HTML document and attach audio, video, animation, PDF format using <embed>
36. Create an HTML document and add a form in that and add form elements such as, field set, legend, labels, text box, textarea, radio button, check box, drop down list, select menu, file uploads, submit button, reset button
37. Create a HTML document to add style to a document (use different selectors)
38. create a HTML document for adding style to a document
a) Inline style sheet b) Embedded style sheet c) External style sheet
d) Import e) link
39. Create a HTML document to include CSS background properties.
40. Create a HTML document to include CSS text properties
41. Create a HTML document to include CSS list properties
42. Create a HTML document to include CSS fancy Table
43. Create a HTML document to include CSS Box Model
44. Create a HTML document to include CSS Border properties
45. Create a HTML document to include CSS Outline

46. Create a HTML document to include CSS Positioning properties

47. Create a HTML document to implement CSS pseudo-class. Add different colors to a hyperlink, add other style to hyperlinks

SEM/YEAR	: I SEM/1 st Year
COURSE CODE	: 21VI110
TITLE OF THE COURSE	: C Programming lab
L: T/A: P: C	: 0: 0: 5: 5

LIST OF PROGRAMS:

C Programming

- **INTRODUCTION AND DATA TYPES**

1. Write a program in C language to display 'hello world'. Analyze Sub main (), compilation and execution process of a C program.
2. Write a program in C language to perform arithmetic operation like +, -, X, / and % and display the result.
3. By declaring int type variables.
4. By declaring float type variables
5. Write a program in C language to calculate the area of the circle. Formula for calculating area of a circle A is $A=\pi r^2$ where r is the radius and π is a constant.

- **DECISION MAKING AND LOOPING**

1. Write a program in C language to find whether an input number is even or odd.
2. Write a program in C language to check whether an entered alphabet is vowel, consonant, digit or special character.
3. Write a program in C language to print counting numbers from 1 to 100 using 'for loop'
4. Write a program in C language to find the sum of digits of an input number less than 99999.
5. Write a program in C language to display a menu as given below and Execute arithmetic operations. Use switch case.

Menu

Addition 1

Subtraction..... 2

Multiplication3

Division 4

Module Termination 0

Enter your choice (0/1/2/3/4)

- **ARRAY**

1. Create an array and store data into the array and print the same.
2. Write a C program to accept an array and search for an element.
3. Write a C program to create an arrays and sort in descending order and ascending order.
4. Write a C program to perform a transpose of a matrix.

- **STRING**

1. Write a C program to read text and display it
2. Write a C program to accept a string and find the number of vowels and displayit
3. Write a C program to find the length, concatenate, copy of the string using non built in function
4. Write a C program to check whether the string is palindrome or not

- **FUNCTION**

1. Write a function LEAP_YEAR() that receives year as a parameter and display proper message, that the particular year is leap year or not
2. Write a recursive function to calculate the factorial of a number.

- **STRUCTURE**

1. Write a C program to illustrate the comparison of two structure variables and print equal or not taking individual members.
2. Write a program to add two times using structure.

- **POINTER AND FILE**

1. Write a program to create a pointer variable and display the address and value using pointer variable.
2. Create a file write some content into the file and read the content of the file and display it on monitor.

2nd Semester Syllabus

SEM/YEAR	: II SEM/1st Year
COURSE CODE	: 21VI201
TITLE OF THE COURSE	: Python Programming
L: T/A: P: C	: 2: 0: 0: 2

Course Objectives:

1. Master the fundamentals of writing Python scripts.
2. Learn core Python scripting elements such as variables and flow control structures.
3. Discover how to work with lists and sequence data.
4. Write Python functions to facilitate code reuse.
5. Use Python to read and write files.
6. Make their code robust by handling errors and exceptions properly
7. Work with the Python standard library
8. Explore Python's object-oriented features
9. Search text using regular expressions

Course Outcomes:

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Interpret Object oriented programming in Python
3. Design and develop Client Server network applications using Python

Unit 1: Introduction to Python

6 Hrs

History and Features of Python, **Installing Python**, **Very Simple Programs**, Variables, Python Data types and Operators: Python data types, Numbers, Python Strings, Functions and methods, Lists, working with list, Functions and methods, Tuples, working with tuples, Functions and methods, Dictionaries, working with dictionary, Functions, Python Basic operators, Python Program Flow Control: Conditional and control statements, Loops, For Loops in ranges, string, list and directory

Unit 2: **Python Functions, Modules and Packages**

6Hrs

Calling a function, Types of functions ,Function Arguments ,Anonymous functions, Global and local variables, Importing module, Importing own module as well as external modules, Packages, Composition, Powerful Lambda function in python. Python Input, Output and File operations: Printing on screen, Reading data from keyboard, Opening and closing files, Reading and writing Files, Renaming and deleting file. Manipulating file pointer using seeks. Exception Handling: Exceptions, Assertions in Python, Exception Handling, try, except clause and try-finally clause

Unit 3: **Python Object Oriented Programming – Oops**

6Hrs

OOPs concepts, Classes and objects, Attributes, Inheritance, Overloading, Overriding, Data Hiding, Encapsulation and polymorphism. Regular Expressions: Character matching and searching in regular expressions, Extracting data using regular expressions, Regular Expression modifiers, Patterns. CGI

Programming: CGI, CGI architecture, Environment variable, CGI Examples, HTTP Header, GET and POST methods

Unit 4: Databases

6Hrs

Introduction, database connection, executing queries, performing transactions, networking: Socket, Socket Module, Methods, Client and server, Internet modules. Sending Email: Sending Email using SMTP, Sending an HTML e-mail using Python, Sending Attachments as an E-mail

Unit 5: GUI programming

6 Hrs

Python - GUI Programming (Tkinter), Tkinter Programming, Tkinter Widgets, Attributes. Web Scraping: Project: mapIt.py with the web browser Module, Downloading Files from the Web with the requests Module, Saving Downloaded Files to the Hard Drive. Working with Excel Spreadsheets: Installing the openpyxl Module, Reading Excel Documents. Working with PDF and Word Documents: Read PDF Documents, Extracting Text from PDFs, Decrypting PDFs, Creating PDFs

Text Books:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning,
2. Learning Python 2nd edition by MARK LUTZ, David Ascher, O; Reilly Publications
3. Python Programming: A Complete Guide for Beginners to Master, Python Programming Language by Brain Draper

SEM/YEAR	: II SEM/1st Year
COURSE CODE	: 21VI202
TITLE OF THE COURSE	: Mathematics II
L: T/A: P: C	: 2: 0: 0: 2

Course Objectives:

1. Solve mathematically technical problems and apply the concepts of Mathematics to engineering problems
2. Awareness of correlation and regression.
3. Know the basic concepts of statistics.
4. Understand and use concepts of Integration and Differential Equations and its applications
5. Know the solution of percentage, ratios and proportions.

Course Outcomes:

1. Solve system of Probability and Statistics
2. Solve problem of Analytical Geometry
3. Describe and Develop Correlation and Regression analysis model

Unit 1:

RATIOS, PERCENTAGE AND PROPORTIONS

02 Hrs

Ratios, proportion and percentage

Unit 2:

ANALYTICAL GEOMETRY

05Hrs

Rectangles and Squares, Parallelogram, Triangle, Rhombus, Trapezium, Circle, Sector and Arc, Cartesian Co-Ordinates, Equation of axis, Distance, Midpoint, Slope, Condition for Perpendicularity and parallelism, Equation of straight line

Unit 3:

INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

9Hrs

Integrals of functions, rules of integration, Integration by parts Definite Integrals Area under plane curves – simple problems Differential equations

Unit 4:

CORRELATION AND REGRESSION

06 Hrs

Meaning of correlation and Regression, Correlation Analysis, Regression Analysis, Simple Linear Regression

Unit 5:

PROBABILITY AND DISTRIBUTION

8Hrs

Probability, Sample and Event Space, Conditional Probability, Data Types, Uniform Distribution, Normal Distribution, Binomial Distribution, Poisson distribution.

Text Books:

1. Thomas, Weir and Hass(2009), Thomas's Calculus, Twelfth edition, Pearson, India
2. Goon A.M., Gupta M.K. & Dasgupta B: Fundamentals of Statistics, Vol. 1, The World Press Pvt. Ltd., Kolkata.
3. Thomas's Calculus, G.B.Thomas, M.Weir, J. Hass, Pearson , 12th edition

SEM/YEAR	: II SEM/1st Year
COURSE CODE	: 21VI203
TITLE OF THE COURSE	: Software Engineering
L: T/A: P: C	: 2: 0: 0: 2

Course objectives

- This course is introduced to give the students necessary knowledge,
- understanding and Design aspects in Software Engineering
- Understand software development life cycle models, process models, and various design engineering techniques
- Understand the importance of testing and use different types of testing techniques.

Unit 1

6hrs

The software Problem: Software Problem - Cost, Schedule and quality, Scale and Change. Software Process - Process and Project, Component Software Processes Software development

Unit 2

6hrs

Software process: Process Models, Waterfall, Prototyping, Iterative development, Rational Unified Process, Time boxing Model, Extreme programming and Agile processes, Using process model in a project, Project Management Process.

Unit 3

6hrs

Software requirements analysis and specifications: Value of good SRS, Requirement process, Requirement Specification, Desirable Characteristics of an SRS, Components of an SRS, Structure of a Requirements Documents, Functional Specification with use cases, Basics, Examples, Extensions, Developing use cases, Other Approaches for Analysis, Data Flow Diagram, Validation.

Unit 4

6hrs

Software architecture &: Role of Software Architecture, Architecture Views, Component and Connector view, Components, Connectors, Example, Architecture styles for C&C View, Pipe and Filter, Shared data Style, Client Server style, Some other styles, Documenting Architecture Design, Evaluating Architectures.

Unit 5

6hrs

Planning a software project: Planning a software project -Effort Estimation, Top-Down Estimation Approach, Bottom-Up Estimation Approach, Project Schedule and Staffing, Quality Planning, Risk Management Planning, Risk Management Concepts, Risk Assessment, Risk Control, A Practical Risk Management Approach, Project Monitoring Plan, Measurements, Project Monitoring and tracking, Detailed Scheduling

Text Book:

Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition. McGraw Hill International Edition.

SEM/YEAR	: II SEM/1st Year
COURSE CODE	: 21VI204
TITLE OF THE COURSE	: Data Structures with Python
L: T/A: P: C	: 2: 0: 0: 2

Course Objectives:

1. Know various techniques of Data structures
2. Creating Stacks and Queues.
3. Design Trees
4. Implement Graphs

Course Outcomes:

1. To understand and explain linear and dynamic allocation of memory using array and linked list
2. To design programs for queue, stacks, sorting, Searching using linear data structures.
3. To use nonlinear data structures to create make Tree, Graphs

Unit 1: Introduction

8 Hrs

Functions and various implementation of functions. Passing values, array, structure, pointer to a function, Structures, structure variables, pointer to structure variables, Pointers, Double pointer, NULL Pointer, void pointer, Dynamic memory allocation. **Stacks:** The Stack introduction, Definition and operations on stack. Insert/push operation, delete and pop operation and display, Representation of stacks in C using arrays implementing various operation of stack using C, Stack application: Conversion of expressions with implementation using C, Conversion from infix to postfix, Conversion from infix to prefix, Evaluation of postfix expression, Evaluation of prefix expression. **Queues:** Introduction, operation and application of queues, Different types of queues - Sequential representation of queues, Ordinary queue, Circular Queue, Priority queue, Double Ended queue, Input Restricted Deque. Output Restricted Deque

Unit 2: Linked Lists

6 Hrs

Introduction, Singly linked list with operations in lists, Creating ordered list, merging two ordered list, Circular single linked list, Circular single linked list with header node, Doubly linked list and Circular double linked list, Application of linked lists, Addition of two long integers, Evaluation of a polynomial, Addition of two polynomials, Advantage and disadvantage of different lists

Unit 3: Trees

6 Hrs

Introduction, Definition, storage representation of a binary tree, Terminologies associated with trees, Operations on binary tree: Insertion, Traversal, Searching, Copying a Tree, Binary search Tree: Insertion, Searching, Deletion, Application of Trees: Searching, Sorting, Conversion of Expression, Creating binary tree for postfix expression (Expression Tree)

Unit 4: Graphs**5 Hrs**

Introduction- what is graphs, Definition, Basic operations on Graph, Directed graph and Undirected graph, Representation of graph- Adjacency Matrix and Adjacency List, Representation of graph- Adjacency Matrix, Representation of graph- Adjacency List, Advantages and disadvantages of Adjacency Matrix and Adjacency List, Graph categories – Sparse graph and Dense graph, Graph Traversal – BFS and DFS, Depth First Search, Breadth First Search

Unit 5: Sorting and Searching**5 Hrs**

Introduction, Bubble Sort, Merge sort, Radix sort, Quick sort, Insertion Sorts, Simple insertion sorts, Shell sort, Heap sort, Priority Queue using heap, Basic search techniques, algorithmic notation, Searching, searching an ordered Table, Binary search, Interpolation search, Tree searching: Binary search

Text Books:

1. Introduction to Data Structures using C by A. M Padma Reddy
2. Data Structures using C and C++ by Tanenbaum, Tata McGraw Hill Publishers
3. The Definitive Guide, Fifth Edition By David Flanagan (Author)
Professional JavaScript for Web Developers (Wrox Programmer to Programmer) second edition
by Nicholas C. Zakas (Author)
4. Data Structures through C by Yeshwant Kanitkar

SEM/YEAR : II SEM/1st Year
COURSE CODE : 21VI205
TITLE OF THE COURSE : Database Design & Development
L: T/A: P: C : 2: 0: 0: 2

Course Objectives:

1. Understand the Database concepts
2. Design the database with planning and coding
3. Normalize the database
4. Administration of data and data base
5. Solve queries related to the database

Course Outcomes:

4. Ability to Install, configure, and interact with a relational database management system
5. Ability to master the basics of SQL and construct queries using SQL
6. Ability to design and develop a large database with optimal query processing

Unit 1: Introduction to Database System **5 Hrs**

File System versus a DBMS, Purpose of Database system, Database Applications, Basic concepts and definitions

Unit 2: Data Models **6 Hrs**

Entity-Relationship Model, Object Oriented Model, Network Model, Hierarchical Model, Relational model, **Normalization**: What is Normalization? First Normal form, Second Normal form, Third Normal form, Boyce-codd Normal Form

Unit 3: SQL **8 Hrs**

Introduction to SQL, DDL Commands, DML Commands, DCL Commands, TCL Commands, User defined data type, Where Clause operators, Order By, Group By, Having Clauses, DISTINCT, TOP Keywords, Aggregate functions, Built-in functions-numeric, string and Date Functions

Unit 4: Advance SQL **6 Hrs**

SQL Constraints, Sub Queries, Identity column, SQL Joins, Views, Index, Triggers

Unit 5: Transact-SQL **5 Hrs**

Stored Procedure, Function, Control Structures, Conditional Processing using IF statements, While loop, Exception handling by TRY...CATCH, Error functions used within CATCH block

DATA ADMINISTRATION

Database Administrator, Concurrency control, Database Recovery, Database Security

Reference Books:

1. SQL Server 2008 r2 - Black Book
2. SQL Server – Patrick Paul
3. SQL Server 2008 programming – Robert vieira
4. J. Date, A. Kannan and S. Swamynathan, “An Introduction to Database Systems”, 8thed, Pearson Education, 2006
5. Raghu Ramakrishnan, “Database Management Systems”, Third Edition, McGraw Hill, 2003

SEM/YEAR	: II SEM/1 st Year
COURSE CODE	: 21VI206
TITLE OF THE COURSE	: Computer Networks
L: T/A: P: C	: 2: 0: 0: 2

Course objectives

Upon completion of this subject, the trainee will be able to:

1. Explain network technologies and explain how devices access local and remote network resources.
2. Describe router hardware and Explain how switching operates in a small to medium-sized business network. Design an IP addressing scheme to provide network connectivity for a small to medium-sized business network.
3. Configure initial settings on a network device and implement basic network connectivity between devices.
4. Configure monitoring tools available for small to medium sized business networks.
5. Determine how a router will forward traffic based on the contents of a routing table
6. Use monitoring tools and network management protocols to troubleshoot data networks
7. Configure Ethernet switch ports and Implement VLANs.
8. Implement static routing and RIPv2 and Implement DHCP on a router.
9. Implement network address translation (NAT) and Implement access control lists (ACLs) to filter traffic.

Unit 1

6hrs

Introduction to Networks: What is a network? Real world networks, The OSI seven-layer model, **Network Protocols and Standards:** Communications and network protocols and the OSI model, Protocols in real world networks, The Internet

Unit 2

6hrs

Wireless Networking Standards: Wireless devices, Wireless networking standards, Issues for wireless networks, Wireless networking protocols, **Network Topology and Architecture:** Network topology concepts, Common network topologies and their application, Topologies and protocols

Unit 3

6hrs

Network Media and Connectors: Network media, Network connectors, selecting media and connectors, **Network Hardware:** Network hardware, Hardware selection, creating a network

Unit 4

6hrs

Wireless Network Hardware: Wireless network hardware, Wireless hardware selection creating a wireless network, Security Software, Network security threats, Security countermeasures Security software, Firewalls, Functions of a firewall, Types of firewall

Unit 5

6hrs

Network and Server Software: Network software requirements, Wireless network software requirements, Configuring network software Voice over IP and, Video Conferencing Voice over IP (VoIP),

Video conferencing, Installing and configuring voice and video networks **Virtual Private Networks:**
Virtual private networks (VPN), Advantages and disadvantages of VPN

Reference Books:

Computer Networks III and IV Edition – Andrew S. Tanenbaum, PH

SEM/YEAR : II / 1

COURSE CODE : 20CSE5204

TITLE OF THE COURSE : Special Topics-II

L: T/A:P: C : 0 : 0 : 2 : 1

Course outcomes

1. To develop problem solving abilities
2. To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
3. To train students in professional skills related to Software Industry
4. To prepare necessary knowledge base for research and development in Computer Science

Course Content

Following are some of the ways (but not limited to) of delivering the "Special Topics":

(i) **Engaging Students in Small Batches (maximum 3/batch) in Projects:** DSU Faculty will define and supervise a project which has a well defined scope. Students will work from requirements to delivering a prototype.

(ii) **Delivery from an Industry Expert:** An industry Expert can offer a project for around 20-25 students, clearly defining the scope. The project will have 4-5 sub-modules. Each student group will work on one sub-module from requirements gathering and analysis all the way to a working module. The sub-teams will integrate the modules and will together deliver a working prototype. The industry expert will engage all the teams on one afternoon face to face. One or two SOE faculty will also co-supervise the project.

(iii) **A Start-up company** might have a few project ideas to try out and they would engage a team of 20-25 students (in 4-5 batches) to work on these project ideas from concept to a prototype, with a close supervision from the start-up company technologist together with DSU faculty.

(iv) **Testing a new Product:** A Company has come up with a new product and they require a team of 30-40 students to thoroughly test all the features of the product and come up with a validation of the features of the product, a summary of features that fail to work and also a recommendation on a set of features that may have to be added to the product.

(v) A professor from an elite university from within India or abroad, offering a **short course** on a domain which is very current and state of art. The content has a built in project component.

(vi) A student undergoes a **on-line certification course** (such as coursera, Edx founded by Harvard and MIT, MOOC, NPTEL, SWAYAM etc). Student obtains a certificate and an 'End of the Semester' exam will be conducted by the respective department.

(vii) An expert from a company offers a **3 or 4 day workshop** (on-campus or outside the campus) involving mostly hands-on and a project component and a group of students successfully complete the workshop, with well defined learning components and deliverables.

(viii) Students participate and successfully complete a **Hackathon** (of Minimum two days), conducted by a reputed institution/organization. The deliverables include the pre-hackathon components, work done during Hackathon and post-Hackathon work (if applicable).

(ix) **Industry Project** : Students in a small team of 4-5 work on a project defined by an industry (including DERBI and AIC) during a semester and successfully complete the project.

(x) **Summer Internship**: A group of students take up Summer Internship at DSU or outside, successfully complete the internship. If done within DSU, a project exhibition will also form a part of evaluation.

(xi) **Visit to a University Abroad** : A group of students participate in a well structured program in a University abroad and complete all the requirements of the university.

(xii) **Working under a Research professor** within DSU or from premium institutes such as IISc, IIT, IIIT etc on a specific project/task.

SEMESTER/YEAR : 7TH SEM/ 4TH YEAR
COURSE CODE : 15CS428
TITLE OF THE COURSE : DATA WAREHOUSING AND DATA MINING
L: T/A: P: C : 3 : 0 : 0 : 3

COURSE OBJECTIVES:

1. Be familiar with the concepts of data warehouse and data mining
2. Apply preprocessing statistical methods for any given raw data.
3. Be acquainted with the tools and techniques used for knowledge Discovery in Databases

COURSE OUTCOMES: At the end of the course students will be able to

1. Learn the concepts of database technology evolutionary path which has led to the need for data mining and its applications
2. Explore DWH and OLAP , and devise efficient & cost effective methods for maintaining DWHs
3. Develop practical work of DM techniques and design hypotheses based on the analysis to conceptualize a DM solution to a practical problem.

MODULE 1 - DATA WAREHOUSING:

8Hrs

Data warehousing Components – Building a Data warehouse -- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools – Metadata.

MODULE 2 - BUSINESS ANALYSIS:

9Hrs

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.

MODULE 3 - DATA MINING:

9Hrs

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Types of Data-attributes and measurements, types of data sets, Data Quality, Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues – Data Preprocessing.

MODULE 4 - CLUSTERING AND TRENDS IN DATA MINING:

9Hrs

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – K-means- Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications

MODULE 5 - ASSOCIATION RULE MINING AND CLASSIFICATION:

10Hrs

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

TEXTBOOKS:

1. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition,Tenth Reprint,2007.
- 2.Jiawei Han and MichelineKamber, "Data Mining Concepts and Techniques", Second Edition,Elsevier,2007.

REFERENCES:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, " Introduction To Data Mining", PersonEducation,2007.
- 2.K.P. Soman, Shyam Diwakar and V. Ajay ", Insight into Data mining Theory and Practice", Easter Economy, Edition, PrenticeHallofIndia, 2006.
3. G. K. Gupta, " Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
- 4.DanielT.Larose, "Data Mining Methods and Models", Wile-Interscience, 2006.

SEMESTER/YEAR : V SEM
COURSE CODE : 15CT304
TITLE OF THE COURSE : PROFESSIONAL AND BUSINESS ETHICS
L: T/A:P: C : 3 : 2: 0 : 4

Course objectives

1. To make students understand the meaning of good ethics, doing things right and the obstacles to making good ethical decisions
2. To enable students to identify and critically assess the principles and values they personally embrace and use in addressing the ethical issues which arise in their working lives.
3. To acquaint students with some of the major kinds of ethical problems encountered while performing work assignments and some possible ways of responding to them

Course outcomes

1. Reflect on ethical and sustainable business practices
2. Understand the role of ethics in all function areas of business including management, marketing, international business, human resources, finance, and accounting
3. Discuss the most pressing issues confronting business leaders today

Module 1

Ethics in general

(8 hours)

Introduction, Needs, Principles, Laws & Ethics; Development of Personal Ethics, Workplace Ethics for Employees-Ethical behavior in workplace- Ethical violations by employees, Employee Attitude and Ethics, Employee Etiquettes. Benefits of ethics - employee commitment, investor loyalty, customer satisfaction, profits
Case study.

Module 2

Professionalism

(10 hours)

Unethical Conduct for employees and employers. Factors leading to Unethical Behaviors'. Different unethical behaviors. Measures to control unethical behaviours. Rewarding ethical behavior
Case study.

Module 3

Business Ethics and Corporate Governance

(8 hours)

Overview of Business Ethics, Corporate Governance, Ethical issues in human resource management- The principal of ethical hiring, Firing, worker safety, whistle blowing, Equality of opportunity, Discrimination, Ethics and remuneration, Ethics in retrenchment. Ethical Dilemmas at workplace, Ethical issues in global business, corporate responsibility of employers. Introduction to SEBI corporation and role of government.
Case study.

Module 4

Workplace Privacy & Ethics

(10 hours)

Watching what you say and what you do in the workplace, Hardware, Software and Spyware, Plagiarism and Computer Crimes, Convenience and Death of Privacy, Defense of employee privacy rights.

Case study.

Module 5

Teamwork in the Workplace & Ethics

(10 hours)

Teams, Elements of team, Stages of team development, team meetings, team dynamics, team rules, and teams work and professional responsibility, rules of professional responsibility, ASME code of ethics.

Case study.

Text Books:

1. Ethical Theory and Business, 8th Edition, Tom L. Beauchamp, Norman E. Bowie and Denis Arnold
2. Business Ethics, 9th Edition, O.C. Ferrell, John Fraedrich, and Linda Ferrell, Cengage Learning.

Reference Books:

1. How technology is compromising Workplace Privacy, Fredrick S Lane 111, AMACOM Div American Mgmt Assn, 2003
2. Ethics in the Workplace, Dean Bredeson, Keith Goree, Cengage Learning, 2011.
3. Ethics in 21st Century, Mary Alice Trent, Oral Roberts University, Longman.
4. Ethics in workplace, Elizabeth P Tierney, Oak tree press
5. Ethics in Workplace: System Perspective, William F Roth, Pearson, 2014.

SEMESTER/YEAR : 7TH SEM

COURSE CODE : 16IE467

TITLE OF THE COURSE : Fundamentals of CLOUD COMPUTING

L: T/A: P: C : 3:0:0:3

COURSE OBJECTIVES:

1. Understand various basic concepts related to cloud computing technologies
2. Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS
3. Understand the applications of Cloud Computing
4. Get exposure to Microsoft Azure, Google Cloud Platform, Amazon Web Services

COURSE OUTCOMES:

1. Define Cloud computing and characteristics
2. Describe benefits and drawbacks of Cloud computing
3. Explain various types of virtualization and capacity planning metrics
4. Discuss various types of cloud services
5. Discuss Cloud Security and various challenges

MODULE 1 - INTRODUCTION 8Hrs

Basics of cloud computing, **Cloud Computing Models (Paas, Saas, Iaas)**, Understanding Public Clouds, Private Clouds, Community Cloud and Hybrid Clouds, Cloud Computing Benefits and risks, Cloud Computing Challenges, **Cloud Computing Architecture and Virtualization**. Introduction to Google App Engine.

MODULE 2- CLOUD Technologies 8Hrs

Overview of Cloud Computing techniques (Grid Computing, Cloud Computing, Utility Computing, Fog Computing, Edge computing). Introduction to Cloud security.

MODULE 3 – CLOUD VIRTUALIZATION TECHNOLOGY 8Hrs

Introduction, why virtualization, virtualization benefits, application virtualization, virtual machine, desktop virtualization, server virtualization, storage virtualization, Network virtualization implementing virtualization, Hypervisor.

MODULE 4 – ACCESSING THE CLOUD AND MIGRATING TO THE CLOUD 8Hrs

Accessing the Cloud: Cloud Web access technologies (SOAP ,REST),Platforms, web applications framework, web hosting service, web APIs, web browsers.

Migrating to the Cloud: Broad approaches to migrating into the cloud, the seven-step model of migration into a cloud.

MODULE 5- CLOUD APPLICATIONS 8Hrs

Cloud Platforms in Industry: Amazon Web Services, Google Cloud Platform, Microsoft Azure.

Cloud Applications: Scientific Applications (Healthcare: ECG Analysis in the Cloud) and Business and Consumer Applications (Social Networking, Smart Grids)

Text Books

Module 1 & 5:

- Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud. Computing McGraw Hill Education

Module 2:

- Cloud Computing, Dr. Kumar Saurabh, Wiley Publications, 2012
- Guide to Cloud Computing, Richard hill, Springer Publications, 2013

Module 3:

- Cloud Computing A Practical Approach, Anthony T Velte et.al, MC Graw Hill publications, 2014
- Cloud Computing Principles and Paradigms, Rajkumar Buyya et.al, Wiley Publications, 2015

Module 4:

- Cloud Computing Technologies and Strategies of the Ubiquitous data center, Brain J.S et.al, CRC Press, 2014

SEMESTER/YEAR : 7TH SEM
COURSE CODE : 16IE468
TITLE OF THE COURSE : Machine Learning with Python
L: T/A: P: C : 2:0:2:3

Course Objectives:

1. To understand the difference between the two main types of machine learning methods: supervised and unsupervised
2. To learn Supervised learning algorithms, including classification and regression
3. To learn Unsupervised learning algorithms, including Clustering and Dimensionality Reduction
4. To get hands-on experience in machine learning algorithms using libraries in Python
5. Real-life examples of the different ways machine learning affect society

Course Outcomes:

1. Differentiate between the two main types of machine learning methods: supervised and unsupervised
2. Program Supervised learning algorithms, including classification and regression
3. Program Unsupervised learning algorithms, including Clustering and Dimensionality Reduction

Course Content

Module 1: Introduction to Python and Machine Learning

Overview , Applications of Machine Learning, Types of Machine Learning, Basics of Python, Python Libraries for Machine Learning

Pandas for importing Data, Numpy, Scipy, data visualization using Matplotlib **9 hours**

Module 2: Regression

Linear Regression, Non-linear Regression, Model Evaluation **7 hours**

Module 3: Classification

Logistic Regression, K-Nearest Neighbor, Decision Trees, Naive Bayes classifier, Support Vector Machines, Model Evaluation **8 hours**

Module 4: Feature selection and Dimensionality Reduction

Principal Component Analysis (PCA), Multidimensional Scaling (MDS), Bagging and Boosting

8 hours

Module 5: Unsupervised Learning

This course has an integrated lab to provide high level exposure to using Python and some ML framework such as scikitlearn to build ML applications.

Textbook:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education
2. Sebastian Raschka, Python Machine Learning, third edition, 2019 Packt Publishing Ltd.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First impression, 2014.
4. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining -Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2012.

Reference Books:

1. Machine Learning Algorithms
<https://www.oreilly.com/library/view/machine-learning-algorithms/9781785889622/>
2. Rudolph Russell :Machine learning step by step guide to implement
3. Shai Shalev-Shwartz, Shai Ben-David :Understanding Machine learning from theory to algorithms
4. Scikit-Learn : <https://link.springer.com/book/10.1007/978-1-4842-5373-1>

1. Title of the course: Introduction to Entanglement and Quantum Computing
2. Course number : 16IE472
3. Status of the course: Elective
4. Structure of credits: 3 credits course
5. Offered to: Senior UG and/or PG (students from all departments)
6. New course/modification to: New
7. To be offered by: Department of Physics
8. To take effect from: July 2021
9. Prerequisite: Undergraduate physics and mathematics at the level of second year science or engineering studies.
10. **Course Objective(s):** This course will provide an introduction to fundamental concepts of quantum theory, including the path integral formulation. Principles of quantum entanglement will be introduced, and an understanding of quantum gates will be developed. Foundations for learning principles of quantum computing will be laid down. The course will prepare students from a wide range of background to take specialized studies in quantum information theory and quantum computations.

12. Course Content:

Module 1	Description of a mechanical system in classical and quantum physics. Classical vs. Quantum Uncertainty. Quantum Entanglement.
Module 2	Einstein-Podolsky-Rosen Paradox. Correlations in quantum measurements. Bell's inequalities
Module 3	Classical vs. Quantum computing. Brief review of Classical logic gates. Bits vs. Qubits. Bloch sphere description of qubits. Universal Quantum logic gates, Pauli gates, Hadamard gate, Swap gate etc., Physical qubits. Multi-qubit quantum Gates.
Module 4	Complete solution to Deutsch-Jozsa algorithm, Introduction to Grover and Shor algorithm.
Module 5	No-Cloning and No deleting Theorem and introduction to Quantum Teleportation. Quantum dense coding, quantum cryptography. Time-delay in quantum information processing. Race for quantum supremacy. Recent advancements toward realization of quantum communication and computation protocols

13. Textbook(s):

- 1) *Quantum Computation and Quantum Information* by M. A. Nielsen and I. L. Chuang (Cambridge University Press, 2nd Edition, 2010)
- 2) *Problems and Solutions in Quantum Computing and Quantum Information* by Willi-Hans Steeb and Yorick Hardy (World Scientific, 4th Edition, 2020)

14. Reference(s):

- 1) *Introduction to Quantum Mechanics* by David J. Griffiths and Darrell F. Schroeter (Cambridge University Press, 3rd Edition, 2018)
- 2) *Quantum Entanglement* by Paul F. Kisk (CreateSpace Independent Publishing Platform, 1st Edition, 2016)

Expected outcome: Students would get in-depth understanding of the fundamental principles of quantum entanglement. They would understand how quantum gates achieve capabilities that far surpass those of classical computers. Theorem like “no cloning theorem” and analysis of teleportation would equip students with the capabilities and limitations of quantum entanglement.

Course Title	Analog Electronics
Course Code	19CS2305
Year	2019-2023
Semester	III

1. Course Size and Instruction Method

Credits	L	T	P	Hours/Week
3	2	0	2	4

2. Course Details

2.1 Course Aim and Summary

The course “Analog Electronics” aims at introducing principles of Analog circuits and electronic devices. The course introduces diodes and transistors as fundamental devices and deals with their characteristics. The course covers design of clippers, clampers, filters, operational amplifiers and oscillators using fundamental devices and study of their characteristics.

The objectives of the Course are:

- 1 To understand the applications of Analog Electronics
- 2 To analyze transistor as an amplifier
- 3 To understand the hybrid model of a transistor
- 4 To derive the h-parameters for hybrid model.
- 5 To analyze h-parameter equivalent circuits for CE amplifier
- 6 Understand concepts of transfer gain, transfer function and frequency response of feedback amplifiers
- 7 To compare characteristics of ideal op-amp with practical op-amp.
- 8 To analyze Open loop and closed loop configurations of operational amplifier.
- 9 To learn advantages of active filters over passive filters.
- 10 To understand the frequency response characteristics of active filters.
- 11 To analyze first order low pass butter worth filter
- 12 To analyze first order high pass butter worth filter
- 13 Discuss types of band pass filters
- 14 To understand the need of data acquisition and data conversion in real world.
- 15 Learn different types of Analog to digital converters (ADC)
- 16 Learn different types of Digital to analog converters (DAC)
- 17 To understand the concept of voltage regulators
- 18 To analyze series regulators and shunt regulators with op-amp
- 19 To learn three terminal IC regulator

2.2 Course Outcomes

After undergoing this course, students will be able to:

SL.No	Outcomes	Blooms Taxonomy Level
CO1	Understand the applications of diodes and hybrid model of a transistor.	2 -Understand
CO2	Analyse the characteristics of Operational amplifiers.	4–Analyse
CO3	Design of various Active filters and analyse their frequency responses.	3 –Design
CO4	Understand various Analog to Digital and Digital to Analog convertor circuits .	2 –Understand
CO5	Analyse the behaviour of voltage regulators.	4–Analyse
CO6	Demonstrate the working of various circuits like clippers, clampers , op-amps and transistors.	3 -Apply

2.3 Course Content

Module 1	Introduction to Analog Electronics Overview of Transistors: Biasing of Transistors, Transistor as an amplifier and Configurations, Small signal model (Hybrid Model) of transistor, Analysis of CE amplifier with collector to base bias.	6 hours
Module 2	Feedback and Operational Amplifiers Feedback amplifiers: Transfer gain, Transfer function, Frequency response and Bandwidth. Operational Amplifiers: Ideal op-amp, Equivalent circuit of practical op-amp. Op-amp IC 741: Open loop and Closed loop configuration.	6 hours
Module 3	Active Filters Advantage of active filters, Frequency response characteristics of filter, First order low pass Butter Worth filter, High pass Butter Worth filter, Band pass filter.	6 hours
Module 4	Data Acquisition and Data Convertors Data Acquisition: Need for Data Acquisition. Data Convertors: ADC, Different Types of ADCs, DAC, Different types of DACs.	5 hours
Module 5	Regulated Power Supply Voltage regulators, Types of voltage regulators, Shunt regulators using op-amp, Series regulator using op-amp, Three terminal IC regulator.	5 hours

Note: Additional 28 Hours are for Lab

2.4 Text Book and References

Text books:

1. A Malvino, D J Bates, Electronics Principles, 7th Edition, McGraw Hill Education India, 2007
2. A P Godse and U A Bakshi, Electronics Circuits, Technical Publications, 2005

Reference books:

1. David A Bell, Electronic Devices and Circuits, PHI, 5th edition, 2007.
2. Millman & Halkias, Electronics Devices and Circuits, Mc Graw Hill, 2007.
3. J. Millman, H. Taub and M Prabhakara Rao, Pulse, Digital and Switching Waveforms, 2nd Edition, Tata Mc-Graw Hill Education, 2007.

SEM/YEAR: I/II/III/IV SEM

COURSE CODE: 19CSE5051

TITLE OF THE COURSE: Real Time Systems

L: T/A:P: C : 3 : 0 : 2 : 4

Course objectives

1. Develop an understanding of various Real Time systems Application
2. obtain a broad understanding of the technologies and applications for the emerging and exciting domain of real-time systems
3. Get in-depth hands-on experience in designing and developing a real operational system.

Course outcomes

- Understand concepts of Real-Time systems and modeling
- Recognize the characteristics of a real-time system
- Understand and develop document on an architectural design of a real-time system
- Develop and document Task scheduling, resource management, real-time operating systems and fault tolerant applications of Real-Time Systems.

Course Content

Unit I: Introduction

9Hrs

Definition, Typical **Real Time Applications: Digital Control, High Level Controls, Signal Processing** etc., Release Times, Dead-lines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

Unit II: Real Time Scheduling

8Hrs

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

Unit III: Resources Sharing

9Hrs

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Module Resources, Controlling Concurrent Accesses to Data Objects.

Unit IV: Real Time Communication**8Hrs**

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols.

Unit V: Real Time Operating Systems and Databases**8Hrs**

Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Con-currency Control, Overview of Commercial Real Time databases.

TEXT BOOKS

1. Real Time Systems – Jane W. S. Liu, Pearson Education Publication

REFERENCE BOOKS

1. Real Time Systems – Mall Rajib, Pearson Education
2. Real-Time Systems: Scheduling, Analysis, and Verification – Albert M. K. Cheng, Wiley.

SEMESTER/YEAR : I SEM
COURSE CODE : 19CSE5171
TITLE OF THE COURSE : ADVANCED OS LAB
L: T/A: P: C : 0: 0: 4: 2

COURSE OBJECTIVES

1. To have practical implementation of OS
2. To implement design strategies for Operating System.
3. To design Distributed systems and give implementation aspects of distributed Process management

COURSE OUTCOMES

1. Understanding the design and implementation aspects OS Understand and develop skills to design distributed systems and process Management Lab experiments and mini projects will include concurrent programming, process management, socket programming, client server computing, distributed message passing, remote procedure calls, and distributed process management.

SEMESTER/YEAR : I SEM
COURSE CODE : 19CSE5172
TITLE OF THE COURSE : DBMS LAB
L: T/A: P: C : 0: 0: 4: 2

COURSE OBJECTIVES

1. To have practical exposure to advanced Data base concepts, query optimization and concurrency control.
2. To design Relational Data bases for a few applications and carry out various activities.
3. To implement a graph algorithms as applicable in Social Networks

COURSE OUTCOMES

1. Understanding advanced concepts in DBMS and query optimization Understand and develop skills to handle data warehouse, OO data bases and document data bases Lab experiments and mini projects will include Query Optimizer, concurrency control and locking, relational data base design, social network analysis.

SEMESTER/YEAR : II SEM
COURSE CODE : 19CSE5271
TITLE OF THE COURSE : HPC LAB
L: T/A: P: C : 0: 0: 4: 2

COURSE OBJECTIVES:

1. To have practical exposure to OS and programming aspects in High Performance Computing.
2. To design and implement distributed memory programming, shared memory programming and parallel applications.

COURSE OUTCOMES:

1. Understand, design and develop programs for better performance, Understand and develop programs in the distributed memory programming and shared memory programming environments. Also develop skills in developing parallel programs to solve the problems.
2. Lab experiments and mini projects will include program execution (processes, virtual memory, system calls, and dynamic memory allocations), Identifying program bottlenecks (profiling, tracing,), Simple high level language optimization, program parallelization, programming using MPI/PVM.

SEM/YEAR	: IV SEM/2nd Year
COURSE CODE	: 19VI410
TITLE OF THE COURSE	: Business Intelligence Lab
L: T/A: P: C	: 0: 0: 4: 4

List of Experiments:

1. Import the legacy data from different sources such as (Excel, SqlServer, Oracle etc.) and load in the target system.
2. Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver / Power BI.
3. Data Visualization from ETL Process
4. Creating a Cube in SQL server 2012
5. Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.

SEM/YEAR	: V SEM/3rd Year
COURSE CODE	: 19VI509
TITLE OF THE COURSE	: IOT Lab
L: T/A: P: C	: 0: 0: 4: 4

List of Experiments:

1. Introduction to **Arduino platform and programming**
2. Interfacing Arduino to Zigbee module
3. Interfacing Arduino to GSM module
4. Interfacing Arduino to Bluetooth Module
5. Introduction to **Raspberry PI platform and python programming**
6. Interfacing sensors to Raspberry PI
7. Communicate between Arduino and Raspberry PI using any wireless medium
8. Setup a cloud platform to log the data
9. Log Data using Raspberry PI and upload to the cloud platform
10. **Design an IOT based system**

SEM/YEAR	: V SEM/3 rd Year
COURSE CODE	: 19VI510
TITLE OF THE COURSE	: Business IT Project
L: T/A: P: C	: 0: 0: 6: 7

A business project is a **project specifically intended to achieve a business objective**. For example, an IS or IT project may have as its objective implementing a new general ledger system. ... This type of project is focused on achieving objectives determined during the business planning or strategic process

Other common examples of IT projects include **designing an organization's IT infrastructure, deploying systems and software**, and employing IT security measures etc.

SEM/YEAR : II/I

COURSE CODE : 20CIT5201

TITLE OF THE COURSE : CLOUD NETWORKING & SECURITY

L: T/A:P: C : 3 : 0 : 4 : 5

Course objectives

1. Explore in-depth the challenges for cloud networking
2. Acquiring the ability to build, deploy and manage applications running on cloud platforms
3. Learning the tools and techniques used to secure and protect network resources
4. Understanding different protocols and tools used to keep networks running and secure.

Course outcomes

- Configure, maintain, and troubleshoot network components and their connection to IT infrastructure
- Implement the right networking solution

Course Content

Module 1: Network Security, Network Performance Monitoring	10Hrs
Modul2 2: Cloud Administration	12Hrs
Cloud Architecture	
Module 3: Cloud Governance	10Hrs
Module 4: Cloud Data Storage	10Hrs
Module 5: Application Development	10Hrs

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SEMESTER	III					
YEAR	II					
COURSE CODE	20CS2301					
TITLE OF THE COURSE	DISCRETE MATHEMATICAL STRUCTURES					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	-	42	3

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES :

- Solve problems using relations and generating functions.
- Understand and Construct mathematical arguments.
- Use propositional and predicate logic in knowledge representation and program verification.
- Develop recursive algorithms based on mathematical induction.
- Know essential concepts in graph theory and related algorithms.
- Apply knowledge of discrete mathematics in Elementary Number Theory and problem solving.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Classify functions, basic set theory relations.	L4
CO2	Demonstrate the correctness of an argument using propositional and predicate logic, laws and truth tables.	L2
CO3	Compare and differentiate graphs in different geometries related to edges.	L4
CO4	Apply mathematical induction, counting principles, recursion, elementary number theory.	L3
CO5	Apply and solve Euclidean Division Algorithm and Chinese Remainder Theorem.	L3

COURSE CONTENT:	
MODULE 1	9Hrs
RELATIONS AND FUNCTIONS: Relation and Types of relations, Closure Properties, Equivalence Relations, Partial Ordering Relations, n-ary relations, Functions: one-to-one, onto and invertible functions, sequences, indexed classes of sets, recursively defined functions, cardinality Counting Principles: Permutation, combination, the pigeon hole principle, inclusion-exclusion principle Self – Learning Component: Set theory definition and Properties	
MODULE 2	8Hrs
LOGIC: Propositions and truth tables, tautologies and contradictions, logical equivalence, algebra of propositions, logical implications, predicate logic, theory of inference for propositional logic and predicate logic. Introduction to Predicate Calculus.	
MODULE 3	9Hrs
NUMBER THEORY : Properties of Integers: Introduction, order and inequalities, absolute value, mathematical induction, division algorithm, divisibility, primes, greatest common divisor, Euclidean algorithm, fundamental theorem of arithmetic, congruence relation, congruence equations and Chinese Remainder Theorem (CRT).	
MODULE 4	7Hrs
GRAPH THEORY: Graphs and multi-graphs, sub-graphs, isomorphic and homomorphic graphs, paths, connectivity, Euler and Hamilton paths, labelled and weighted graphs, complete, regular and bipartite graphs, planar graphs.	
MODULE 5	9Hrs
TREES AND GRAPH COLORING: Trees: Definitions-properties - fundamental theorems of trees-rooted trees-binary trees-spanning trees- Kruskal's Algorithm- Prim's Algorithm- Cut-Set, BFS and DFS. Coloring of planar graphs, Chromatic Number- Chromatic partitioning- The four Color Problem-Five-color and Four-color theorem- Thickness and crossing.	

TEXT BOOKS :

1. K. H. Rosen, Discrete Mathematics & its Applications, 7th Ed., Tata McGraw-Hill, 2007.
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall India (PHI).

REFERENCES:

1. M.Huth and M. Ryan, Logic in Computer Science, Cambridge University N.Press, 2004.

SEMESTER	III					
YEAR	II					
COURSE CODE	20CS2303					
TITLE OF THE COURSE	DIGITAL ELECTRONICS & LOGIC DESIGN					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	2	42	4

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES :

- To understand various number systems and conversion from one to other number systems
- To introduce basic postulates of Boolean algebra
- To manipulate expressions into POS or SOP form.
- To introduce the methods for simplifying Boolean expressions like K-Map and Quine Mclusky
- To understand the concept of don't care conditions and how they can be used to further optimize the logical functions
- To design simple combinational circuits such as multiplexers, decoders, encoders
- To understand the differences between combinational and sequential Logic circuits
- To familiar with basic sequential logic component-SR Latch
- To understand the basics of various types of memories.
- To present the working of various Flip- Flops (T flip-flop, D flip-flop, R-S flip-flop, JK flip-flop)
- To get familiarized with State Diagram, State Table, State Assignment
- To design combinational circuits using programmable logic devices.
- To design sequential circuits such as different types of Counters, Shift Registers

COURSE OUTCOMES :

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Demonstrate the knowledge of binary number systems, logic families, Boolean algebra and logic gates	L2
CO2	Analyze different methods used for simplification of Boolean expressions	L4
CO3	Design combinational logic circuits using combinational logic elements	L3
CO4	Design combinational circuits using Programmable Logic Devices	L3
CO5	Analyze sequential logic elements in the design of synchronous and asynchronous systems	L4
CO6	Design sequential systems composed of standard sequential modules, such as counters and registers	L3

COURSE CONTENT:	
MODULE 1	9Hrs
NUMBER SYSTEMS: BCD number representation, Unsigned and signed number representation, Binary arithmetic.	
BOOLEAN ALGEBRA AND SIMPLIFICATION: Laws of Boolean algebra, Theorems of Boolean algebra, Boolean/Switching functions and their implementation.	
SIMPLIFICATION OF BOOLEAN EXPRESSIONS AND FUNCTIONS: Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions. Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine-McClusky Method.	
MODULE 2	8Hrs
DESIGN OF COMBINATIONAL LOGIC CIRCUITS: Modular combinational logic elements- Multiplexers and Demultiplexers, Decoders, Magnitude comparator, BCD converter, Encoders, Priority encoders.	
MODULE 3	7Hrs
PROGRAMMABLE LOGIC: Programmable Logic Arrays, Design of Combinational Circuits using Programmable Logic Devices (PLDs): Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PAL) devices.	
MODULE 4	9Hrs
INTRODUCTION TO SEQUENTIAL CIRCUITS : Introduction to Sequential Circuits. Combinational Vs sequential circuits, Clock, Clock Triggering, Memory elements and their excitation functions – Latches, T flip-flop, D flip-flop, R-S flip-flop. JK flip-flop and their excitation requirements, State diagram, state table and state equation, Design of synchronous sequential circuits like Sequence Detectors and binary counters.	
MODULE 5	9Hrs
APPLICATION OF LOGIC CIRCUITS SEQUENTIAL CIRCUITS (REGISTERS AND COUNTERS): Registers-Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In -Parallel Out, Universal Shift Register, Applications of Shift Registers, Asynchronous and Synchronous Counters	

TEXT BOOKS :

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 6th Edition, N. Pearson Education, 2018
2. Donald P. Leach, Albert Paul Malvino & Goutam Saha: Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015

REFERENCES :

1. D Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2010.
2. Charles H. Roth: Fundamentals of Logic Design, Jr., 7th Edition, Cengage Learning, 2014
3. John M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.

SEMESTER	III					
YEAR	II					
COURSE CODE	20CS2305					
TITLE OF THE COURSE	COMPUTATIONAL THINKING WITH PYTHON					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	-	42	3

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
***	***	***	***

COURSE OBJECTIVES :

- To understand basic concepts of computational thinking.
- To introduce python programming for problem solving.
- To introduce different debugging and unit testing tools.
- To solve real world problems using python data structures.
- Learn to handle files and exception handling in python.
- To explore Python's object-oriented features.
- To build Web services and Networked programs in python.
- To train students to design an application as part of the course mini- project using computational thinking with python.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Understand basic concepts of computational thinking.	L2
CO2	Outline basic python programming for problem solving.	L2
CO3	Apply computational thinking to solve real world programs using Python	L3
CO4	Build python programs using core data structures like list, dictionaries and tuples	L3
CO5	Implement object oriented concepts using python	L3
CO6	Design applications related to web services and network Programming.	L3

COURSE CONTENT:	
MODULE 1	8Hrs

INTRODUCTION TO COMPUTATIONAL THINKING AND PYTHON: Introduction to computational thinking: Stages of Computational thinking, Design using Flowcharts, Implementation, Testing Python Basics: Values, expressions and statements, Conditional execution, Functions Iterations	
MODULE 2	9Hrs
PYTHON ENVIRONMENT AND DATA STRUCTURES : Python Environment: Usage of Debugging and Unit Testing tools in python, Introduction to Github, Executing the python programs using Jupyter notebooks, Python Data Structures: Strings, Arrays, Lists, Tuples, Sets and Dictionaries	
MODULE 3	9Hrs
PYTHON FILES AND EXCEPTION HANDLING: Files: File types, modes, File functions, File attributes, File positions, Looping over file, Exception Handling: Try-Except, Exception syntax, examples, Types of exception with except, multiple exceptions with except, Try-Finally, Raise exceptions with arguments, Python built-in exceptions, User-defined exceptions, Assertions	
MODULE 4	9Hrs
PYTHON OBJECTS : Classes and Objects: Creating classes, Using Objects, Accessing attributes, Classes as Types, Introduction to Multiple Instances, Inheritance.	
MODULE 5	7Hrs
Applications of Python Applications: Networked Programs, Using web services	

TEXT BOOKS :

1. "Python for Everybody-Exploring Data Using Python 3", Dr. Charles R. Severance,
2. "Introduction to Computing & Problem Solving with Python", Jeeva Jose, P. Sojan Lal, Khanna Book Publishing; First edition (2019).

REFERENCES :

1. "Computer Science Using Python: A Computational Problem- Solving Focus", Charles Dierbach, Introduction John Wiley, 2012.
2. "Introduction to Computation and Programming Using Python", John V Guttag, Prentice Hall of India, 2015.
3. "How to think like a Computer Scientist, Learning with Python", Allen Downey, Jeffrey Elkner and Chris Meyers, Green Tea Press, 2014.
4. "Learning to Program with Python", Richard L. Halterman, 2011.

SEMESTER/YEAR	: III SEM/II YEAR
COURSE CODE	: 20CS2310
TITLE OF THE COURSE	: Liberal Studies - I
L: T/A:P: C	: 1 :0: 0 : 1

Course objectives

1. To become active citizens and capable professionals who impact their communities, workplaces, and society, contributing to a more inclusive and just world.

Course outcomes

- Critically analyze and integrate knowledge (theory and practice) across disciplines.
- Connect interdisciplinary academic learning to real-world challenges, experiences and problem-solving.

Course Content:

courses on Humanities, Social Sciences, Management and Entrepreneurship, Psychology, Languages and Performing arts, Sports, Design Thinking, Law, Economics, Finance etc. These courses demonstrates a broad knowledge base across the disciplines of natural science, fine arts, social science, mathematics, English for all round development of the student

SEMESTER/YEAR	: III SEM/II YEAR
COURSE CODE	: 20CS2410
TITLE OF THE COURSE	: Liberal Studies - II
L: T/A:P: C	: 1 :0: 0 : 1

Course objectives

1. To become active citizens and capable professionals who impact their communities, workplaces, and society, contributing to a more inclusive and just world.

Course outcomes

- Critically analyze and integrate knowledge (theory and practice) across disciplines.
- Connect interdisciplinary academic learning to real-world challenges, experiences and problem-solving.

Course Content:

courses on Humanities, Social Sciences, Management and Entrepreneurship, Psychology, Languages and Performing arts, Sports, Design Thinking, Law, Economics, Finance etc. These courses demonstrates a broad knowledge base across the disciplines of natural science, fine arts, social science, mathematics, English for all round development of the student

SEM/YEAR	: IV SEM/2 nd Year
COURSE CODE	: 20VC407
TITLE OF THE COURSE	: Web Programming Lab
L: T/A: P: C	: 0: 0: 5: 5

List of Experiments:

1. **Design the static web pages required for an online book store web site.**
 - a) **HOME PAGE:** The static home page must contain three frames. Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below). Left frame: At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link “MCA” the catalogue for MCABooks should be displayed in the Right frame. Right frame: The pages to the links in the left frame must be loaded here. Initially this page contains description of the web site.
 - b) **login page**
 - c) **CATALOGUE PAGE:** The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following: 1. Snapshot of Cover Page. 2. Author Name. 3. Publisher. 4. Price. 5. Add to cart button.
 - d) **REGISTRATION PAGE:** Create a “registration form “with the following fields 1) Name (Text field) 2) Password (password field) 3) E-mail id (text field) 4) Phone number (text field) 5) Sex (radio button) 6) Date of birth (3 select boxes) 7) Languages known (check boxes – English, Telugu, Hindi, Tamil) 8) Address (text area)
 - e) Design a web page using CSS (Cascading Style Sheets) which includes the following:
 - 1) Use different font, styles: In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles

SEMESTER	VI					
YEAR	III					
COURSE CODE	19CT3602					
TITLE OF THE COURSE	SMALL BUSINESS LAUNCH					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	-	--	03	03	52	03

COURSE OBJECTIVES:

- Experience with a set of tools and methods for setting up an online service
- Knowledge of the role of multiple functions in creating a small business
- Ability to coordinate multiple, interdisciplinary tasks to achieve a common objective
- Emphasis of specific knowledge from other courses through practice and reflection in an action-oriented setting

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Identify customer needs and pain points	L1
CO2	Generate concept & validate idea	L3
CO3	Use design thinking to create a wireframe of your online service	L3
CO4	Launch your App/Website	L3
CO5	Register your small business	L2

COURSE CONTENT:	
MODULE 1	10 Hrs
Introduction, Identifying Customer Needs, Opportunity Identification & Planning, Idea Generation and Validation, Entrepreneurial Culture, Digital Business Opportunity	
MODULE 2	10 Hrs
Business Plan & its Components, Business Model and Strategies, Selection of Appropriate Business Model, Business Model Canvas, Feasibility Study	
MODULE 3	10 Hrs
Lean Thinking, Specifications, Wireframe Generation & Validation	
MODULE 4	11 Hrs
Bootstrap Themes and Templates, Basics of HTML, CSS & JavaScript, Meteor, Apache Cordova, UI Frameworks – Blaze, Angular, React, Google Firebase, Firebase Realtime	

Database	
MODULE 5	11 Hrs
Service-Market Fit, legal Aspects & Entrepreneurial Law, New Venture Creation & Launch, Sustainability Goals	

PROJECT DELIVERABLES

7. Proposal Handout & Presentation
 - a. The Problem
 - b. Need
 - c. Existing Alternatives
 - d. Potential Market
8. Wireframe Sketches, Target Specifications
 - a. List Critical Customer Needs
 - b. For a., Prepare a List of Target Specifications
 - c. Prepare Wireframe
9. Create App/Website
10. Business Model
11. Register your business

TEXTBOOKS

1. Fisher, Steven, Duane, Ja-Nae (2016). Start-up Equation – A Visual Guidebook for Building your Start-up, New Delhi: Tata McGraw-Hill
2. Houssein Yahiaoui, Firebase Cookbook: Over 70 Recipes to help you create real-time web and mobile applications with Firebase, Packt Publishing, November 2017.

REFERENCE BOOKS

1. Holt H., David (2017). Entrepreneurship: New Venture Creation, New Delhi: Pearson Education
- Zimmerer, W. Thomas and Scarborough, M. Norman and Doug Wilson (2009). Essentials of Entrepreneurship and Small Business Management, 5/e; New Delhi: Prentice Hall India

SEM/YEAR	: IV SEM/2 nd Year
COURSE CODE	: 20VI406
TITLE OF THE COURSE	: Data Handling and Visualization
L: T/A: P: C	: 2: 0: 0: 2

Course objectives

- Explain what data visualization is and its importance in our world today
- Understand why Python is considered one of the best data visualization tools
- Describe matplotlib and its data visualization features in Python
- List the types of plots and the steps involved in creating these plots
- Critically synthesize the theory and practical application of visualization for problem solving.

Course Out comes

- Produce compelling and useful data visualizations.
- Apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques.

Unit 1: Data Collection Structures

6Hrs

Lists: Creating Lists, Accessing Values in Lists, Adding and Updating Lists, Deleting List Elements, **Basic List Operations**, Indexing, Slicing, and Matrices, Built-in List Functions and Methods,

Dictionaries: Creating Dictionaries, Updating and Accessing Values in Dictionaries, Deleting Dictionary Elements, Built-in Dictionary Functions, Methods, Tuples: Creating Tuples, Concatenating, Basic Tuples Operations,

Unit 2: Data Frames

6Hrs

Creating Data Frames from a Dict of Series or Dicts, Creating Data Frames from a Dict of Ndarrays/Lists, Creating Data Frames from a Structured or Record Array, Creating Data Frames from a List of Dicts, Creating Data Frames from a Dict of Tuples, Selecting, Adding, and Deleting Data Frame Columns, Indexing and Selecting Data Frames, Transposing a Data Frame, Data Frame Interoperability with Numpy Functions,

Unit 3: Data Gathering and Cleaning**5Hrs**

Cleaning Data, Checking for Missing Values, Handling the Missing Values, Reading and Cleaning CSV Data, Merging and Integrating Data, Reading Data from the JSON Format, Reading Data from the HTML Format, Reading Data from the XML Format

Unit 4: The Importance of Data Visualization in Business Intelligence**8Hrs**

Why Is Data Visualization Important? Why Do Modern Businesses Need Data Visualization? The Future of Data Visualization, How Data Visualization Is Used for Business Decision-Making: Faster Responses, Simplicity, Easier Pattern Visualization, Team Involvement, Unify Interpretation

Introducing Data Visualization Techniques:

Loading Libraries, Popular Libraries for Data Visualization in Python: Matplotlib, Plotly, Geoplotlib, Pandas, Introducing Plots in Python

Unit 5: Data Visualization**5Hrs**

Direct Plotting: Line Plot, Bar Plot, Pie Chart, Box Plot, Histogram Plot, Scatter Plot, Seaborn Plotting System: Strip Plot, Box Plot, Swarm Plot, Joint Plot, Matplotlib Plot: Line Plot, Bar Chart, Histogram Plot, Scatter Plot, Stack Plot, Pie Chart

Text Books:

Data Analysis and Visualization Using Python by Dr. Ossama Embarak, APress, 2018