St. MARTIN'S ENGINEERING COLLEGE

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Dhulapally, Secunderabad – 500100
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III YEAR I SEMESTER (PE-I or PE-II)

S. No.	Course Code	Course Title	L	T	P	Credits	CIE	SEE	Total
Professional Elective - I									
1	CS511PE	Information Theory & Coding	3	0	0	3	30	70	100
2	CS512PE	Advanced Computer Architecture	3	0	0	3	30	70	100
3	CS513PE	Data Analytics	3	0	0	3	30	70	100
4	CS514PE	Image Processing	3	0	0	3	30	70	100
5	CS515PE	Principles of Programming Languages	3	0	0	3	30	70	100
(OR) **Professional Elective - II**									
6	CS521PE	Computer Graphics	3	0	0	3	30	70	100
7	CS522PE	Advanced Operating Systems	3	0	0	3	30	70	100
8	CS523PE	Informational Retrieval Systems	3	0	0	3	30	70	100
9	CS524PE	Distributed Databases	3	0	0	3	30	70	100
10	CS525PE	Natural Language Processing	3	0	0	3	30	70	100

III YEAR II SEMESTER (PE-III)

S. No.	Course Code	Course Title	L	T	P	Credits	CIE	SEE	Total
1	21MBA06A	Research Methodologies	3	0	0	3	30	70	100
Professional Elective - III									
2	CS611PE	Concurrent Programming	3	0	0	3	30	70	100
3	CS612PE	Network Programming	3	0	0	3	30	70	100
4	CS613PE	Scripting Languages	3	0	0	3	30	70	100
5	CS614PE	Mobile Application Development	3	0	0	3	30	70	100
6	CS615PE	Software Testing Methodologies	3	0	0	3	30	70	100

IV YEAR I SEMESTER (PE-IV and PE- V)

S. No.	Course Code	Course Title	L	T	P	Credits	CIE	SEE	Total
Professional Elective - IV									
1	CS711PE	Graph Theory	3	0	0	3	30	70	100
2	CS712PE	Introduction to Embedded Systems	3	0	0	3	30	70	100
3	CS713PE	Artificial Intelligence	3	0	0	3	30	70	100
4	CS714PE	Cloud Computing	3	0	0	3	30	70	100
5	CS715PE	Ad-hoc & Sensor Networks	3	0	0	3	30	70	100
Professional Elective - V									
6	CS721PE	Advanced Algorithms	3	0	0	3	30	70	100
7	CS722PE	Real Time Systems	3	0	0	3	30	70	100
8	CS723PE	Soft Computing	3	0	0	3	30	70	100
9	CS724PE	Internet of Things	3	0	0	3	30	70	100
10	CS725PE	Software Process & Project Management	3	0	0	3	30	70	100

IV YEAR II SEMESTER (PE-VI)

S. No.	Course Code	Course Title	L	T	P	Credits	CIE	SEE	Total
1	CS805PC	Technical Paper writing	-	-	-	2	30	70	100
Professional Elective - VI									
2	CS811PE	Computational Complexity	3	0	0	3	30	70	100
3	CS812PE	Distributed Systems	3	0	0	3	30	70	100
4	CS813PE	Neural Networks & Deep Learning	3	0	0	3	30	70	100
5	CS814PE	Human Computer Interaction	3	0	0	3	30	70	100
6	CS815PE	Cyber Forensics	3	0	0	3	30	70	100

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B.TECH HONORS (CSE)

INFORMATION THEORY & CODING (Professional Elective-I)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS511PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisite

1. Digital Communications

COURSE OBJECTIVES

- To acquire the knowledge in measurement of information and errors.
- Understand the importance of various codes for communication systems
- To design encoder and decoder of various codes.
- To known the applicability of source and channel codes

COURSE OUTCOMES Upon completing this course, the student will be able to

- Learn measurement of information and errors.
- Obtain knowledge in designing various source codes and channel codes
- Design encoders and decoders for block and cyclic codes
- Understand the significance of codes in various applications

UNIT-I	Coding for Reliable Digital Transmission and storage	Classes: 12

Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Source Codes: Shannon-fano coding, Huffman coding

UNIT-II	Linear Block Codes	Classes: 12

Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system.

UNIT-III	Cyclic Codes	Classes: 12

Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, shortened cyclic codes, Error-trapping

decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT-IV	Convolutional Codes	Classes: 12

Encoding of Convolutional Codes- Structural and Distance Properties, state, tree, trellis diagrams, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT-V	BCH Codes	Classes: 12

Minimum distance and BCH bounds, Decoding procedure for BCH codes, Syndrome computation and iterative algorithms, Error locations polynomials for single and double error correction.

TEXT BOOKS

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, PrenticeHall, Inc 2014.
2. Error Correcting Coding Theory-Man Young Rhee, McGraw – Hill Publishing 1989

REFERENCE BOOKS

1. Digital Communications- John G. Proakis , 5th ed., , TMH 2008.
2. Introduction to Error Control Codes-Salvatore Gravano-oxford
3. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon , 2006, WileyIndia.
4. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.

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B.TECH HONORS (CSE)

ADVANCED COMPUTER ARCHITECTURE (Professional Elective - I)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS512PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites: Computer Organization

COURSE OBJECTIVES

- To impart the concepts and principles of parallel and advanced computer architectures.
- To develop the design techniques of Scalable and multithreaded Architectures.
- To Apply the concepts and techniques of parallel and advanced computer architectures todesign modern computer systems

COURSE OUTCOMES

- Computational models and Computer Architectures.
- Concepts of parallel computer models.
- Scalable Architectures, Pipelining, Superscalar processors, multiprocessors

UNIT-I		Classes: 11

Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

UNIT-II		Classes: 13

Principals of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

UNIT-III		Classes: 12

Bus Cache and Shared memory, Backplane bus systems, Cache Memory organizations, Shared-Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

UNIT-IV		Classes: 12

Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of

Multicomputers, Message-passing Mechanisms, Multivetor and SIMD computers, Vector Processing Principals, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations,The connection machine CM-5,

UNIT-V		**Classes: 11**

Scalable, Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputers, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

TEXT BOOK:

1. Advanced Computer Architecture Second Edition, Kai Hwang, Tata McGraw Hill Publishers.

REFERENCE BOOKS:

1. Computer Architecture, Fourth edition, J. L. Hennessy and D.A. Patterson. ELSEVIER.
2. Advanced Computer Architectures, S.G. Shiva, Special Indian edition, CRC, Taylor &Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Wellein, CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
5. Computer Architecture, B. Parhami, Oxford Univ. Press.

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B.TECH HONORS (CSE)

DATA ANALYTICS (Professional Elective - I)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS513PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites

1. A course on "Database Management Systems".
2. Knowledge of probability and statistics.

COURSE OBJECTIVES

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate theaccuracy of the algorithms.
- To understand the various search methods and visualization techniques.

COURSE OUTCOMES : After completion of this course students will be able to

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

UNIT-I		**Classes: 12**

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missingvalues, duplicate data) and Data Processing & Processing.

UNIT-II		**Classes: 12**

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modelingin Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputationsetc. Need for Business Modeling.

UNIT-III		**Classes: 12**

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization,and Model Building etc.

Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT-IV		Classes: 12
Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction		
UNIT-V		**Classes: 12**
Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.		

TEXT BOOKS:

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan KaufmannPublishers.

REFERENCE BOOKS:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway LabsJeffrey D Ullman Stanford Univ.

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B.TECH HONORS (CSE)

IMAGE PROCESSING (Professional Elective - I)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS514PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites

1. Students are expected to have knowledge in linear signals and systems, Fourier Transform, basic linear algebra, basic probability theory and basic programming techniques; knowledge ofDigital Signal Processing is desirable.
2. A course on "Computational Mathematics"
3. A course on "Computer Oriented Statistical Methods"

COURSE OBJECTIVES

- Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
- The topics include image acquisition; sampling and quantization; preprocessing; enhancement;restoration; segmentation; and compression.

COURSE OUTCOMES

- Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition,sampling, and quantization.
- Demonstrate the knowledge of filtering techniques.
- Demonstrate the knowledge of 2D transformation techniques.
- Demonstrate the knowledge of image enhancement, segmentation, restoration andcompression techniques.

UNIT-I	**Digital Image Fundamentals**	**Classes: 12**

Digital Image through Scanner, Digital Camera. Concept of Gray Levels.Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

UNIT-II	**Image Enhancement**	**Classes: 12**

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering,Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

UNIT-III	**Image Restoration**	**Classes: 12**

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, LeastMean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT-IV	**Image Segmentation**	**Classes: 12**

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding,Region Oriented Segmentation.

UNIT-V	Image Compression	Classes: 12

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image CompressionModels, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

TEXT BOOK:

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education,2nd Ed, 2004.

REFERENCE BOOKS:

1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MAT LAB: Rafael C. Gonzalez, Richard E. Woods, Steven L.Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wilely, 3rd Edition, 2004.

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B. TECH HONORS (CSE)

PRINCIPLES OF PROGRAMMING LANGUAGES (Professional Elective - I)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS515PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites

1. A course on "Mathematical Foundations of Computer Science"
2. A course on "Computer Programming and Data Structures"

COURSE OBJECTIVES

- Introduce important paradigms of programming languages
- To provide conceptual understanding of high-level language design and implementation
- Topics include programming paradigms; syntax and semantics; data types, expressions and statements; subprograms and blocks; abstract data types; concurrency; functional and logic programming languages; and scripting languages

COURSE OUTCOMES

- Acquire the skills for expressing syntax and semantics in formal notation
- Identify and apply a suitable programming paradigm for a given computing application
- Gain knowledge of and able to compare the features of various programming languages

UNIT-I	Preliminary Concepts	Classes: 12

Reasons for Studying Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Language Design Trade-Offs, Implementation Methods, Programming Environments

Syntax and Semantics: General Problem of Describing Syntax and Semantics, Formal Methods of Describing Syntax, Attribute Grammars, Describing the Meanings of Programs

UNIT-II	Names, Bindings, and Scopes	Classes: 12

Introduction, Names, Variables, Concept of Binding, Scope, Scope and Lifetime, Referencing Environments, Named Constants

Data Types: Introduction, Primitive Data Types, Character String Types, User Defined Ordinal Types, Array, Associative Arrays, Record, Union, Tuple Types, List Types, Pointer and Reference Types, Type Checking, Strong Typing, Type Equivalence

Expressions and Statements: Arithmetic Expressions, Overloaded Operators, Type

Conversions, Relational and Boolean Expressions, Short Circuit Evaluation, Assignment Statements, Mixed-Mode Assignment

Control Structures – Introduction, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands.

UNIT-III	**Classes: 12**

Subprograms and Blocks: Fundamentals of Sub-Programs, Design Issues for Subprograms, Local Referencing Environments, Parameter Passing Methods, Parameters that Are Subprograms, Calling Subprograms Indirectly, Overloaded Subprograms, Generic Subprograms, Design Issues for Functions, User Defined Overloaded Operators, Closures, Coroutines

Implementing Subprograms: General Semantics of Calls and Returns, Implementing Simple Subprograms, Implementing Subprograms with Stack-Dynamic Local Variables, Nested Subprograms,Blocks, Implementing Dynamic Scoping

Abstract Data Types: The Concept of Abstraction, Introductions to Data Abstraction, Design Issues, Language Examples, Parameterized ADT, Encapsulation Constructs, Naming Encapsulations

UNIT-IV	**Classes: 12**

Concurrency: Introduction, Introduction to Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, Concurrency in Function Languages, Statement Level Concurrency.Exception Handling and Event Handling: Introduction, Exception Handling in Ada, C++, Java, Introduction to Event Handling, Event Handling with Java and C#.

UNIT-V	**Classes: 12**

Functional Programming Languages: Introduction, Mathematical Functions, Fundamentals of Functional Programming Language, LISP, Support for Functional Programming in Primarily ImperativeLanguages, Comparison of Functional and Imperative Languages

Logic Programming Language: Introduction, an Overview of Logic Programming, Basic Elements ofProlog, Applications of Logic Programming.

Scripting Language: Pragmatics, Key Concepts, Case Study: Python – Values and Types, Variables,Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library. (Text Book 2)

TEXT BOOKS:

1. Concepts of Programming Languages Robert. W. Sebesta 10/E, Pearson Education.
2. Programming Language Design Concepts, D. A. Watt, Wiley Dreamtech, 2007.

REFERENCE BOOKS:

1. Programming Languages, 2nd Edition, A.B. Tucker, R. E. Noonan, TMH.
2. Programming Languages, K. C. Louden, 2nd Edition, Thomson, 2003

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B.TECH HONORS (CSE)

COMPUTER GRAPHICS (Professional Elective – II

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS521PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites

1. Familiarity with the theory and use of coordinate geometry and of linear algebra such asmatrix multiplication.
2. A course on "Computer Programming and Data Structures"

COURSE OBJECTIVES

- The aim of this course is to provide an introduction of fundamental concepts and theory of computer graphics.
- Topics covered include graphics systems and input devices; geometric representations and 2D/3D transformations; viewing and projections; illumination and color models; animation; rendering and implementation; visible surface detection;

COURSE OUTCOMES

- Acquire familiarity with the relevant mathematics of computer graphics.
- Be able to design basic graphics application programs, including animation
- Be able to design applications that display graphic images to given specifications

UNIT-I		Classes: 12

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

Output primitives: Points and lines, line drawing algorithms (Bresenham's and DDA Algorithm), mid- point circle and ellipse algorithms

Polygon Filling: Scan-line algorithm, boundary-fill and flood-fill algorithms

UNIT-II		Classes: 12

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT-III		Classes: 12

3-D object representation: Polygon surfaces, quadric surfaces, spline representation,

Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.

UNIT-IV		**Classes: 12**

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transformsand clipping.

UNIT-V		**Classes: 12**

Computer animation: Design of animation sequence, general computer animation functions, rasteranimation, computer animation languages, key frame systems, motion specifications

Visible surface detection methods: Classification, back-face detection, depth-buffer, BSP-treemethods and area sub-division methods

TEXT BOOKS:

1. "Computer Graphics *C version*", Donald Hearn and M. Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner andHughes, Pearson Education.
3. Computer Graphics, Steven Harrington, TMH

REFERENCE BOOKS:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.

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B.TECH HONORS (CSE)

ADVANCED OPERATING SYSTEMS (Professional Elective - II)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS522PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems)
- Hardware and software features that support these systems.

COURSE OUTCOMES

- Understand the design approaches of advanced operating systems
- Analyze the design issues of distributed operating systems.
- Evaluate design issues of multi processor operating systems.
- Identify the requirements Distributed File System and Distributed Shared Memory.
- Formulate the solutions to schedule the real time applications.

UNIT-I		Classes: 12

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. **Theoretical Foundations:** Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

UNIT-II		Classes: 12

Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms, **Non-Token – Based Algorithms:** Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, **Token-Based Algorithms:** Suzuki-Kasami's Broadcast Algorithm, Singhal's Heurisric Algorithm, Raymond's Heuristic Algorithm.

UNIT-III		Classes: 12

Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems,Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection,Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, HierarchicalDeadlock Detection Algorithms

UNIT-IV		Classes: 12

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures **Multi Processor Operating Systems**: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling.

Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

UNIT-V		Classes: 12

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration

Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, MemoryCoherence, Coherence Protocols, Design Issues

TEXT BOOK:

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, TataMcGraw-Hill Edition 2001

REFERENCE BOOK:

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall,Edition – 2, 2007

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B.TECH HONORS (CSE)

INFORMATION RETRIEVAL SYSTEMS (Professional Elective - II)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS523PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites:

1. Data Structures

COURSE OBJECTIVES

- To learn the important concepts and algorithms in IRS
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

COURSE OUTCOMES

- Ability to apply IR principles to locate relevant information large collections of data
- Ability to design different document clustering algorithms
- Implement retrieval systems for web search tasks.

Design an Information Retrieval System for web search tasks.

UNIT-I		Classes: 12

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

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

UNIT-II		Classes: 12

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

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

UNIT-III		Classes: 12

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

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

UNIT-IV		Classes: 12

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

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

UNIT-V		**Classes: 12**

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

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

TEXT BOOK:

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

REFERENCE BOOKS:

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

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B.TECH HONORS (CSE)

DISTRIBUTED DATABASES (Professional Elective - II)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS524PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites:

1. A course on "Database Management Systems"

COURSE OBJECTIVES

- The purpose of the course is to enrich the previous knowledge of database systems and exposing the need for distributed database technology to confront with the deficiencies of the centralized database systems.
- Introduce basic principles and implementation techniques of distributed database systems.
- Equip students with principles and knowledge of parallel and object-oriented databases.
- Topics include distributed DBMS architecture and design; query processing and optimization; distributed transaction management and reliability; parallel and object database management systems.

COURSE OUTCOMES

- Understand theoretical and practical aspects of distributed database systems.
- Study and identify various issues related to the development of distributed database system.
- Understand the design aspects of object-oriented database system and related development.

UNIT-I — Classes: 12

Introduction; Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas.

Distributed DBMS Architecture: Architectural Models for Distributed DBMS, DDMBS Architecture. **Distributed Database Design**: Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

UNIT-II — Classes: 12

Query processing and decomposition: Query processing objectives, characterization of queryprocessors, layers of query processing, query decomposition, localization of distributed data.

Distributed query Optimization: Query optimization, centralized query optimization, distributed queryoptimization algorithms.

UNIT-III		Classes: 12
Transaction Management: Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.		
UNIT-IV		**Classes: 12**
Distributed DBMS Reliability: Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and networkpartitioning. **Parallel Database Systems**: Parallel database system architectures, parallel data placement, parallelquery processing, load balancing, database clusters.		
UNIT-V		**Classes: 12**
Distributed object Database Management Systems: Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing. **Object Oriented Data Model**: Inheritance, object identity, persistent programming languages,persistence of objects, comparison OODBMS and ORDBMS		
TEXT BOOKS: 1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, PearsonEdn. Asia, 2001. 2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.		
REFERENCE BOOK: 1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: “Database Systems: The Complete Book”, Second Edition, Pearson International Edition		

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B.TECH HONORS (CSE)

NATURAL LANGUAGE PROCESSING (Professional Elective - II)

III B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS525PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites: Data structures, finite automata and probability theory

COURSE OBJECTIVES

- Introduce to some of the problems and solutions of NLP and their relation to linguistics andstatistics.

COURSE OUTCOMES

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

UNIT-I		Classes: 12

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

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

UNIT-II		Classes: 12

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

UNIT-III		Classes: 12

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word SenseSystems, Software.

UNIT-IV		Classes: 12

Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT-V		Classes: 12

Discourse Processing: Cohension, Reference Resolution, Discourse Cohension and Structure **Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, ParameterEstimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

TEXT BOOKS:

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

REFERENCE BOOK:

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

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B.TECH HONORS (CSE)
RESEARCH METHODOLOGIES

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
21MBA06A	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing and induce paper publication skills

COURSE OUTCOMES

- Distinguish research methods
- Carryout literature review thoroughly to identify contemporary research problems
- Data collection and analysis
- Write and publish a technical research paper
- Review papers effectively

UNIT-I	**Introduction**	Classes: 12

Objective of Research; Definition and Motivation; Types of Research; Research Approaches; Steps in Research Process; Criteria of Good Research.

UNIT-II	**Research formulation and literature review:**	Classes: 12

Problem Definition and Formulation; Literature Review; Characteristics of Good Research Problem; Literature Review Process; Plagiarism, Ethics in Research.

UNIT-III	**Data collection & Data analysis:**	Classes: 12

DATA COLLECTION: Primary and Secondary Data; Primary and Secondary Data Sources; Data Collection Methods; Data Processing; Classification of Data. DATA ANALYSIS: Statistical Analysis; Multivariate Analysis; Correlation Analysis; Regression Analysis; Principle Component Analysis; Samplings

UNIT-IV	**Research design:**	Classes: 12

RESEARCH DESIGN: Need for Research Design; Features of a Good Design; Types of Research Designs; Induction and Deduction.

HYPOTHESIS FORMULATION AND TESTING: Hypothesis; Important Terms; Types of Research Hypothesis; Hypothesis Testing; Z-Test; t-Test; fTest; Making a Decision; Types of Errors; ROC Graphics.

UNIT-V	Presentation of the research work:	Classes: 12

PRESENTATION OF THE RESEARCH WORK: Business Report; Technical Report; Research Report; General Tips for Writing Report; Presentation of Data; Oral Presentation; Bibliography and References; Intellectual Property Rights; Open-Access Initiatives; Plagiarism.

TEXT BOOKS:

1. Research Methodology. Methods & Technique: Kothari. C.R.
2. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"

REFERENCES:

1. Practical Research: planning and Design (8th Edition) – Paul D. Leedy and Jeanne E. Ormrod.

2. A Hand Book of Education Research – NCTE

3. Methodology of Education Research – K.S. Sidhu.

4. Tests, Measurements and Research methods in Behavioural Sciences- A.K. Singh.

5. Statistical Methods- Y.P. Agarwal.

6. Methods of Statistical Ananlysis- P.S Grewal.

7. Fundamentals of Statistics – S.C. Gupta, V.K. Kapoor.

8. Intellectual Property Rights by Deborah E. Bouchoux, Cengage Learning.

9. Managing Intellectual Property – The Strategic Imperative, Vinod V.Sople, 2nd Edition, PHI Learning Private Limited.

10. Research methodology – S.S. Vinod Chandra, S. Anand Hareendran

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B.TECH HONORS (CSE)

CONCURRENT PROGRAMMING (Professional Elective - III)

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS611PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites

1. A course on "Operating Systems"
2. A course on "Java Programming"

COURSE OBJECTIVES

To explore the abstractions used in concurrent programming

COURSE OUTCOMES

1. Ability to implement the mechanisms for communication and co-ordination among concurrentprocesses.
2. Ability to understand and reason about concurrency and concurrent objects
3. Ability to implement the locking and non-blocking mechanisms
4. Ability to understand concurrent objects

UNIT-I — Classes: 12

Introduction - Shared Objects and Synchronization, A Fable, Properties of Mutual Exclusion, The Moral, The Producer–Consumer Problem, The Harsh Realities of Parallelization. Mutual Exclusion - Time, Critical Sections, 2-Thread Solutions, The Peterson Lock, The Filter Lock, Lamport' s Bakery Algorithm.

UNIT-II — Classes: 12

Concurrent Objects - Concurrency and Correctness, Sequential Objects, Quiescent consistency, Sequential Consistency, Linearizability, Linearization Points, Formal Definitions

Linearizability, Compositional Linearizability, The Nonblocking Property, Progress conditions, Dependent Progress Conditions, The Java Memory Model, Locks and synchronized Blocks, Volatile Fields, Final Fields.

UNIT-III — Classes: 12

Synchronization Operations, Consensus Numbers, Consensus Protocols, The compareAndSet() Operation, Introduction Universality, A Lock-Free Universal, Construction Wait- Free Universal Construction, Spin Locks , Test-And-Set Locks

UNIT-IV		Classes: 12
Linked Lists: The Role of Locking, Introduction, List-Based Sets, Concurrent Reasoning, Coarse- Grained Synchronization, Fine-Grained Synchronization, Optimistic Synchronization, Lazy Synchronization, Non-Blocking Synchronization		
UNIT-V		**Classes: 12**
Concurrent Queues and the ABA Problem, Concurrent Stacks and Elimination, Transactional Memories		

TEXT BOOKS:

1. The Art of Multiprocessor Programming, by Maurice Herlihy and Nir Shavit, Morgan Kaufmman Publishers, 1st Edition, Indian Reprint 2012.

REFERENCE BOOKS:

1. Java Concurrency in Practice by Brian Goetz, Tim Peierls, Joshua Block, Joseph Bowbeer,David Holmes and Doug Lea, Addison Wesley, 1st Edition, 2006.
2. Concurrent Programming in Java™: Design Principles and Patterns, Second Edition by DougLea, Publisher: Addison Wesley, Pub Date: October 01, 1999.

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B.TECH HONORS (CSE)

NETWORK PROGRAMMING (Professional Elective - III)

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS612PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To understand inter process and inter-system communication
- To understand socket programming in its entirety
- To understand usage of TCP/UDP / Raw sockets
- To understand how to build network applications

COURSE OUTCOMES

- To write socket API based programs
- To design and implement client-server applications using TCP and UDP sockets
- To analyze network programs

UNIT-I — Classes: 11

Introduction to Network Programming: OSI model, Unix standards, TCP and UDP & TCP connectionestablishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

Sockets: Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

UNIT-II — Classes: 13

TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signalhandling server process termination, Crashing and Rebooting of server host shutdown of server host. **Elementary UDP sockets**: Introduction UDP Echo server function, lost datagram, summary of UDPexample, Lack of flow control with UDP, determining outgoing interface with UDP.

I/O Multiplexing: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echoserver

UNIT-III — Classes: 12

Socket options: getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options. **Advanced I/O Functions**-Introduction, Socket Timeouts, recv and send Functions,readv and writev Functions, recvmsg and sendmsg Functions, Ancillary Data, How Much Data Is Queued?, Sockets andStandard I/O, T/TCP: TCP for Transactions.

UNIT-IV		Classes: 12

Elementary name and Address conversions: DNS, gethost by Name function, Resolver option,Function and IPV6 support, uname function, other networking information.

Daemon Processes and inetd Superserver – Introduction, syslogd Daemon, syslog Function,daemon_init Function, inetd Daemon, daemon_inetd Function

Broadcasting- Introduction, Broadcast Addresses, Unicast versus Broadcast, dg_cli Function UsingBroadcasting, Race Conditions

Multicasting- Introduction, Multicast Addresses, Multicasting versus Broadcasting on A LAN, Multicasting on a WAN, Multicast Socket Options, mcast_join and Related Functions, dg_cli Function Using Multicasting, Receiving MBone Session Announcements, Sending and Receiving, SNTP: SimpleNetwork Time Protocol, SNTP (Continued)

UNIT-V		Classes: 11

Raw Sockets-Introduction, Raw Socket Creation, Raw Socket Output, Raw Socket Input, Ping Program,Traceroute Program, An ICMP Message Daemon,
Datalink Access- Introduction, BPF: BSD Packet Filter, DLPI: Data Link Provider Interface, Linux:
SOCK_PACKET, libpcap: Packet Capture Library, Examining the UDP Checksum Field.

Remote Login: Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rloginOverview, RPC Transparency Issues.

TEXT BOOKS:

1. UNIX Network Programming, by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, PearsonEducation
2. UNIX Network Programming, 1st Edition, - W. Richard Stevens. PHI.

REFERENCE BOOKS:

1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls,Pearson Education
3. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

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B.TECH HONORS (CSE)

SCRIPTING LANGUAGES (Professional Elective - III)

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS613PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites:

1. A course on "Computer Programming and Data Structures"
2. A course on "Object Oriented Programming Concepts"

COURSE OBJECTIVES

- This course introduces the script programming paradigm
- Introduces scripting languages such as Perl, Ruby and TCL.
- Learning TCL

COURSE OUTCOMES

- Comprehend the differences between typical scripting languages and typical system andapplication programming languages.
- Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select anappropriate language for solving a given problem.
- Acquire programming skills in scripting language

UNIT-I	Introduction	Classes: 12

Introduction: Ruby, Rails, The structure and Excution of Ruby Programs, Package Management withRUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and webservices
RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

UNIT-II	Extending Ruby	Classes: 12

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

UNIT-III	Introduction to PERL and Scripting	Classes: 12

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

UNIT-IV	Advanced PERL	Classes: 12

Advanced PERL

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

UNIT-V	TCL & Tk	Classes: 12

TCL

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

Tk

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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B.TECH HONORS (CSE)

MOBILE APPLICATION DEVELOPMENT (Professional Elective - III)

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS614PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites

1. Acquaintance with JAVA programming
2. A Course on DBMS

COURSE OBJECTIVES

- To demonstrate their understanding of the fundamentals of Android operating systems
- To improves their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

COURSE OUTCOMES

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Student will be able to develop, deploy and maintain the Android Applications.

UNIT-I		Classes: 12

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes,layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT-II		Classes: 12

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT-III		**Classes: 12**

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, ImplicitIntents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding andusing Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT-IV		**Classes: 12**

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT-V		**Classes: 11**

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning,2013

REFERENCE BOOK:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

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B.TECH HONORS (CSE)

SOFTWARE TESTING METHODOLOGIES (Professional Elective - III)

III B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS615PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites

1. A course on "Software Engineering"

COURSE OBJECTIVES

- To provide knowledge of the concepts in software testing such as testing process, criteria,strategies, and methodologies.
- To develop skills in software test automation and management using latest tools.

COURSE OUTCOMES

Design and develop the best test strategies in accordance to the developmentmodel.

UNIT-I		Classes: 12

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy ofbugs

Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates andachievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT-II		Classes: 12

Transaction Flow Testing: transaction flows, transaction flow testing techniques. Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing. Domain Testing:domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT-III		Classes: 12

Paths, Path products and Regular expressions: path products & path expression, reduction procedure,applications, regular expressions & flow anomaly detection.
Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT-IV		Classes: 12

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT-V		Classes: 12

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter orWin-runner).

TEXT BOOKS:

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

REFERENCE BOOKS:

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

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B.TECH HONORS (CSE)

GRAPH THEORY (Professional Elective - IV)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS711PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Pre-requisites: An understanding of Mathematics in general is sufficient.

COURSE OBJECTIVES

- To formulate and prove central theorems about trees, matching, connectivity, colouring and planar graphs;
- To use graph theory as a modelling tool
- To understand the important classes of graph theoretic problem.
- To describe and apply some basic algorithms for graphs.

COURSE OUTCOMES

- Know some important classes of graph theoretic problems;
- Be able to formulate and prove central theorems about trees, matching, connectivity, colouringand planar graphs;
- Be able to describe and apply some basic algorithms for graphs;
- Be able to use graph theory as a modelling tool.

UNIT-I		Classes: 12

Introduction-Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian andHamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphsfrom smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

UNIT-II		Classes: 12

Connected graphs and shortest paths - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra"s shortest path algorithm, Floyd-Warshall shortest path algorithm.

UNIT-III		Classes: 12

Trees- Definitions and characterizations, Number of trees, Cayley"s formula, Kircho↵-matrix-tree theorem, Minimum spanning trees, Kruskal"s algorithm, Prim"s algorithm, Special classes of graphs,Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury"s algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

UNIT-IV		Classes: 12

Independent sets coverings and matchings– Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall‟s Theorem, K¨onig‟s Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

UNIT-V		Classes: 12

Vertex Colorings- Basic definitions, Cliques and chromatic number, Mycielski‟s theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

TEXT BOOKS:

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics.Springer, 1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.

REFERENCE BOOKS:

1. Lecture Videos**:** http://nptel.ac.in/courses/111106050/13
2. Introduction to Graph Theory, Douglas B. West, Pearson.
3. Schaum's Outlines Graph Theory, Balakrishnan, TMH
4. Introduction to Graph Theory, Wilson Robin j, PHI
5. Graph Theory with Applications to Engineering And Computer Science, Narsing Deo, PHI
6. Graphs - An Introductory Approach, Wilson and Watkins

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B.TECH HONORS (CSE)

INTRODUCTION TO EMBEDDED SYSTEMS (Professional Elective - IV)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS712PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Pre-requisites:

1. A course on "Digital Logic Design and Microprocessors"
2. A course on "Computer Organization and Architecture"

COURSE OBJECTIVES

- To provide an overview of principles of Embedded System
- To provide a clear understanding of role of firmware, operating systems in correlation withhardware systems.

COURSE OUTCOMES

- Expected to understand the selection procedure of processors in the embedded domain.
- Design procedure of embedded firm ware.
- Expected to visualize the role of realtime operating systems in embedded systems.
- Expected to evaluate the correlation between task synchronization and latency issues

UNIT-I		Classes: 11

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification of Embedded Systems, Major application areas, Purpose of E bedded Systems, Characteristics and Quality attributes of Embedded Systems.

UNIT-II		Classes: 13

The Typical Embedded System: Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System components.

UNIT-III		Classes: 12

Embedded Firmware Design and Development: Embedded Firmware Design, Embedded FirmwareDevelopment Languages, Programming in Embedded C.

UNIT-IV		Classes: 12

RTOS Based Embedded System Design: Operating System basics, Types of Operating Systems, Tasks, Process, Threads, Multiprocessing and Multi-tasking, Task Scheduling, Threads-Processes- Scheduling putting them together, Task Communication, Task Synchronization, Device Drivers, How tochoose an RTOS

UNIT-V		Classes: 11

Integration and Testing of Embedded Hardware and Firmware: Integration of Hardware andFirmware, Boards Bring up**The Embedded System Development Environment:** The Integrated Development Environment (IDE), Types of files generated on Cross-Compilation, Disassembler/Decompiler, Simulators, Emulatorsand Debugging, Target Hardware Debugging, Boundary Scan.

TEXT BOOK:

1. Shibu K V, "Introduction to Embedded Systems", Second Edition, Mc Graw Hill

REFERENCE BOOKS:

1. Rajkamal, Embedded Systems Architecture, Programming and Design, Tata McGraw-Hill
2. Frank Vahid and Tony Givargis, "Embedded Systems Design" - A Unified Hardware/SoftwareIntroduction, John Wiley
3. Lyla, "Embedded Systems" –Pearson
4. David E. Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint2000.

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B.TECH HONORS (CSE)

ARTIFICIAL INTELLIGENCE (Professional Elective - IV)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS713PE	B. Tech	3	0	0	3	30	70	100

Prerequisites:

1. A course on "Computer Programming and Data Structures"
2. A course on "Advanced Data Structures"
3. A course on "Design and Analysis of Algorithms"
4. A course on "Mathematical Foundations of Computer Science"
5. Some background in linear algebra, data structures and algorithms, and probability will all behelpful

COURSE OBJECTIVES

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic searchtogether with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machinelearning.

COURSE OUTCOMES

- Ability to formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a givenproblem.
- Possess the ability to apply AI techniques to solve problems of game playing, and machinelearning.

UNIT-I		Classes: 12

Problem Solving by Search-I: Introduction to AI, Intelligent Agents

Problem Solving by Search –II: Problem-Solving Agents, Searching for Solutions, Uninformed SearchStrategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching wih Partial Observations,

Online Search Agents and Unknown Environment .

UNIT-II		Classes: 12

Problem Solving by Search-II and Propositional Logic

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-TimeDecisions.

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT-III		Classes: 12

Logic and Knowledge Representation

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Eventsand Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

UNIT-IV		Classes: 12

Planning

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search,Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT-V		Classes: 12

Uncertain knowledge and Learning

Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning;Dempster-Shafer theory.

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning:Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning UsingRelevance Information, Inductive Logic Programming.

TEXT BOOK:

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig,Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn, E. Rich and K.Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

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B.TECH HONORS (CSE)

CLOUD COMPUTING (Professional Elective - IV)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS714PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Pre-requisites:

1. A course on "Computer Networks"
2. A course on "Operating Systems"
3. A course on "Distributed Systems"

COURSE OBJECTIVES

- This course provides an insight into cloud computing
- Topics covered include- distributed system models, different cloud service models, service-oriented architectures, cloud programming and software environments, resource management.

COURSE OUTCOMES

- Ability to understand various service delivery models of a cloud computing architecture.
- Ability to understand the ways in which the cloud can be programmed and deployed.
- Understanding cloud service providers.

UNIT-I		Classes: 12

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT-II		Classes: 12

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing,Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

UNIT-III		Classes: 12

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managingthe Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT-IV		Classes: 12

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT-V		Classes: 12

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjrasoft, Aneka Platform.

TEXT BOOK:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej
   M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier,2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather,Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

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B.TECH HONORS (CSE)

AD-HOC & SENSOR NETWORKS (Professional Elective - IV)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS715PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites

1. A course on "Computer Networks"
2. A course on "Mobile Computing"

COURSE OBJECTIVES

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the security of sensor networks
- To understand the applications of ad-hoc and sensor networks

COURSE OUTCOMES

- Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc andWireless Sensor Networks
- Ability to solve the issues in real-time application development based on ASN.
- Ability to conduct further research in the domain of ASN

UNIT-I		Classes: 12

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology- based routing algorithms-**Proactive**: DSDV; **Reactive**: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-**Location Services**-DREAM, Quorum-based; **Forwarding Strategies:** Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT-II		Classes: 12

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

UNIT-III		Classes: 12

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-

GeoTORA, MGR**.** TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT-IV		**Classes: 12**

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

UNIT-V		**Classes: 12**

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

TEXT BOOKS:

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

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI
2. Advanced Computer Network-B.M Harwani DT Editorial Service.

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B.TECH HONORS (CSE)

ADVANCED ALGORITHMS (Professional Elective - V)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS721PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Pre-requisites:

1. A course on "Computer Programming & Data Structures"
2. A course on "Advanced Data Structures & Algorithms"

COURSE OBJECTIVES

- Introduces the recurrence relations for analyzing the algorithms
- Introduces the graphs and their traversals.
- Describes major algorithmic techniques (divide-and-conquer, greedy, dynamic programming, Brute Force, Transform and Conquer approaches) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-case, average-case and best-case analysis.
- Introduces string matching algorithms
- Introduces linear programming.

COURSE OUTCOMES

- Ability to analyze the performance of algorithms
- Ability to choose appropriate data structures and algorithm design methods for a specifiedapplication
- Ability to understand how the choice of data structures and the algorithm design methodsimpact the performance of programs

UNIT-I		Classes: 12

Introduction: Role of Algorithms in computing, Order Notation, Recurrences, Probabilistic Analysis and Randomized Algorithms. Sorting and Order Statistics: Heap sort, Quick sort and Sorting in Linear Time.

Advanced Design and Analysis Techniques: Dynamic Programming- Matrix chain Multiplication, Longest common Subsequence and optimal binary Search trees.

UNIT-II		Classes: 12

Greedy Algorithms - Huffman Codes, Activity Selection Problem. Amortized Analysis. **Graph Algorithms:** Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms.

UNIT-III		Classes: 12
Sorting Networks: Comparison Networks, Zero-one principle, bitonic Sorting Networks, Merging Network, Sorting Network. **Matrix Operations**- Strassen's Matrix Multiplication, Inverting matrices, Solving system of linear Equations		
UNIT-IV		**Classes: 12**
String Matching: Naive String Matching, Rabin-Karp algorithm, matching with finite Automata, Knuth-Morris - Pratt algorithm.		
UNIT-V		**Classes: 12**
NP-Completeness and Approximation Algorithms: Polynomial time, polynomial time verification, NP-Completeness and reducibility, NP-Complete problems. Approximation Algorithms- Vertex cover Problem, Travelling Sales person problem		

TEXT BOOK:

1. Introduction to Algorithms," T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, ThirdEdition, PHI.

REFERENCE BOOKS:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam,Galgotia publications pvt. Ltd.
2. Design and Analysis Algorithms - Parag Himanshu Dave, Himanshu Bhalchandra DavePublisher**:** Pearson
3. Algorithm Design: Foundations, Analysis and Internet examples, M.T. Goodrich and R.Tomassia, John Wiley and sons.
4. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearsoneducation

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B.TECH HONORS (CSE)

REAL TIME SYSTEMS (Professional Elective - V)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS722PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisite: Computer Organization and Operating System

COURSE OBJECTIVES

- To provide broad understanding of the requirements of Real Time Operating Systems.
- To make the student understand, applications of these Real Time features using casestudies.

COURSE OUTCOMES

- Be able to explain real-time concepts such as preemptive multitasking, task priorities, priorityinversions, mutual exclusion, context switching, and synchronization, interrupt latency and response time, and semaphores.
- Able describe how a real-time operating system kernel is implemented.
- Able explain how tasks are managed.
- Explain how the real-time operating system implements time management.
- Discuss how tasks can communicate using semaphores, mailboxes, and queues.
- Be able to implement a real-time system on an embedded processor.
- Be able to work with real time operating systems like RT Linux, Vx Works, MicroC /OSII, Tiny Os

UNIT-I		Classes: 12

Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT-II		Classes: 12

Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services,Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

UNIT-III		Classes: 12

Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

UNIT-IV		Classes: 12
Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.		
UNIT-V		**Classes: 12**
Case Studies of RTOS: RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, and Tiny OS.		

TEXT BOOK:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

REFERENCE BOOKS:

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.
2. Advanced UNIX Programming, Richard Stevens
3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

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B.TECH HONORS (CSE)

SOFT COMPUTING (Professional Elective - V)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS723PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

COURSE OBJECTIVES

- Familiarize with soft computing concepts
- Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
- Familiarize the Neuro-Fuzzy modeling using Classification and Clustering techniques
- Learn the concepts of Genetic algorithm and its applications
- Acquire the knowledge of Rough Sets.

COURSE OUTCOMES

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

- Identify the difference between Conventional Artificial Intelligence to ComputationalIntelligence.
- Understand fuzzy logic and reasoning to handle and solve engineering problems
- Apply the Classification and clustering techniques on various applications.
- Understand the advanced neural networks and its applications
- Perform various operations of genetic algorithms, Rough Sets.
- Comprehend various techniques to build model for various applications

UNIT-I		Classes: 12

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing,Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing,Applications of Soft Computing Techniques.

UNIT-II		Classes: 12

Fuzzy Systems: Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems

UNIT-III		Classes: 12

Fuzzy Decision Making, Particle Swarm Optimization

UNIT-IV		Classes: 12

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

UNIT-V		Classes: 11

Rough Sets, Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.

TEXT BOOK:

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha –Cengage Learning

REFERENCE BOOKS:

1. S. N. Sivanandam & S. N. Deepa, "Principles of Soft Computing", 2nd edition, Wiley India, 2008.
2. David E. Goldberg, "Genetic Algorithms-In Search, optimization and Machine learning",Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PearsonEducation, 2004.
4. G.J. Klir & B. Yuan, "Fuzzy Sets & Fuzzy Logic", PHI, 1995.
5. Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998.
6. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw- Hill Internationaleditions, 1995

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B.TECH HONORS (CSE)

INTERNET OF THINGS (Professional Elective - V)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS724PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

COURSE OUTCOMES

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect themto network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.

Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

UNIT-I		Classes: 12

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail,Logistics, Agriculture, Industry, health and Lifestyle

UNIT-II		Classes: 12

IoT and M2M – Software defined networks, network function virtualization, difference between SDN andNFV for IoT Basics of IoT System Management with NETCOZF, YANG-NETCONF, YANG, SNMP NETOPEER

UNIT-III		Classes: 12

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Pythonpackages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT-IV		Classes: 12
IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controllingoutput, reading input from pins.		
UNIT-V		**Classes: 12**
IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API		
TEXT BOOKS: 1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, UniversitiesPress, 2015, ISBN: 9788173719547 2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014,ISBN: 9789350239759		

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B.TECH HONORS (CSE)

SOFTWARE PROCESS & PROJECT MANAGEMENT (Professional Elective - V)

IV B. TECH- I SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS725PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To acquire knowledge on software process management
- To acquire managerial skills for software project development
- To understand software economics

COURSE OUTCOMES

- Gain knowledge of software economics, phases in the life cycle of software development,project organization, project control and process instrumentation
- Analyze the major and minor milestones, artifacts and metrics from management and technicalperspective
- Design and develop software product using conventional and modern principles of softwareproject management

UNIT-I		Classes: 12

Software Process Maturity
Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.
Process Reference Models
Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

UNIT-II		Classes: 12

Software Project Management Renaissance
Conventional Software Management, Evolution of Software Economics, Improving SoftwareEconomics, The old way and the new way.
Life-Cycle Phases and Process artifacts
Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

UNIT-III		Classes: 12

Workflows and Checkpoints of process
Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic statusassessments.

Process Planning

Work breakdown structures, Planning guidelines, cost and schedule estimating process, iterationplanning process, Pragmatic planning.

UNIT-IV		**Classes: 12**

Project Organizations

Line-of- business organizations, project organizations, evolution of organizations, process automation.Project Control and process instrumentation

The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmaticsoftware metrics, metrics automation.

UNIT-V		**Classes: 12**

CCPDS-R Case Study and Future Software Project Management Practices

Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

TEXT BOOKS:

1. Managing the Software Process, Watts S. Humphrey, Pearson Education
2. Software Project Management, Walker Royce, Pearson Education

REFERENCE BOOKS:

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
2. Process Improvement essentials, James R. Persse, O'Reilly, 2006
3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
5. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
6. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon,2nd edition, Wiley India, 2004.
7. Agile Project Management, Jim Highsmith, Pearson education, 2004.

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B.TECH HONORS (CSE)

COMPUTATIONAL COMPLEXITY (Professional Elective - VI)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS811PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites:

1. A course on "Computer Programming and Data Structures"
2. A course on "Discrete Structures and Graph Theory"

COURSE OBJECTIVES

- Introduces to theory of computational complexity classes
- Discuss about algorithmic techniques and application of these techniques to problems.
- Introduce to randomized algorithms and discuss how effective they are in reducing time andspace complexity.
- Discuss about Graph based algorithms and approximation algorithms
- Discuss about search trees

COURSE OUTCOMES

- Ability to classify decision problems into appropriate complexity classes
- Ability to specify what it means to reduce one problem to another, and construct reductions forsimple examples.
- Ability to classify optimization problems into appropriate approximation complexity classes
- Ability to choose appropriate data structure for the given problem
- Ability to choose and apply appropriate design method for the given problem

UNIT-I	Classes: 12

Computational Complexity: Polynomial time and its justification, Nontrivial examples of polynomial-timealgorithms, the concept of reduction (reducibility), Class P Class NP and NP- Completeness, The P versus NP problem and why it's hard

UNIT-II	Classes: 12

Algorithmic paradigms: Dynamic Programming – Longest common subsequence, matrix chain multiplication, knapsack problem, Greedy – 0-1 knapsack, fractional knapsack, scheduling problem, Huffman coding, MST, Branch-and-bound – travelling sales person problem, 0/1 knapsack problem, Divide and Conquer – Merge sort, binary search, quick sort.

UNIT-III	Classes: 12

Randomized Algorithms: Finger Printing, Pattern Matching, Graph Problems, Algebraic Methods, Probabilistic Primality Testing, De-Randomization Advanced Algorithms.

UNIT-IV		Classes: 12
Graph Algorithms: Shortest paths, Flow networks, Spanning Trees; Approximation algorithms, Randomized algorithms. Approximation algorithms: Polynomial Time Approximation Schemes.		
UNIT-V		**Classes: 12**
Advanced Data Structures and applications: Decision Trees and Circuits, B-Trees, AVL Trees, Red andBlack trees, Dictionaries and tries, Maps, Binomial Heaps, Fibonacci Heaps, Disjoint sets, Union by Rank and Path Compression		

TEXT BOOKS:

1. T. Cormen, C. Leiserson, R. Rivest and C. Stein, Introduction to Algorithms, Third Edition,McGraw-Hill, 2009.
2. R. Motwani and P. Raghavan, Randomized Algorithms, Cambridge University Press, 1995.

REFERENCE BOOKS:

1. J. J. McConnell, Analysis of Algorithms: An Active Learning Approach, Jones & BartlettPublishers, 2001.
2. D. E. Knuth, Art of Computer Programming, Volume 3, Sorting and Searching, Second Edition,Addison-Wesley Professional, 1998.
3. S. Dasgupta, C. H. Papadimitriou and U. V. Vazirani, Algorithms, McGraw-Hill, 2008.

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B.TECH HONORS (CSE)

DISTRIBUTED SYSTEMS (Professional Elective - VI)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS812PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites

1. A course on "Operating Systems"
2. A course on "Computer Organization & Architecture"

COURSE OBJECTIVES

- This course provides an insight into Distributed systems.
- Topics include- Peer to Peer Systems, Transactions and Concurrency control, Security andDistributed shared memory

COURSE OUTCOMES

- Ability to understand Transactions and Concurrency control.
- Ability to understand Security issues.
- Understanding Distributed shared memory.
- Ability to design distributed systems for basic level applications.

UNIT-I — Classes: 12

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

UNIT-II — Classes: 12

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

UNIT-III — Classes: 12

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays,Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, OceanStore. Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physicalclocks, logical time and logical clocks, global states, distributed debugging.

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

UNIT-IV		Classes: 12
Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.		
UNIT-V		**Classes: 11**
Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, Consistency models.		

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, PearsonEducation.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani andMukesh Singhal, Cambridge, rp 2010.

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B.TECH HONORS (CSE)

NEURAL NETWORKS & DEEP LEARNING (Professional Elective - VI)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS813PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

COURSE OUTCOMES

- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for Deep Models
- Ability to apply optimization strategies for large scale applications

UNIT-I		Classes: 12

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-II		Classes: 12

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT-III		Classes: 12

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT-IV		Classes: 12

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop

and Manifold, Tangent Classifier		
UNIT-V		**Classes: 11**
Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second- Order Methods, Optimization Strategies and Meta-Algorithms **Applications:** Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing		
TEXT BOOKS: 1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville 2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.		

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B.TECH HONORS (CSE)

HUMAN COMPUTER INTERACTION (Professional Elective - VI)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS814PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

COURSE OBJECTIVES

- To gain an overview of Human-Computer Interaction (HCI), with an understandingof user interface design in general, and alternatives to traditional "keyboard and mouse" computing; become familiar with the vocabulary associated with sensory and cognitive systems as relevant to taskperformance by humans;
- be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation; appreciate the importance of a design and evaluationmethodology that begins with and maintains a focus on the user;
- be familiar with a variety of both conventional and non-traditional user interface paradigms, the latter including virtual and augmented reality, mobile and wearable computing, and ubiquitous computing;
- To understand the social implications of technology and their ethical responsibilities as engineers in the design of technological systems. Finally, working in small groups on a product design from start to finish will provide you with invaluable team-work experience.

COURSE OUTCOMES

- Ability to apply HCI and principles to interaction design.
- Ability to design certain tools for blind or PH people.

UNIT-I		Classes: 11

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

UNIT-II		Classes: 13

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

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

UNIT-III		**Classes: 12**

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

UNIT-IV		**Classes: 12**

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

UNIT-V		**Classes: 12**

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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B.TECH HONORS (CSE)

CYBER FORENSICS (Professional Elective - VI)

IV B. TECH- II SEMESTER

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS815PE	B. Tech HONORS (CSE)	3	0	0	3	30	70	100

Prerequisites: Network Security

COURSE OBJECTIVES

- A brief explanation of the objective is to provide digital evidences which are obtained from digitalmedia.
- In order to understand the objectives of computer forensics, first of all, people have to recognizethe different roles computer plays in a certain crime.
- According to a snippet from the United States Security Service, the functions computer has indifferent kinds of crimes.

COURSE OUTCOMES

- Students will understand the usage of computers in forensic, and how to use various forensictools for a wide variety of investigations.
- It gives an opportunity to students to continue their zeal in research in computer forensics

UNIT-I		Classes: 12

Introduction of Cybercrime: Types, The Internet spawns crime, Worms versus viruses, Computers' roles in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology – Steps - Activities in Initial Response, Phase after detection of an incident

UNIT-II		Classes: 12

Initial Response and forensic duplication, Initial Response & Volatile Data Collection from Windows system -Initial Response & Volatile Data Collection from Unix system – Forensic Duplication: Forensicduplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic. Duplicate/Qualified Forensic Duplicate of a Hard Drive

UNIT-III		Classes: 12

Forensics analysis and validation: Determining what data to collect and analyze, validating forensicdata, addressing data-hiding techniques, performing remote acquisitions

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

UNIT-IV		Classes: 12

Current Forensic tools: evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT-V		Classes: 12

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXT BOOKS:

1. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw Hill,2006.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, NewDelhi.
3. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGELearning

REFERENCE BOOKS:

1. Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison- WesleyPearson Education
2. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, SpringerInternational edition.