CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

Choice Based Credit System (with effect from 2018-19)

B.E (Information Technology)

SEMESTER – VI

S.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16ITC24	Computer Networks & Socket Programming	3/1	-	3	30	70	4
2	16ITC25	Data Warehousing and Data Mining	3	-	3	30	70	3
3	16ITC26	Artificial Intelligence	3	-	3	30	70	3
4	16ITC27	Principles of Compiler Design	3/1	-	3	30	70	4
5		Elective – II	3	-	3	30	70	3
6		Elective – III	3	-	3	30	70	3
PRACTICALS								
7	16ITC28	Network Programming Lab	-	3	3	25	50	2
8	16ITC29	Data Mining Lab	-	3	3	25	50	2
9	16ITC30	Mini Project-IV	-	2	-	50	-	1
TOTAL			**20**	**8**	**-**	**280**	**520**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Elective-II

S.No.	Subject Code	Subject Name
1.	16ITE04	Principles of Computer Graphics
2.	16ITE05	File Structures
3.	16ITE06	Object Oriented System Development using UML

Elective-III

S.No.	Subject Code	Subject Name
1.	16ITE07	Digital Image Processing
2.	16ITE08	Information Retrieval Systems
3.	16ITE09	E-Commerce

16ITC24

COMPUTER NETWORKS AND SOCKET PROGRAMMING

Instruction	3L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

This course is introduced to

1. Familiarize students with basics of Socket based Client/Server programming.
2. Provide state-of-the-art knowledge on Network Layer issues including Routing, Addressing, Congestion Control and Quality of Service.
3. Give an overview of how Networks differ and how they can be interconnected.
4. Introduce IP based transport protocols TCP and UDP.
5. Give an insight into the working principles of popular Internet Applications including Email and Domain Name System.
6. Provide a solid understanding of main issues related to network security and the relevant cryptographic techniques.

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Enumerate functions of each layer in the OSI and TCP/IP reference models and build Client/Server applications using the understanding of Socket System calls.
2. Solve problems related to Addressing, Routing and Congestion in computer networks.
3. Understand Internetwork Routing issues and Interoperability among heterogeneous networks.
4. Analyze the functions and performance of Internet Transport Protocols TCP and UDP.
5. Understand the operating principles of Domain Name System and Electronic Mail.
6. Comprehend various network security threats and cryptographic algorithms.

Prerequisites:

Data Communications (16ITC09), Programming and Problem Solving (16CSC01).

UNIT-I

Introduction: Uses of Computer Networks, ISO/OSI and TCP/IP Reference Models, Comparison of the OSI and TCP/IP Reference Models.

Socket programming: Socket address, Elementary socket system calls, Advanced socket system calls, Reserved ports, Socket options, Asynchronous I/O, Out-of-Band data, Internet Super Server, Daemon Processes.

UNIT-II

Network Layer Design Issues: Store and Forward Packet switching, Services, Implementation of Connectionless Service and Connection-Oriented Service, Comparison of Virtual circuits and Datagram subnets.

Routing Algorithms: The Optimality principle, Shortest path routing, Flooding, Distance vector Routing, Link state Routing, Hierarchical Routing, Broadcast and Multicast routings,

Congestion control algorithms: Approaches, Traffic-Aware Routing, Admission Control, Traffic Throttling, Load Shedding,

Quality of Service: Application Requirements, Traffic shaping Packet Scheduling, Integrated and Differentiated Services.

UNIT-III

Internetworking: How networks differ, How networks can be Connected, Tunneling, Internetwork routing, Packet Fragmentation,

The Network Layer in the Internet: The IPv4 protocol, IP addresses, Subnets, Classless Inter Domain Routing, Classful and Special Addressing, Network Address Translation, IP version 6, Label Switching and MPLS, OSPF, BGP.

UNIT-IV

Transport Layer: Transport service primitives, Addressing, Connection Establishment, Connection Release, Error Control and Flow control, Multiplexing and Crash recovery.

Internet Transport Protocols (TCP and UDP): Introduction to UDP, Remote Procedure Call (RPC), Real-Time Transport Protocols, The TCP service model, The TCP protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Sliding Window, TCP Timer management, TCP Congestion Control, Performance issues.

UNIT-V

Application Layer: The Domain Name System- DNS Name Space, Domain Resource Records, Name Servers, Electronic Mail-Architecture and Services, The User Agent, Message Transfer, SMTP and Extensions, Final Delivery,

Network Security: Introduction to Cryptography, Substitution Ciphers, Transposition Ciphers, Symmetric Key Algorithms-The Data Encryption Standard (DES), Triple DES, Public Key Algorithm:RSA Algorithm, Digital Signatures:

Symmetric-Key Signatures, Public-Key Signatures, Message Digests, Authentication Protocols.

Text Books:

1. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", 5th Edition, Pearson Education, 2014.
2. W. Richard Stevens, Unix Network Programming, Prentice Hall/Pearson Education, 2009.

Suggested Reading:

1. Chwan-Hwa (John) Wu, J. David Irwin, Introduction to Computer Networks and Cyber Security, CRC Press, 2013.
2. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet, 5th Edition, Addison-Wesley, 2012.

Web Resources:

1. http://www.nptelvideos.in/2012/11/computer-networks.html
2. beej.us/guide/bgnet/output/print/bgnet_A4.pdf

16ITC25

DATA WAREHOUSING AND DATA MINING

Instruction	3LHours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course is introduced to

1. Familiarise the concepts of Data Warehouse and Data Mining techniques.
2. Examine the types of the data to be mined and apply preprocessing methods on raw data.
3. Present different frequent pattern discovery methods.
4. Describe various classification and clustering techniques.
5. Minecomplex data types.

Course Outcomes:

Upon successful completion of this course, the students should be able to

1. Understand requirements of data warehousing and data mining to the decision support level of organizations.
2. Apply Pre-Processing techniques on various data formats to make it suitable for data mining algorithms.
3. Generate Association rules for the data.
4. Build models for Classification, prediction, and clustering.
5. Evaluate the performance of various data mining algorithms.
6. Understand mining of complex data.

Prerequisites:

Database Systems (16ITC17), Database Lab (IT 317).

UNIT-I

Introduction: What is Data mining? What kinds of data can be mined? What kinds of pattern can be mined? Major issues in data mining.
Getting to know your data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity.
Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT-II

Data Warehousing and Online Analytical Processing Data Warehouse: Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design

and Usage: A Business Analysis Framework for Data Warehouse Design, Data Warehouse Design Process, Data Warehouse Usage for Information Processing, Data Warehouse Implementation.

Mining Frequent Patterns, Associations and correlations: Basic Concepts, Frequent Item Set Mining Methods, Interesting patterns, Pattern Evaluation Methods. **Advanced Pattern Mining:** Pattern Mining in Multilevel and multidimensional space.

UNIT-III

Classification: Basic Concepts**,** Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Introducing Ensemble Methods, Bagging, Boosting, Random Forests, Improving Classification Accuracy of Class-Imbalanced Data. **Classification: Advanced Methods** Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, Lazy Learners (or Learning from Your Neighbors), Other Classification Methods.

UNIT-IV

Cluster Analysis: Basic Concepts and Methods: Cluster Analysis, Partitioning Methods, Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic Methods, DBSCAN, Evaluation of Clustering.

UNIT-V

Outlier Detection: Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity-Based Approaches

Data Mining Trends and Research Frontiers: Mining Complex Data Types: Mining Sequence Data: Mining Other Kinds of Data, Data Mining Applications, Data Mining and Society, Data Mining Trends.

Text Book:

1. Han J, Kamber M, Jian P "Data Mining: Concepts and Techniques", Third Edition, Elsevier, 2012.

Suggested Reading:

1. Pang-Ning Tan, Michael Steinback, Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2008.
2. M. Humphires, M.Hawkins, M.Dy,"Data Warehousing: Architecture and Implementation", Pearson Education, 2009.
3. Anahory, Murray, "Data Warehousing in the Real World", Pearson Education, 2008.
4. Kargupta, Joshi, etc., "Data Mining: Next Generation Challenges and Future Directions", Prentice Hall of India Pvt. Ltd, 2007.

Web Resources:

1. https://www.kdnuggets.com/
2. http://archive.ics.uci.edu/ml/index.php

16ITC26

ARTIFICIAL INTELLIGENCE

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course is introduced to

1. Learn problem solving techniques.
2. Familiarize with knowledge representation and logical reasoning techniques used in Artificial Intelligence.
3. Learn probabilistic reasoning models on uncertain data.
4. Design machine learning and neural network systems.
5. Learnsyntax and semantics of the natural language.

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Solve problems using Exhaustive and Heuristic Search Techniques.
2. Apply inference methods in propositional logic to prove statements.
3. Apply probabilistic reasoning models on uncertain data.
4. Apply classification and clustering techniques on data sets.
5. Understand the working of neural networks to store and process information
6. Understand syntax and semantics of the language and knowledge representations.

Prerequisites:

Discrete Structures and Applications (16ITC01), Fundamentals of Data Science (16ITC12).

UNIT-I

Introduction – The Foundations of AI, History of AI.

Intelligent agents – Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Solving problems by searching – Problem Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed Search Strategies, Heuristic Functions.

Adversarial search – Games, Optimal decisions in games, Alpha-Beta Pruning.
Constraint Satisfaction Problems- Defining constraint satisfaction Problems.

UNIT-II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT-III

Quantifying 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, Exact Inference in Bayesian Networks.

Probabilistic Reasoning over Time-Time and Uncertainty, Inference in Temporal Models, Hidden Markov Models, Kalman Filters.

UNIT-IV

Learning from Examples- Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines.
Learning Probabilistic Models- Statistical Learning, Learning with Complete Data. **Learning with Hidden Variables: The EM Algorithm**

UNIT-V

Natural Language Processing-Language Models, Text Classification, Information Retrieval, Information Extraction.
Natural Language for Communication-Phrase Structure Grammars, Syntactic Analysis, Augmented Grammars and Semantic Interpretation.

Text Books:

1. Russell, Norvig, "Artificial intelligence - A Modern Approach", Pearson Education, Third Edition, 2015.
2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning, 2011.

Suggested Reading:

1. Nilsson, N., “Artificial Intelligence: A New Synthesis”, San Francisco, Morgan Kaufmann, 1998.
2. Rich, Knight, Nair: “Artificial intelligence”, Tata McGraw Hill, Third Edition, 2009.
3. Tom M. Mitchell, “Machine Learning”, McGraw Hill, 1997.
4. Kulkarni, Parag, Joshi, Prachi ,”Artificial Intelligence : Building Intelligent Systems”, PHI, 2015.
5. Peter Jackson, “Introduction to Expert Systems”, Third Edition, Pearson Addison Wesley, 1998.

Web Resources:

1. http://www.nptel.ac.in/courses/106105077/
2. https://www.coursera.org/specializations/machine-learning

16ITC27

PRINCIPLES OF COMPILER DESIGN

Instruction	3L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

This course is introduced to

1. Learn various phases of Compiler Design.
2. Design scanner and Parsers.
3. Develop Intermediate code and generate code for target machine.
4. Familiarize with machine dependent and machine independent optimization techniques.
5. Present the role of a symbol table and error recovery strategies.

Course Outcomes:

Upon successful completion of this course, the students should be able to

1. Understand various phases in the design of compiler.
2. Generate a lexical analyser.
3. Design top-down and bottom-up parsers.
4. Develop Syntax Directed Translation scheme and Generate Intermediate code for a language.
5. Develop algorithms to generate code for a target machine.
6. Understand Data flow Analysis and Apply the optimization techniques.

Prerequisites:

Programming and Problem Solving (16CSC01), Data Structures and Algorithms (16ITC02),
Theory of Automata (16ITC20).

UNIT-I

Introduction: Programs related to compilers, Translation process, Major data structures, Other issues in compiler structure, Boot strapping and porting.
Lexical analysis: The role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, The Lexical-Analyzer Generator Lex.

UNIT-II

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down parsing, Bottom-Up parsing, Introduction to LR Parsing, More powerful LR parsers, Using Ambiguous Grammars, Parser Generators.

UNIT-III

Syntax Directed Translation: Syntax Directed Definitions, Evaluation Orders for SDDs, Applications of Syntax Directed Translation.

Intermediate code generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow.

UNIT-IV

Runtime Environments: Storage Organization, Stack Allocation of Space, Access to Non local Data on the Stack, Heap Management, Introduction to Garbage Collection.

Code Generation : Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Peephole Optimization, Register Allocation and Assignment.

UNIT-V

Machine Independent Optimizations: The Principal Sources of Optimizations, Introduction to data flow analysis, Foundation of data flow analysis.

Text Books:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman ,"Compilers: Principles, Techniques &Tools", Pearson Education, Second Edition, 2014.
2. Kenneth C Louden, "Compiler Construction: Principles and Practice", Cengage Learning.

Suggested Reading:

1. Keith D Cooper & Linda Torczon, "Engineering a Compiler", Morgan Kafman, Second Edition.
2. Dick Grune, Kees van Reeuwijk, Henri E. Bal , Ceriel J.H. Jacobs, Koen Langendoen ," Modern Compiler Design", Springer, Second Edition.

Web Resources:

1. http://nptel.ac.in/courses/106108113

16ITE04

PRINCIPLES OF COMPUTER GRAPHICS

(Elective-II)

Instruction	3LHours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

This course is introduced to

1. Explain the core concepts of computer graphics.
2. Displaying two dimensional output primitives for raster graphics system.
3. Acquire knowledge about transformation techniques in 2D and 3D.
4. To learn various algorithms on clipping techniques.
5. To acquire knowledge about curve generation and animations.

Course outcomes:

Students who complete this course should be able to

1. Understand the core concepts of computer graphics.
2. Understand the techniques for performing 2D and 3D transformations.
3. Describe various techniques for clipping.
4. Demonstrate problem solving skills with application to computer graphics.
5. Understand graphics techniques for curve generation.
6. Explain fundamentals of shading and animation techniques.

Prerequisites: Engineering Mathematics-I (16MTC01)

UNIT-I

Computer Graphics: Introduction, Application areas, Overview of graphics systems: Video-display devices, Raster-scan systems, Random scan systems, Graphics monitors and Work stations and input devices, Graphics software.
Output primitives: Points and lines, line drawing algorithms: DDA and Bresenham's line generation, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms, Fill-Area Functions, Cell Array, Character generation.

UNIT-II

Attributes of Output Primitives: Line Attributes, Curve Attributes, color and gray scale levels, Area Fill Attributes, Character Attributes, Bundled Attributes, Inquiry Functions.
Structures and Hierarchical Modeling: Structure concepts, Editing Structures, Hierarchical modeling with structures. Graphical User Interfaces and Interactive

Input Methods: The User Dialogue, Logical Classification of Input Devices, Input Functions, Interactive Picture Construction Techniques.

UNIT-III

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 and Liang-Barsky line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT-IV

3-D Object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces, CSG, Octrees, BSP Trees.

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, projections, view volume and general projection transforms.

UNIT-V

Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods. **Computer animation:** Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.

Text Books:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics C version", Second Edition, Pearson Education.
2. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

Suggested Reading:

1. "Computer Graphics" Second edition, Zhigandxiang, Roy Plastock, Schaum's outlines, Tata Mc- Graw hill edition.
2. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
3. "Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
4. Principles of Computer Graphics, ShaliniGovil, Pai, 2005, Springer.
5. Computer Graphics, Steven Harrington, TMH.

Web Resources:

1. http://nptel.iitm.ac.in/courses/Webcourse-contents/IITDelhi/ Computer%20Graphics/csmain.html

16ITE05

FILE STRUCTURES
(Elective-II)

Instruction	3LHours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course is introduced to

1. Understand File operations.
2. Understand UNIX File system.
3. Understand Indexing and Hashing Concepts to organize data in files.
4. Understand B+-Trees to organize files.

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Understand file structures including sequential, indexed, indexed sequential, hashed file structures.
2. Implement file operations including read, write, update and search.
3. Apply object-oriented concepts to design file systems.
4. Understand B_+-trees to implement file systems.
5. Develop and analyse external sorting methods.

Prerequisites:

Programming and problem solving (16CS01), data structures and algorithms (16ITC01), object oriented programming (16ITC03).

UNIT-I

Fundamental File Structure Concepts: Field and Record Organization, Using Classes to Manipulate Buffers, Using Inheritance for Record Buffer Classes, Managing Fixed Length, Fixed Field Buffers, An Object-Oriented Class for Record Files.

Managing Files and Records: Record Access, More about Record Structures, Encapsulating Record I/O Operations in a Single Class, File Access and File Organization.

UNIT-II

Fundamental File Processing Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters in Files, The UNIX Directory Structure, Physical Devices and Logical Files, Physical Devices as Files ,File-related Header Files, UNIX File System Commands.

Indexed Files of Data Objects- Indexing: A Simple Index for Entry-Sequenced File, Template Classes in C++, Object-Oriented support for Indexed, Entry-Sequenced Files of Data Objects, Indexes That Are Too Large to Hold in Memory, Indexing to Provide Access by Multiple Keys, Retrieval Using Combinations of Secondary Keys, Improving the Secondary Index Structure: Inverted Lists, Selective Indexes, Binding.

UNIT-III

Multilevel Indexing and B-Trees: Introduction: The Invention of the B-Tree, Statement of the Problem, Indexing with Binary Search Trees, Multi-level Indexing, A Better Approach to Tree Indexes, B-Trees: Working up from the Bottom, Example of Creating a B- Tree, An Object-Oriented Representation of B-Trees, B-Tree Methods Search, Insert, and Others, B-Tree Nomenclature, Formal Definition of B-Tree Properties, Worst-case Search Depth, Deletion, Merging, and Redistribution, Redistribution during Insertion: A Way to Improve Storage Utilization, B* Trees, Buffering of Pages: Virtual B-Trees, Variable-length Records and Keys.

UNIT-IV

Indexed Sequential File Access and B+ Trees : Indexed Sequential Access, Maintaining a Sequence Set, Adding a Simple Index to the Sequence Set, The Content of the Index: Separators Instead of Keys, The Simple Prefix B+ Tree, Simple Prefix B+ Tree Maintenance, Index Set Block Size, Internal Structure of Index Set Blocks: A Variable-order B-Tree, Loading a Simple Prefix B+ Tree, B+ Trees, B-Trees, B+ Trees, and Simple Prefix B+ Trees in Perspective.

Hashing: Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distributions, How Much Extra Memory Should Be Used, Collision Resolution by Progressive Overflow, Storing More Than One Record per Address: Buckets, Making Deletions, Other Collision Resolution Techniques, Patterns of Record Access.

UNIT-V

Extendible Hashing: Introduction, How Extendible Hashing Works, Implementation, Deletion, Extendible Hashing Performance, Alternative Approaches, Multi list and Inverted Files, Sorting of Large Files, **External sorting**: Secondary storage algorithms.

Text Book:

1. Michael j. Folk, Greg Riccardi, Bill Zoellick; *File Structures: An Object Oriented Approach with C++*, 3/e Pearson Publishers.

Suggested Reading:

1. Horowitz, E., and Sahni.S: Fundamentals of Data structures. Computer Science Press, 1978.
2. Wirth, Nicolaus: Algorithms + Data structures = Programs. Prentice-Hall International, 1975.
3. Knuth, D.: The Art of Computer Programming, Vols. 1-2. Addison-Wesley, 1970-80.

16ITE06

OBJECT ORIENTED SYSTEM DEVELOPMENT USING UML

(Elective-II)

Instruction	3LHours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course is introduced to:

1. Acquaint the student with the precise vocabulary and powerful notation used in Unified modeling language.
2. Describe the basic structural modeling concepts in UML.
3. Familiarize students with architectural modeling.
4. Explain the concepts of Unified software development process.
5. Acquaint the students with UML notations and discuss several case studies.

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Understand the precise vocabulary and powerful notation used in Unified modeling language.
2. Provide comprehensive introduction to basic structural modeling in UML.
3. Develop the component and deployment diagrams in architectural modeling.
4. Understand the Unified software development process and apply to UML models.
5. Involve in analysis and design of UML models for various case studies.
6. Relate the applications of Unified process in UML modeling.

Prerequisites:

Object Oriented Programming (16ITC03), Software engineering (16ITC26)

UNIT-I

UML Introduction: Why we Model, Introducing the UML, Elements of UML. Basic Structural Modeling: Classes, Relationships, Common Mechanisms, Diagrams, Class Diagrams.

Advanced Structural Modeling: Advanced Classes, Advanced Relationships, Interfaces, Types and Roles, Packages, Instances, Object Diagrams, Components, Case studies on class diagrams.

UNIT-II

Basic BehavioralModeling: Interactions, Use Cases, Use Case Diagrams, Interaction diagrams, Activity diagrams, Case studies on Use Case diagrams, Interaction diagrams.

Advanced BehavioralModeling: Events and Signals-types of events-internal and external events, State Machines, Processes and Threads, Time and space, State Chart Diagrams, Case studies on State chart diagrams.

UNIT-III

Architectural Modeling: Artifacts, Deployment , Collaborations, Patterns and Frame-works, Artifact Diagrams, Deployment Diagrams, components of deployment diagrams-nodes and links, common modeling techniques for deployment diagrams-modeling a fully distributed system, modeling embedded systems, modeling client-server systems, Systems and Models- subsystems, trace relationships, Case studies on Deployment diagrams.

UNIT-IV

Unified Software Development Process: The Unified Process, phases in unified software development process-inception, elaboration, construction and transition, The Four P's-people, project, product, process, A Use-Case Driven Process-Importance of Use case modeling, An Architecture-Centric Processes, base lining the architecture, An Iterative and Incremental Process-a generic iteration, advantages of iterative and incremental process.

UNIT-V

Core Workflows: Requirements Capture, Capturing Requirements as Use Cases, Analysis-role of analysis in software life cycle, artifacts, workers and activities in analysis workflow, Design-workers, artifacts and activities in design workflow, Implementation-role of implementation in software life cycle, Test, testing artifacts-test case, test plan, test procedure.

Text Books:

1. Grady Booch, James Rumbaugh, Ivor Jacobson, "The Unified Modeling Language-User Guide (Covering UML 2.0)", Third Edition, Pearson Education, India, 2010.
2. Ivor Jacobson, Grady Booch, James Rumbaugh, "The Unified Software Development Process", second edition ,Pearson Education, India, 2008.

Suggested Reading:

1. Martin Fowler, Kendall Scott "UML Distilled**:** A Brief Guide to the Standard Object Modeling Language" Addison Wesley, Fourth Edition, 2011.
2. Hans van Vliet "Software Engineering Principles and Practice", Second Edition, 2010.

Web Resources:

1. IBM Rational http://www-306.ibm.com/software/rational/uml/
2. Practical UML - A Hands-On Introduction for Developers http://www.togethersoft.com/services/practical_guides/umlonlinecourse/
3. http://www-inst.eecs.berkeley.edu/~cs169/

16ITE07

DIGITAL IMAGE PROCESSING
(Elective-III)

Instruction	3LHours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To learn the fundamental concepts and applications of digital image processing.
2. To learn the image processing concepts: intensity transformations, spatial filtering, smoothing and sharpening in both spatial and frequency domains, image restoration and reconstruction.
3. To learn the image analysis concepts: morphological image processing, image segmentation, image representation and description, and object recognition.
4. To understand colour image processing techniques.
5. To learn various image compression methods.

Course Outcomes:

Upon successful completion of the course, student will be able to

1. Explain the fundamental concepts and discuss the applications of digital image processing.
2. Explain intensity transformations, spatial filtering, smoothing and sharpening in both spatial and frequency domains, image restoration and reconstruction.
3. Demonstrate the image analysis concepts like morphological image processing, image segmentation, image representation and description, and object recognition.
4. Illustrate colour image processing techniques.
5. Distinguish and describe various image compression methods.

Prerequisites:

Engineering Mathematics- I (16MTCO1)

UNIT-I

Basics: Introduction, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of visual perception, Image Sampling

and Quantization - Basic Concepts in Sampling and Quantization, Representing Digital Images, Spatial and Intensity Resolution;

Some Basic Relationships between Pixels - Neighbours of a Pixel, Adjacency, Connectivity, Regions, and Boundaries, Distance Measures
Intensity Transformations: Some Basic Intensity Transformation Functions, Image Negatives, Log Transformations, Power-Law (Gamma) Transformations, Piecewise-Linear Transformation Functions, Histogram Processing - Histogram Equalization, Histogram Matching (Specification), Local Histogram Processing.

UNIT- II

Spatial Filtering: Fundamentals of Spatial Filtering, The Mechanics of Spatial Filtering, Spatial Correlation and Convolution, Smoothing Spatial Filters - Smoothing Linear Filters, Order-Statistic (Nonlinear) Filters; Sharpening Spatial Filters – Foundation, Using the Second Derivative for Image Sharpening—The Laplacian, Unsharp Masking and Highboost Filtering.

Filtering in the Frequency Domain: The 2-D Discrete Fourier Transform and its inverse, Some Properties of the 2-D Discrete Fourier Transform - Relationships Between Spatial and Frequency Intervals, Translation and Rotation, Periodicity, Symmetry Properties, Fourier Spectrum and Phase Angle, The 2-D Convolution Theorem.

The Basics of Filtering in the Frequency Domain - Frequency Domain Filtering Fundamentals Correspondence Between Filtering in the Spatial and Frequency Domains, Image Smoothing Using Frequency Domain Filters, Ideal Low pass Filters, Butterworth Low pass Filters, Gaussian Low pass Filters, Image Sharpening Using Frequency Domain Filters - Ideal High pass Filters, Butterworth High pass Filters, Gaussian High pass Filters, The Laplacian in the Frequency Domain, Unsharp Masking, Highboost Filtering.

UNIT- III

Image Restoration and Reconstruction: A Model of the Image Degradation/ Restoration Process, Noise Models - Spatial and Frequency Properties of Noise, Some Important Noise Probability Density Functions, Periodic Noise, Estimation of Noise Parameters, Restoration in the Presence of Noise Only—Spatial Filtering, Mean Filters, Order-Statistic Filters, Adaptive Filters; Periodic Noise Reduction by Frequency Domain Filtering – Band reject Filters, Band pass Filters; Estimating the Degradation Function - Estimation by Image Observation, Estimation by Experimentation, Estimation by Modelling; Inverse Filtering; Minimum Mean Square Error (Wiener) Filtering; Constrained Least Squares Filtering.

Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing.

UNIT- IV

Image Segmentation:Fundamentals, detection of isolated points, line detection, basic edge detection, edge linking and boundary detection; thresholding – foundation, basic global thresholding, optimum global thresholding using otsu's method; region-based segmentation - region growing, region splitting and merging; segmentation using morphological watersheds - background, dam construction, watershed segmentation algorithm.

Representation and Description: Representation-Boundary (Border) Following, Chain Codes, Polygonal Approximations Using Minimum-Perimeter Polygons, Signatures, Boundary Descriptors - Some Simple Descriptors, Shape Numbers, Fourier Descriptors, Statistical Moments, Regional Descriptors - Some Simple Descriptors, Topological Descriptors, Texture.

Object Recognition: Patterns and Pattern Classes, Recognition Based on Decision-Theoretic Methods – Matching, Optimum Statistical Classifiers, Neural Networks.

UNIT-V

Colour Image Processing: Colour Fundamentals; Colour Models - RGB Colour Model, CMY and CMYK Colour Models, The HSI Colour Model; Pseudo colour Image Processing - Intensity Slicing, Intensity to Colour Transformations; Basics of Full-Colour Image Processing - Colour Transformations, Colour Edge Detection **Image Compression**: Fundamentals-Coding Redundancy, Spatial and Temporal Redundancy, Irrelevant Information, Measuring Image Information, Fidelity Criteria, Image Compression Models - Image Formats, Containers, and Compression Standards; Some Basic Compression Methods - Huffman Coding, Arithmetic Coding, LZW Coding, Block Transform Coding.

Text Book:

1. Rafael C Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education, Third Edition.

Suggested Reading:

1. Vipula Singh, "Digital Image Processing with MatLab and lab View", Elsevier.
2. Thomas B. Moeslund, "Introduction to Video and Image Processing: Building Real Systems and Applications", Springer, 2012.
3. Milan Sonka, Vaclav Halvac and Roger Boyle, "Image Processing, Analysis, and Machine Vision", Second Edition, Thomson Learning Publishers.
4. Kenneth R.Castleman, "Digital Image Processing", Pearson Education, 2006.

16ITE08

INFORMATION RETRIEVAL SYSTEMS

(Elective – III)

Instruction	3LHours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course is introduced to

1. To familiarize the different Information Retrieval models.
2. To understand how to write query languages and evaluation.
3. To build index and perform compression on the data.
4. To familiarize pattern matching algorithms.
5. To learn parallel and distributes models.

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Understand different Information Retrieval models.
2. Understand the query language to retrieve the data.
3. Analyse and improve the retrieval results.
4. Understands the operations on the text data and builds index of the data.
5. Apply different pattern matching algorithms on text data.
6. Understand parallel and distributed Information Retrieval models.

Prerequisites:

Database Systems (16ITC17), Data Warehousing and Data Mining (16ITC25).

UNIT-I

Introduction: Basic concepts, Past present and Future of IRS, Retrieval Process.
Modeling: Introduction, A Taxonomy of IR Models, Retrieval: Adhoc and Filterig, A formal characterization of IR Models, Classic IR, Set Theoretic Models, Algebraic Models, Probabilistic Models.

UNIT-II

Structured Text Retrieval Models, Models for Browsing.
Retrieval Evaluation: Introduction, Reference Collections.
Query languages: Introduction, Keyword-based querying, pattern Matching, Structural Queries, Query Protocols.

UNIT-III

Query operations: Introduction, User Relevance Feedback, Automatic Local Analysis, Automatic Global Analysis.
Text and Multimedia Languages and Properties: Introduction, Meta Data, Text, Markup Languages, Multimedia.

UNIT-IV

Text operations: Introduction, Document Preprocessing, Document Clustering, Text Compression, Comparing Text Compression Techniques Indexing: Introduction, Inverted Files, Other Indices for Text Searching, Boolean Queries.

UNIT-V

Searching: Sequential Searching, Pattern Matching, Structural Queries, Compression Parallel and Distributed IR: Introduction, Parallel IR, Distributed IR.

Text book:

1. Ricardo, Baeza-yates, BerthierRibeiro-Neto, "Modern Information Retrieval" Pearson Education, 2008.

Suggested Reading:

1. Christopher D. Manning and PrabhakarRaghavan and HinrichSchütze, "Introduction to
2. Information Retrieval", Cambridge University Press, 2009.
3. David A. Grossman, OphirFrieder, "Information Retrieval - Algorithms and Heuristics", Springer, 2nd Edition (Distributed by Universities Press), 2004.
4. Gerald Kowalski, "Information Retrieval Systems: Theory and Implementation", Springer.
5. William B. Frakes, Ricardo Baeza- Yates, "Information Retrieval – Data Structures & Algorithms", Pearson Education, 2008.

Web Resources:

1. https://class.coursera.org/nlp/lecture
2. http://www.dcs.gla.ac.uk/Keith/Preface.html

16ITE09

E-COMMERCE
(Elective-III)

Instruction	3LHours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

This course is introduced to

1. Analyze features of existing e-commerce businesses, and propose future directions or innovations for specific businesses.
2. To understand the role of multimedia in E-Commerce and security issues of E-Commerce.
3. Discuss electronic commerce and the stakeholders and their capabilities and limitations in the strategic convergence of technology and business.
4. Identify advantages and disadvantages of technology choices such as merchant server software and electronic payment options.
5. To understand the Emerging tools for Resource search and discovery.

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Able to implement e-commerce in business applications.
2. To make effective use of multimedia in E-commerce applications.
3. To resolve security issues in Electronic Payment Systems.
4. Able to describe the Document infrastructure for E-commerce and advertisement in Market.
5. To make use of emerging tools in Resource search and discovery.
6. Be aware of global perspectives (needs, rules/regulations, and specifications).

UNIT-I

Introduction: Electronic commerce and Physical Commerce, different type of ecommerce, some e-commerce scenario, Advantages of e-commerce.
Basic technologies of Ecommerce: Client side Programming, Server Side Programming, Database connectivity, session tracking techniques.

UNIT-II

Internet Payment System: Characteristics of payment system, SET Protocol for creditcard payment, E-cash, E-check, Micropayment system.

E-commerce strategies: Strategies for marketing, Sales and Promotions, Strategies forPurchasing and support activities, Strategies for Web Auctions, Virtual Communities,and web portals.

UNIT -III

E-Business -Introduction: E-Business vs E-commerce,, Characteristics of e-Business, e-Business role and their challenges, e-business Requirements, impacts of e-business.

E-business strategies: Strategic positioning, Levels of e-business strategies, Strategicplanning process, Strategic alignment, the consequences of e-Business, Success factorsfor implementation of e-business strategies. Business models, Business process and collaborations.

UNIT-IV

Advance technologies of E-commerce: Mobile Agent, WAP, XML, Data Mining, RichInternet Application, Web 2.0, REST Web Services, Web Mashup, Working of SearchEngines, Internet Security.

UNIT- V

Integration of Application: Approaches to Middleware, RPC and RMI, EnterpriseApplication Integration, e-business Integration, loosely Coupled e-Business solutions forintegration, Service Oriented Architecture, EAI and web Services, WS-security.

Text Books:

1. E-Commerce Fundamentals and application (Henry Chan) Wiley publication.
2. Electronic Commerce (Gary Schneider) Thomson Course technology.
3. E-Business Organizational and technical foundation (Michael P) Wiley Publication.

Suggested Reading:

1. E- Commerce Strategies, Technology and applications (David) Tata McGraw-Hill.
2. Introduction to E-commerce (Jeffrey) Tata- McGraw-Hill.
3. E-Business and Commerce- Strategic Thinking and Practice (Brahm) biztantra.

Web Resources:

1. http://www.w3schools.com/xml/default.asp
2. http://www.tizag.com/xmlTutorial/
3. https://www.practicalecommerce.com/

16ITC28

NETWORK PROGRAMMING LAB

Instruction	3LHours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

This course is introduced to

1. Familiarize students with client/server architecture in application development.
2. Provide understanding of elementary socket system calls, advanced socket system calls.
3. Expose students to the usage of TCP and UDP based sockets.
4. Provide knowledge of network routing algorithms and application layer protocols.
5. Cryptographic principles and encryption algorithms.

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Use elementary socket system calls and develop distributed applications.
2. Model and evaluate performance of networking systems.
3. Implement the Routing algorithms.
4. Develop and implement next generation protocols required for emerging applications.
5. Understand the operating principles of Electronic Mail (SMTP), HTTP.
6. Comprehend various network security threats and implement the cryptographic algorithms.

Prerequisites:

Programming and Problem Solving (16CSC01), Java Programming (16ITC10).

List of Programs

1. Understanding and using of commands like ifconfig, netstat, ping, arp, telnet, ftp, finger, traceroute, whoisetc. Usage of elementary socket system calls (socket(), bind(), listen(), accept(), connect(), send(), recv(), sendto(), recvfrom()).
2. Implementation of Connection oriented concurrent service (TCP).
3. Implementation of Connectionless Iterative time service (UDP).
4. Implementation of Select system call.
5. Implementation of getsockopt(), setsockopt() system calls.

6. Implementation of getpeername() system call.
7. Implementation of remote command execution using socket system calls.
8. Implementation of Distance Vector Routing Algorithm.
9. Implementation of HTTP.
10. Implementation of RSA algorithm.
11. Develop an Internet Mail Application.
12. Multimedia file transmission using FTP.

Note: Implement programs 2 to 7 in C and 8 to 12 in JAVA.

Text Book:

1. W. Richard Stevens, "Unix Network Programming", Prentice Hall, Pearson Education, 2009.

Suggested Reading:

1. Douglas E.Comer, "Hands-on Networking with Internet Technologies", Pearson Education.
2. James Kurose and Keith Ross. Computer Networking: A Top-Down Approach Featuring the Internet.

Web Resources:

1. https://in.udacity.com/course/computer-networking—ud436
2. https://www.mooc-list.com/course/learn-socket-programming-tutorial-c-scratch-eduonix.

16ITC29

DATA MINING LAB

Instruction	3LHours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

This course is introduced to

1. Weka tool and R-Tool for data mining.
2. Present various pre-processing techniques.
3. Familiarise with data visualization.
4. Acquaint various features available in weka for mining interesting patterns.
5. Present various mining techniques to analyse the data in R - Tool.

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Describe the data using various visualisation techniques.
2. Identify and apply necessary pre-processing techniques on raw data.
3. Generate interesting patterns using appropriate data mining techniques.
4. Perform pattern evaluation.
5. Visualise the knowledge mined.
6. Build a data mining system for a given application.

Prerequisites:

Database Systems (16ITC17)

List of Programs

I. Introduction to data mining using Weka and R-Tool.

II. Experiment the following in Weka Tool.

1. Perform the following Preprocessing operations:
    - i. Attribute selection
    - ii. Handling missing values
    - iii. Discretisation
    - iv. Converting nominal attributes to binary attributes
    - v. Normalisation
    - vi. Standardisation
    - vii. Outlier detection and elimination.

2. Generate Association Rules using Apriori and FP Growth algorithms.
3. Build the following classifiers and check their efficiency:
    i. Decision Tree
    ii. Naïve Bayes
    iii. Bagging
    iv. AdaBoost
    v. Random forest
    vi. K-NN
4. Apply the following clustering algorithms on datasets and visualise the clusters
    i. K-Means
    ii. Hierarchical
    iii. DBSCAN
5. Build Linear Regression model.

III.Experiment the following in R-Tool:

1. Data Import/Export
2. Data Exploration and Visualization
3. Association Rule Mining
4. Regression and Classification
5. Data Clustering
6. Text Mining with R: Twitter Data Analysis
7. Time Series Analysis and Mining

(Note: Wherever necessary interpret the results and measure the performance)

Text Books:

1. Ian H.Witten, EibeFank, Mark A Hall, "Data Mining Practical Machine Learning Tools and Techniques", Third edition, 2011.
2. Pawel Cichosz, "Data Mining Algorithms: Explained Using R", Wiley (2015).

Suggested Reading:

1. Han J, Kamber M, Jian P "Data Mining: Concepts and Techniques", Third Edition, Elsevier, 2012.
2. Yanchang Zhao, "R and Data mining: Examples and Case Studies", First Edition, Elsevier 2012.

Web Resources:

1. https://www.cs.waikato.ac.nz/ml/weka/
2. http://www.rdatamining.com/
3. http://illimine.cs.uiuc.edu/
4. https://www.kdnuggets.com/
5. http://archive.ics.uci.edu/ml/index.php

16ITC30

MINI PROJECT – IV

Instruction	2 Hours per week
Duration of End Examination	-
Semester End Examination	-
CIE	50 Marks
Credits	1

Course Objectives:

1. To enable students learn by doing.
2. To develop capability to analyze and solve real world problems.
3. To develop innovative ideas among the students.

Course Outcomes:

Students should be able to do the following:

1. To provide innovative solutions.
2. To work in a team.
3. To manage time and resources in the best possible manner.

The Students are required to implement one of the projects from project exercise given in the suggested readings of the theory subjects of the current semester / as suggested by the respective course faculty of that semester. During the implementation of the project, Personnel Software Process (PSP) has to be followed. Report of the project work has to be submitted for evaluation.