35401

AUTOMATA AND COMPILER DESIGN

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1 Period / week	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Problem Solving through C

Course Objectives:

1. To demonstrate the interplay between different models and formal languages.
2. Employ finite state machines to solve problems in computing.
3. Classify machines by their power to recognize the languages.
4. Explain deterministic and non-deterministic machines.
5. Emphasize the concepts learnt in lexical analysis, syntax analysis, semantic analysis, intermediate code generation and type checking process through several programming exercises.
6. To provide the understanding of language translation peculiarities by designing complete translator for mini language.

Unit I – Introduction to Automata

Languages, definitions, Regular Expressions, Regular Grammars, Acceptance of Strings and Languages, Finite Automaton Model, DFA, NFA, conversion of NFA to DFA, Conversion of Regular Expression to NF.

Unit II– Stages of Compilation and Lexical Analysis and Top Down Parsing

Chomsky hierarchy of Languages, Phases of compilation overview, Pass, Phase, Interpretation, Bootstrapping.
Context free grammars, Top Down Parsing: Parse Trees, Ambiguous Grammars, Backtracking, LL (1), Recursive Descent parsing, Predictive parsing, pre-processing steps for predictive processing.

Unit III – Bottom Up Parsing and Semantic Analysis and Symbol Table Organization

Bottom-up parsing and handle pruning, LR (k) grammar parsing, LALR (k) grammars, Error Recovery in parsing, parsing ambiguous grammars, YACC parser generator.
Intermediate source program forms - AST, polish notation and 3 address code, Attribute Grammars, Syntax Directed Translation, Conversion of popular programming constructs into intermediate code forms, Inherited Grammars, Type Checking, Equivalence of type expressions.

Unit IV – Data Structure Support and Code Optimization

Symbol table format, organization, Block structured languages, hashing, Block structure and non-block structure storage allocation: static, runtime and heap allocation for arrays, strings and records.
Consideration for optimization, Scope of optimization, DAG representation, Basic blocks, partitioning into basic blocks, Compile Time Evaluation, Common Subexpression elimination, dead code elimination, Strength Reduction, Code Movement, Loop Invariant Method, Loop Fusion, Loop Unrolling, Induction Variables and Reduction in Strength.

Unit V – Code Generation

Absolute Code, Relocatable Machine Code, Assembler Code, Register and Address Descriptors, Implementing Global Register Allocation, Usage Counts, Using DAG for register allocation, Simple Code generation Algorithm, Generic Code generation Algorithm, Generating code from DAG.

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

CO 1 : Employ finite state machines to solve problems in computing and classify machines by their power to recognize languages.
CO 2 : Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.
CO 3 : Ability to implement semantic rules into a parser that performs attribution while parsing and apply error detection and correction methods.
CO 4 : Apply the code optimization techniques to improve the space and time complexity of programs while programming.
CO 5 : Ability to design a compiler for a concise programming language.

Text Books:

1. Introduction to Automata Theory Languages and Computation, Hopcroft H.E. and Ullman J.D., Pearson Education, 2009.
2. Principles of Compiler Design, A.V Aho and J D Ullman, Pearson Education.
3. Modern Compiler Construction in C, Andrew W. Appel, Cambridge University Press.

References:

1. Compiler Construction: Principles And Practice, Kenneth C. Louden, Thomson/ Delmar Cengage Learning, 2006.
2. Lex & yacc, Doug Brown, John Levine and Tony Mason, 2nd Edition, O'reilly Media.
3. Engineering a compiler, Keith Cooper and Linda Torczon, 2nd Edition, Morgan Kaufmann, 2011.

35402

LINUX PROGRAMMING

(Common to CSE & IT)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Operating Systems

Course Objectives:

1. Review basic concepts covered in the core Operating Systems course prerequisite as they are realized in the Linux platform.
2. Effectively use a variety of tools for Linux application development.
3. To develop the skills necessary for systems programming including file system programming, process and signal management, and inter-process communication.
4. Create socket base applications.

Unit I - Files

Files: Files concept, File System Structure, Inodes, File Attributes, File types, Library functions, the standard I/Oand formatted I/O in C, stream errors, kernel support for files, System calls, file descriptors, low level file Access- File structure related system calls(File APIs), file and record locking, file and directory management Directory file APIs, Symbolic links& hard links.

Unit II - Process, Signals

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

Unit III - IPC, Message Queues, Semaphores

IPC: Introduction to IPC, Pipes, FIFOs, Introduction to three types of IPC – message queues, semaphores and shared memory.
Message Queues: Kernel support for messages, Unix system V APIs for messages, client/server example.
Semaphores: Kernel support for semaphores, Unix system V APIs for semaphores.

Unit IV - Shared Memory, Multithreaded Programming

Shared Memory: Kernel support for shared memory, Unix system V APIs for shared memory, semaphore and shared memory example.
Multithreaded Programming: Differences between threads and processes, Thread structure and uses. Threads and Lightweight Processes, POSIX Thread APIs, Creating Threads. Thread Attributes. Thread Synchronization with semaphores and with Mutexes, Example programs.

Unit V - Sockets, Advanced I/O

Sockets: Introduction to Sockets, Socket Addresses, Socket system calls for connection oriented protocol and connectionless protocol, example, client/server programs.
Advanced I/O: Introduction, Non-Blocking I/O, Record Locking, I/O Multiplexing, select and pselect Functions, Poll Function, Asynchronous I/O, POSIX Asynchronous I/O readv and writev functions, readn and written-functions, Memory-Mapped I/O

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

CO 1 : Implement a simple file system.
CO 2 : Implement the process abstraction and asynchronous event handling
CO 3 : Implement IPC Mechanisms, Messages Queues and Semaphores and related API's.
CO 4 : Design server programs based on various design alternatives
CO 5 : Be familiar with using sockets to implement client-server environment and Advanced I/O.

Text Books:

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

References:

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

35403

DATA WAREHOUSING AND DATA MINING

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1 Period / week	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Database Management Systems

Course Objectives:

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

Unit I – Introduction to Data Mining and Data warehouse

Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Data Warehouse, Multidimensional Data Model, A Three tier Data Warehouse Architecture, OLAP Technology for Data Mining.
Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

Unit II - Association Rule Mining

Data Characterization, Data Discrimination, Attribute-Oriented Induction.
Association Rule Mining: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

Unit III - Classification and Prediction

Classification: Introduction to Classification and Prediction, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods.

Accuracy and Error measures: evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods.

Unit IV - Cluster Analysis

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

Unit V - Time series, Text and Web Mining

Mining Time-Series Data, Mining Sequence Patterns in Transactional Databases, Text Mining, Mining the World Wide Web.
Applications and Trends in Data Mining: Data Mining Applications, Major issues and challenges in Data Mining, Social Impacts of Data Mining.

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

CO 1	:	Understand different data mining tasks and apply the algorithms most appropriate for addressing them
CO 2	:	Analyze and assess the raw input data from source and process it to provide suitable input for a range of Data mining algorithms

CO 3 : Discover and Analyze interesting patterns from different kinds of databases.
CO 4 : Apply the techniques of clustering, classification to implement unsupervised and supervised learning mechanisms
CO 5 : Evaluate and select appropriate Data mining algorithm for different Data Mining tasks.
CO 6 : Create a Data mining solutions to the practical problems.

Text Book:

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

References:

1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education, 2007.
2. Data Mining Techniques, Arun K Pujari, 2nd Edition, Universities Press.
3. Data Warehousing in the Real World, Sam Aanhory and Dennis Murray, Pearson Edition Asia.
4. Insight into Data Mining, K.P.Soman, S.Diwakar and V.Ajay, PHI, 2008.
5. Data Warehousing Fundamentals, Paulraj Ponnaiah, Wiley student Edition.

35404

MVC Through SCRIPTING LANGUAGES

(Professional Elective – II)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Object Oriented Programming through Java

Course Objectives:

1. To Introduce the interpretation features of different languages
2. To give practical experience of client side scripting
3. To enable the students to improve their productivity through scripting constructs
4. To develop the skills necessary for server side scripting and database connectivity.
5. To expose different web application frameworks.

Unit I - Introduction to Python

Basic Elements of Python, Objects, Expressions, and Numerical Types, Variables and Assignment, Branching Programs, Strings and Input, Iteration.

Unit II – Functions and Structured Types

Function Definitions, Keyword Arguments and Default Values, Scoping, Specifications, Recursion, Examples on Recursion, Global Variables, Modules, Files, Tuples, Sequences and Multiple Assignment, Lists, Functions as Objects, Dictionaries.

Unit III - Classes and Object-Oriented Programming

Abstract Data Types and Classes, Designing Programs Using Abstract Data Types, Inheritance, Multiple Levels of Inheritance, Encapsulation and Information Hiding, Generators.

Unit IV - Advanced Python Programming

Integrated Web Applications in Python: Building Small, Efficient Python Web Systems, Web Application Framework. Python Web Application Framework, Introduction to python IDE (PyCharm), Pycharm initial configuration, Execution of Python Scripts, connecting to Mysql Database using Pycharm, Introduction to Django Framework.

Unit V - Node JS & AngularJS

Introduction, Environmental Setup, First Application, REPL Terminal, Call back Concept, Event Loop, Buffers, Streams, File System, Web modules, Express Framework. Introduction to AngularJS, Directive, Filt1ers, Tables, Modules, Forms, Views, Scopes, Services, Some Applications on AngularJS.

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

CO 1	:	Develop client side scripts using different scripting languages
CO 2	:	Implement the MVC architecture using effective frameworks
CO 3	:	Demonstrate the Database connectivity using IDEs
CO 4	:	Map objects with relational model
CO 5	:	Master the versatile web languages

Text Books:

1. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
2. Beginning PHP and MySQL: From Novice to Professional, Jason Gilmore, 4th Edition, APress Publications (Dream tech.), 2010.
3. Learning Node: Moving to the Server-Side, Shelly Powers, 2nd Edition, O'REILLY, 2016.
4. AngularJS, Brad Green and Shyam Seshadri, 1st Edition, O'Reilly Media, 2013.

References:

1. Open Source Web Development with LAMP: Using Linux, Apache, MySQL, Perl and PHP, James Lee and Brent Ware, Addison Wesley- Pearson Education.
2. Programming Python, Mark Lutz, O'Reilly Media.
3. Guide to Programming with Python, M Dawson, Cengage Learning.
4. PHP and MySQL by Example, E Quigley, Prentice Hall /Pearson.
5. PHP Programming Solutions, V Vaswani, TMH.

35405

BIG DATA ANALYTICS

(Professional Elective – II)
(Common to CSE & IT)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Database Management Systems

Course Objectives:

1. To acquire knowledge of Big data and its evolution, Various kinds of data and systems for handling the data
2. To understand nature of Big data and the systems for handling such data
3. To apply MapReduce paradigm for solving big data problem
4. To illustrate NoSQL databases such as Hbase with suitable examples
5. To Learn social media and mobile analytics

Unit I – Data Management

Data Management (NOS 2101):Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/signal/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Preprocessing. Export all the data onto Cloud ex. AWS/Rackspace etc.
Maintain Healthy, Safe & Secure Working Environment (NOS 9003): Introduction, workplace safety. Report Accidents & Emergencies, Protect health & safety as your work, course conclusion, assessment

Unit II – Big Data Tools

Big Data Tools (NOS 2101): Introduction to Big Data tools like Hadoop, Spark, Impala etc., Data ETL process, Identify gaps in the data and follow-up for decision making.
Provide Data information in Standard Formats (NOS 9004): Introduction, Knowledge Management. Standardized reporting & companies, Decision Models, course conclusion. Assessment.

Unit III – Big Data Analytic

Big Data Analytic: Run descriptive to understand the nature of the available data, collate all the data sources to suffice business requirement, Run descriptive statistics for all the variables and observer the data ranges, Outlier detection and elimination.

Unit IV – Machine Learning Algorithms

Machine Learning Algorithms (NOS 9003): Hypothesis testing and determining the multiple analytical methodologies, Train Model on 213 sample data using various Statistical/Machine learning algorithms, Test model on 1/3 sample for prediction etc.

Unit V – Data Visualization (NOS 9004)

Data Visualization (NOS 2101): Prepare the data for Visualization, Use tools like Tableau, QlickView and 03, Draw insights out of Visualization tool. Product Implementation
Mobile Analytics: Introducing Mobile Analytics, Define Mobile Analytics, Mobile Analytics and Web Analytics, Types of Results from Mobile Analytics, Types of Applications for Mobile Analytics, Introducing Mobile Analytics Tools.

*** NOS: National Occupational Standards**

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

CO 1 : Define and examine Bigdata and its evolution, various kinds of data and systems for handling the data
CO 2 : Explain Bigdata management using the systems such as Hadoop
CO 3 : Demonstrate application of MapReduce paradigm for solving big data problems such as word count
CO 4 : Articulate NoSQL databases and their underlying structures with suitable examples
CO 5 : Describe social media and mobile analytics and state tools for such analysis

Text Books:

1. Student's Handbook for Associate Analytics. NASSCOM
2. Big Data And Analytics, Seema Acharya and Subhasini Chellappan, Wiley Publications.
3. Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization, DreamTech Press, 2015.

References:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira, online version available: http:/Iwww.dataminingbook.info/uploadslbook.pdf
3. Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman and Jeffrey D. Ullman.
4. http://www.vistrails.org!i ndex.phplCourse:_Big_Data_Analysis.
5. Business Intelligence: Practice, Technologies and Management, Rajiv Sabherwal and Irma Becerra-Fernandez, John Wiley, 2011.
6. Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications, Larissa T. Moss, Shaku Atre, Addison-Wesley, 2003.
7. Oracle Business Intelligence : The Condensed Guide to Analysis and Reporting, Yuli Vasiliev, SPD Shroff, 2012

37406

INFORMATION SECURITY ASSESSMENTS AND AUDITS

(Professional Elective – II)
(Common to CSE & IT)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Course Objectives:

1. Examine the role of information systems security and audit in enhancing digital asset safeguarding, data integrity, system effectiveness, and system efficiency.
2. Explain the nature of threats and vulnerabilities to information processes and security concepts; and how effective technical and managerial solutions can be devised.
3. Explain the key activities and techniques in performing risk management and information systems control.
4. Achieve professional qualification as Certified Information Systems Auditor (CISA).

Unit I - Information Security Performance Metrics and Audit

Information Security Performance Metrics and Audit: Security Metrics and Reporting, Common Issues and Variances of Performance Metrics, Introduction to Security Audit, Servers and Storage devices, Infrastructure and Networks, Communication Routes, Information Security Methodologies (Black-box, White-box, Grey-box), Phases of Information Security Audit and Strategies, Ethics of an Information Security Auditor etc. Maintain Healthy, Safe & Secure Working environment (NOS 9003).

Unit II - Information Security Audit Tasks, Reports and Post Auditing Actions

Information Security Audit Tasks, Reports and Post Auditing Actions: Pre-audit checklist, Information Gathering, Vulnerability Analysis, External Security Audit, Internal Network Security Audit, Firewall Security Audit, **IDS** Security Auditing, Social Engineering Security Auditing, Web Application Security Auditing, Information Security Audit Deliverables & Writing Report, Result Analysis, Post Auditing Actions, Report Retention etc. Provide Data/Information in Standard formats (NOS 9004).

Unit III - Vulnerability Management

Vulnerability Management: Information Security Vulnerabilities — Threats and Vulnerabilities, Human-based Social Engineering, Computer-based Social Engineering, Social Media Countermeasures, Vulnerability Management — Vulnerability Scanning, Testing, Threat management, Remediation etc.

Unit IV – Information Security Assessments

Information Security Assessments: Vulnerability Assessment, Classification, Types of Vulnerability Assessment, Vulnerability Assessment Phases, Vulnerability Analysis Stages, Characteristics of a Good Vulnerability Assessment Solutions &Considerations, Vulnerability Assessment Reports — Tools and choosing a right Tool, Information Security Risk Assessment, Risk Treatment, Residual Risk, Risk Acceptance, Risk Management Feedback Loops etc.

Unit V – Configuration Reviews

Configuration Reviews: Introduction to Configuration Management, Configuration Management Requirements-Plan-Control, Development of configuration Control Policies, Testing Configuration Management etc.

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

CO 1 : Demonstrate the knowledge of information systems risk management to assess and manage risks in organizations
CO 2 : Understand the technical nature of information systems threats and the technical and managerial solutions to manage them

CO 3 : Evaluate and examine innovative controls relating to business processes and using different control objectives, activities and metrics to monitor and maintenance
CO 4 : Apply appropriate techniques to handle the information systems audit life cycle and the main types of information systems audit
CO 5 : Appreciate the professional code of ethics of the Information Systems Audit and Control Association

Text Books:

1. Assessing Information Security: Strategies, Tactics, Logic and Framework, A Vladimirov, K. Gavrilenko and A.Michajlowski, 1st Edition, IT Governance Publishing, 2010.
2. The Art of Computer Virus Research and Defense, Peter Szor, Addison Wesley, 2005

References:

1. http://csrc.nist.gov/publications/nistpubs/800-40-Ver2/SP800-40v2.pdf
2. https://www.sans.ord/reading-room/whitepapers/threats/implementino-vulnerability-management-process¬34180

35406

SOFT COMPUTING

(Professional Elective – II)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Design and Analysis of Algorithms

Course Objectives:

1. To give students knowledge of soft computing theories fundamentals.
2. To solve optimization problems and addressing the large scale classification problems.

Unit I - AI Problems and Search

AI Problems and Search: AI problems, Techniques, Problem Spaces and Search, Heuristic Search Techniques- Generate and Test, Hill Climbing, Best First Search Problem reduction, Constraint Satisfaction and Means End Analysis. Approaches to Knowledge Representation- Using Predicate Logic and Rules.

Unit II – Artificial Neural Networks

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 III – Unsupervised Learning Network

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 IV – Introduction to Classical Sets

Introduction to Classical Sets (crisp Sets) and Fuzzy Sets- operations and Fuzzy sets. Classical Relations-and Fuzzy Relations- Cardinality, Operations, Properties and composition. Tolerance and equivalence relations. Membership functions- Features, Fuzzification, membership value assignments, Defuzzification.

Unit V – Fuzzy Arithmetic and Fuzzy Measures

Fuzzy Arithmetic and Fuzzy Measures, Fuzzy Rule Base and Approximate Reasoning Fuzzy Decision making Fuzzy Logic Control Systems, Genetic Algorithm- Introduction and basic operators and terminology. Applications: Optimization of TSP, Internet Search Technique.

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

CO 1	:	Comprehend AI problems and apply various problem solving techniques like Hill climbing, Means End Analysis
CO 2	:	Explain Supervised Learning networks and their training algorithms
CO 3	:	Understand Unsupervised learning networks, their specific features and their applications
CO 4	:	Comprehend fuzzy sets, their operations and their applications.
CO 5	:	Appreciate and apply fuzzy arithmetic and fuzzy logic control systems.

Text Books:

1. Principles of Soft Computing, S N Sivanandam and S N Deepa, Wiley India, 2007.
2. Soft Computing and Intelligent System Design, Fakhreddine O Karray and Clarence D Silva, Pearson Education, 2004.

References:

1. Artificial Intelligence and Soft Computing: Behavioural and Cognitive Modeling of the Human Brain, Amit Konar, CRC press, Taylor and Francis Group.
2. Artificial Intelligence, Elaine Rich and Kevin Knight, TMH, 2008.
3. Artificial Intelligence, Patric Henry Winston, 3rd Edition, Pearson Education.
4. A first course in Fuzzy Logic, Hung T Nguyen and Elbert A Walker, CRC Press, Taylor and Francis Group.

35407/35456

DESIGN PATTERNS

(Professional Elective – III)
(Common to CSE & IT)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Object Oriented Programming through Java

Course Objectives:

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

Unit I - Introduction

Introduction: What Is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

Unit II – A Case Study

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

Unit III – Creational Patterns

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

Unit IV – Structural Patterns

Structural Patterns: Adapter, Bridge and Composite, Decorator, façade, Flyweight, Proxy.

Unit V – Behavioral Patterns

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

Course Outcomes: At the end of the course, a student is able to

CO 1	:	Appreciate the basic concepts of design patterns and able to know how to select and use the design patterns
CO 2	:	Identify the design pattern in the existing code and use of creational patterns.
CO 3	:	Apply and use the structural patterns
CO 4	:	Identify and use the behavioral patterns
CO 5	:	Find and catalog patterns in the object oriented software

Text Books:

1. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, Addison-Wesley, 1995.
2. Java™ Design Patterns: A Tutorial**,** James W. Cooper*,* Addison Wesley, 2000.

References:

1. Patterns in Java: A catalog of reusable Design Patterns Illustrated with UML, Mark Grand, Volume 1, Wiley DreamTech.
2. Patterns in Java, Mark Grand, Volume 2, Wiley DreamTech, 2008.
3. Java Enterprise Design Patterns, Mark Grand, Wiley DreamTech, 2006**.**

35408

SEMANTIC WEB AND SOCIAL NETWORKS

(Professional Elective – III)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Web Technologies

Course Objectives:

1. To explain the features, rationale, and advantages of Semantic Web technology.
2. To demonstrate the overall architecture of the Semantic Web.
3. To identify the component technologies of the Semantic Web and explain their roles.
4. To illustrate the design principles of the Semantic Web by applying the technologies.
5. To discuss the methodologies in Ontology Engineering and the research issues in Semantic Web Technologies.

Unit I - Introduction to Semantic Web

The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee WWW, The goal of Semantic Web, Semantic Web Stack.

Unit II -The Building blocks of Semantic Web

Resource Description Framework (RDF), RDF Schema, Ontologies and their role in the Semantic Web, Ontologies Languages for the Semantic Web, Web Ontology Language (OWL), Three Faces of OWL - OWL Full, OWL DL, OWL Lite.

Unit III - Ontology Engineering

Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries, Ontology Mapping, Ontology Mapping Tools, Validating your OWL Ontology, SPARQL.
Programming Semantic Web Applications: Jena Framework, Sesame.

Unit IV - Semantic Web Applications

XML Based Web Services, Creating an OWL-S Ontology for Web Services. Semantic Web Applications, Semantic Web Services, Semantic Search, Introduction to Swoogle, e-learning, Enterprise Application Integration, Knowledge Base.

Unit V - Social Network Analysis

What is Social Networks Analysis, Development of the Social Networks Analysis, Key Concepts and Measures in Network Analysis, Electronic Sources for Network Analysis, Blogs and Online Communities, Web Based Networks, Building Semantic Web Applications with Social Network features, Web Mining and Social Networks, FOAF.

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

CO 1	:	Understand the rationale behind Semantic Web.
CO 2	:	Model Ontologies using Resource Description Framework (RDF).
CO 3	:	Model and design Ontologies using Web Ontology Language (OWL).
CO 4	:	Query Ontologies and RDF data using SPARQL.
CO 5	:	Make an association between Semantic web and Web 2.0.
CO 6	:	Apply Semantic web technologies to Social Network applications and real world applications

Text Books:

1. Thinking on the Web, Berners Lee, Godel and Turing, Wiley interscience, 2008.
2. Introduction to the Semantic Web and Semantic Web Services, Liyang Yu, Chapman and Hall/CRC, Taylor and Francis group, 2010.
3. Social Networks and the Semantic Web, Peter Mika, Springer,2007.

References:

1. Semantic Web Technologies: Trends and Research in Ontology Based Systems, J. Davies, Rudi Studer and Paul Warren, John Wiley & Sons.
2. Programming the Semantic Web, T.Segaran, C Evans and J Taylor, O'Reilly Media, 2009.
3. Semantic Web Programming, John Hebeler, Matthew Fisher, Ryan Blace Andrew Perez—Lopez and Mike Dean, Wiley Publishing Inc, 2009.
4. A Semantic Web Primer, Grigoris Antoniou and Frank Van Harmelen, MIT Press, 2008.

35409

WEB SERVICES AND CLOUD COMPUTING

(Professional Elective – III)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Data Communications and Computer Networks

Course Objectives:

1. To understand the differences between a web application and a web service.
2. To understand the new computing paradigms which enable on-demand access of shared resources over the Internet.
3. To learn about the various types of service models and deployment models.
4. To be able to choose among the pay-per-use services offered by the cloud vendors.
5. To learn about the role of virtualization in cloud computing.

Unit I - SOA and Web Services

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

Unit II - ReST-based Web Services

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

Unit III - Cloud Computing

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

Unit IV - Virtualization

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

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

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

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

CO 1	:	Learn about Cloud Provider, User and Services provided by Cloud.
CO 2	:	Explore the Cloud Architecture, SOA
CO 3	:	Realize the importance of Virtualization, How it is useful to Cloud Computing.
CO 4	:	Learn federation presence, identity and privacy in the cloud, common standards in cloud computing
CO 5	:	Know about end user access to cloud computing and also mobile platform virtualization.
CO 6	:	Explore case studies like Amazon S3, Amazon cloud front and Amazon SQS, Google App Engine, Microsoft Dynamic CRM

Text Books:

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

References:

1. Web Services and SOA: Principles and Technology, Michael P. Papazoglou, Pearson, 2012.
2. ReSTful Web Services, Leonard Richardson and Sam Ruby, O'Reilly.
3. Mastering Cloud Computing, Raj Kumar Buyya, Christian Vecchiola and S Thamarai Selvi, Morgan Kaufmann, 2013.
4. Cloud Computing: Implementation Management and Security, John W. Rittinghouse, and James F. Ransome, CRC Press, 2009.

37410

INTERNET OF THINGS

(Professional Elective – IV)
(Common to CSE & IT)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Data Communications and Computer Networks

Course Objectives:

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

Unit I – Introduction to Internet of Things

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, and Communication protocols, Embedded Systems, IoT Levels and Templates
Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

Unit II – IoT and M2M

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

Unit III – Introduction to Python

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
Python packages - JSON, XML, HTTPLib, URLLib, MTPLib

Unit IV – IoT Physical Devices and Endpoints

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, controlling output, reading input from pins.

Unit V – IoT Physical Servers and Cloud Offerings

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Web server – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

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

CO 1 : Understand the characteristics, protocols and communication models required for logical design of IOT.
CO 2 : Gain knowledge of IOT enabling technologies and domain areas of application.
CO 3 : Understand of the hardware platforms for implementing an IOT. The student will have the ability to interface the IOT based Board with different peripheral devices such as keyboard, display device and serial communication devices.

CO 4 : Understand of the details of requirements gathering and specification of an IOT based system. The student will have the ability to integrate devices and develop an application.
CO 5 : Implement an IOT based system using python language.

Text Books:

1. Internet of Things: A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015.
2. Getting Started with Raspberry Pi, Matt Richardson and Shawn Wallace, O'Reilly (SPD), 2014.

References:

1. Getting Started with Sensors: Measure the World with Electronics, Arduino, and Raspberry, KimmoKarvinen and TeroKarvenien, First Edition, Shroff/O'Reilly, 2014.
2. Getting Started with Arduino: The Open Source, Massimo Banzi, Shroff Publishers & Distributors Private Ltd.
3. Getting Started with Raspberry Pi, Richardson Matt, Shroff Publishers & Distributers Private Limited.
4. Arduino Projects for Dummies, Brock Craft, Wiley.

35410

WIRELESS NETWORKS AND MOBILE COMPUTING

(Professional Elective – IV)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Data Communications and Computer Networks

Course Objectives:

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

Unit I - Introduction to Network Technologies and Cellular Communications

Hiper LAN: Protocol Architecture, Channel Access Control Sub-layer, Physical layer & MAC Sub-Layer.
GSM: System architecture, Protocols, Localization and calling, Handover, Security, and New data services.
Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture

Unit II - (Wireless) Medium Access Control

Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, collision Avoidance (MACA, MACAW) protocols.
Mobile IP Network Layer:
IP and Mobile IP Network layers, Packet Delivery and Hand Over Management, Location Management Registration, tunneling and encapsulation, Dynamic Host Configuration Protocol (DHCP).

Unit III - Mobile Transport Layer

Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP.
Databases and mobile computing: Database Hoarding and caching techniques, client-server computing and adaptation. Power-aware mobile computing.

Unit IV - Data Dissemination and Synchronization

Communications asymmetry, classification of data delivery mechanisms, data dissemination broad cast models, selective tuning and indexing method, digital audio and video broadcasting (DAB & DVB). Data synchronization-introduction, software and protocols.
Mobile Ad hoc Networks (MANETs):
Introduction, applications and challenges of a MANET, applications.

Unit V - MANETs

Routing algorithms such as DSR, AODV, DSDV, **Distributed Networks & Characteristics:** Clustering of nodes, Coordination of nodes, Wireless sensor networks
Protocols and Platforms for Mobile Computing: WAP, Bluetooth, XML, J2ME, Java Card, Palm OS, Windows CE.

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

CO 1	:	Apply advanced data communication methods and networking protocols for wireless and mobile environment
CO 2	:	Utilize and employ application frame works for developing mobile applications including under disconnected and weakly connected environment

CO 3 : Select components and networks for particular application.
CO 4 : Understand issues related to client server computing with adaptation, power-aware and context aware computing and MANET Protocols
CO 5 : Have a good understanding of how the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support

Text Books:

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

References:

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

35411

SOFTWARE TESTING METHODOLOGIES

(Professional Elective – IV)
(Common to CSE & IT)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Software Engineering

Course Objectives:

1. To acquire knowledge on basic principles, concepts on different testing techniques and methodologies and to demonstrate how they can uncover different errors (bugs).
2. To understand the taxonomy of bugs & testing and the stages at which different tests are to be performed.
3. To design the test cases and execute to uncover errors related to internal processing logic within modules, interfacing, and functionality of software.
4. To gain theory and knowledge to design and & implement testing tools with an aim to enhance the performance of testing.

Unit I – Introduction and Overview of Testing

Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs. Overview of Unit & integration testing, and white box & black box testing.

Unit II - Flow Graphs, Path Testing, Paths, Path Products and Regular Expressions

Flow Graphs, Path Testing: Basic concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.
Paths, Path Products and Regular Expressions: Path products and path expression, reduction procedure, applications, regular expressions and flow anomaly detection.

Unit III - Dataflow Testing and Domain Testing

Dataflow Testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.
Domain Testing: Domains and paths, domain testing, domains and interface testing, domains and testability.

Unit IV – Logic Based Testing, States, State Graphs and Transition Testing

Logic Based Testing: Overview, decision tables, path expressions, kv charts, specifications.
States, State Graphs and Transition Testing: Overview, state bugs, transition bugs, state testing.

Unit V - Graph Matrices and Application

Integration Testing, Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools.
System and Acceptance Testing: Functional system testing, Non-functional system testing, Acceptance testing.
Testing Object Oriented Systems: Introduction to Object Oriented testing concepts, Differences in OO Testing.

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

CO 1	:	Apply basic concepts of testing, path testing, and predicate testing for testing code.
CO 2	:	Derive path expressions for a flow graph and know its usage for various applications.
CO 3	:	Acquire knowledge of domain errors, type's domain bugs and sources of domain errors.

CO 4 : Appreciate the purpose of logic based testing using decision tables, reduction using KV charts and integration testing as a phase of testing.
CO 5 : Represent a problem using graph matrices, node reduction algorithm, understand the functional and non- functional system testing techniques.
CO 6 : Select test cases for Acceptance testing based on required criteria, and understand different concepts of Object Oriented testing.

Text Books:

1. Software Testing Techniques, Boris Beizer, 2nd Edition, Dreamtech, 2009.
2. Software Testing: Principles and Practices, Srinivasan D and Gopalaswamy R, Pearson Education, 2008.

References:

1. Software Testing and Quality Assurance: Theory and Practice, Sagar Naik, Wiley, 2008.
2. Software Testing in Real World, Edward Kit, Pearson Education, 2008.
3. Effective methods of Software Testing, E. William Perry, 3rd Edition, John Wiley, 2006.

35431

LINUX PROGRAMMING LAB

(Common to CSE & IT)

Lab Session	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	-	End Exam Marks	:	70
Credits	:	2	End Exam Duration	:	3 Hours

Course Objectives:

1. Make the students to appreciate the kernel architecture types-monolithic and micro kernel.
2. Realize the operating system principles and abstractions.

LIST OF EXPERIMENTS:

1. Implement 'cp' and 'mv' Shell commands using file related system calls.
2. Create a new file with 0666 access permissions and enable the close-on-exec flag.
3. Change the file control information while setting of O_SYNC flag
4. Implement 'ls –ls file1' Shell command using stat, and fcntl system calls.
5. Implement 'ls –ls dir1' Shell command using directory related system calls
6. Write a C program which creates a child process and the parent waits for child's exit
7. Write a C program to demonstrate the difference between the fork and vfork system calls.
8. Write a C program in which main process creates a child process and registers a signal handler to get the exit status of the child asynchronously
9. Implement 'ls | wc –l –c –w' command using pipe and exec functions
10. Establish bidirectional communication between sender program and receiver program using multiple FIFOs.
11. Implement SVR .based Message Queue IPC mechanism to establish asynchronous communication between two communicating processes.
12. Implement the following communication model:
    - Process 1 creates a Message Queue resource.
    - Process 2 enacts the server role
    - Process 3 and 4 are clients
    - Process 3 seeks 'isprime' service from the server by inserting the payload in the message queue
    - Process 4 seeks 'iseven' service form the server by inserting the payload in the message queue
    - Server retrieves the service request from the Message queue and insets the reply
    - Intended Client retrieves the response.
13. Implement Shared Memory based communication model with the following features:
    1. Server and multiple clients communicate with each other through shared memory
    2. Synchronization of SHM access is realized through semaphores.
14. Implement client/server model using socket API
15. Implement a concurrent server using fork based model while avoiding the zombie state of the client.
16. Implement a concurrent server model using pthread API
17. Solve the producer consumer problem using pthread API
18. Implement peer-to-peer communication model using socket API.
19. Solve the process synchronization on I/O using record locking mechanism
20. Implement I/O multiplexing using select system call.

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

CO 1	:	Realize basic system calls and library functions on file operations
CO 2	:	Model the process abstraction and process control
CO 3	:	Implement concurrent programs using process and thread API and establish communication among them
CO 4	:	Implement and deploy scalable client-server architecture while utilizing relevant design patterns

35432

DATA MINING AND COMPILER DESIGN LAB

Lab Session	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	-	End Exam Marks	:	70
Credits	:	2	End Exam Duration	:	3 Hours

Software: Use Weka 3.7 (open source) or above version available

List of Tasks:

1. Implement the following subtasks on the German Credit Data set.

Subtasks:

a) List all the categorical (or nominal) attributes and the real-valued attributes separately.

b) What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes.

c) One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.

d) Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy?

e) Is testing on the training set as you did above a good idea? Why or Why not?

f) One approach for solving the problem encountered in the previous question is using cross-validation? Describe what cross-validation is briefly. Train a Decision Tree again using cross-validation and report your results. Does your accuracy increase/decrease? Why?

g) Check to see if the data shows a bias against "foreign workers" (attribute 20),or "personal-status"(attribute 9). One way to do this (perhaps rather simple minded) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute you can use the reprocess tab in Weka's GUI Explorer. Did removing these attributes have any significant effect? Discuss.

h) Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the arff data file to get all the attributes initially before you start selecting the ones you want.)

i) Sometimes, the cost of rejecting an applicant who actually has a good credit (case 1) might be higher than accepting an applicant who has bad credit (case 2). Instead of counting the misclassifications equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the second case. You can do this by using a cost matrix in Weka. Train your Decision Tree again and report the Decision Tree and cross-validation results. Are they significantly different from results obtained in problem 6 (using equal cost)?

j) Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees? How does the complexity of a Decision Tree relate to the bias of the model?

k) You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning - Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross-validation (you can do this in Weka) and report the Decision Tree you obtain? Also, report your accuracy using the pruned model. Does your accuracy increase?

l) (Extra Credit): How can you convert a Decision Trees into "if-then-else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules - one such classifier in Weka is rules. PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one! Can you predict what attribute that might be in this dataset? OneR classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and one R.

2. Construct a Naïve Bayesian Classifier Model on IRIS Data set. Test the build Classification Model Using 10-fold cross validation .Comment on the performance of the Constructed Classification Model.
3. Apply Apriori Frequent Item Set Mining Algorithm on Super Market dataset. List the top 10 Association rules. (Check the results for different support and confidence threshold values).
4. Apply FP-growth Frequent Item Set Mining Algorithm on Super Market dataset. List the top 10 Association rules. Check the results for different support and confidence threshold values
5. Apply the Hierarchical Clustering Technique on Weather dataset and comment on the performance of the algorithm.
6. Create a Data Set of 30 instances characterized by four attributes (income, age, expenditure, assets) in arff format. Apply K-Means Clustering technique on the generated Data set. Compute the performance of K-Means algorithm against hierarchal Clustering algorithm.

Compiler Design Experiments:

1. Implement a hand coded scanner using C and extract the variables, keywords, arithmetic operators and operands form the source program.
2. Implement a Lex based scanner program to extract the constructs of C programming language.
3. Implement a top-down parser
4. Develop a LL (1) parser to generate an Abstract Syntax Tree.
5. Design and Implement a YACC based parser an generate an annotated parse tree
6. Generate an Assembly code for the given arithmetic expression.
7. Implement the code optimization algorithms
8. Finally schedule the code using Ullman algorithm.

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

CO 1 : Implement decision trees
CO 2 : Implement different classifiers
CO 3 : Implement clustering techniques
CO 4 : Implement a hand coded compiler for arithmetic expressions using Lex and YACC
CO 5 : Implement code scheduling algorithm.

38451

MANAGEMENT SCIENCE

(Common to all Branches, Except Mechanical)

Instruction	:	4 Periods / week	Sessional Marks	:	30
Tutorial	:	0 Period / week	End Exam Marks	:	70
Credits	:	4	End Exam Duration	:	3 Hours

Course Objectives:

1. To learn various principles of Management and to make them effective business decision makers
2. To make the students understand functional areas and potential problems of business for efficient utilization of resources
3. To have an overview of project management to the students for more effective project planning and controlling
4. To understand the basic elements involved in strategic management process
5. To provide knowledge about contemporary best practices of management for better understanding of future business trends

Unit I – Management & Organizational Structures

Concept of Management and organization-functions of management-Taylor's scientific management, Fayol's principles of management, Douglas Mc-Gregor's Theory X and Theory Y, Maslow's Hierarchy of Human Needs–Mc.Kensey's 7'S Framework-Concept of Organizational Structure–Principles of Organizations Structure, Corporate Social responsibility.

Unit II - Operations & Marketing Management

Manufacturing Process Technology-Types of Facilities layout-Work-study-Basic Procedure involved in Method study and Work Measurement-Statistical Quality Control Charts-Materials Management-Objectives of Inventory control– EOQ Technique (Simple problems); Concept of Marketing, Marketing Vs Selling, Marketing Mix, Channels of Distribution, Product Life Cycle, New Product development.

Unit III - Project Management

Network Analysis-project management- Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) – Differences between PERT AND CPM, Calculation of Slack and Float-Identifying critical path-Probability of completing the project under PERT, Project cost analysis, Project crashing – (Simple problems).

Unit IV - Human Resources Management (HRM) & Strategic Management

Basic functions of HR Manager-Job Analysis, Job description, Job rotation, Human Resource Planning, Recruitment, Selection, training, development, placement-performance appraisal techniques; Vision, Mission, goals, objectives, policy, strategy, programme; Environmental scanning, SWOT Analysis - Strategy Formulation, Implementation and control.

Unit V - Contemporary Best practices

Total Quality Management (TQM), Six sigma, Enterprise Resource Planning (ERP), Business application with Cloud Computing, Business Process Outsourcing (BPO), Business Process Re-engineering (BPR) - Balance scorecard.

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

CO 1	:	Make business decisions for effective business administration
CO 2	:	Identify Business strategies for effective and efficient utilization of resources
CO 3	:	To explore new business opportunities in the dynamic business environment
CO 4	:	To perform SWOT analysis of the internal and external environment
CO 5	:	To implement contemporary best practices in an organization

Text Books:

1. Principles of Management, Koontz and Weihrich, Tata McGraw-Hill, 2002
2. Business Policy and Strategic Management, W. Glueck and L.R. Jauch, McGraw-Hill, 1998.

References:

1. Marketing Management, Philip Kotler, Prentice Hall, 2002.
2. Human Resource Management, Gray Dessler, Pearson Education, 2002.
3. PERT/CPM, L.S. Srinath, Affiliated East-West Press, 2000.
4. Industrial Engineering and Management, O.P. Khanna, Dhanpat Rai, 1999.
5. Management Science, A.R. Aryasri, Tata McGraw- Hill, 2004.

37456/37403

AD HOC AND SENSOR NETWORKS

(Professional Elective - V)
(Common to CSE & IT)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Data Communications and Computer Networks

Course Objectives:

1. To understand the applications of ad hoc and sensor networks
2. To understand the MAC and transport protocols for ad hoc networks
3. To understand the concepts of sensor networks
4. To understand the security of sensor networks

Unit I - Introduction to Ad Hoc Wireless Networks

Introduction to Ad Hoc Wireless Networks: Characteristics of MANETs, Applications of MANETs, Challenges.
Routing in MANETs: Topology-based versus Position-based approaches, Topology based routing protocols, Position based routing, Other Routing Protocols.

Unit II - Data Transmission in MANETs

Data Transmission in MANETs: The Broadcast Storm, Multicasting, Geocasting
TCP over Ad hoc Networks: TCP Protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc networks

Unit III - Basics of Wireless Sensors and Applications

Basics of Wireless Sensors and Applications: introduction, The Mica Mote, Sensing and Communication Range, Design issues, Energy consumption, Clustering of Sensors, Applications of WSNs.
Data Retrieval In Sensor Networks: Classification of WSNs, MAC layer, Routing layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

Unit IV - Security

Security: Security in Ad hoc Wireless Networks, Key Management, Secure Routing, Cooperation in MANETs, Intrusion Detection Systems.
Sensor Network Platforms and Tools: Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms

Unit V – Operating System

Operating System —TinyOS Imperative Language: nesC, Dataflow style language: T1nyGALS, Node- Level Simulators, ns-2 and its sensor network extension, TOSSIM

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

CO 1 : Understand basics of MANETs and routing protocols
CO 2 : Understand how TCP modified for wireless networks
CO 3 : Design of different layers of WSN
CO 4 : Understand issues and challenges of security in WSNs
CO 5 : Design and implement sensor network protocols in the NesC/TinyOS

Text Books:

1. Ad Hoc and Sensor Networks: Theory and Applications, Carlos De Morais Cordeiro and Dharma Prakash Agrawal, World Scientific Publications /Cambridge University Press, March 2006.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao and Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, Reprint 2009.

References:

1. Ad hoc Wireless Networks: Architectures and Protocols, C.Siva Ram Murthy and B.S.Murthy, Pearson Education, 2004.
2. Wireless Sensor Networks: Principles and Practice, Fei Hu, Xiaojun Cao, Auerbach / CRC Press, Taylor & Francis Group, 2010.
3. Wireless Ad hoc Mobile Wireless Networks: Principles, Protocols and Applications, Subir Kumar Sarkar et al., Auerbach Publications, Taylor & Francis Group, 2008.
4. Ad hoc Networking, Charles E.Perkins, Pearson Education, 2001.
5. Wireless Ad hoc Networking, Shih-Liri Wu and Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group, 2007

35453

MACHINE LEARNING

(Professional Elective - V)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Design and Analysis of Algorithms

Course Objectives:

1. Acquire knowledge of Machine Learning and its evolution, Various kinds of techniques in machine learning
2. Understand different paradigms such as Decision trees, Artificial Neural Networks, Bayesian Learning etc., for Machine Learning
3. Apply the different learning theories and techniques for solving learning problems
4. Illustrate algorithms for learning with suitable examples
5. Create a learning system

Unit I - Introduction

INTRODUCTION - Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning
Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias

Unit II – Decision Tree Learning

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning
Artificial Neural Networks – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition
Advanced topics in artificial neural networks
Evaluation Hypotheses – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, Ageneral approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

Unit III – Bayesian Learning

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm
Computational learning theory – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning - **Instance-Based Learning**- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning
Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

Unit IV –Learning Sets of Rules

Learning Sets of Rules– Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution

Analytical Learning- Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

Unit V – Combining Inductive and Analytical Learning

Combining Inductive and Analytical Learning–Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators,
Reinforcement Learning– Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

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

CO 1 : Acquire and demonstrate the knowledge of Machine Learning and its evolution, various kinds of techniques in machine learning
CO 2 : Implement different paradigms such as Decision trees, Artificial Neural Networks, Bayesian Learning etc., for Machine Learning
CO 3 : Apply the different learning theories and techniques for solving learning problems
CO 4 : Illustrate algorithms for learning with suitable examples
CO 5 : Create a learning system

Text Books:

1. Machine Learning, Tom M. Mitchell, MGH.
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis(CRC)

References:

1.Machine Learning Methods in the Environmental Sciences: Neural Networks and Kernels, William W Hsieh, Cambridge University Press, 2008.
2.Pattern Classification, Richard O Duda, Peter E. Hart and David G. Stork, John Wiley & Sons Inc., 2001.
3. Neural Networks for Pattern Recognition, Chris Bishop, Oxford University Press,1995
4. Machine Learning: The Art and Science of Algorithms That Make Sense of Data, Peter Flach, Cambridge University Press, 2012.

35454

PREDICTIVE ANALYTICS

(Professional Elective - V)
(Common to CSE & IT)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Big Data Analytics

Course Objectives:

1. Acquire knowledge of predictive analytics tools and environment, Various methods used for predictive analytics
2. Understand different methods and techniques such as linear regression, logistic regression, objective segmentation, forecasting and feature extraction methods for predictive analytics
3. Apply the methods and the techniques for solving predictive analytics problems
4. Illustrate the methods and the techniques with suitable examples
5. Create a system for solving problems in predictive analytics

Unit I - Introduction to Predictive Analytics and Linear Regression (NOS 2101)

What and Why Analytics, Introduction to Tools and Environment, Application of Modelling in Business, Databases and Types of data and variables, Data Modelling Techniques, Missing imputations, etc., Need for Business Modelling, Regression – Concepts, Blue property – assumptions – Least Square Estimation, Variable Rationalization and Model Building, etc.

Unit II - Logistic Regression (NOS 2101)

Model Theory, Model fit Statistics, Model Conclusion, Analytics applications to various business domains, etc. Regression vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Over-fitting, Pruning and Complexity, Multiple Decision Trees, etc.

Unit III - Objective Segmentation (NOS 2101)

Regression vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Over-fitting, Pruning and Complexity, Multiple Decision Trees, etc.
Develop Knowledge, Skill and Competencies
Introduction to Knowledge skills and competencies, Training and Development, Learning and Development, Policies and Record Keeping

Unit IV - Time Series Methods/Forecasting, Feature Extraction (NOS 2101)

Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average, Energy, etc and Analyze for prediction.

Unit V - Working with Documents (NOS0703)

Standard Operating Procedures for documentation and knowledge sharing, Defining purpose and scope documents, Understanding structure of documents – case studies, articles, white papers, technical reports, minutes of the meeting, etc., Style and format, Intellectual Property and Copyright, Document preparation tools – Visio, PowerPoint, Word, Excel, etc., Version Control, Accessing and updating corporate knowledge base, Peer review and feedback.

*** NOS: National Occupational Standards**

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

CO 1 : Acquire the knowledge of predictive analytics tools and environment, various methods used for predictive analytics
CO 2 : Understand different methods and techniques such as linear regression, logistic regression, objective segmentation, forecasting and feature extraction methods for predictive analytics
CO 3 : Apply the methods and the techniques for solving predictive analytics problems
CO 4 : Illustrate the methods and the techniques with suitable examples
CO 5 : Create a system for solving given problem in predictive analytics

Text Book:

1. Student's Handbook for Associate Analytics-III, NASSCOM.

Reference:

1. An Introduction to Statistical Learning with Applications in R, Gareth James, Daniel Witten, Trevor Hastie and Robert Tibshirani, springer-Verlag, 2013.

35455

IMAGE PROCESSING AND PATTERN RECOGNITION

(Professional Elective - V)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Computer Graphics

Course Objectives:

1. Assess and understand the challenges behind the design of machine vision systems.
2. Understand the general processes of image acquisition, storage, enhancement, segmentation, representation, and description.
3. Implement filtering and enhancement algorithms for monochrome as well as color images.
4. Appreciate the challenges and understand the principles and applications of visual pattern recognition.

Unit I - The Digitized Image and its Properties

Applications of image processing, image function, image representation, sampling, quantization, color images, metrics and topological properties of digital images, histograms, image quality, noise in image.

Unit II - Image Preprocessing

Pixel brightness transformation, position dependent brightness correction, gray scale transformation; geometric transformation, local preprocessing image smoothening, edge detectors, zero-crossing, scale in image processing, canny edge detection, parametric edge models, edges in multispectral images, local preprocessing and adaptive neighborhood preprocessing, image restoration.

Unit III - Image Segmentation

Threshold detection methods, optimal thresholding multispectral thresholding, thresholding in hierarchical data structures. Edge based image segmentation- edge image thresholding, edge relaxation, border tracing, and border detection.

Unit IV - Mathematical Morphology and Image Textures

Basic morphological concepts, four morphological principles, binary dilation, erosion, Hit or miss transformation, opening and closing; thinning and skeleton algorithms; Morphological segmentation -particles segmentation and watersheds, particle segmentation.
statistical texture description, methods based on spatial frequencies, co-occurrence matrices, edge frequency, and texture recognition method applications Image representation and description- representation, boundary descriptors, regional descriptors

Unit V - Pattern Recognition Fundamentals

Basic concepts of pattern recognition, fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model.

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

CO 1	:	Assess the challenges behind the design of computer vision systems.
CO 2	:	Describe and explain the general processes of image acquisition, storage, enhancement, segmentation, representation, and description
CO 3	:	Implement filtering and enhancement algorithms for monochrome as well as color images
CO 4	:	Design and implement visual pattern recognition solutions
CO 5	:	Extract Object, pattern and knowledge from the image

Text Books:

1. Image Processing Analysis and Machine Vision, Millansonka, Vaclav Hiavac and Roger Boyle, 3rd Edition, CL Engineering, 2013.
2. Digital Image Processing, Rafel C. Gonzalez and Richard E. Woods, 3rd Edition, Pearson Education, 2008.

References:

1. Pattern Recognition Principles, Julus T. Tou and Rafel C. Gonzalez, 1st Edition, Addision - Wesley publishing.
2. Pattern Recognition with Image Analysis, Richard Johnsonbaugh, Earl Gose and Steve Jost, 1st Edition, Prentice Hall of India Private limited, 2009.

37455

INFORMATION SECURITY INCIDENT RESPONSE & MANAGEMENT

(Professional Elective - V)
(Common to IT & CSE)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1	End Exam Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: NIL

Course Objectives:

1. Students will have an understanding of the key themes and principles of information security management and be able to apply these principles in designing solutions to managing security risks effectively.
2. Students will understand how to apply the principles of information security management in a variety of contexts.
3. Students will have an appreciation of the interrelationship between the various elements of information security management and its role in protecting organizations.

Unit I - Managing Information Security Services

Managing Information Security Services: Configuring Network Devices, Identifying Unauthorized Devices, Testing the Traffic Filtering Devices, Configuring Router, Configuring Modes—Router/Global/Interface/Line/PrivilegeEXEC/ROM/User EXEC, Configuring a Banner/ Firewall/ Bastion Host NPN server etc.

Unit II - Troubleshooting Network Devices and Services

Troubleshooting Network Devices and Services: Introduction & Methodology of Troubleshooting, Troubleshooting of Network Communication-Connectivity-Network Devices-Network Slowdowns-Systems-Modems etc.

Unit III – Information Security Incident Management & Data Backup

Information Security Incident Management & Data Backup: Information Security Incident Management overview-Handling-Response, Incident Response Roles and Responsibilities, Incident Response Process etc. Data Back introduction, Types of Data Backup and its techniques, Developing an Effective Data Backup Strategy and Plan, Security Policy for Back Procedures.

Unit IV – Log Correlation

Log Correlation: Computer Security Logs, Configuring& Analyzing Windows Logs, Log Management-Functions & Challenges, Centralized Logging and Architecture, Time Synchronization — NTP/NIST etc. Develop Knowledge Skill and competences (NOS 9005)

Unit V – Handling Network Security Incidents

Handling Network Security Incidents: Network Reconnaissance Incidents, Network Scanning Security Incidents, Network Attacks and Security Incidents, Detecting DoS Attack, DoS Response Strategies, Preventing/stopping a DoS Incident etc.
Handling Malicious Code Incidents: Incident Handling Preparation, Incident Prevention, Detection of Malicious Code, Containment Strategy) Evidence Gathering and Handling, Eradication and Recovery, Recommendations etc. Project.

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

CO 1 : Understand information security challenges, particularly in the area of Critical Information Infrastructure and the urgency to better secure these assets
CO 2 : Understand how security principles must be adhered to when securing the infrastructures.

CO 3 : Understand the importance of balancing security, operational effectiveness and cost
CO 4 : Analyze and to aptly secure the cyber perimeter of the infrastructures against cyber attacks
CO 5 : Aid an organization in its response and recovery from cyber-attacks and to further enhance its security implementations

Text Books:

1. Managing Information Security Risks: The Octave Approach, Christopher Alberts, and Audrey Dorofee, Addison Wesley, 2002
2. Cryptography and Network Security: Principles and Practices, William Stallings, 4th Edition, Prentice Hall / Pearson Education Inc., 2005

Reference:

1. https://wvvw.sans.orq/reading-room/whitepapers/incident/security-incident-handlinosmall-organizations-32979