JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	CS3101	Data Warehousing and Data Mining	3	0	0	3
2	CS3102	Computer Networks	3	0	0	3
3	CS3103	Compiler Design	3	0	0	3
4	CS3104	Artificial Intelligence	3	0	0	3
5	PE3101	**Professional Elective- I** 1. Computer Graphics 2. Principles of Programming Languages 3. Advanced Data Structures 4. Software Testing Methodologies 5. Advanced Computer Architecture	3	0	0	3
6	CS3105	Computer Networks Lab	0	0	2	1
7	CS3106	AI Tools & Techniques Lab	0	0	3	1.5
8	CS3107	Data Mining Lab	0	0	3	1.5
9	MC3101	Employability Skills -II*	2	0	0	0
		Total	17	0	8	19
***Internal Evaluation through Seminar / Test for 50 marks**						

III Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	CS3201	Web Technologies	3	0	0	3
2	CS3202	Distributed Systems	3	0	0	3
3	CS3203	Design and Analysis of Algorithms	3	0	0	3
4	PE3201	**Professional Elective -II** (NPTEL/SWAYAM) **Duration: 12 Weeks Minimum** ***Course/subject title can't be repeated**	3	0	0	3
5	OE3201	**Open Elective- I** (Inter Disciplinary)	3	0	0	3
6	HS3201	Managerial Economics and Financial Accountancy	3	0	0	3
7	CS3204	Web Technologies Lab	0	0	4	2
9	PR3201	Industrial Training / Skill Development Programmes / Research Project in higher learning institutes	0	0	0	1
		Total	18	0	4	21

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

Course Objectives:

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools

Course Outcomes:

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

- Design a Data warehouse system and perform business analysis with OLAP tools
- Apply suitable pre-processing and visualization techniques for data analysis
- Apply frequent pattern and association rule mining techniques for data analysis
- Apply appropriate classification techniques for data analysis
- Apply appropriate clustering techniques for data analysis

UNIT I

Data Warehousing, Business Analysis and On-Line Analytical Processing (OLAP): Basic Concepts, Data Warehousing Components, Building a Data Warehouse, Database Architectures for Parallel Processing, Parallel DBMS Vendors, Multidimensional Data Model, Data Warehouse Schemas for Decision Support, Concept Hierarchies, Characteristics of OLAP Systems, Typical OLAP Operations, OLAP and OLTP.

UNIT II

Data Mining – Introduction: Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, applications, Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III

Data Mining - Frequent Pattern Analysis: Mining Frequent Patterns, Associations and Correlations, Mining Methods, Pattern Evaluation Method, Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT IV

Classification: Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection, Techniques to improve Classification Accuracy

UNIT V

Clustering: Clustering Techniques, Cluster analysis, Partitioning Methods, Hierarchical methods, Density Based Methods, Grid Based Methods, Evaluation of clustering, Clustering high dimensional data, Clustering with constraints, Outlier analysis, outlier detection methods.

Text Books:

1) Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.



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2) Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson,2016.

Reference Books:

1) Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.
2) K.P. Soman, ShyamDiwakar and V. Ajay, ―Insight into Data Mining Theory and Practice‖, Eastern Economy Edition, Prentice Hall of India, 2006.
3) Ian H.Witten and Eibe Frank, ―Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.

e-Resources:

1) https://www.saedsayad.com/data_mining_map.htm
2) https://nptel.ac.in/courses/106/105/106105174/
3) (NPTEL course by Prof.Pabitra Mitra) http://onlinecourses.nptel.ac.in/noc17_mg24/preview
4) (NPTEL course by Dr. Nandan Sudarshanam & Dr. Balaraman Ravindran) http://www.saedsayad.com/data_mining_map.htm

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

Course Objectives:
The main objectives are

- Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model
- Study data link layer concepts, design issues, and protocols
- Gain core knowledge of Network layer routing protocols and IP addressing
- Study Session layer design issues, Transport layer services, and protocols
- Acquire knowledge of Application layer and Presentation layer paradigms and protocols

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

- Illustrate the OSI and TCP/IP reference model
- Analyze MAC layer protocols and LAN technologies
- Design applications using internet protocols
- Implement routing and congestion control algorithms
- Develop application layer protocols

UNIT I
Introduction: History and development of computer networks, Basic Network Architectures: OSI reference model, TCP/IP reference model, and Networks topologies, types of networks (LAN, MAN, WAN, circuit switched, packet switched, message switched, extranet, intranet, Internet, wired, wireless).

UNIT II
Physical layer: Line encoding, block encoding, scrambling, modulation demodulation (both analog and digital), errors in transmission, multiplexing (FDM, TDM, WDM, OFDM, DSSS), Different types of transmission media. Data Link Layer services: framing, error control, flow control, medium access control. Error & Flow control mechanisms: stop and wait, Go back N and selective repeat. MAC protocols: Aloha, slotted aloha, CSMA, CSMA/CD, CSMA/CA, polling, token passing, scheduling.

UNIT III
Local Area Network Technology: Token Ring. Error detection (Parity, CRC), Ethernet, Fast Ethernet, Gigabit Ethernet, Personal Area Network: Bluetooth and Wireless Communications Standard: Wi-Fi (802.11) and Wi-MAX.

UNIT IV
Network layer: Internet Protocol, IPv6, ARP, DHCP, ICMP, Routing algorithms: Distance vector, Link state, Metrics, Inter-domain routing. Sub netting, Super netting, Classless addressing, Network Address Translation.

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UNIT V

Transport layer: UDP, TCP. Connection establishment and termination, sliding window, flow and congestion control, timers, retransmission, TCP extensions, Queuing theory, Single and multiple server queuing models, Little's formula. Application Layer. Network Application services and protocols including e-mail, www, DNS, SMTP, IMAP, FTP, TFTP, Telnet, BOOTP, HTTP, IPSec, Firewalls.

Text Books:

1) Computer Networks , Andrew S. Tanenbaum, David J. Wetherall, Pearson Education India; 5 edition, 2013
2) Data Communication and Networking , Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2012

Reference Books:

1) Computer Networks: A Systems Approach, LL Peterson, BS Davie, Morgan-Kauffman , 5th Edition, 2011.
2) Computer Networking: A Top-Down Approach JF Kurose, KW Ross, Addison-Wesley, 5th Edition, 2009
3) Data and Computer Communications , William Stallings , Pearson , 8th Edition, 2007

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105183/

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

Course Objectives:

- To study the various phases in the design of a compiler
- To understand the design of top-down and bottom-up parsers
- To understand syntax directed translation schemes
- To introduce LEX and YACC tools
- To learn to develop algorithms to generate code for a target machine

Course Outcomes:

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

- Design, develop, and implement a compiler for any language
- Use LEX and YACC tools for developing a scanner and a parser
- Design and implement LL and LR parsers
- Design algorithms to perform code optimization in order to improve the performance of a program in terms of space and time complexity
- Apply algorithms to generate machine code

UNIT I

Language Processors, the structure of a compiler, the science of building a compiler, programming language basics.

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

UNIT II

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Recursive and Non recursive top down parsers, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars, Parser Generators.

UNIT III

Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, and Implementing L-Attributed SDD's. Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Back patching, Switch-Statements, Intermediate Code for Procedures.

UNIT IV

Run-Time Environments: Storage organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.

Machine-Independent Optimizations: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

UNIT V

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, A Simple Code



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Generator.
Machine-dependent Optimizations: Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

Text Books:

1) Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson.
2) Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.

Reference Books:

1) Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
2) The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH
3) Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition.

e-Resources:

1) https://nptel.ac.in/courses/106/104/106104123/

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

Course Objectives:

- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs
- To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

Course Outcomes:

- Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
- Apply the language/framework of different AI methods for a given problem
- Implement basic AI algorithms- standard search algorithms or dynamic programming
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

UNIT I

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT II

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

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT III

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT IV

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web

UNIT V

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory

Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership

functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

Text Books:

1) Artificial Intelligence- Saroj Kaushik, CENGAGE Learning
2) Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

Reference Books:

1) Artificial Intelligence- Deepak Khemani, TMH, 2013
2) Introduction to Artificial Intelligence, Patterson, PHI
3) Atificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105077/
2) http://aima.cs.berkeley.edu/

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

Course Objectives:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects

Course Outcomes:

After learning the course, the student will be able:

- Illustrate the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations
- Apply projections and visible surface detection techniques for display of 3D scene on 2D screen
- Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics

UNIT I

Introduction to Graphics: Application areas of Computer Graphics, overview of graphics systems, video-display devices, graphics monitors and work stations and input devices. 2D Primitives: Output primitives-Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing Line, Polygon, Curve and Text clipping algorithms.

UNIT II

3D Concepts: Parallel and Perspective projections, Three dimensional object representation-Polygons, Curved lines, Splines, Quadric Surfaces, Visualization of data sets, 3D transformations, Viewing, Visible surface identification.

UNIT III

Graphics Programming: Color Models- RGB, YIQ, CMY, HSV, Animations -General Computer Animation, Raster, Keyframe. Graphics programming using OPENGL-Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes.

UNIT IV

Rendering: Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadows of objects, Building a camera in a program, Creating shaded objects

UNIT V

Overview of Ray Tracing: Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.

Text Books:

1) Donald Hearn, Pauline Baker, Computer Graphics – C Version, second edition, Pearson Education,2004.



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2) Schaum's Outline of Computer Graphics Second Edition, Zhigang Xiang, Roy A. Plastock.

Reference Books:

1) James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007.
2) F.S. Hill, Computer Graphics using OPENGL, Second edition, Pearson Education, 2003.

e-Resources:

1) http://math.hws.edu/eck/cs424/downloads/graphicsbook-linked.pdf
2) https://nptel.ac.in/courses/106/106/106106090/

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III Year – I Semester		L	T	P	C
		3	0	0	3
PRINCIPLES OF PROGRAMMING LANGUAGES					

Course Objectives:

- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms

Course Outcomes:

- Describe the syntax and semantics of programming languages and gain practical knowledge in lexical analysis and parsing phases of a compiler
- Make use of different constructs in programming languages with merits and demerits
- Design and implement sub programs in various programming languages
- Developing the knowledge on different programming language features like object-orientation, concurrency, exception handling and event handling
- Analyzing functional paradigm and ability to write small programs using Scheme and ML and Develop programs logic paradigm and ability to write small programs using Prolog

UNIT I

Syntax and semantics: Evolution of programming languages, describing syntax, context, free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive - decent bottom - up parsing.

UNIT II

Data, data types, and basic statements: Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and Boolean expressions, assignment statements, mixed mode assignments, control structures – selection, iterations, branching, guarded Statements.

UNIT III

Subprograms and implementations: Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping.

UNIT IV

Object- orientation, concurrency, and event handling: Object – orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores, Monitors, message passing, threads, statement level concurrency, exception handling, event handling.



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UNIT V

Functional programming languages: Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, Programming with ML
Logic programming languages: Introduction to logic and logic programming, Programming with Prolog, multi - paradigm languages.

Text Books:

1) Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.
2) Programming Languages, Principles & Paradigms, 2ed, Allen B Tucker, Robert E Noonan, TMH.

Reference Books:

1) R. Kent Dybvig, "The Scheme programming language", Fourth Edition, MIT Press, 2009.
2) Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Prentice Hall, 1998.
3) Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009.
4) W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.

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III Year – I Semester		L	T	P	C
		3	0	0	3
ADVANCED DATA STRUCTURES					

Course Objectives:

- Describe and implement a variety of advanced data structures (hash tables, priority queues, balanced search trees, graphs)
- Analyze the space and time complexity of the algorithms studied in the course
- Identify different solutions for a given problem; analyze advantages and disadvantages to different solutions
- Demonstrate an understanding of Amortization
- Demonstrate an understanding of various search trees

Course Outcomes:

Upon completion of the course, graduates will be able to

- Illustrate several sub-quadratic sorting algorithms.
- Demonstrate recursive methods
- Apply advanced data structures such as balanced search trees, hash tables, priority queues and the disjoint set union/find data structure

UNIT I

Sorting: Medians and order statistics, External Sorting, Introduction, K-way Merging, Buffer Handling for parallel Operation, Run Generation, Optimal Merging of Runs.
Hashing: Introduction, Static Hashing, Hash Table, Hash Functions, Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques, Dynamic Hashing-Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Alternate hash functions (mid-square, folding, digit analysis), Double Hashing

UNIT II

Priority Queues and Advance Heaps: Double Ended Priority queues, Leftist Trees: Height Biased, Weight Biased. Binomial Heaps: Cost Amortization, Definition of Binomial Heaps, Insertion, Melding two Binomial Heaps, deletion of min element. Fibonacci Heaps: Definition, Deletion from an F-heap, Decrease key, Cascading Cut.

UNIT III

Advanced and Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees-rotations, insertion, deletion operations, Red-Black Trees, Definition, Representation of a Red-Black Tree, Searching a Red-Black Tree, Inserting into a Red Black Tree, Deletion from a Red-Black Tree, Joining Red-Black Trees, Splitting a Red-Black tree.

UNIT IV

Multi-way Search Trees: M-Way Search Trees, Definition and Properties, Searching an M-Way Search Tree, B-Trees, Definition and Properties, Number of Elements in a B-tree, Insertion into B-Tree, Deletion from a B-Tree, B+-Tree Definition, Searching a B+-Tree, Insertion into B+-tree, Deletion from a B+-Tree.

UNIT V

Digital Search Structures: Digital Search Trees: Definition, Search, Insert and Delete. Binary Tries, Compressed Binary Tries. Multi-way Tries: Definition, searching a Trie, sampling



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strategies, Insertion, Deletion, Height of a Trie. Prefix Search and applications. Suffix Trees.

Text Books:

1) Fundamentals of DATA STRUCTURES in C: 2nd ed, , Horowitz , Sahani, Anderson-freed, Universities Press
2) Data Structures, a Pseudo code Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.

Reference Books:

1) Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson
2) "Introduction to Algorithms", T. Cormen, R.Rivest, C. Stein, C. Leiserson, PHI publication, Second Edition, 2004, ISBN 81-203-2141-3.

e-Resources:

1) Web : http://lcm.csa.iisc.ernet.in/dsa/dsa.html
2) http://utubersity.com/?page_id=878
3) http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
4) http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

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III Year – I Semester		L	T	P	C
		3	0	0	3
SOFTWARE TESTING METHODOLOGIES					

Course Objectives:

- To study fundamental concepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing
- To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report
- To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing
- To understand software test automation problems and solutions
- To learn how to write software test documents and communicate with engineers in various forms

Course Outcomes:

By the end of the course, the student should have the ability to:

- Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods
- Design and conduct a software test process for a software project
- Analyze the needs of software test automation
- Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects
- Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web based and object oriented software testing problems
- Write test cases for given software to test it before delivery to the customer and write test scripts for both desktop and web based applications

UNIT I

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation.

UNIT II

Dynamic Testing-Black Box testing techniques**:** Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing.

White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing.

UNIT III

Static Testing: Inspections, Structured Walkthroughs, Technical Reviews.

Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing.

Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques.

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UNIT IV

Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite
Software Quality Management: Software Quality metrics, SQA models.
Debugging: process, techniques, correcting bugs.

UNIT V

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit . Test Automation using Selenium tool.
Testing Object Oriented Software: basics, Object oriented testing
Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems.

Text Books:

1) Software Testing, Principles and Practices, Naresh Chauhan, Oxford
2) Software Testing, Yogesh Singh, CAMBRIDGE

Reference Books:

1) Foundations of Software testing, Aditya P Mathur, 2ed, Pearson
2) Software testing techniques – Baris Beizer, Dreamtech, second edition.
3) Software Testing, Principles, techniques and Tools, M G Limaye, TMH
4) Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

e-Resources:

1) https://www.tutorialspoint.com/software_testing_dictionary/test_tools.htm

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

Course Objectives:

- Understand the Concept of Parallel Processing and its applications
- Implement the Hardware for Arithmetic Operations
- Analyze the performance of different scalar Computers
- Develop the Pipelining Concept for a given set of Instructions
- Distinguish the performance of pipelining and non pipelining environment in a processor

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate the types of computers, and new trends and developments in computer architecture
- Outline pipelining, instruction set architectures, memory addressing
- Apply ILP using dynamic scheduling, multiple issue, and speculation
- Illustrate the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges
- Apply multithreading by using ILP and supporting thread-level parallelism (TLP)

UNIT I

Computer Abstractions and Technology: Introduction, Eight Great Ideas in Computer Architecture, Below Your Program, Under the Covers, Technologies for Building Processors and Memory, Performance, The Power Wall, The Sea Change: The Switch from Uni-processors to Multiprocessors, Benchmarking the Intel Core i7, Fallacies and Pitfalls.

UNIT II

Instructions: Language of the Computer: Operations of the Computer Hardware, Operands of the Computer Hardware, Signed and Unsigned Numbers, Representing Instructions in the Computer, Logical Operations, Instructions for Making Decisions, Supporting Procedures in Computer Hardware, Communicating with People, MIPS Addressing for 32-Bit Immediates and Addresses, Parallelism and Instructions: Synchronization, Translating and Starting a Program, A C Sort Example to Put It All Together, Arrays versus Pointers, ARMv7 (32-bit) Instructions, x86 Instructions, ARMv8 (64-bit) Instructions.

UNIT III

Arithmetic for Computers: Introduction, Addition and Subtraction, Multiplication, Division, Floating Point, Parallelism and Computer Arithmetic: Subword Parallelism, Streaming SIMD Extensions and Advanced Vector Extensions in x86, Subword Parallelism and Matrix Multiply.

UNIT IV

The Processor: Introduction, Logic Design Conventions, Building a Datapath, A Simple Implementation Scheme, An Overview of Pipelining, Pipelined Datapath and Control, Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, The ARM Cortex-A8 and Intel Core i7 Pipelines.

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UNIT V

Large and Fast: Exploiting Memory Hierarchy: Introduction, Memory Technologies, The Basics of Caches, Measuring and Improving Cache Performance, Dependable Memory Hierarchy, Virtual Machines, Virtual Memory, A Common Framework for Memory Hierarchy, Using a Finite-State Machine to Control a Simple Cache, Parallelism and Memory Hierarchies: Cache Coherence, Parallelism and Memory Hierarchy: Redundant Arrays of Inexpensive Disks, Advanced Material: Implementing Cache Controllers, The ARM Cortex-A8 and Intel Core i7 Memory Hierarchies.

Text Books:

1) Computer Organization and Design: The hardware and Software Interface, David A Patterson, John L Hennessy, 5th edition, MK.
2) Computer Architecture and Parallel Processing – Kai Hwang, Faye A.Brigs, Mc Graw Hill.

Reference Books:

1) Modern Processor Design: Fundamentals of Super Scalar Processors, John P. Shen and Miikko H. Lipasti, Mc Graw Hill.
2) Advanced Computer Architecture – A Design Space Approach – Dezso Sima, Terence Fountain, Peter Kacsuk , Pearson.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105163/

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III Year – I Semester		L	T	P	C
		0	0	2	1
COMPUTER NETWORKS LAB					

Course Objectives:

- Understand and apply different network commands
- Analyze different networking functions and features for implementing optimal solutions Apply different networking concepts for implementing network solution
- Implement different network protocols

Course Outcomes:

- Apply the basics of Physical layer in real time applications
- Apply data link layer concepts, design issues, and protocols
- Apply Network layer routing protocols and IP addressing
- Implement the functions of Application layer and Presentation layer paradigms and Protocols

Experiments:

1) Implement the data link layer framing methods such as character stuffing and bit stuffing.
2) Write a C program to develop a DNS client server to resolve the given hostname.
3) Implement on a data set of characters the three CRC polynomials – CRC-12, CRC-16 and CRC-CCIP.
4) Implement Dijkstra's algorithm to compute the Shortest path in a graph.
5) Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm
6) Take an example subnet of hosts. Obtain broadcast tree for it.
7) Write a client-server application for chat using UDP
8) Implement programs using raw sockets (like packet capturing and filtering)
9) Write a C program to perform sliding window protocol.
10) Get the MAC or Physical address of the system using Address Resolution Protocol.
11) Simulate the Implementing Routing Protocols using border gateway protocol(BGP)
12) Simulate the OPEN SHORTEST PATH FIRST routing protocol based on the cost assigned to the path.

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III Year – I Semester		L	T	P	C
		0	0	3	1.5
AI TOOLS & TECHNIQUES LAB					

Course Objectives:

- Study the concepts of Artificial Intelligence
- Learn the methods of solving problems using Artificial Intelligence
- Introduce the concepts of machine learning

Course Outcomes:

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

- Identify problems that are amenable to solution by AI methods
- Identify appropriate AI methods to solve a given problem
- Use language/framework of different AI methods for solving problems
- Implement basic AI algorithms
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

Experiments:

1) Study of Prolog.
2) Write simple fact for the statements using PROLOG.
3) Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing
4) Write a program to solve the Monkey Banana problem.
5) Write a program in turbo prolog for medical diagnosis and show the advantage and disadvantage of green and red cuts
6) Write a program to implement factorial, Fibonacci of a given number
7) Write a program to solve 4-Queen and 8-puzzle problem.
8) Write a program to solve traveling salesman problem.
9) Write a program to solve water jug problem using LISP
10) Implementation of A* Algorithm using LISP /PROLOG
11) Implementation of Hill Climbing Algorithm using LISP /PROLOG
12) Implementation of DFS and BFS for water jug problem using LISP /PROLOG
13) Implementation of Towers of Hanoi Problem using LISP /PROLOG

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

Course Objectives:

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

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

- Extend the functionality of R by using add-on packages
- Examine data from files and other sources and perform various data manipulation tasks on them
- Code statistical functions in R
- Use R Graphics and Tables to visualize results of various statistical operations on data
- Apply the knowledge of R gained to data Analytics for real life applications

List of Experiments:

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

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

   a. Extract two column names using column name.
   b. Extract the first two rows and then all columns.
   c. Extract 3rd and 5th row with 2nd and 4th column.
6) Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into
   i. 0 to 1 range with min-max normalization.
   ii. a value around 0 with z-score normalization.



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7) Create a data frame with 10 observations and 3 variables and add new rows and columns to it using 'rbind' and 'cbind' function.
8) Write R program to implement linear and multiple regression on 'mtcars' dataset to estimate the value of 'mpg' variable, with best R^2 and plot the original values in 'green' and predicted values in 'red'.
9) Implement k-means clustering using R.
10) Implement k-medoids clustering using R.
11) implement density based clustering on iris dataset.
12) implement decision trees using 'readingSkills' dataset.
13) Implement decision trees using 'iris' dataset using package party and 'rpart'.
14) Use a Corpus() function to create a data corpus then Build a term Matrix and Reveal word frequencies.

Text Books:

1) R and Data Mining: Examples and Case Studies, 1st ed, Yanchang Zhao, Sprnger, 2012.
2) R for Everyone, Advanced Analytics and Graphics, 2nd ed, Jared Lander, Pearson, 2018.

e-Resources:

1) www.r-tutor.com

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

Course Objectives:
The main of this course is

- To learn how to make effective presentations and impressive interviews
- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self management skills for the work site

Course Outcomes:
By the end of this course, the student

- Recite the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Apply their core competencies to succeed in professional and personal life

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

1) Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success.
2) Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness.
3) Etiquette and Manners – Social and Business.
4) Time Management – Concept, Essentials, Tips.
5) Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.
6) Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills.
7) Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resoultion.
8) Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Managemet of Stress
9) Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertivness Skills.
10) Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

Reference Books:

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



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5) Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
6) English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.