COURSE STRUCTURE (R20)
AND
DETAILED SYLLABUS
(III YEAR)

COMPUTER SCIENCE & INFORMATION TECHNOLOGY

For
B.Tech., Four Year Degree Course
(Applicable for the batches admitted from 2020-21)

LENDI INSTITUTE OF ENGINEERING AND TECHNOLOGY

An Autonomous Institution
Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada
Accredited by NAAC with "A" Grade and NBA (CSE,ECE, EEE & ME)
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DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY (CSIT)
B. Tech III-Year Course Structure and Syllabus –R20

S. No.	Course code	Course Title	Category	L	T	P	Credits
		III Year - I Semester					
1	R20CSE-PC3101	Formal Languages and Automata Theory	PC	3	0	0	3
2	R20CIT-PC3101	Computer Networks	PC	3	0	0	3
3	R20CIT-PC3102	Web Technologies	PC	3	0	0	3
4	R20CSE-OE3107 R20ECE-OE3105 R20MEC-OE3102	**Open Elective/Job Oriented Elective-1** 1.Artificial Intelligence 2.Embedded Systems 3.Computer Graphics	OE	3	0	0	3
5	R20CIT-PE3101.1 R20CIT-PE3101.2 R20CIT-PE3101.3	**Professional Elective-1** 1. Software Engineering 2. Advance Data structures 3. Advanced Operating Systems	PE	3	0	0	3
6	R20CSS-PC3103	Computer Networks Lab	PC	0	0	3	1.5
7	R20CIT-PC3103	Web Technologies Lab	PC	0	0	3	1.5
8	R20BSH-SC3102	Employability Skills-2 (**Skill Oriented course-3**)	SC	1	0	2	2
9	R20BSH-MC3101	Entrepreneurship & Incubation (Mandatory Course)	MC	2	0	0	0
10	R20CIT-SI3101	Summer Internship-1 (Evaluation)	SI	0	0	0	1.5
			Total	18	0	08	21.5

Track No.	Course Code	Course Title	Category	L	T	P	Credits
		Honors Course -2					
1	R20CIT-HN3101	TCP/IP Protocol Suite (Track-1)	**HN**	3	0	2	4
2	R20CIT-HN3102	Block Chain Technologies (Track -2)	**HN**	3	0	2	4
3	R20CIT-HN3103	Angular JS Framework (Track-3)	**HN**	3	0	2	4
4	R20CIT-HN3104	Natural Language Processing (Track-4)	**HN**	3	0	2	4
		Minor Course-3					

S. No.	Course code	Course Title	Category	L	T	P	Credits
		III Year - II Semester					
1	R20CIT-PC3201	Data Ware housing and Data Mining	PC	3	0	0	3
2	R20CIT-PC3202	Compiler Design	PC	3	0	0	3
3	R20CIT-PC3203	Software Testing Methodologies	PC	3	0	0	3
4	R20CIT-PE3201.1 R20CIT-PE3201.2 R20CIT-PE3201.3	**Professional Elective course-2:** 1. Design and Analysis Algorithms 2.Advanced Computer Networks 3. Web Services	PE	3	0	0	3
5	R20BSH-OE3201 R20ECE-OE3204 R20CSE-OE3207	**Open Elective Course/Job Oriented Elective-2:** 1. Operation Research 2. Industrial Internet of Things (IoT) 3. Machine Learning	OE	3	0	0	3
6	R20CIT-PC3204	Data Ware housing and Data Mining Lab	PC	0	0	3	1.5
7	R20CIT-PC3205	Compiler Design Lab	PC	0	0	3	1.5
8	R20CIT-PC3206	Software Testing Methodologies Lab	PC	0	0	3	1.5
9	R20CIT-SC3201	Django Framework (Skill Oriented Course-4)	SC	1	0	2	2
10	R20BSH-MC3203	Intellectual Property Rights (Mandatory course)	MC	2	0	0	0
			Total	18	0	11	21.5

Honors Course -3

Track No.	Course Code	Course Title	Category	L	T	P	Credits
1	R20CIT-HN2201	Wireless Sensor Networks (Track-1)	HN	3	0	2	
2	R20CIT-HN2202	Block chain Technologies (Track-2)	HN	3	0	2	4
3	R20CIT-HN2203	.Net Framework (Track-3)	HN	3	0	2	
4	R20CIT-HN2204	Natural Language Processing (Track-4)	HN	3	0	2	
		Minor Course-3					
		Summer Internship-2(After Second Year & Evaluated in IV-I Semester)					

Honor Degree In Computer Science And Information Technology

Track-I (Networks)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CIT-HN2201	Data Communication	HN	3	0	2	4
2	III-I	R20CIT-HN3101	TCP/IP Protocol Suite	HN	3	0	2	4
3	III-II	R20CIT-HN3201	Wireless Sensor Networks	HN	3	0	2	4
4	IV-I	R20CIT-HN4101	Internet of Things	HN	3	0	2	4
5	II Year to IV Year	R20CIT-HNMS01.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CIT-HNMS01.2	Honors MOOCS-2	HN	0	0	0	2
							Total	20

Track- II (Cyber Security)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CIT-HN2202	Information Security	HN	3	0	2	4
2	III-I	R20CIT-HN3102	Secure Coding	HN	3	0	2	4
3	III-II	R20CIT-HN3202	Blockchain Technologies	HN	3	0	2	4
4	IV-I	R20CIT-HN4102	Vulnerability Assessment & Penetration Testing	HN	3	1	0	4
5	II Year to IV Year	R20CIT-HNMS02.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CIT-HNMS02.2	Honors MOOCS-2	HN	0	0	0	2
							Total	20

Track III (Web Frameworks)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CIT-HN2203	Web UI Framework	HN	3	0	2	4
2	III-I	R20CIT-HN3103	Angular Framework	HN	3	0	2	4
3	III-II	R20CIT-HN3203	.Net Framework	HN	3	0	2	4
4	IV-I	R20CIT-HN4103	J2EE Framework	HN	3	0	2	4
5	II Year to IV Year	R20CIT-HNMS03.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CIT-HNMS03.2	Honors MOOCS-2	HN	0	0	0	2
							Total	20

Track IV (Data Science)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CIT-HN2203	Advanced Python Programming	HN	3	0	2	4
2	III-I	R20CIT-HN3103	Mathematical Essential For Data Science	HN	3	1	0	4
3	III-II	R20CIT-HN3203	Natural Language Processing	HN	3	0	2	4
4	IV-I	R20CIT-HN4103	Deep Learning	HN	3	0	2	4
5	II Year to IV Year	R20CIT-HNMS03.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CIT-HNMS03.2	Honors MOOCS-2	HN	0	0	0	2
							Total	20

Subject Code	Subject Name	L	T	P	C
R20CSE-PC3101	Formal Languages & Automata Theory	3	0	0	3

Course Objectives:

This course is designed to:

- Introduce languages, grammars, and computational models
- Discussing regular expressions and regular languages
- Illustrating pushdown-automata and context free grammar.
- Explain Turing machines
- Demonstrate decidability and undecidability for NP Hard problems

Course Outcomes:

Students will be able to:

1. Design finite state machines for acceptance of languages.
2. Understand regular expressions and finite automata.
3. Develop context free grammars for formal languages.
4. Design pushdown automata for context free grammars.
5. Design Turing machine.

UNIT – I:

Finite Automata: Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String by a Finite Automation, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT – II:

Regular Expressions: Regular Expressions, Regular Sets, Identity Rules, Equivalence of two Regular Expressions, Manipulations of Regular Expressions, Finite Automata, and Regular Expressions, Inter Conversion, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closers Properties, Applications of Regular Expressions, Finite Automata and Regular Grammars, Regular Expressions and Regular Grammars.

UNIT – III:

Context Free Grammars: Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, E-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT – IV:

Pushdown Automata: Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description   Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic   and Non – Deterministic Pushdown Automata, Equivalence of Pushdown   Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata, and   Application of Pushdown Automata.

UNIT – V:

Turing Machine: Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine,   Design of Turing Machines, Techniques for Turing Machine Construction, Types of Turing   Machines, Church's Thesis, Universal Turing Machine Decidable and Un-decidable ProblemsPost's Correspondence Problem, Classes of P and NP, NP hard and NP-Complete   Problems.

Text Books:
1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J. D.Ullman, 3rd Edition, Pearson, 2008.
2. Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandra Sekaran, 3rd Edition, PHI, 2007.

Reference Books:
1. Formal Language and Automata Theory, K.V.N. Sunitha and N.Kalyani, Pearson, 2015.
2. Introduction to Automata Theory, Formal Languages and Computation, ShyamalenduKandar, Pearson, 2013.
3. Theory of Computation, V.Kulkarni, Oxford University Press, 2013.
4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014.

Subject Code	Subject Name	L	T	P	C
R20CIT-PC3101	Computer Networks	3	0	0	3

Course Objectives:
- Understand the network architecture and applications.
- Understand about the basic Networking Components and their functionality.
- Understand the functionalities of the Data Link Layer.
- Understand the protocols for data transfer.
- Analyse different protocols and architecture of IEEE 802.11

Course Outcomes:
1. Understand and Compare the Reference Models.
2. Identify the Network Components and learn about their functionality.
3. Analyse the services provided by the Data Link Layer to the Network Layer.
4. Understand the use of Datalink Layer protocols.
5. Understand the architecture of IEEE 802.11

UNIT 1:

Introduction: Components of a Data Communication system, Dataflow,Network Topologies LAN, MAN, WAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model

UNIT 2:

Physical Layer and overview of PL Switching: **Transmission Media**: Guided, Unguided. Bandwidth, throughput, Latency.Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing,

UNIT 3:

Data Link Layer Design Issues: **Data link layer**: Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction, CRC**Elementary Data Link Layer protocols**: simplex protocol, Simplex stop and wait, Simplex protocol forNoisyChannel. **Sliding window protocol**: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: Configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing.

UNIT 4:

Random Access: ALOHA, MAC addresses, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance **Network Layer**: Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast, distance vector routing. **The Transport Layer**: addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, End to end protocols.

UNIT –V:

Application layer (WWW and HTTP): Architecture: Client (Browser) ,Server ,Uniform Resource Locator HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication, HTTP Generic Message Format, HTTP Request Message Format, HTTP Response Message Format.

Text Books:
1. Data Communications and Networking ,Behrouz A Forouzan, Fourth Edition.
2. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010

Reference Books:
1. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education
2. Larry L. Peterson and Bruce S. Davie, "Computer Networks - A Systems Approach" (5th ed), Morgan Kaufmann/ Elsevier, 2011

Subject Code	Subject Name	L	T	P	C
R20CIT-PC3102	Web Technologies	3	0	0	3

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

Course Outcomes:
1. Analyze a web page and identify its elements and attributes.
2. Create web pages using XHTML and Cascading Styles sheets and Build dynamic web pages.
3. Build web applications using PHP.
4. Programming through PERL and Ruby
5. Write simple client-side scripts using AJAX

UNIT-I:

HTML, CSS: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, HypertextLinks, Lists, Tables, Forms, HTML5

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

UNIT-II:

Java script: The Basic of Java script: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions

DHTML: Positioning Moving and Changing Elements

UNIT-III:

XML: Document type Definition, XML schemas, Document object model, XSLT,DOM and SAX Approaches,

AJAX A New Approach: Introduction to AJAX, Integrating PHP and AJAX.

UNIT-IV:

PHP Programming: Introducing PHP: Creating PHP script, Running PHP script.

Working with variables and constants: Using variables, Using constants, Data types, Operators. **Controlling program flow:** Conditional statements, Control statements, Arrays, functions. Working with forms and Databases such as MySQL.

UNIT-V:

Introduction to PERL, Operators and if statements, Program design and control structures, Arrays, Hashs and File handling, Regular expressions, Subroutines, Retrieving documents from the webwith Perl. Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, Classes,Iterators, Pattern Matching. Overview of Rails.

Text Books:
1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrelll, Gosselin, Zak, Karparhi, Maclntyre, Morrissey, Cengage

Reference Books:
1. Ruby on Rails Up and Running, Lightning fast Web development, Bruce Tate, CurtHibbs, Oreilly (2006)
2. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012)
3. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.

4. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
5. http://www.upriss.org.uk/perl/PerlCourse.html

Subject Code	Subject Name	L	T	P	C
R20CSE-OE3107	Artificial Intelligence (Open Elective-1)	3	0	0	3

Course Objectives:
- Expose various AI Applications areas.
- Introduce problem solving techniques like state space search and other control strategic techniques.
- Disseminate various logic techniques like predicate logic and propositional logic
- Demonstrate the applications of AI based Expert systems
- Elucidate probability theory and fuzzy logic

Course Outcomes:
1. Demonstrate various AI applications and AI languages
2. Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.
3. Apply predicate and propositional logic techniques.
4. Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information
5. Analyze and design a real-world problem for implementation and understand the dynamic behavior of a system.

UNIT-I:

Introduction to artificial intelligence: Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends in AI

UNIT-II:

Problem solving: state-space search and control Strategies: Introduction, general problemsolving, 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, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution refutation in propositional 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.**Expert system and applications:** Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems, application of expert systems, list of shells and tools

UNIT-V:

Uncertainty measure:
Probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory.
Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistics variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

Text Books:
1. Artificial Intelligence- SarojKaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nded, Stuart Russell, Peter Norvig, PEARSON

Reference Books:

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Luger, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson
4. Artificial Intelligence- Rich, Kevin Knight, Shiv Shankar B Nair, 3rded, TMH
5. Introduction to Artificial Intelligence, Patterson, PHI

Subject Code	Subject Name	L	T	P	C
R20ECE-OE3105	Embedded Systems (Open Elective-1)	3	0	0	3

Course Objectives:
- To introduce major components of an embedded system
- To introduce 8-bit micro controller architecture
- Understand OS basics and process scheduling.
- Learn task communication and synchronization
- Understand Embedded Product Development life cycle

Course Outcomes:
1. Acquires basic knowledge of embedded systems. (L2)
2. Analyze architecture of microcontroller. (L4)
3. Analyze various preemptive and Non-preemptive task scheduling algorithms. (L4)
4. Analyze various task communication and synchronization mechanisms in real time operating systems. (L4)
5. Acquire knowledge on Embedded Product Development life cycle and embedded systems development tools (L2)

Unit 1:

Introduction: What is an embedded system Vs. General computing system, history, classification, major application areas, and purpose of embedded systems. Core of embedded system, memory, sensors and actuators, communication interface, embedded firmware, other system components.

Unit 2:

8-bit microcontrollers architecture: Characteristics, quality attributes application specific. Factors to be considered in selecting a controller, 8051 architecture, memory organization, registers, oscillator unit, ports, source current, sinking current, design examples.

Unit 3:

RTOS and Scheduling: Operating basics, types, RTOS, tasks, process and threads, multiprocessing and multitasking, types of multitasking, non-preemptive, preemptive scheduling.

Unit 4:

Task communication of RTOS: Shared memory, pipes, memory mapped objects, message passing, message queue, mailbox, signaling, RPC and sockets, task communication/synchronization issues, racing, deadlock, live lock, the dining philosopher's problem. The producer-consumer problem, Priority Inversion, Priority ceiling, Task Synchronization techniques, busy waiting, sleep and wakery, semaphore, mutex, critical section objects.

Unit 5:

Simulators: Emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry.

Text Books:

1. Introduction to embedded systems Shibu.K.V, TMH, 2009.
2. Embedded Software Primer, David Simon, Pearson.

References:

1. Ayala &Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE.
2. Embedded Systems, Rajkamal, TMH, 2009.
3. The 8051 Microcontroller and Embedded Systems, Mazidi, Pearson.

Subject Code	Subject Name	L	T	P	C
R20MEC-OE3102	**Computer Graphics** **(Open Elective-1)**	3	0	0	3

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:
1. Interpret algorithms to draw line, circle and ellipse.
2. Solve transformations related to the object.
3. Analyze algorithms of line, polygon, curve and text.
4. Classify surface detection methods.
5. Create shaded objects and Develop basic primitives with OPENGL.

UNIT-I:

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 -3Dtransformations – Viewing -Visible surface identification.

UNIT-III:

Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSPtree methods, area sub-division and octree methods.

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

UNIT-IV:

Rendering and Overview of Ray Tracing: Introduction to Shading models – Flat and Smooth shading – Adding texture to faces–Adding shadows of objects,Rendering texture – Drawing Shadows.

UNIT-V:

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

Text Books:
1. Computer Graphics *C* version, Donald Hearn, M.Pauline Baker, Pearson
2. Computer Graphics with Virtual Reality Systems, Rajesh K Maurya, Wiley.

Reference Books
1. Introduction to Computer Graphics, Using Java 2D and 3D, Frank Klawonn, Springer
2. Computer Graphics, Steven Harrington, TMH.

Subject Code	Subject Name	L	T	P	C
R20CIT-PE3101.1	Software Engineering (Professional Elective-1)	3	0	0	3

Course Objectives:
- Explain the phases of Software Development.
- Teach the customer requirement gathering techniques.
- Teach Software Design techniques
- Demonstrate coding standards
- Apply the testing techniques on software

Course outcomes: Students will be able to:
1. Understand the need of Software Life Cycle Models (L1)
2. Demonstrate the Requirements of the Software Systems process (L2)
3. Summarize the system models of software engineering (L2)
4. Choose appropriate software architecture style for real-time software projects (L3)
5. Analyze various testing techniques, Risk management and Software quality of the software products(L4)

UNIT-1

Introduction: Introduction to Software Engineering, Evolving role of Software, Software Crisis, Changing Nature of Software, Software myths, Process Models for Software Development, Waterfall, prototyping Evolutionary models: Incremental model, Spiral model, Agile developmental process.

UNIT-2

Software Requirements Engineering: Functional & Non-functional requirements, Feasibility studies, Requirements Elicitation and Analysis, requirements validation, Software Requirements Specification, Process and System Models, context models, behavioral model, Data model.

UNIT-3

Design Engineering: Design concepts, data design, software architecture, Architectural styles and patterns, User interface design - Golden rules, User interface analysis and design, Effective Modular Design.

UNIT-4

Coding & Testing: Coding standards, code review and verification, Testing levels: Unit testing, integration testing, system testing – alpha and beta testing, black box and white box testing, debugging.

UNIT-5

Risk Management: Risk types, strategies, Estimation and Planning. Software Quality – McCall Quality factors, Six Sigma for Software Quality, Quality Assurance and its techniques.

Text books:
1. Roger S. Pressman, Software Engineering, A practitioner's Approach, 7th Edition, McGraw-Hill International Edition, 2009
2. Rajib Mal, Fundamentals of software Engineering, 3rd Edition, Eastern Economy Edition, 2009.

Reference books:
1. Sommerville, Software Engineering, 7th Edition, Pearson education, 2004
2. K KAggarwal and Yogeshsingh, Software engineering,3rd Edition,New age International publication,2008

Subject Code	Subject Name	L	T	P	C
R20CIT-PE3101.2	Advanced Data Structures (Professional Elective-1)	3	0	0	3

Course Objectives:
- To Demonstrate the importance of Internal and External Sorting Techniques
- Describe the various implements of Hashing Techniques, variants of trees, heaps, queues and analysis
- To Deal with the Optimal, Efficient binary search trees and Multi-way Trees
- To Create awareness on Digital Search trees, Binary ties, Patricia

Course Outcomes:
1. Understand how to handle massive amounts of data which resides in external memory i.e. disks and CDs etc using external sorting algorithms and apply external sorting algorithm on massive amounts of data.
2. Understand and implement indexing techniques using hashing concepts like static hashing and dynamic hashing.
3. Apply concepts of Binary Heap and binomial queues in real time applications such as event simulations problem, selection problem.
4. Apply the data structures such as AVL, Red-Black and Optimal Binary Search Trees for faster searching in directories.
5. Apply data structures such as M-way search trees, B trees and B+ trees in data base indexing.

UNIT-I:
Sorting: Basic concepts, Sorting by insertion (Insertion sort), selection heap sort), exchange (bubble sort, quick sort), distribution (radix sort) and merging (merge sort)Algorithms.
External Sorting: External Sorting, Introduction, K-way Merging - Buffer Handling for parallel Operation- Run Generation- Optimal Merging of Runs.

UNIT-II:
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,

UNIT -III:
Priority Queues (Heaps): Model, Simple Implementation, Binary Heap-Structure Property- Heap-Order Property-Basic Heap Operations- Other Heap Operation, Applications of Priority Queues- The Selection Problem Event Simulation Problem, Binomial Queues- Binomial Queue Structure – Binomial Queue Operation- Implementation of Binomial Queues

UNIT-IV
Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees, 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. Splay tree Introduction

UNIT-V:
Multiway 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.

Text Books:
1. Data Structures, a Pseudo code Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage
2. Fundamentals of Data Structures in C: 2nd ed, , Horowitz , Sahani, Andersonfreed, Universities Press
3. Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson

Reference Books:
1. File Structures :An Object oriented approach with C++, 3rd ed, Michel J Folk, Greg Riccardi, Bill Zoellick
2. C and Data Structures: A Snap Shot oriented Treatise with Live examples from Science and Engineering, NB Venkateswarlu& EV Prasad, S Chand, 2010.

Subject Code	Subject Name	L	T	P	C
R20CIT-PE3101.3	Advanced Operating Systems **(Professional Elective-1)**	3	0	0	3

Course Objectives:
- Learn various issues in distributed operating systems.
- Discuss how dead locks are handled in distributed operating systems.
- Provide various difficulties in shared memory and failure recovery mechanisms.
- Learn the basics of Linux system and perform administrative tasks on Linux Servers.
- Discuss about multiprocessor and distributed database systems.

Course Outcomes
1. Understand the basics of distributed operating systems.(L2)
2. Analyze various deadlock handling mechanisms in distributed environment.(L4)
3. Analyze different load balancing and fault recovery algorithms.(L4)
4. Understand about Linux and Android operating systems.(L2)
5. Evaluate multiprocessor and distributed database systems.(L5)

UNIT - I:
Introduction to OS: Types of OS, OS services and functions, Architectures of Distributed Systems – System Architecture types - issues in distributed operating systems. Theoretical Foundations – inherent limitations of a distributed system - lamp ports logical clocks - vector clocks - casual ordering of messages - global state, Termination detection. Distributed Mutual Exclusion - introduction the classification of mutual exclusion and associated algorithms - a comparative performance analysis.

UNIT - II:
Distributed Deadlock Detection: Introduction - deadlock handling strategies in distributed systems - issues in deadlock detection and resolution - control organizations for distributed deadlock detection - centralized and distributed deadlock detection algorithms -hierarchical deadlock detection algorithms. Agreement protocols - introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, applications of agreement algorithms. Distributed resource management: introduction-architecture - mechanism for building distributed file systems - design issues- log structured file systems.

UNIT-III:
Distributed shared memory: Architecture- algorithms for implementing DSM - memory coherence and protocols - design issues. Distributed Scheduling - introduction - issues in load distributing - components of a load distributing algorithm - stability - load distributing algorithm - performance comparison - selecting a suitable load sharing algorithm - requirements for load distributing -task migration and associated issues. Failure Recovery and Fault tolerance: introduction- basic concepts - classification of failures - backward and forward error recovery, backward error recovery- recovery in concurrent systems - consistent set of check points - synchronous and asynchronous check pointing and recovery - check pointing for distributed database systems- recovery in replicated distributed databases.

UNIT-IV:
Linux System: Components of LINUX, Interprocess Communication, Synchronization, Interrupt,Exception and System Call.**Android Software Platform**: Android Architecture, Operating System Services, Android Runtime Application Development, Application Structure, Application Process management.

UNIT-V:
Multiprocessor operating systems: Basic multiprocessor system architectures - inter connection Networks for multiprocessor systems - caching - hypercube architecture. Multiprocessor Operating System – structures of multiprocessor operating system,

operating system design issues- threads- process Synchronization and scheduling. Distributed database systems, concurrency control algorithms - introduction, basic synchronization primitives, lock based algorithms-timestamp based algorithms, optimistic algorithms - concurrency control algorithms.

Text Books:

1.Mukesh Singhal, Niranjan G.Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", TMH,2001

Reference Books:

1.Andrew S.Tanenbaum, "Modern operating system", PHI,2003

2.Pradeep K.Sinha, "Distributed operating system-Concepts and design", PHI,2003.

Subject Code	Subject Name	L	T	P	C
R20CSS-PC3103	Computer Networks Lab	0	0	3	1.5

Course Objectives:
- To understand the system calls.
- To understand the concepts of framing techniques.
- To understand the error detecting techniques.
- To understand routing strategies.
- To understand the connection oriented and connection less services.

Course Outcomes:
1. To implement the simple commands used for networking.
2. To understand the Framing techniques.
3. To implement the Error Detection techniques. ·
4. To implement the Routing protocols.
5. To understand the Connection Oriented and Connection Less service.

List of Programs:

Week 1: Study of different types of network cables and practically implement the cross-wired cable and straight through cables using crimping tool.

Week2: Configuration of various topologies related to LANs and WANs Using Packet Tracer.

Week3: Study on Network Layer and data link layer using Packet Tracer

Week 4: Write a program to implement Bit Stuffing and Byte Stuffing.

Week 5: Write a program to implement CRC**.**

Week 6: Take an example subnet of hosts. Obtain broadcast tree for it.

Week 7: Implement Dijkstra's algorithm to compute the shortest path through a graph and Configure RIP using Packet tracer.

Week 8: Take an example subnet graph with weights indication delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm.

Week 9: Configure a network using Link state Protocol OSPF using Packet Tracer.

Week 10: Configure DHCP on router using Packet Tracer.

Week 11: Configure VLAN Using Packet Tracer.

Week 12: Internal exam

Reference Books:
1. Unix Network Programming, Volume 1: The Sockets Networking API Addison-Wesley Professional Computing Series
2. Network Programmability and Automation: Skills for the Next-Generation Network Engineer

SubjectCode	SubjectName	L	T	P	C
R20CIT-PC3103	Web Technologies Lab	0	0	3	1.5

Course Objectives:

- To acquire knowledge of XHTML, Java Script and XML to develop web applications
- Ability to develop dynamic web content using Java Servlets and JSP
- To understand JDBC connections and Java Mail API
- To understand the design and development process of a complete web application
- Design the following static web pages required for an online book store website.

1) HOMEPAGE:

The static home page must contain three frames.

Top frame: Logo and the college name and links to Homepage, Login page, Registration page, Catalogue page and Cartpage (the description of these pages will be given below).

Left frame: At least four links for navigation, which will display the catalogue of respective links.

For e.g.: When you click the link "MCA" the catalogue for MCA Books should be displayed in the Right frame.

Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web sit

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
mca mba BCA	Description of the Web Site			
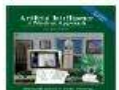
2) login page

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA MBA BCA	Login : [11a51f0003] Password: [*******] [Submit] [Reset]			

3)CATOLOGUE PAGE:

The catalogue page should contain the details of all the books available in the website in a table. The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Addto cartbutton.

4. REGISTRATIONPAGE:

Create a "*registration form* "with the following fields

1) Name(Text field)
2) Password(password field)
3) E-mail id (text field)
4) Phone number (text field)
5) Sex (radio button)
6) Date of birth(3selectboxes)
7) Languages known(checkboxes –English, Telugu, Hindi, Tamil)
8) Address(text area)

5. Design a webpage using CSS (Cascading **S**tyle **S**heets**)** which includes the following:
1)Use different font, styles:
In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles

6. Write an XML file which will display the Book information which includes the following:
1) Title of the book
2) Author Name
3) ISBN number
4) Publisher name
5) Edition
6) Price

Write a Document Type Definition (DTD) to validate the above XML file.

7. Write Ruby program reads a number and calculates the factorial value of it and prints the Same.

8. Write a Ruby program which counts number of lines in a text files using its regular Expressions facility.

9. Write a Ruby program that uses iterator to find out the length of a string.

10. Write simple Ruby programs that uses arrays in Ruby.

11. Write programs which uses associative arrays concept of Ruby.

12. Write Ruby program which uses Math module to find area of a triangle.

13. Write Ruby program which uses tk module to display a window

14. Define complex class in Ruby and do write methods to carry operations on complex objects.

15. Write a program which illustrates the use of associative arrays in perl.

16. Write perl program takes set names along the command line and prints whether they are regular files or special files.

Subject Code	Subject Name	L	T	P	C
R20BSH-SC3201	**Employability Skills-2** **(Skill Oriented Course-3)**	3	0	0	3

Course Objectives

- Encourage use of a wide range of grammatical structures and vocabulary in speech and writing
- Demonstrate good writing skills for effective paraphrasing, argumentative essays, and formal correspondence
- Provide training and opportunities to develop fluency in English through participation informal group discussions and presentations using audio-visual aids
- Knowing the best practices at the workplace to perform well in the interview.
- Encouraging smart self-learning, communication skills that focus on employability.

Course Outcomes

1. understand the grammatical forms of English and the use of these forms in specific communicative and career context
2. use a wide range of reading comprehension strategies appropriate to texts, to retrieve information
3. strengthen their ability to write paragraphs, essays, emails and summaries
4. improve their speaking ability in English both in terms of fluency and comprehensibility by participating in Group discussion and oral assignments
5. prepare their own resume and answer interview related questions unhesitatingly with acceptable soft skills

Unit 1

Preparing for Written Assessment **[6 Hours]**

Grammar: Articles: Know how to use different types of Articles**,** use articles appropriately in context Identify errors in the use of articles, **Prepositions**: Learn to use prepositions in context, Identifying errors in the use of prepositions, Look at the different functions of Prepositions, **Tenses**: understand the different form of tense used in sentences, know the various purposes of using different Tense forms, Use appropriate tense forms of verbs in context, Identify the errors in the use of tense forms.

Soft Skills: Leadership:Introduction to Leadership, Leadership Power, Leadership Styles, Leadership in Administration. **Interpersonal Relations**:Introduction to Interpersonal Relations, Analysis of different ego states, Analysis of Transactions, Analysis of Strokes, Analysis of Life position

Unit 2

Reading Comprehension **[6 Hours]**

Purposes & Strategies of Reading:know the general purpose of Reading,assess your skills of reading ,develop reading Strategies **Skimming for details**:Skim through a variety of passages, understand how skimming will orient you to the text, **Identifying main Ideas**:Identify the main ideas in the give text,Look for supporting statements in a passage, understand how the writer supports main ideas with details **Scanning for information:**Scan passages for factual information, understand how scanning can help find certain answers quickly,know how to look for factual answers,**drawing inferences:**Understand how to draw inferences,infer meanings while reading passages, **vocabulary**:Learn strategies to understand difficult words used in the passage,Apply strategies of reading to understand a variety of passages,**practise tests**

Soft Skills:Communication: Introduction to Communication, Flow of Communication, Listening, Barriers of Communication, How to overcome barriers of communication. **Stress Management**:Introduction to Stress, Causes of Stress, Impact Stress, Managing Stress

Unit 3

Writing paragraphs & Essays   **[6 Hours]**

Features of Good Writing:understand what makes a piece of writing good,Analyze & discuss some samples of good & bad writing, **Gathering Ideas**: Discuss various techniques for gathering ideas before you start writing, practice some of the techniques that can be used in the Prewriting stage ,**Purposes of Writing:**understand the importance of purpose of writing,explore various purpose of writing,choose content & language based on the purpose **Writing for Specific audience:**Study ways of tailoring content to suit a target audience,analyze text to deduce the target audience,discuss how language is used to suit the target audience **organizing ideas:**understand the importance of organizing ideas in a text,Learn the different ways of organizing ideas,practice organizing ideas while writing **Soft Skills:Group Dynamics and Team Building:** Importance of groups in organization,Interactions in group, Group Decision Taking, Team Building, Interaction with the Team, How to build a good team?

Unit 4

Preparing for oral Assignment   **[6 Hours]**

Group Discussion: Group Discussions as a tool for selection, skills for GD,Leadership & Problem-Solving Skills, Types of GD, Group Dynamics, Roles & Functions: Beginning, Presenting, Elaborating, Roles & Functions: Clarifying, Synthesizing & Challenging, Roles & Functions: Agreeing, Disagreeing & Summarizing., Etiquette: Body Language & Time Management, GD Activities

Soft Skills: Conflict Management:Introduction to Conflict, Causes of Conflict, Managing Conflict **Time Management:** Time as a Resource, Identify Important Time Wasters, Individual Time Management Styles, Techniques for Better Time Management.

Unit 5

Interview Skills   **[6 Hours]**

Purpose of interviews: Know what recruiters looking for during Interviews,Become familiar with the process of career search, understand your skills,interests,achievements and attitude better **Preparing a Resume:**Understand what a job application is,know the details to be included in a CV,Know how to lay out details of a CV & prepare CV on your own **Writing a Cover Letter:**Study the information which is included in a cover letter.Learn how to organize information in a cover letter ,**Before and at the interview:**Learn how to prepare for an interview,learn how to behave during the interview, discuss what the interviewer might assess you on **Answering FAQs about yourself & your families:**Learn how to answer questions about yourself & family, Learn how to identify & talk about your strengths and Weaknesses **Answering FAQs about Soft Skills:Motivation:** Introduction to Motivation, Relevance and types of Motivation, Motivating subordinates, Analysis of Motivation

ASSESSMENT

The learners will demonstrate their knowledge and abilities through completion of the following required assessments while or at the end of this course — 4 Quizzes, 5 GD, 4 Activities on Interview Readiness and Soft Skills, 1 Personal Interview

Grammar & Vocabulary Quizzes: (20M): 4 Quizzes are conducted on Grammar and Vocabulary. The Quiz consists of 50 questions and will be scaled down to 10 Marks. Maximum duration of the quiz is 50 Minutes only and it is Computer Based Test (CBT)

Writing: (20M): The writing consists of Personal Inquisitive Questions (PIQ), Paragraph Writing, Picture Perception Discussion Test (PPDT), Essay Writing and Statement of

Purpose (SOP)

Job Skills:(60M): Since the course outcome demands students' job readiness, this part of the assessment emphasizes *their skill of preparing a Resume and Visume, participating in a GD, Self Analysis through Case Study etc.,* to ace the job interview.

Resume:(10M): Each student is required to submit 2 independently written Resumes along with a Cover Letter and a Statement of Purpose during the course. (SOP by assuming the candidate is applying for Higher Education Abroad).

GD:(25M): Each student has to perform **4** Group Discussions during the course on a peer evaluation basis which fetches them **10 Marks each.**

The Final Assessment through one formal GD in the External Examination is for 10 marks.

The obtained score will be scaled down to **25 Marks.**

The GD will be assessed on the following criteria :
- *Content (3M)*
- *Body Language(2M)*
- *Group dynamics & Leadership Skills (3M)*
- *Communication Skills (2M)*

PI & Soft Skills:25M Student will be assessed on
- *Presentation of his/her Readiness of Interview (Grooming) with Prepared Visume (10M)*
- *Aptitude based/Case Study based /Behaviour based Questions (10M)*
- Soft Skills Activity **(10M)**

Personal Interview (PI) /Activities on Interview Readiness:(20M)

The External Examiners assess on Interview readiness

Tell something about Yourself (10M)

Assessment Parameters:
- *Initiation*
- *Confidence level*
- *Body Language*
- *Attention Grabbing*

JAM/Face to Face Interview (10M):

Student will be given a topic on-Spot for JAM and will be assessed by the External examiner on
- *Flow of Speech*
- *Accuracy and Language*
- *Confidence*

Grading:

Writing	G&V	Job Skills	Total
/20	/20	/60	/100

Pass Criterion:
1. Student has to Secure **40%** to pass this examination
2. Student who has an achievement certificate of any National or International Level Quiz/Psychometric Analysis, he/she has to secure a Minimum **30 Marks** in this examination (**Certificate+30 Marks**) to pass the summative exam.
3. Clearing all categories is mandatory. Need to get **60%** in each category.
4. **30M** +Certificate=Successful or **40M**+No certificate=Successful

Subject Code	Subject Name	L	T	P	C
R20BSH-MC3201	Entrepreneurship & Incubation (Mandatory Course)	1	0	2	0

Course Objectives:
- Creation of environment and facilities to instruct students and assist in identifying products or services.
- Develop innovative products, services, processes and techniques.
- Able to prepare financial proposals and start-ups.
- Promote the ideas to collaborate with entrepreneur skills in establishment of start-ups.
- Encourage the students to learn current trends of Science and Technology opportunities.

Course outcomes:
- Enriches the knowledge of Entrepreneurial behavior, and skill development.
- Initiate business ideas that have value in the end-market.
- Identify the validity of idea and its unique selling proportion.
- Comprehend opportunity and challenges of-start up (L2)
- Analyze various Government and non-Government financial resource.

Unit-I:

Fundamentals of Entrepreneurship: Entrepreneurship-Concept, Importance, Characteristics –Myths of Entrepreneurship -Role of Entrepreneurs in Indian economy– Social and Ethical Perspectives of Entrepreneurship.

Application: Case lets: Business cases of young entrepreneurs

Learning Outcomes: At the end of this unit students will be able to:
- Interpret the concepts of entrepreneurship and the characteristics of an entrepreneur.(L2)
- Explain the significance of entrepreneurship in the economic development of a nation.(L3)

Unit II:

Ideation and Evaluation of Business Ideas: Opportunity identification – Ideations process - Sources of business ideas – Role of creativity –Sources of Innovation –Technological Innovation and Entrepreneurship - Product/ Service design–Design Thinking.

Case lets: Business cases of OYO.

Activity: Collection of novel business ideas.

Learning Outcomes: At the end of this unit students will be able to:
- Choose the right business ideas.(L3)
- Evaluate the business idea. (L2)

Unit-III:

Feasibility Analysis and Business plan: Thrust areas of entrepreneurship- Techno-economic feasibility assessment-Financial feasibility – Market feasibility– Preparation of Business plan–Business canvas & Lean canvas.

Activity: Preparation of business plan(draft)

Learning Outcomes: At the end of this unit students will be able to:
- Evaluate technical feasibility.(L1)
- Develop Lean canvas. (L4)

Unit-IV:

Business Incubation and startups: Fundamentals of business incubation-Services of incubators-Start-ups-meaning, significance-startup strategy-Present scenario of startups.

Activity: Analyze and evaluate new start-up..

Learning Outcomes: At the end of this unit students will be able to:
- Describe the process of business incubation/incubators(L2)
- Select a suitable incubator and build a feasible business model.(L3)

Unit -V:

Financial resources: Sources of finance–Bootstrapping-Government Support–MSMEs-Crowd Funding–Venture Capitalists & Angel Investors.

Activity: Business plan final version

Learning Outcomes: At the end of this unit students will be able to:
- Knowledge about various sources of finance for entrepreneurship. (L2)
- Analyze the opportunities Seed capital /Angel financiers and understand operation.(L3)

Text Book:

1. T.V Rao, Donald F. Kuratko, Entrepreneurship, A South-Asian Perspective, Cengage Learning.
2. Datsy Davies, Indian Startups, Amazon Asia –Pacific Holdings Private Limited

Reference Books:

1. P. N. Rath, Sarjue Pandita, Entrepreneurship: Startup India& Standup India, Lexicon Publishing House.
2. Madhurima Lall, Shikha Sahai, Entrepreneurship, Excel Books(P)Ltd.
3. Rajeev Roy, Entrepreneurship, Oxford Higher Education.
4. H.Nandan, Fundamentals of Entrepreneurship, PHI Learning (P)Ltd.

Subject Code	Subject Name	L	T	P	C
R20CIT-PC3201	**Data Mining and Data Warehouse**	3	0	0	3

Course objectives:
- Students will be enabled to understand and implement classical models and algorithms in Data Warehousing and Mining.
- They will learn about different tools used in data mining.
- They will learn how to analyze the data, identify the problems, and choose the relevant models and algorithms to apply
- They will further be able to assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior

Course Outcomes :
1. Understand stages in building a Data Warehouse and correlate the various system architectures.
2. Understand the need and importance of reporting and query tools.
3. Understand the need and importance of data mining functionalities.
4. Understand the process of classification.
5. Apply the Clustering techniques on sample data.

<div align="center">UNIT –I:</div>

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

<div align="center">UNIT –II:</div>

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

<div align="center">UNIT III:</div>

Data Mining: Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.

<div align="center">UNIT –IV:</div>

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

<div align="center">UNIT –V:</div>

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

<div align="center">TEXT BOOKS:</div>

1. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third

3. Edition, Elsevier, 2012.AULibrary.com

Reference Books:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Aja, "Insight into Data Mining Theory and Practice",Eastern Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition,Prentice Hall of India, 2006.
4. Daniel T. Larose, "Data Mining Methods and Models", Wiley-Interscience, 2006.

Subject Code	Subject Name	L	T	P	C
R20CIT-PC3202	**Compiler Design**	**3**	**0**	**0**	**3**

Course Objectives:

- To teach concepts of language translation and phases of compiler design
- To describe the common forms of parsers
- To inculcate knowledge of parser by parsing LL parser and LR parser
- To demonstrate intermediate code using technique of syntax directed translation
- To Illustrate the various optimization techniques for designing various optimizing compiler

Course Outcomes:

1. Understand the functionalities of compilation phases and role of lexical analyzer.
2. Analyze the working process of top-down parser.
3. Analyze the working process of Bottom-up parser.
4. Understand the symbol table and storage organization techniques.
5. Design the optimized code by applying optimization techniques.

UNIT-I:

Overview of language processing – preprocessors – compiler – assembler – interpreters – linkers & loaders - structure of a compiler – phases of a compiler. Lexical Analysis – Role of Lexical Analysis – Lexical Analysis Vs. Parsing – Token, patterns and Lexemes – Lexical Errors – Regular Expressions – Regular definitions for the language constructs – Strings, Sequences, Comments – Transition diagram for recognition of tokens, Reserved words and identifiers, Examples.

UNIT-II:

Syntax Analysis – Role of a parser – classification of parsing techniques – Top down parsing – First and Follow- LL (1) Grammars, Non-Recursive predictive parsing – Error recovery in predictive parsing.

UNIT -III:

Introduction to simple LR – Why LR Parsers – Model of an LR Parsers – Operator Precedence- Shift Reduce Parsing – Difference between LR and LL Parsers, Construction of SLR Tables. More powerful LR parses, construction of CLR (1), LALR Parsing tables, Dangling ELSE Ambiguity, Error recovery in LR Parsing.

UNIT-IV

Semantic analysis, SDT, evaluation of semantic rules, symbol tables, use of symbol tables. Runtime Environment: storage organization, stack allocation, access to non-local data, heap management, parameter passing mechanisms.

UNIT-V:

Intermediate code, three address code, quadraples, triples, abstract syntax trees, basic blocks, CFG. Machine independent code optimization - Common sub expression elimination, constant folding, copy propagation, dead code elimination, strength reduction, loop optimization, procedure inlining. Machine dependent code optimization: Peephole optimization, register allocation, instruction scheduling, inter procedural optimization, garbage collection via reference counting.

Text Books:

1. Compilers, Principles Techniques and Tools- Alfred V Aho, Monical S Lam, Ravi Sethi, Jeffrey D. Ullman,2nd ed, Pearson,2007.
2. Principles of compiler design, V. Raghavan, 2nd ed, TMH, 2011.
3. Principles of compiler design, 2nd ed, Nandini Prasad, Elsevier

Reference Books:

1. Compiler construction, Principles and Practice, Kenneth C Louden, CENGAGE
2. Implementations of Compiler, A new approach to Compilers including the algebraic methods, Yunlinsu, SPRINGER

Subject Code	Subject Name	L	T	P	C
R20CIT-PC3203	Software Testing Methodologies	3	0	0	3

Course Objectives: students are able to
- Fundamentals for various testing methodologies.
- Describe the principles and procedures for designing test cases.
- Provide supports to debugging methods.
- Acts as the reference for software testing techniques and strategies.

Course Outcomes: Students are able to
1. Understand the basic testing procedures.
2. Able to support in generating test cases and test suites.
3. Able to test the applications manually by applying different testing methods and automation tools.
4. Apply tools to resolve the problems in Real time environment.
5. Apply State Graphs and Transition Testing.

UNIT-I:

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

UNIT-II:

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

UNIT-III:

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

UNIT-IV:

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

UNIT – V:

State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, and Testability Tips. Graph Matrices and Application: -Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.

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

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

Subject Code	Subject Name	L	T	P	C
R20CIT-PE3201.1	Design and Analysis Algorithms (Professional Elective-2)	3	0	0	3

Course Objectives:
- Discuss performance analysis of algorithms.
- Familiarize with different algorithm design techniques
- Explain the selection of appropriate data structure and algorithm for a specified problem and its impact on performance
- Explain algorithm design techniques like greedy method, divide & conquer, dynamic programming, backtracking and branch & bound.
- Introduce complexity classes P, NP, NP-Complete and NP Hard problems.

Course Outcomes:
1. Understand the functionalities of compilation phases and role of lexical analyzer.
2. Analyze the working process of top-down parser.
3. Analyze the working process of Bottom-up parser.
4. Understand the symbol table and storage organization techniques.
5. Design the optimized code by applying optimization techniques.

UNIT I :
Introduction: Algorithm, Algorithm specification, Performance analysis, Space Complexity, Time Complexity, Asymptotic Notations, Practical Complexities

UNIT II:
Divide and Conquer: General method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Selection, Strassen's matrix multiplication

UNIT III:
Greedy Method: General method, Knapsack problem, Job Scheduling with Deadlines, Minimum cost Spanning Trees, Optimal storage on tapes, Optimal merge patterns, Single-source shortest paths.
Dynamic programming: General Method, Multistage graphs, All-pairs shortest paths, Optimal binary search trees, 0/1 knapsack, The traveling salesperson problem, Reliability Design. Basic Traversal and Search Techniques: Techniques for binary trees, Techniques for Graphs, connected components and Spanning trees, Bi-connected components and DFS

UNIT IV :
Back tracking: General Method, 8 – queens problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles, Knapsack Problem

UNIT V:
Branch and Bound:The method, Travelling salesperson, 0/1 Knapsack problem, Efficiency considerations. **Lower Bound Theory**: Comparison trees, Lower bounds through reductions – Multiplying triangular matrices, inverting a lower triangular matrix, Computing the transitive closure.

Text Books
1. Ellis Horowitz, Sartaj Sahni and Rajasekaran, Fundamentals of Computer Algorithms, 2nd Edition, 2012, University Press.
2. Parag Himanshu Dave and Himanshu Bhalchandra Dave, Design and Analysis of Algorithms, Second Edition, Pearson Education.

References
1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition,
2. Pearson Education, 2012.
3. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
5. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.

Subject Code	Subject Name	L	T	P	C
R20CIT-PE3201.2	Advanced Computer Networks (Professional Elective-2)	3	0	0	3

Course Objectives:
- To make the addressing mechanisms and address translation familiar to the student.
- To identify the fields in the Packet and its importance.
- Understand the Routing Protocols and its importance.
- Analyse the difference between connection oriented and connection less protocols.
- Understand the data transfer applications.

Course Outcomes:
1. Understand the Addressing Mechanisms.
2. Understand the packet Format and Various security fields in it.
3. Analyse the working of Routing Protocols.
4. Understand the Transport Layer Protocols.
5. Understand the e-mail architecture and file transfer.

<div align="center">Unit 1:</div>

IP Addressing: Address Space, Notations, Class full addressing, Classless addressing, Address translation (NAT), Internet Protocol (IP): Datagram Format, Fragmentation, Options. ICMPv4: Messages, Debugging Tools, ICMP Checksum, Mobile IP: Addressing, Agents, Three Phases. Inefficiency in Mobile. Virtual Private Network Technology.

<div align="center">Unit-2:</div>

IPv6 Addressing: Representation, address space, address space allocation, Auto configuration, Re numbering. Transition from IPv4 to IPv6: Dual Stack, Tunneling, Header Translation. IPv6 Protocol: Packet format , Extension Header.

<div align="center">Unit 3:</div>

Introduction: Inter-domain, Intra-domain Routing. **Routing Algorithms:** Distance Vector Routing, Bellman—Ford algorithm, LinkState Routing, Path Vector Routing. Unicast Routing Protocols: Internet Structure, Routing Information Protocol(RIP),Open Shortest Path First(OSPF), Border Gateway Protocol Version 4(BGP4). Protocols: Multicast DistanceVector (DVMRP), Multicast Link State (MOSPF),Protocol Independent Multicast(PIM).

<div align="center">Unit 4:</div>

User Datagram Protocol: User Datagram, UDP Services, UDP Applications **.** Transmission Control Protocol: TCP Services ,TCP features, Segment, ATCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers, Options. SCTP: SCTP Services, SCTP Features, Packet Format, Flow Control, Error Control.

<div align="center">Unit 5:</div>

WorldWideWeb and HTTP, FTP, TFTP, e-mail : Architecture, SMTP ,POP ,email security, MIME, Remote Login: Telnet and SSH.

<div align="center">Text Books:</div>

1. Data Communications and Networking , Behrouz A Forouzan, Fourth Edition.
2. InterNetworking with TCP/IP Volume 1 Fourth Edition, Prentice Hall India Private Limited

<div align="center">Reference Books:</div>

1. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, Firouz Mosharraf, McGraw Hill Education
2. Advanced Computer Network, B.M.Harwaniand DT Editorial, Dreamtech

Subject Code	Subject Name	L	T	P	C
R20CIT-PE3201.3	**Web Services** **(Professional Elective-2)**	**3**	**0**	**0**	**3**

Course Objectives:
- Understand web services and Service oriented architecture (SOA).
- Implement java generic classes and annotations.
- Implement java persistence using JSON and XML Parsers.
- Implement XML Web services using WSDL and JAX-WS.
- Implement RESTFul Web Services using JAX-RS.

Course Outcomes:
1. Understand the importance of Web Services and Service Oriented Architecture.
2. Implement Java Generic data Structures and Annotations.
3. Implement object persistence using different APIs.
4. Apply XML Web Services using JAX-WS APIs.
5. Apply RESTFul Web Services using JAX-RS APIs.

Unit 1:

Introduction to Web Services - Introduction to Web Services, Web Service Architecture, Applications of Web Services, Distributed Computing VS Web Services, Service Registries, Service Discovery, UDDI Architecture, UDDI Data Model, Service Oriented Architecture (SOA).

Unit 2:

Generics & Annotations: Generics in Java, Advantages of generics, Generic Classes, Type Parameters, Wild Cards, Nested Collections, Annotations, Annotation Elements, Built-in Annotations, Custom Annotations.

Unit 3:

Object Persistence: XML, Rules of XML Document, XML Schema and NameSpace, Marshalling and UnMarshalling XML document using JAXB, DOM Parser, JSON Object, JSON Array, Serializing and De-serializing JSON, JSON Parsing using Jackson APIs.

Unit 4:

SOAP Web Services: Introduction to SOAP, SOAP Architecture, WSDL, Structure of WSDL, WSDL Document Elements: Definitions, Types, Message, Operation, portType, binding, port & services, Schema Types and Binding styles, Publishing SOAP Web Services, Consuming Web Services, Exploring javax.xml.ws.*.

Unit 5:

RESTFul Web Services: Introduction to RESTFul Web Services, HTTP Request & Response Header, HTTP Methods, Publishing and Consuming Rest based XML Web Services, Publishing and Consuming REST based JSON web services, Exploring JAX-RS through Jersey APIs: javax.ws.rs.*.

Text Books:
1. Java, How to Program, 9th Edition, Dieitel & Deitel, 2012.
2. Java Web Services: Up and Running, 2nd Edition by Martin Kalin, 2013, Orielly Media.
3. Java XML and JSON, 2nd Edition, Jeff Friesen, Apress.

Reference Books:
1. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.
2. Building web Services with Java, 2nd Edition, S. Graham and others, Pearson Education.
3. Java Web Services, D.A. Chappell & T. Jewell, O'Reilly, SPD.

Subject Code	Subject Name	L	T	P	C
R20BSH-OE 3201	**Operation Research** **(Open Elective/Job Oriented Elective-2)**	**3**	**0**	**0**	**3**

OBJECTIVEs:
- Identify and develop operational research models from the verbal description of the real system.
- Understand the mathematical tools that are needed to solve optimization problems.
- Use mathematical software to solve the proposed models.
- Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering

COURSE OUTCOME: students are able to learn
1. Methodology of Operations Research.
2. Linear programming: solving methods, duality, and sensitivity analysis.
3. Integer Programming.
4. Network flows.
5. Multi-criteria decision techniques.
6. Decision making under uncertainty and risk.
7. Game theory. Dynamic programming.

UNIT-I:
Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions.

UNIT-II:
Transportation Problem. Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method

UNIT-III:
Assignment model. Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem and assignment problem Sequencing models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines – Processing n Jobs through m Machines

UNIT-IV:
Dynamic programming. Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems Games Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games

UNIT-V:
Replacement Models. Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy

Text Books:
1. P. Sankara Iyer,"Operations Research", Tata McGraw-Hill, 2008.
2. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

Reference Books:

1. J K Sharma. "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
2. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.
3. J K Sharma., "Operations Research, Problems and Solutions, 3e", Macmillan India Ltd.
4. N.V.S. Raju, "Operations Research", HI-TECH, 2002

Subject Code	Subject Name	L	T	P	C
R20ECE-OE 3204	**Internet of Things (Open Elective)**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
- Identify problems that are amenable to give solution by IOT Technology.
- IoT Framework for Design Principles for Connected Devices.
- Implement various Business Models for Business Processes in the Internet of Things.
- Design and carry out an empirical evaluation of different algorithms on problem formalization

COURSE OUTCOMES:
1. Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things
2. Conceptually identify vulnerabilities, including recent attacks, involving the Internet of Things
3. Develop critical thinking skills.
4. Compare and contrast the threat environment based on industry and/or device type

UNIT - I:

The Internet of Things: An Overview of Internet of things,Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples OF IoTs, Design Principles For Connected Devices

UNIT – II:

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT – III:

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT– IV:

Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT–V:

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

TEXTBOOKS:
1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

REFERNCE BOOKS:
1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things CunoPfister , OreillyML

Subject Code	Subject Name	L	T	P	C
R20CSE-OE3207	Machine Learning (Open Elective/Job Oriented Elective-2)	**3**	**0**	**0**	**3**

Course Objectives:
- Familiarity with a set of well-known supervised, unsupervised and semi-supervised learning algorithms.
- The ability to implement some basic machine learning algorithms.
- Understanding of how machine learning algorithms are evaluated.

Course Outcomes:
1. Recognize the characteristics of machine learning that make it useful to real-world Problems.
2. Characterize machine learning algorithms as supervised, semi-supervised and Unsupervised.
3. Have heard of a few machine learning toolboxes.
4. Be able to use support vector machines.
5. Be able to use regularized regression algorithms.
6. Understand the concept behind neural networks for learning non-linear functions.

UNIT -I:

The ingredients of machine learning, Tasks: the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning. Binary classification and related tasks: Classification, Scoring and ranking, Class probability estimation

UNIT-II:

Beyond binary classification: Handling more than two classes, Regression, Unsupervised and descriptive learning. Concept learning: The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts

UNIT-III:

Tree models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. Rule models: Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning

UNIT -IV:

Linear models: The least-squares method, The perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, obtaining probabilities from linearclassifiers, Going beyond linearity with kernel methods.Distance Based Models: Introduction, Neighbours and exemplars, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering.

UNIT- V:

Probabilistic models: The normal distribution and its geometric interpretations, Probabilistic models for categorical data, Discriminative learning by optimising conditional likelihood Probabilistic models with hidden variables. Features: Kinds of feature, Feature transformations, Feature construction and selection. Model ensembles: Bagging and random forests, Boosting

TEXT BOOKS:
1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2. Machine Learning, Tom M. Mitchell, MGH.

REFERENCE BOOKS:
1. Understanding Machine Learning: From Theory toAlgorithms, Shai Shalev-Shwartz, ShaiBen-David, Cambridge.
2. Machine Learning in Action, Peter Harington, 2012, Cengage.

Subject Code	Subject Name	L	T	P	C
R20CIT-PC 3204	Data Mining and Data Ware House Lab	3	0	0	3

Course Objective:
- Practical exposure on implementation of well known data mining tasks.
- Exposure to real life data sets for analysis and prediction.
- Learning performance evaluation of data mining algorithms in a supervised and An unsupervised setting.
- Handling a small data mining project for a given practical domain.

Course Outcomes:
1. Understand the Environment of weka tool and prepare Data sets.
2. Understand various pre-processing Techniques.
3. Analyze Various classification Algorithms.
4. Apply the Association rule mining to various data sets to Extract Patterns.
5. Analyze various clustering Algorithms.

Experiments:
1. Demonstration of preprocessing on dataset student.arff
2. Demonstration of preprocessing on dataset labor.arff
3. Demonstration of classification rule process on dataset student.arff using j48 algorithm
4. Demonstration of classification rule process on dataset employee.arff using j48 algorithm
5. Demonstration of classification rule process on dataset employee.arff using id3 algorithm
6. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm
7. Demonstration of Association rule process on dataset contactlenses.arff using a priori algorithm
8. Demonstration of Association rule process on dataset test.arff using apriori algorithm
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means
10. Demonstration of clustering rule process on dataset student.arff using simple k-means.

Subject Code	Subject Name	L	T	P	C
R20CIT-PC3205	**Compiler Design Lab**	**3**	**0**	**0**	**3**

Course Objectives:
- Teach the design and development of lexical analyzer
- Teach the design and development of parser
- Describe the concept of lex tool.
- Explain code optimization techniques.

Course Outcomes: Student should be able to.
1. Acquire knowledge on designing lexical analyzer.
2. Acquire knowledge on designing parsers.
3. Implement lex program using LEX tool.
4. Understand the techniques of loop unrolling and constant propagation.

Lab Programs

1. Design a lexical analyzer for given language
2. Simulate First and Follow of a Grammar.
3. Develop an operator precedence parser for a given language.
4. Construct a recursive descent parser for an expression.
5. Construct a LL (1) parser for an expression
6. Design predictive parser for the given language
7. Implementation of shift reduce parsing algorithm.
8. Design a LALR bottom-up parser for the given language.
9. Implement the lexical analyzer using lex tools.
10. Write a program to perform loop unrolling.
11. Write a program for constant propagation.

Subject Code	Subject Name	L	T	P	C
R20CIT-PC3206	**Software Testing Methodologies Lab**	0	0	3	1.5

OBJECTIVES:
- Demonstrate the UML diagrams with ATM system descriptions.
- Demonstrate the working of software testing tools with c language.
- Study of testing tools- win runner, selenium etc.
- Writing test cases for various applications

COURSE OUTCOMES: Student should be able to.
1. Find practical solutions to the problems
2. Solve specific problems alone or in teams
3. Manage a project from beginning to end
4. Work independently as well as in teams
5. Define, formulate and analyze a problem

Programs

- Write programs in 'C' Language to demonstrate the working of the following constructs:
  - do...while
  - while....do
  - if...else
  - switch
  - for
- "A program written in 'C' language for Matrix Multiplication fails" Introspect the causes for

its failure and write down the possible reasons for its failure.

- Take any system (e.g. ATM system) and study its system specifications and report the various bugs.
- Write the test cases for any known application (e.g. Banking application).
- Create a test plan document for any application (e.g. Library Management System)
- Study of Win Runner Testing Tool and its implementation
a) Win runner Testing Process and Win runner User Interface.
b) How Win Runner identifies GUI(Graphical User Interface) objects in an application and describes the two modesfor organizing GUI map files.
c) How to record a test script and explains the basics of Test Script Language (TSL).
d) How to synchronize a test when the application responds slowly.
e) How to create a test that checks GUI objects and compare the behaviour of GUI objects in different versions of the sample application.
f) How to create and run a test that checks bitmaps in your application and run the test on different versions ofthe sample application and examine any differences, pixel by pixel.
g) How to Create Data-Driven Tests which supports to run a single test on several sets of data from a data table.
h) How to read and check text found in GUI objects and bitmaps.
i) How to create a batch test that automatically runs the tests.
j) How to update the GUI object descriptions which in turn supports test scripts as
k) the application changes.
- Apply Win Runner testing tool implementation in any real time applications.

Subject Code	Subject Name	L	T	P	C
R20CIT-SC3201	DJango Framework (Skill Oriented Course-4)	3	0	0	3

Course Objectives:
- Understand the fundamentals of DJango Framework.
- Creating basic Templates for Client side web pages.
- Create DJango model objects for generating data processing.
- Understand DJango Forms for input processing and signals for profiles.
- Implement Serializers and Models using Rest APIs.

Course Outcomes:
1. Understand the environment of DJango Web Server Framework.
2. Create URLMappings and Views using Templates.
3. Create DJango models for processing data from templates.
4. Understand DJango Forms and Signals.
5. Implement Restfull APIs using DJango Rest Framework

Unit 1:
Django Frame Work- Introduction to DJango, Features of DJango, Application areas of DJango, Flask vs DJango, DJango Components, Install and Configure DJango Components.

Unit 2:
Django Templates: URLs, Views, Static Files, Images, Forms, Application development using Templates, Template Objects, tags, Filters, Loops and Inheritance.

Unit 3:
Django Models: Introduction to DJango Models, Admin Panel, Database Relationships, One-One, One- Many, Many-Many, Model Queries, Rendering Data to Templates, Dynamic URLs and Routing, CRUD operations.

Unit 4:
Dynamic Forms & Signals: Inline Form sets, Search Forms, User Registration and Login Authentication, User Roles & Permissions, User Profiles, Image Upload, DJango Signals, Creating customer profiles with DJango

Unit 5:
Django Rest Frame Work: Introduction to DJango Rest Framework**,** Features of Rest APIs, Installation of DJango Rest Framework, api_view, Response, JSONResponse, Models and Serializers, PATH and urlpatterns, HTTP methods GET, POST, PUT and DELETE methods

Text Books:
1. DJango RESTful Web Services: The easiest way to build Python RESTful APIs by Gaston C Hillar ,
2. Building Website with DJango, 1 Edition, by Awanish Ranjan

Reference Books:
1. Light Weight DJango by O'Reilly Media, by Julia Elman and Mark Lavin
2. Python Web Development with DJango, by O'Reilly – Paul Bissex and Jeff Forcier

Subject Code	Subject Name	L	T	P	C
R20BSH-MC3203	Intellectual Property Rights & Patents (Mandatory Course)	2	0	0	0

Course Objectives:
- To impart knowledge of Intellectual property rights on trademarks, copyrights and patents and also agencies responsible for IPR
- To create the awareness of copyright law and various rights acquired by the owner or original creators.
- To illustrate the patent law, registration process and grants, protects in India and abroad.
- To explain the significance of trademark and service mark in business Organisations and its infringement.
- To assess and maintain the protection of trade secret in the organisation and also emerging trends in cyber security and cybercrimes.

Course Outcomes:
At the end of the course, student will be able to:
1. Understand Intellectual Property Law, Innovations and Inventions of Trade related Intellectual Property Rights (L2)
2. Understand the principles and rights afforded by Copyright (L2)
3. Understand the Patent Requirements, Patent Law, Infringement and Litigation (L2)
4. Outline the registration Processes of Trade Mark and Dilution of Ownership of Trade mark (L2)
5. State the main ideas of Employee Confidentiality Agreement and Trade Secret Litigation and also identify the legal procedures to prevent cybercrimes. (L2)

UNIT-I

Introduction to Intellectual Property Rights (IPR): Introduction to IPRs, Basic concepts and need for Intellectual Property – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR IPR Tool Kit - Agencies for IPR Registration – Emerging trends in IPR - Use and Misuse of Intellectual Property Rights

Application: Applicability and relativity between elements of Intellectual property rights and creating innovative ideas.

Learning Outcomes:
At the end of this unit student will be able to:
- Understand the knowledge about the elements of IPR (L2)
- Learn International Instruments and emerging areas of IPR (L1)
- List the Agencies responsible for Registration and laws related to IPR (L1)

UNIT-II

Copyrights and Neighboring Rights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights Subject Matters of Copyright – Copyright Ownership – Transfer and Duration. Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Semiconductor Chip Protection Act.

Application: Practice of copyrights case and Identification of the infringement to the owner of the copyright.

Learning Outcomes:
At the end of this unit student will be able to:
- Understand how one can generate economic wealth through copyrights (L2)
- Understand the importance of protection, promotion and enforcement of copy rights (L2)

- List the limitations and Infringement of Copyrights (L2)

UNIT-III

Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Patent Search - Patent Registration and Granting of Patent - Ownership and Transfer — Infringement of Patent Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

Application: Checking the eligibility for several patents and suggest remedies for problems through case study.

Learning Outcomes:

At the end of this unit student will be able to:
- Demonstrate the registration process of Patents (L2)
- Understand the infringement of patents and their remedies (L2)
- Contrast Patents, Software protection and Computer related Innovations (L2)

UNIT-IV

Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies- Case study.

Application: Compare and contrast different trademarks and know how to register trademark

Learning Outcomes:

At the end of this unit student will be able to:
- Demonstrate registration and maintenance of trademarks (L2)
- Illustrate procedure for trademark claims (L2)
- Understand transfer of rights in Trademarks (L2)

UNIT-V

Trade Secrets & Cyber Law: Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Confidentiality Agreements – Breach of Contract – Trade Secret Litigation .

Cyber Law and Cyber Crime: Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - Cyber Crimes - Prevention and Punishment - Case study.

Application:
- Adapt how to protect trade secret physically and from the employees of the organization.
- Choose and exhibit various securities to access like biometrics, login passwords, facial recognition, UID number, which protects the individual properties

Learning Outcomes:

At the end of this unit student will be able to:
- Understand the level of physical security (L2)
- Outline Employee Confidentiality Agreements (L2)
- Explain about the prevention and punishment of cybercrimes (L2)
- Understand the various levels of liability of network providers (L2)

Text Books:

1. Fundamentals of IPR for Engineers- Kompal Bansal &Parishit Bansal, B. S. Publications,2013
2. Intellectual Property -Deborah E.Bouchoux ,Cengage Learning, New Delhi.,2012

References Books:

1. Intellectual property rights- PrabuddhaGanuli., Tata Mcgraw hill, 2012.
2. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012

Web links:

1. http://www.ipindia.gov.in/patents.htm
2. htttp://www.ipindia.gov.in/trade-marks.htm
3. https://copyright.gov.in/
4. http://www.wipo.int/portal/en/index.html
5. https://indiankanoon.org/