Syllabus of
UNDERGRADUATE DEGREE COURSE

B.Tech. V Semester

Computer Science and Engineering

Rajasthan Technical University, Kota
Effective from session: 2019 – 2020

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus
III Year-V Semester: B.Tech. Computer Science and Engineering

5CS3-01: Information Theory & Coding

Credit: 2   **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P   **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:**Objective, scope and outcome of the course.	01
2	**Introduction to information theory:** Uncertainty, Information and Entropy, Information measures for continuous random variables, source coding theorem. Discrete Memory less channels, Mutual information, Conditional entropy.	05
3	**Source coding schemes for data compaction:** Prefix code, Huffman code, Shanon-Fane code &Hempel-Ziv coding channel capacity. Channel coding theorem. Shannon limit.	05
4	**Linear Block Code:** Introduction to error connecting codes, coding & decoding of linear block code, minimum distance consideration, conversion of non-systematic form of matrices into systematic form.	05
5	**Cyclic Code:** Code Algebra, Basic properties of Galois fields (GF) polynomial operations over Galois fields, generating cyclic code by generating polynomial, parity check polynomial. Encoder & decoder for cyclic codes.	06
6	**Convolutional Code:** Convolutional encoders of different rates. Code Tree, Trllis and state diagram. Maximum likelihood decoding of convolutional code: The viterbi Algorithm fee distance of a convolutional code.	06
	Total	28

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

III Year-V Semester: B.Tech. Computer Science and Engineering

5CS4-02: Compiler Design

Credit: 3   **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P   **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction:** Objective, scope and outcome of the course. Compiler, Translator, Interpreter definition, Phase of compiler, Bootstrapping, Review of Finite automata lexical analyzer, Input, Recognition of tokens, Idea about LEX: A lexical analyzer generator, Error handling.	06
3	**Review of CFG Ambiguity of grammars:** Introduction to parsing. Top down parsing, LL grammars & passers error handling of LL parser, Recursive descent parsing predictive parsers, Bottom up parsing, Shift reduce parsing, LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar. Operator precedence parsing, Introduction of automatic parser generator: YACC error handling in LR parsers.	10
4	**Syntax directed definitions;** Construction of syntax trees, S-Attributed Definition, L-attributed definitions, Top down translation. Intermediate code forms using postfix notation, DAG, Three address code, TAC for various control structures, Representing TAC using triples and quadruples, Boolean expression and control structures.	10
5	**Storage organization;** Storage allocation, Strategies, Activation records, Accessing local and non-local names in a block structured language, Parameters passing, Symbol table organization, Data structures used in symbol tables.	08
6	**Definition of basic block control flow graphs;** DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG.	07
	Total	42

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA
Syllabus
III Year-V Semester: B.Tech. Computer Science and Engineering

5CS4-03: Operating System

Credit: 3   **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P   **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction and History of Operating systems:** Structure and operations; processes and files Processor management: inter process communication, mutual exclusion, semaphores, wait and signal procedures, process scheduling and algorithms, critical sections, threads, multithreading	04
3	**Memory management:** contiguous memory allocation, virtual memory, paging, page table structure, demand paging, page replacement policies, thrashing, segmentation, case study	05
4	**Deadlock:** Shared resources, resource allocation and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms **Device management:** devices and their characteristics, device drivers, device handling, disk scheduling algorithms and policies	15
5	**File management:** file concept, types and structures, directory structure, cases studies, access methods and matrices, file security, user authentication	07
6	**UNIX and Linux operating systems as case studies;** Time OS and case studies of Mobile OS	08
	Total	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA
Syllabus
III Year-V Semester: B.Tech. Computer Science and Engineering

5CS4-04: Computer Graphics & Multimedia

Credit: 3   **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P   **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Basic of Computer Graphics:**Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards	06
3	**Graphics Primitives:**Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers. Aliasing, and introduction to Anti Aliasing (No anti aliasing algorithm).	07
4	**Two Dimensional Graphics:**Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping	08
5	**Three Dimensional Graphics:**3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces.3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.	08
6	**Illumination and Colour Models:**Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection.	06
7	**Animations &Realism:**Design of Animation sequences – animation function – raster animation – key frame systems – motion specification – morphing – tweening. **ComputerGraphics Realism:** Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing.	06
	Total	42

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

III Year-V Semester: B.Tech. Computer Science and Engineering

5CS4-05: Analysis of Algorithms

Credit: 3   **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P   **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Background**: Review of Algorithm, Complexity Order Notations: definitions and calculating complexity. **Divide And Conquer Method**: Binary Search, Merge Sort, Quick sort and Strassen's matrix multiplication algorithms.	06
3	**Greedy Method**: Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees. **Dynamic Programming**: Matrix Chain Multiplication. Longest CommonSubsequence and 0/1 Knapsack Problem.	10
4	**Branch And Bound**: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem. **Pattern Matching Algorithms**: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.	08
5	**Assignment Problems:** Formulation of Assignment and Quadratic Assignment Problem. **Randomized Algorithms-** Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2- SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems.	08
6	**Problem Classes Np, Np-Hard And Np-Complete:** Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems.Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover andSet Cover Problem.	08
	Total	41

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus
III Year-V Semester: B.Tech. Computer Science and Engineering

5CS5-11: Wireless Communication

Credit: 2   **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P   **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Wireless Channels:**Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters-Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.	06
3	**Cellular Architecture:** Multiple Access techniques - FDMA, TDMA, CDMA – Capacity calculations–Cellular concept- Frequency reuse - channel assignment- hand off- interference & system capacity- trunking & grade of service – Coverage and capacity improvement.	05
4	**Digital Signaling For Fading Channels:** Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.	05
5	**Multipath Mitigation Techniques:** Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macrodiversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver,	06
6	**Multiple Antenna Techniques:** MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information- capacity in fading and non-fading channels.	05
	Total	28

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA
Syllabus
III Year-V Semester: B.Tech. Computer Science and Engineering

5CS5-12: Human Computer Interaction

Credit: 2   **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P   **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	Historical evolution of the field, Interactive system design, Concept of usability -definition and elaboration, HCI and software Engineering, GUI design and Aesthetics, Prototyping techniques.	02
2	**Model-based Design and evaluation:** Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Fitts' law and Hick-Hyman's law, Model-based design case studies,	03
3	**Guidelines in HCI:**Shneiderman's eight, golden rules, Norman's seven principles, Norman's model of interaction, Nielsen's ten heuristics with example of its use Heuristic evaluation, Contextual inquiry, Cognitive walkthrough	05
4	**Empirical research methods in HCI:** Introduction (motivation, issues, research question formulation techniques), Experiment design and data analysis (with explanation of one-way ANOVA)	06
5	**Task modelling and analysis:** Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT),ʃintroduction to formalism in dialog design, design using FSM (finite state machines) State charts and (classical) Petri Nets in dialog design	06
6	**Introduction to CA**, CA types, relevance of CA in IS design Model Human Processor (MHP), OOP- Introduction OOM- Object Oriented Modeling of User Interface Design	05
	Total	28

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

III Year-V Semester: B.Tech. Computer Science and Engineering

5CS5-13: Bioinformatics

Credit: 2 Max. Marks: 100(IA:20, ETE:80)

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction:** Basics of biology	02
3	**Sequences:** Problem Statement, Edit distance and substitution matrices, HMMs and pairwise HMMs, Global and local alignments, Spliced alignment, Space-efficient sequence alignment, Multiple alignment, Database searching tools, Sequence by hybridization, Profile HMMs	07
4	**Structures:** Protein structure alignment, Protein structure prediction	06
5	**Phylogenetic trees:** Large parsimony and small parsimony problems, Probabilistic approaches, Grammar-based approaches	07
6	**Miscellaneous topics:** Pathways and networks, Microarrays, Biomedical images	05
	Total	28

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus
III Year-V Semester: B.Tech. Computer Science and Engineering

5CS4-21: Computer Graphics & Multimedia Lab

Credit: 1   **Max. Marks:50 (IA:30, ETE:20)**
0L+0T+2P   **End Term Exam: 2 Hours**

SN	List of Experiments
1	Implementation of Line, Circle and ellipse attributes
2	To plot a point (pixel) on the screen
3	To draw a straight line using DDA Algorithm
4	Implementation of mid-point circle generating Algorithm
5	Implementation of ellipse generating Algorithm
6	Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear
7	Composite 2D Transformations
8	Cohen Sutherland 2D line clipping and Windowing
9	Sutherland – Hodgeman Polygon clipping Algorithm
10	Three dimensional transformations - Translation, Rotation, Scaling
11	Composite 3D transformations
12	Drawing three dimensional objects and Scenes
13	Generating Fractal images

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus
III Year-V Semester: B.Tech. Computer Science and Engineering

5CS4-22: Compiler Design Lab

Credit: 1   **Max. Marks:50 (IA:30, ETE:20)**
0L+0T+2P   **End Term Exam: 2 Hours**

SN	List of Experiments
1	Introduction: Objective, scope and outcome of the course.
2	To identify whether given string is keyword or not.
3	Count total no. of keywords in a file. [Taking file from user]
4	Count total no of operators in a file. [Taking file from user]
5	Count total occurrence of each character in a given file. [Taking file from user]
6	Write a C program to insert, delete and display the entries in Symbol Table.
7	Write a LEX program to identify following: 1. Valid mobile number 2. Valid url 3. Valid identifier 4. Valid date (dd/mm/yyyy) 5. Valid time (hh:mm:ss)
8	Write a lex program to count blank spaces,words,lines in a given file.
9	Write a lex program to count the no. of vowels and consonants in a C file.
10	Write a YACC program to recognize strings aaab,abbb using $a^n b^n$, where b>=0.
11	Write a YACC program to evaluate an arithmetic expression involving operators +,-,* and /.
12	Write a YACC program to check validity of a strings abcd,aabbcd using grammar $a^n b^n c^m d^m$, where n , m>0
13	Write a C program to find first of any grammar.

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus
III Year-V Semester: B.Tech. Computer Science and Engineering

5CS4-23: Analysis of Algorithms Lab

Credit: 1   **Max. Marks:50 (IA:30, ETE:20)**
0L+0T+2P   **End Term Exam: 2 Hours**

SN	List of Experiments
1	Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
2	Implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3	a. Obtain the Topological ordering of vertices in a given digraph. b. Compute the transitive closure of a given directed graph using Warshall's algorithm.
4	Implement 0/1 Knapsack problem using Dynamic Programming.
5	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
6	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
7	a. Print all the nodes reachable from a given starting node in a digraph using BFS method. b. Check whether a given graph is connected or not using DFS method.
8.	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
9.	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
10	Implement N Queen's problem using Back Tracking.

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA
Syllabus
III Year-V Semester: B.Tech. Computer Science and Engineering

5CS4-24: Advance Java Lab

Credit: 1   **Max. Marks:50 (IA:30, ETE:20)**
L+0T+2P   **End Term Exam: 2 Hours**

SN	List of Experiments
1	Introduction To Swing, MVC Architecture, Applets, Applications and Pluggable Look and Feel, Basic swing components : Text Fields, Buttons, Toggle Buttons, Checkboxes, and Radio Buttons
2	Java database Programming, java.sql Package, JDBC driver, Network Programming With java.net Package, Client and Server Programs, Content And Protocol Handlers
3	RMI architecture, RMI registry, Writing distributed application with RMI, Naming services, Naming And Directory Services, Overview of JNDI, Object serialization and Internationalization
4	J2EE architecture, Enterprise application concepts, n-tier application concepts, J2EE platform, HTTP protocol, web application, Web containers and Application servers
5	Server side programming with Java Servlet, HTTP and Servlet, Servlet API, life cycle, configuration and context, Request and Response objects, Session handling and event handling, Introduction to filters with writing simple filter application
6	JSP architecture, JSP page life cycle, JSP elements, Expression Language, Tag Extensions, Tag Extension API, Tag handlers, JSP Fragments, Tag Files, JSTL, Core Tag library, overview of XML Tag library, SQL Tag library and Functions Tag library

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