Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. V Semester

Computer Science and Engineering (Cyber Security)

Rajasthan Technical University, Kota

Effective from session: 2021-22 onwards

5CCS3-01: Information Theory & Coding

Credit: 2 **Max. Marks: 100 (IA:30, ETE:70)**
2L+0T+0P **End Term Exam: 3 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

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

III Year-V Semester: B.Tech. Computer Science and Engineering (Cyber Security)

5CCS4-02: Compiler Design

Credit: 3 **Max. Marks: 100 (IA:30, ETE:70)**

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

5CCS4-03: Operating System

Credit: 3 **Max. Marks: 100 (IA:30, ETE:700)**

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

5CCS4-04: Computer Graphics & Multimedia

Credit: 3 **Max. Marks: 100 (IA:30, ETE:70)**
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

5CCS4-05: Analysis of Algorithms

Credit: 3 **Max. Marks: 100 (IA:30, ETE:70)**
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

5CCS5-11: Cyber Space Operations and Design

Credit: 2 **Max. Marks: 100 (IA:30, ETE:70)**
2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Understanding the Cyberspace Environment and Design :**Cyberspace environment and its characteristics, Developing a design approach, Planning for cyberspace operation. Cyberspace Operational Approaches-Foundational approaches that utilize cyberspace capabilities to support organizational missions, The pros, and cons of the different approaches.	6
3	**Cyberspace Operations :** Network Operations (NETOPS), Defensive Cyberspace Operations (DCO), Offensive Cyberspace Operations (OCO), Defense and Diversity of Depth network design, Operational methodologies to conduct cyberspace operations.	6
4	**Cyberspace Integration :** Design a cyberspace operation and integrate it with a Joint Operations plan, Practice the presented methodologies in a practical application exercise.	5
5	**Building Cyber Warriors and Warrior Corps :** The warrior and warrior corps concept as applied to cyber organizations, The challenges of training and developing a cyber-workforce from senior leadership to the technical workforce.	7
6	**Designing Cyber Related Commands :** Mission statements, Essential tasks, Organizational structures, Tables of organizations Training and Readiness for Cyber Related Commands Mission Essential Tasks (METs), Developing the cyber workforce, Plan your own training programs within your organization.	7
	Total	32

TEXT BOOK	
1	Paulo Shakarian et al. "Introduction of Cyber Warfare: A Multidisciplinary Approach," syngress, Elsevier 2013.
2	Jeffery carr et al, "Inside Cyber Warfare: Mapping the Cyber Underworld," O'Reilly Publication December 2012.
3	Jason Andress et al. "Cyber Warfare: Techniques, Tactics and Tools for Security Practitioners" Syngress, Elsevier 2013.
4	R. A. Clarke, Robert Knake "Cyber War: The Next Threat to National Security and What to Do About It" Haper Collins Publisher 2010.

5CCS5-12: Digital Forensics and Incident Response

Credit: 2 **Max. Marks: 100 (IA:30, ETE:70)**

2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Forensics Overview:** Computer Forensics Fundamentals, Benefits of Computer Forensics, Computer Crimes, Computer Forensics Evidence and the Courts, Legal Concerns and Privacy Issues Forensics Process: Forensics Investigation Process, Securing the Evidence and Crime Scene, Chain of Custody, Law Enforcement Methodologies.	8
2	**Forensic Evidence:** Sources, Evidence Duplication, Preservation, Handling, and Security, Forensics Soundness, Order of Volatility of Evidence, Collection of Evidence on a Live System, Court Admissibility of Volatile Evidence.	6
3	**Acquisition and Duplication:** Sterilizing Evidence Media, Acquiring Forensics Images, Acquiring Live Volatile Data, Data Analysis, Metadata Extraction, File System Analysis, Performing Searches, and Recovering Deleted, Encrypted, and Hidden files, Internet Forensics, Reconstructing Past Internet Activities and Events, E-mail Analysis, Messenger Analysis: AOL, Yahoo, MSN, and Chats.	8
4	**Mobile Device Forensics:** Evidence in Cell Phone, PDA, Blackberry, iPhone, iPod, and MP3. Evidence in CD, DVD, Tape Drive, USB, Flash Memory, Digital Camera, Court Testimony, Testifying in Court, Expert Witness Testimony, Evidence Admissibility.	7
	Total	30

TEXT BOOK	
1	Jason Luttgens, Matthew Pepe, Kevin Mandia, Incident Response & Computer Forensics, McGraw-Hill Osborne Media, 3 rdediton, 2014.
2	Keith J. Jones, Richard Bejtlich, Curtis W. Rose, Real Digital Forensics: Computer Security and Incident Response, Paperback – Import, 2005.
3	John Sammons, The Basics of Digital Forensics: The Primer for Getting Started in Digital• Forensics Paperback, February 24, 2012.
4	Hacking Exposed: Network Security Secrets & Solutions, Stuart McClure, Joel Scambray and George Kurtz, McGraw-Hill, 2005.

5CCS5-13: Bioinformatics

Credit: 2 **Max. Marks: 100 (IA:30, ETE:70)**
2L+0T+0P **End Term Exam: 3 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

5CCS4-21: Computer Graphics & Multimedia Lab

Credit: 1 **Max. Marks: 100 (IA:60, ETE:40)**
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

5CCS4-22: Compiler Design Lab

Credit: 1 **Max. Marks: 100 (IA:60, ETE:40)**
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^nb^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^nb^nc^md^m, where n , m>0
13	Write a C program to find first of any grammar.

5CCS4-23: Analysis of Algorithms Lab

Credit: 1 **Max. Marks: 100 (IA:60, ETE:40)**
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.

5CCS4-24: Advance Java Lab

Credit: 1 **Max. Marks: 100 (IA:60, ETE:40)**
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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6CCS3-01: Digital Image Processing

Credit: 2 **Max. Marks: 100 (IA:30, ETE:70)**
2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to Image Processing:** Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation.	04
3	**Image Transformation & Filtering:** Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, colour models, Pseudo colouring, colour transforms, Basics of Wavelet Transforms.	06
4	**Image Restoration:** Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering.	07
5	**Image Compression:** Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.	05
6	**Image Segmentation & Representation:** Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors.	05
	Total	28

6CCS4-02: Machine Learning

Credit: 3 **Max. Marks: 100 (IA:30, ETE:70)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Supervised learning algorithm:** Introduction, types of learning, application, Supervised learning: Linear Regression Model, Naive Bayes classifier Decision Tree, K nearest neighbor, Logistic Regression, Support Vector Machine, Random forest algorithm	09
3	**Unsupervised learning algorithm:** Grouping unlabelled items using k-means clustering, Hierarchical Clustering, Probabilistic clustering, Association rule mining, Apriori Algorithm, f-p growth algorithm, Gaussian mixture model.	08
4	**Introduction to Statistical Learning Theory**, Feature extraction - Principal component analysis, Singular value decomposition. Feature selection – feature ranking and subset selection, filter, wrapper and embedded methods, Evaluating Machine Learning algorithms and Model Selection.	08
5	**Semi supervised learning, Reinforcement learning:** Markov decision process (MDP), Bellman equations, policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State-Action-Reward-State-Action (SARSA), Model-based Reinforcement Learning.	08
6	**Recommended system,** Collaborative filtering, Content-based filtering Artificial neural network, Perceptron, Multilayer network, Backpropagation, Introduction to Deep learning.	08
	Total	42

6CCS4-03: Information Security System

Credit: 2 **Max. Marks: 100 (IA:30, ETE:70)**
2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to security attacks:** services and mechanism, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers.	06
3	**Modern block ciphers**: Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation. Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode.	06
4	**Public Key Cryptosystems with Applications:** Requirements and Cryptanalysis, RSA cryptosystem, Rabin cryptosystem, Elgamal cryptosystem, Elliptic curve cryptosystem.	06
5	**Cryptographic Hash Functions, their applications:** Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA). Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers. Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm.	05
6	**Key management and distribution:** symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure. Remote user authentication with symmetric and asymmetric encryption, Kerberos Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH.	04
	Total	28

6CCS4-04: Computer Architecture and Organization

Credit: 3 **Max. Marks: 100 (IA:30, ETE:70)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Computer Data Representation:** Basic computer data types, Complements, Fixed point representation, Register Transfer and Micro-operations: Floating point representation, Register Transfer language, Register Transfer, Bus and Memory Transfers (Tree-State Bus Buffers, Memory Transfer), Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logical shift unit. Basic Computer Organization and DesignInstruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.	10
3	**Programming The Basic Computer:** Introduction, Machine Language, Assembly Language, assembler, Program loops, Programming Arithmetic and logic operations, subroutines, I-O Programming. Micro programmed Control: Control Memory, Address sequencing, Micro program Example, design of control Unit	7
4	**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC)Pipeline And Vector Processing, Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors	8
5	**Computer Arithmetic:** Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit. Input-Output Organization, Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPUIOP Communication, Serial communication.	8
6	**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. Multipreocessors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence, Shared Memory Multiprocessors.	8
	Total	42

6CCS4-05: Artificial Intelligence

Credit: 2 **Max. Marks: 100 (IA:30, ETE:70)**
2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to AI and Intelligent agent:** Different Approach of AI, Problem Solving : Solving Problems by Searching, Uninformed search, BFS, DFS, Iterative deepening, Bi directional search, Hill climbing, Informed search techniques: heuristic, Greedy search, A* search, AO* search, constraint satisfaction problems.	03
3	**Game Playing:** Minimax, alpha-beta pruning, jug problem, chess problem, tiles problem	06
4	**Knowledge and Reasoning:** Building a Knowledge Base: Propositional logic, first order logic, situation calculus. Theorem Proving in First Order Logic. Planning, partial order planning. Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks.	06
5	**Learning:** Overview of different forms of learning, Supervised base learning: Learning Decision Trees, SVM, Unsupervised based learning, Market Basket Analysis, Neural Networks.	07
6	**Introduction to Natural Language Processing:** Different issue involved in NLP, Expert System, Robotics.	05
	Total	28

6CCS4-06: Block Chain & Cyber Security

Credit: 3 **Max. Marks: 100 (IA:30, ETE:70)**

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

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction Block chain:** History, Definition, Types of Block chain, Hash Functions, Properties of Hash Function, Digital Signature, Working of Block chain, Issues and needs of Block chain, Benefits and Challenges of Block chain, features of Block chain, Block chain Network and Nodes, Peer-to-Peer Network.	07
3	**Block chain Architecture:** Mining Mechanism, Life cycle of Block chain, Merkle Patricia Tree, Gas Limit, Transaction Fees, Anonymity, Reward, Chain policy, Applications of Block chain, Fork and its Types, Generic elements of Block chain, Cryptography in Block chain, Nash Equilibrium, Prisner's Dilemma, ZeroSum Games.	07
4	**Introduction to Cybercrime and Laws:** Definition and Origins of Cybercrime, information Security, Who are Cybercriminals? Classifications of Cybercrimes. How Criminals Plan Them – Introduction, How Criminals Plan the Attacks, Cyber-cafe and Cybercrimes, Bot-nets, Attack Vector, The Indian IT ACT 2000 and amendments.	07
5	**Tools and Methods used in Cybercrime :** Introduction, Proxy Server and Anonymizers, Password Cracking, Key-loggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow.	06
6	**Phishing and Identity Theft:** Introduction, Phishing - Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft – PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life Cycle.	08
7	**Network Defense tools:** Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs. Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System.	08
	Total	44

TEXT BOOK	
1	DejeyNurugan: Cyber forensics, Oxford University Press
2	Jennifer L. Bayuk: Cyber Security, Policy Guide Book, Wiley Publisher
3	Nina Godbole: Cyber Security, Wiley Publisher, Latest Edition
4	Hands-On Cyber security with Block chain by Rajneesh Gupta, Packt Publication, June 2018, ISBN-9781788990189.

6CCS5-11: Cyber Forensic

Credit: 2 **Max. Marks: 100 (IA:30, ETE:70)**
2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to Cyber forensics:** Information Security Investigations, Corporate Cyber Forensics, Scientific method in forensic analysis, investigating large scale Data breach cases. Analyzing Malicious software. Types of Computer Forensics Technology, Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised Internet Tracing Methods, Security and Wireless Technologies, Avoiding Pitfalls with Firewalls Biometric Security Systems.	09
3	**Types of Computer Forensics Systems:** Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Storage Area Network Security Systems, Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless Network Security Systems, Satellite Encryption Security Systems, Instant Messaging (IM) Security Systems, Net Privacy Systems, Identity Management Security Systems, Identity Theft, Biometric Security Systems.	08
4	**Ethical Hacking:** Essential Terminology, Windows Hacking, Malware, Scanning, Cracking. Digital Evidence in Criminal Investigations: The Analog and Digital World, Training and Education in digital evidence, Evidence Collection and Data Seizure: Why Collect Evidence, Collection Options Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody, Reconstructing the Attack, The digital crime scene, Investigating Cybercrime, Duties Support Functions and Competencies.	08
5	**Identification of Data:** Timekeeping, Forensic Identification and Analysis of Technical Surveillance Devices, Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files, Investigating Network Intrusions and Cyber Crime, Network Forensics and Investigating logs, Investigating network Traffic, Investigating Web attacks, Router Forensics. Cyber forensics tools and case studies.	09
	Total	35

TEXT BOOK	
1	John R. Vacca, Computer Forensics: Computer Crime Scene Investigation, 2nd Edition, CharlesRiverMedia, 2005
2	Christof Paar, Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, 2nd Edition, Springer's, 2010
3	Ali Jahangiri, Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers & IT Security Experts, Ali Jahangiri, 2009
4	Computer Forensics: Investigating Network Intrusions and Cyber Crime (Ec-Council Press Series:Computer Forensics), 2010.

6CCS5-12: Intrusion Detection System

Credit: 2 **Max. Marks: 100 (IA:30, ETE:70)**
2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	History of Intrusion detection, Audit, Concept and definition , Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.	05
3	Intrusion Prevention Systems, Network IDs protocol based IDs, Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis, techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, credential analysis non credential analysis.	06
4	Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes.	06
5	Working with Snort Rules, Rule Headers, Rule Options, And The Snort Configuration File etc. Plug-ins, Preprocessors and Output Modules, Using Snort with My SQL.	05
6	Using ACID and Snort Snarf with Snort, Agent development for intrusion detection, Architecture models of IDs and IPs.	05
	Total	28

TEXT BOOK

1	Rafeeq Rehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall , 2003.
2	Christopher Kruegel,Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005.
3	Carl Endorf, Eugene Schultz and Jim Mellander" Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill, 2004.
4	Stephen Northcutt, Judy Novak : "Network Intrusion Detection", 3rd Edition, New Riders Publishing, 2002.
5	T. Fahringer, R. Prodan, "A Text book on Grid Application Development and Computing Environment". 6th Edition, KhannaPublihsers, 2012.

6CCS5-13: Ethical Hacking and Digital Forensics

Credit: 2 **Max. Marks: 100 (IA:30, ETE:70)**
2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction: Objective**, scope and outcome of the course.	01
2	Hacking windows – Network hacking – Web hacking – Password hacking. A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks.	06
3	TCP / IP – Checksums – IP Spoofing port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Firewalls – Packet filter firewalls, Packet Inspection firewalls – Application Proxy Firewalls. Batch File Programming.	07
4	Fundamentals of Computer Fraud – Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process. Architecture strategies for computer fraud prevention – Protection of Web sites – Intrusion detection system – NIDS, HIDS – Penetrating testing process – Web Services – Reducing transaction risks.	07
5	Key Fraud Indicator selection process customized taxonomies – Key fraud signature selection process –Accounting Forensics – Computer Forensics – Journaling and it requirements – Standardized logging criteria – Journal risk and control matrix – Neural networks – Misuse detection and Novelty detection.	07
		28

TEXT BOOK	
1	Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group, 2008.
2	Ankit Fadia " Ethical Hacking" 2nd Edition Macmillan India Ltd, 2006

6CCS4-21: Digital Image Processing Lab

Credit: 1 **Max. Marks: 100 (IA:60, ETE:40)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Point-to-point transformation. This laboratory experiment provides for thresholding an image and the evaluation of its histogram. Histogram equalization. This experiment illustrates the relationship among the intensities (gray levels) of an image and its histogram.
2	Geometric transformations. This experiment shows image rotation, scaling, and translation. Two-dimensional Fourier transform
3	Linear filtering using convolution. Highly selective filters.
4	Ideal filters in the frequency domain. Non Linear filtering using convolutional masks. Edge detection. This experiment enables students to understand the concept of edge detectors and their operation in noisy images.
5	Morphological operations: This experiment is intended so students can appreciate the effect of morphological operations using a small structuring element on simple binary images. The operations that can be performed are erosion, dilation, opening, closing, open-close, close-open.

6CCS4-22: Machine Learning Lab

Credit: 2 **Max. Marks: 100 (IA:60, ETE:40)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Implement and demonstrate the FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples.
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample
4	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
5	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7	Write a program to construct aBayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

6CCS4-23: Python Lab

Credit: 2 **Max. Marks: 100 (IA:60, ETE:40)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Write a program to demonstrate basic data type in python.
2	Write a program to compute distance between two points taking input from the user Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
3	Write a Program for checking whether the given number is an even number or not. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
4	Write a Program to demonstrate list and tuple in python. Write a program using a for loop that loops over a sequence. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
5	Find the sum of all the primes below two million. By considering the terms in the Fibonacci sequence whose values do not exceed four million, WAP to find the sum of the even-valued terms.
6	Write a program to count the numbers of characters in the string and store them in a dictionary data structure Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure
7	Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file? Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
8	Write a program to print each line of a file in reverse order. Write a program to compute the number of characters, words and lines in a file.
9	Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on. Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.
10	Write a program to implement Merge sort. Write a program to implement Selection sort, Insertion sort.

6CCS4-24: Mobile Application Development Lab

Credit: 1 **Max. Marks: 100 (IA:60, ETE:40)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	To study Android Studio and android studio installation. Create "Hello World" application.
2	To understand Activity, Intent, Create sample application with login module.(Check username and password).
3	Design simple GUI application with activity and intents e.g. calculator.
4	Develop an application that makes use of RSS Feed.
5	Write an application that draws basic graphical primitives on the screen
6	Create an android app for database creation using SQLite Database.
7	Develop a native application that uses GPS location information
8	Implement an application that writes data to the SD card.
9	Design a gaming application
10	Create an application to handle images and videos according to size.