Name of Department:- Computer Science and Engineering

1. Subject Code: TIT 704 Course Title: **Cryptography and Network Security**
2. Contact Hours: L: 3 T: - P: -
3. Semester: VII

4. Pre-requisite: TCS 604 Computer Networks - I

5. Course Outcomes: After completion of the course students will be able to

1. Classify security vulnerabilities involved in data communication over Internet and make use of classical algorithms to address the vulnerabilities.
2. Make use of modern block ciphers to secure data transmission and storage
3. Analyze challenges involved in key distribution and select approache that can be adopted
4. Analyze strengths of public key algorithms and explore applications in exchange, authentication and hashing of messages.
5. Appreciate application of algorithms for ensuring access control, authentication, secured transmission of data at different layers.
6. Appraiserisks related to wireless, web, cloud security and measures to be adopted to secure organizational network.

6. Detailed Syllabus

UNIT	CONTENTS	Contact Hrs
Unit – I	Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stenography, stream and block ciphers.	**8**
Unit – II	Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, Modes of operations of block ciphers: ECB, CBC, OFB, CFB, Advanced Encryption Standard (AES) Traffic confidentiality, Key distribution, random numbers, Pseudo random number generation using Linear Congruential and Blum BlumShub algorithms	**10**
Unit – III	Prime and relative prime numbers, modular arithmetic, Primality testing, Euclid's Algorithm for GCD and Extended Euclid's Algorithm for Multiplicative inverse Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm Message Authentication: Requirements, Message Authentication Functions Cryptographic Hash Functions:Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA)-512	**8**
Unit – IV	Authentication Applications: Kerberos and X.509 directory authentication service, electronic mail security-S /MIME	**9**

	IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.	
Unit – V	Wireless Network Security: Wireless Network Threats, Wireless Security Measures, Mobile Device Security, Security Threats and Security Strategy, IEEE 802.11 Wireless LAN Overview, The Wi-Fi Alliance, IEEE 802 Protocol Architecture, IEEE 802.11 Network Components and Architectural Model, IEEE 802.11 Services.Concept of Wireless LAN security and brief of phases of operation Web and Cloud Security: Web Security Considerations, Transport Layer Security, HTTPS,Cloud Security risks and Countermeasures; Data protection in cloud. System Security: The Need for Firewalls, Firewall Characteristics, Types of Firewalls	**10**
	Total	**45**

Text Books:

1. William Stallings, “Cryptography and Network Security: Principals and Practice”, 7th Edition, Pearson, 2017
2. William Stallings, “Network Security Essentials – Applications and Standards”, 4th edition, Pearson Education, 2011

Reference Books

1. Behrouz A Forouzan, Debdeep Mukhopadhyay, “Cryptography and Network Security”Mc-GrawHill, 3rd Edition, 2015
2. Johannes A. Buchmann, “Introduction to Cryptography”, Springer-Verlag, 2012

Name of Department:- Computer Science and Engineering

1. Subject Code: TCS 703 Course Title: **Computer Networks-II**
2. Contact Hours: L: 3 T: - P: -
3. Semester: VII

4. Pre-requisite: TCS 604

5. Course Outcomes: After completion of the course students will be able to

1. Analyze Global and Centralized Routing protocols and utilize tools (such as NS2) to examine routing protocols of LS and DV types
2. Evaluate and select the appropriate technology to meet Data Link Layer requirements
3. Specify the devices, components and technologies to build a cost-effective LAN
4. Appreciate issues for supporting real time and multimedia traffic over public network
5. Describe the key benefited of SDN, in particular those benefits brought about by the separation of data and control planes.
6. Implement client server applications with TCP/UDP Socket Programming

6. Detailed Syllabus

UNIT	CONTENTS	Contact Hrs
Unit - I	Routing Algorithms: Introduction, global vs decentralized routing, The Link State(LS) Routing Algorithm, The Distance Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet: RIP, OSPF, BGP; Introduction to Broadcast and Multicast Routing	**9**
Unit - II	Link Layer and Local Area Networks: Introduction to Link Layer and its services, Where Link Layer is implemented?, Error detection and correction techniques: Parity checks, Checksumming, CRC; Multiple Access protocols: Channel Partitioning, Random Access (Slotted Aloha, Aloha, CSMA), Taking Turns; Link Layer Addressing: MAC addresses, ARP, Ethernet, CSMA/CD, Ethernet Technologies, Link Layer Switches, Switches vs Routers, VLANS	**10**
Unit – III	Multimedia Networking: Introduction, Streaming Stored Audio and Video, Real Time Streaming Protocol(RTSP), Making the Best of the Best Effort Services, Protocols for Real Time Interactive Applications: RTP, RTCP, SIP, H.323; Providing multiple classes of service.	**9**
Unit – IV	Generalized forwarding and SDN Match , Action, Open flow, SDN Control Plane , SDN controller and SDN control Application , Open flow protocol, Data and control plane Interaction , SDN : PAST and FUTURE.	**9**
Unit – V	Network Programming: Sockets-Address structures, TCP sockets, creating sockets, bind, listen, accept, fork and exec function, close function; TCP client server: Echo server, normal startup, terminate and signal handling, server process termination, crashing and rebooting of server, host shutdown; Elementary UDP sockets: UDP echo server, lack of flow control with UDP	**8**
	Total	**45**

Text Book:

1. “Computer Networking A Top Down Approach, Kurose and Ross”, 5th edition, Pearson

Reference Book:

1. Douglas E. Comer, Pearson ,“Internetworking with TCP/IP Volume 1 and 2 “,; 6 edition

Name of Department:- Computer Science and Engineering

1. Subject Code: TCS 704 Course Title: **Advanced Computer Architecture**
2. Contact Hours: L: 3 T: - P: -
3. Semester: VII

4. Pre-requisite: TCS 404

5. Course Outcomes: After completion of the course students will be able to

1. Analyze the classes of computers, and new trends and developments in computer architecture.
2. Evaluate advanced performance enhancement techniques such as pipelines ,dynamic scheduling branch predictions, caches.
3. Compare and contrast the modern computer architectures such as RISC, Scalar, and multi CPU systems.
4. Critically evaluate the performance of different CPU architecture.
5. Improve the performance of applications running on different CPU architectures.
6. Develop applications for high performance computing systems.

1. Detailed Syllabus

UNIT	CONTENTS	Contact Hrs
Unit - I	Fundamentals: Computer Architecture and Technology Trends, Moore's Law, Classes of Parallelism and Parallel Architectures, Instruction Set Architecture: The Myopic View of Computer Architecture, Trends in Technology, Trends in Cost, Processor Speed, Cost, Power, Power Consumption, Fabrication Yield Performance Metrics and Evaluation: Measuring Performance, Benchmark Standards, Iron Law of Performance, Amdahl's Law, Lhadma's Law	**10**
Unit - II	Memory Hierarchy Design: Basics of Memory Hierarchy, Coherence and locality properties, Cache memory organizations, Cache Performance, Cache optimization techniques, Virtual Memory, Techniques for Fast Address Translation	**9**
Unit – III	Pipelining: What is pipelining, Basics of a RISC ISA, The classic five-stage pipeline for a RISC processor, Performance issues in pipelining, Pipeline Hazards	**10**
Unit – IV	Branches and Prediction: Branch Prediction, Direction Predictor, Hierarchical Predictors, If Conversion, Conditional Move Instruction Level Parallelism: Introduction, RAW and WAW, dependencies, Duplicating Register Values, ILP	**8**
Unit – V	Multiprocessor architecture: taxonomy of parallel architectures. Centralized shared-memory, Distributed shared-memory architecture, Message passing vs Shared Memory	**9**
	Total	**46**

Text/ Reference Books

1. John L. Hennessy, David A. Patterson, **"Computer Architecture:** A Quantitative Approach" 5th edition, Morgan Kaufmann
2. **"**by Kai Hwang **,"Advanced Computer Architecture"**, McGraw Hill Publishing

Name of Department: - Computer Science and Engineering

1. Subject Code: TCS 731 Course Title: **Computer Forensics**
2. Contact Hours: 3 - -
3. Semester: **VII**
4. Prerequisite:
5. Course Outcomes: After completion of the course students will be able to

1. Understand the importance of a systematic procedure for investigation of data found on digital storage media that might provide evidence of wrong-doing.
2. Identify and document potential security breaches of computer data that suggest violations of legal, ethical, moral, policy and/or societal standards
3. Use tools for faithful preservation of data on disks for analysis and find data that may be clear or hidden on a computer or another device
4. Work with computer forensics tools used in data analysis, such as searching, absolute disk sector viewing and editing, recovery of files, password cracking, etc.
5. Present the results of forensics analysis as an expert.
6. Discuss the Cyber Laws and Cyber Crimes.

6. Details of the Course: -

UNIT	CONTENTS	Contact Hrs
Unit - I	**Cyber Crimes, Laws and Cyber Forensics:** Introduction to IT laws & Cyber Crimes, The World and India **Cyber Forensics Investigation**: Introduction to Cyber Forensic Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking	**9**
Unit - II	**Digital Forensics Fundamentals:** Introduction to Incident response, digital forensics stepwise procedure, Computer/network/Internet forensic and anti-forensics , Unix/Linux incident response, Unix/Linux forensics investigation steps and technologies, Memory forensics, Windows incident response tools , Windows forensics tools **Data and Evidence Recovery**- Introduction to Deleted File Recovery, Formatted Partition Recovery, Data Recovery Tools, Data	**9**

	Recovery Procedures and Ethics, Preserve and safely handle original media, Document a "Chain of Custody", Complete time line analysis of computer files based on file creation, file modification and file access, Recover Internet Usage Data, Recover Swap Files/Temporary Files/Cache Files, Introduction to Encase Forensic Edition, Forensic Tool Kit (FTK) etc, Use computer forensics software tools to cross validate findings in computer evidence-related cases, Dump Analysis, Browser forensics, Multimedia forensics, Taking RAM dump and Volatile Memory Analysis	
Unit – III	Software Security: Memory Layout, Buffer Overflow, Code Injection, Other Memory Exploits, Format String Vulnerabilities, Defenses against low-level exploits: Memory Safety, Type Safety, Avoiding Exploitation, Return Oriented Programming, Control Flow Integrity, Secure Coding; Web Security: Basics, SQL Injection, Countermeasures, Session Hijacking, Cross Site Scripting, Program Analysis Image Analysis: Using software to analyze an image, Searching image for evidence, File carving	**10**
Unit – IV	Hardware Security: Digital System Specification, Watermarking, Good Watermarks, Fingerprinting, Hardware metering, Physical Attacks and Countermeasures, Modular Exponentiation (ME) Basics, ME in Cryptography, ME Implementation and Vulnerability, Montgomery Reduction	**8**
Unit – V	Analysis and Validation: Types of Investigation Software, Validating Forensics Data, Data Hiding Techniques, Performing Remote Acquisition, Network Forensics, Email Investigations, Cell Phone and Mobile Devices Forensics, Virtual Machin Forensics, Cloud forensics, Live forensics Case Studies: Blackmailing, Credit-Card fraud, Hosting Obscene Profiles, Illegal money transfer, Fake Travel Agent	**8**
	Total	**44**

TEXT BOOKS:

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, —"Computer Forensics and Investigations", Cengage Learning, India Edition, 2016
2. MarjieT.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall

REFERENCES:

1. Kenneth C.Brancik —"Insider Computer Fraud Auerbach ", Publications Taylor &; Francis Group
2. "CEH official Certfied Ethical Hacking Review Guide", Wiley India Edition, 2015

Name of Department:- Computer Science and Engineering

1. Subject Code: TCS 756 Course Title: **Human Computer Interaction**
2. Contact Hours: L: 3 T: - P: -
3. Semester: VII

4. Pre-requisite: Fundamentals of Computer architecture

5. Course Outcomes: After completion of the course students will be able to

1. Explain the capabilities of both humans and computers from the viewpoint of human information processing.
2. Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.
3. Apply an interactive design process and universal design principles to designing HCI systems.
4. Describe and use HCI design principles, standards and guidelines.
5. Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.
6. Discuss tasks and dialogs of relevant HCI systems based on task analysis and dialog design.

6. Detailed Syllabus

UNIT	CONTENTS	Contact Hrs
Unit - I	Introduction : Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface	**8**
Unit - II	Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions	**8**
Unit – III	Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design	**9**
Unit – IV	Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls.	**8**

	Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors	
Unit – V	Software tools – Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers	**8**
	Total	**41**

.**Text Books :**

1. “The essential guide to user interface design”, Wilbert O Galitz, Wiley DreamaTech.

2. “Designing the user interface”. 3rd Edition Ben Shneidermann , Pearson Education Asia.

Reference Book:

1. “Human – Computer Interaction”. ALAN DIX, JANET FINCAY, GRE GORYD, ABOWD, RUSSELL BEALG, PEARSON.

Name of Department:- Computer Science and Engineering

1. Subject Code: TCS 722 Course Title: **Data Warehousing and Data Mining**
2. Contact Hours: L: 3 T: - P: -
3. Semester: VII

4. Pre-requisite: Excellent knowledge of Database Management Systems

5. Course Outcomes: After completion of the course students will be able to

1. Describe the fundamental concepts, benefits and problem areas associated with datawarehousing
2. Understand the various architectures and main components of a data warehouse.
3. Find the issues that arise when implementing a data warehouse.
4. Understand the techniques applied in data mining.
5. Compare and contrast OLAP and data mining as techniques for extracting knowledge from a data warehouse.
6. Find the association rules.

6. Detailed Syllabus

UNIT	CONTENTS	Contact Hrs
Unit - I	Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation	**9**
Unit - II	Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases	**8**
Unit – III	What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based	**9**

	Methods- STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis	
Unit – IV	Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting	**9**
Unit – V	Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse	**8**
	Total	**43**

Books:

1. M.H.Dunham,"DataMining:Introductory and Advanced Topics" Pearson Education
Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier

Name of Department:- Computer Science and Engineering

1. Subject Code: TCS 706 Course Title: **Artificial Intelligence**
2. Contact Hours: L: 3 T: - P: -
3. Semester: VII

4. Pre-requisite: Basics of mathematics and database are required

5. Course Outcomes: After completion of the course students will be able to

1. Identify the basics of the theory and practice of Artificial Intelligence.
2. Learn the basics of Artificial Intelligence programming.
3. Identify various searching techniques use to solve the AI problems.
4. Apply knowledge representation techniques and problem solving strategies to common AI applications.
5. Build self-learning and research skills to tackle a topic of interest on his/her own or as part of a team.
6. Apply the knowledge of AI and agents in developing multidisciplinary real world projects

6. Detailed Syllabus

UNIT	CONTENTS	Contact Hrs
Unit – I	**Introduction** Introduction to Artificial Intelligence, Simulation of sophisticated & Intelligent Behavior indifferent area, problem solving in games, natural language, automated reasoning visualperception, heuristic algorithm versus solution guaranteed algorithms.	**10**
Unit – II	**Understanding Natural Languages** Parsing techniques, context free and transformational grammars, transition nets, augmentedtransition nets, Fillmore's grammars, Shanks Conceptual Dependency, grammar free analyzers, sentence generation, and translation.	**9**
Unit – III	**Knowledge Representation** First order predicate calculus, Horn Clauses, Introduction to PROLOG, Semantic NetsPartitioned Nets, Minskey frames, Case Grammar Theory, Production Rules KnowledgeBase, The Inference System, Forward & Backward Deduction	**10**
Unit – IV	**Expert System** Existing Systems (DENDRAL, MYCIN, DART,XOON expert, shells), domain exploration, Meta Knowledge, Expertise Transfer, Self ExplainingSystem, Architecture of Expert system	**9**
Unit – V	**Pattern Recognition** Introduction to pattern Recognition, Structured Description, Symbolic Description, Machineperception, Line Finding, Interception, Semantic, & Model, Object Identification, SpeechRecognition. **Programming Language:** Introduction to programming Language, LISP, PROLOG	**8**
	Total	**46**

Text/ Reference Books:

1. Charnick “Introduction to Artificial Intelligence.” Addision Wesley.
2. Rich & Knight, “Artificial Intelligence”.TMH
3. Winston, “LISP”, Addison Wesley.
4. Marcellous, “Expert Systems Programming”, PHI.