Code	Title	Content
CST 475-2	Data Warehousing and Data Mining	History , Data Warehouse, OLAP technology , Data types , Multidimensional Data Mode, Preprocessing, Mining Primitives, Query Language, Graphical User Interfaces, Architectures, Data Generalization, Characterizations, Class Comparisons, Classification methods , Bayesian Classification ,Naïve Bayes ,Clustering K-Means, Decision trees, ANN, SVM, Apriori Algorithm, Single-Dimensional Boolean Association Rules, Multi-Level Association Rules, Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, study of Government and Companies Data warehouses
CST 483-3	**Remote Sensing and Image Interpretation**	A brief history of remote sensing for earth observation, Remote Sensing Basics, Frame Captured Sensors and Line Scanners, Satellite-based Sensors in Visible and Infrared Wavelengths, Active Sensors: Radar and LiDAR, Fundamentals of image processing techniques and image interpretation, Remote Sensing Applications
CST 474-2	**Bioinformatics**	Introduction to Molecular Biology ,Cell, DNA, RNA ,Amino Acid , Protein , Motif, Mitosis , Meiosis, Genetic information , Some genetic diseases, Biotechnology , Bioinformatics tools ,, Molecular Docking tools, Biological Data and online Databases ,Nucleic acid databases, Protein databases (Primary, Composite, and Secondary), Phylogeny ,Tree view and Multiple sequence alignment, Phylogeny Comparison, Reconstruction, Bioinformatics algorithms and Implementation ,Local, global alignment , Longest Common Subsequence , Motif finding, Sequence Alignment ,Scoring matrix Global, Local ,Multiple sequence alignment ,FAST, BLAST, Homology Modeling , Amino Acid , Ramchandran plot , Protein 3D structure,. Genomic Analysis. DNA Microarray analysis , Normalization ,Clustering, Pathway and Survival analysis tools, Introduction to Oncogenomics , Next Generation sequencing, Emerging trends in Bioinformatics
CST 478-2	**Robotics**	Introduction, Karel Čapek's Rossum's Universal Robots, Maschinenmensch ("machine-human"/ gynoid humanoid robot), Isaac Asimov's Three Laws of Robotics, Mechanical construction, Electrical/Pneumatic control, computer programming, Applications, Manufacturing, Automation, Health care, Mining /Underwater/ Volcanoes, Defense, Bomb disposal robots, firefighting robots, Cybernetics, UAVs / Quadcopters. Robot Classification, Manipulator robot arms (Industrial Robots), Mobile robots, Humanoid robots, Pet robots, Exoskeletons, Robot Design, Actuators and effectors, Sensors, Manipulator robots kinematics, Robot dynamics, DOF, Forward and Inverse kinematics, Trajectory planning, Serial and parallel manipulators, Mobile Robots locomotion / Navigation, Self-localization, Path planning, Vision-Based Navigation, Map-building and map interpretation, Optimized algorithms, Multi Agent Systems, Social impacts, Emerging Trends
CST 453-2	**Cloud Computing**	Technologies for Network-Based System, System Models for Distributed and Cloud Computing, Reference Architecture. Cloud Models, Characteristics, Cloud Services, Public vs Private Cloud, Cloud Solutions,

		Cloud ecosystem, Service management, Computing on demand, Virtualization: Overview, Types, Implementation Levels, Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices Virtual Clusters, Resource management and Data-center Automation**.** Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources **,** Parallel and Distributed Programming Paradigms ,Twister and Iterative Map Reduce, Mapping Applications, Programming Support, Cloud Software Environments , Security Overview, Challenges and Risks, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Identity Management and Access Control.
CST 473-2	**Augmented Reality**	Virtual Environment, Virtual Reality, Recognition, Optical/Speech **,**Spatial Augmented Reality, HUDs (Head-Up Display), Wearable Displays, Head-Mounted displays, Virtual tables, Smart projectors Marker-based & Markerless implementation **,** Quick Response (QR) codes, Marker incl. Fiducial markers, Embedding, 3D Virtual Model, Recognition and Tracking techniques, Image Registration, Visual Odometry **,** Virtual Worlds, Gesture Recognition & Control, AR Smart Glasses, AR Windshields ARML Applications in Architecture and Construction, Industrial design, Medical, Public Safety, Military, Augmented Legality, Archaeology, AR Bionics, Visual Prosthesis (Bionic eyes), AR Contact Lenses, Virtual Retinal Display (VRD) **,**Desktop metaphor, Spatial immersion and interaction, Navigation, Translation, Holograms, Augmented ID, Crime finders, Economics, Kondratieff Waves, Social Impacts: Generation C, The Outernet Emerging Trends in Gaming & Interactive Multimedia i.e. Exergames, Internet of Things, Nanotech AR
CST 449-2	**UI and UX Engineering**	What is User Experience (UX) Design, Understanding Users, Principles of UX Design, Prototyping, Conducting User Research, Project Requirements and Planning, The Structure, Information Architecture and Interaction Design, Usability Testing**,** The Skeleton, Interface, Navigation and Information Design, Designing and Planning the User Interface, Principles and Patterns in Design Language, Interaction Styles, Guidelines and Standards, Accessibility
CST 477-3	**Fuzzy Logic and Neural Networks**	Introduction to ANN, Feed-forward neural network, Feed-Back neural network Radial basis function (RBF) Network, Learning, Supervised learning Vs. Unsupervised learning, Reinforcement learning, Back Propagation algorithm , Perceptron, Binary classifiers, Bias and Momentum, Activation Function, Recurrent neural networks, Hopfield network, Boltzmann machine, , Bi-directional RNN, Kohonen Self-Organizing maps, Applications of NN, Data mining, Time Series Prediction, Fitness approximation, Classification, Pattern and Sequence Recognition, Novelty detection, Sequential decision making Introduction to Fuzzy, Comparison to probability, Membership functions, Propositional & Predicate fuzzy logic Fuzzy sets, Fuzzy set

		operations, complement, intersection, union, aggregation; Fuzzy sub-algebra, Multiset, Representing Sets, Crisp Set, Setting Rules, Fuzzy Type 2, Fuzzy Inference Models, Mamdani, Takagi Sugeno, Tsukamoto Fuzzy models Fuzzy Controllers, Defuzzification, Feedback controllers, Applications & Emerging Trends of Fuzzy,Antilock brakes, Adaptive Fuzzy Systems, Introduction to Fuzzy 2, Level 2 fuzzy sets, Neuro-Fuzzy networks
CST 476-2	**Digital Forensics**	Introduction to computer forensics, Types of computer crime, The forensics process, Computer misuse, Data protection, Criminal damage, Cybercrime, File system forensic, Recovering graphics files, Windows and UNIX forensic analysis, Network forensic, E-Mail investigations, Cell phone and mobile device forensics, Forensic tools for crime investigations
CST 464-2	**Embedded Systems and Device Interfacing**	Introduction to Atmel AVR and Microchip PIC microcontrollers, Memory Mappaed Vs. I/O Mapped, IO ports, Compilers & Simulation IDEs, Applications of Embedded Systems , Embedded Systems Classification, High Performance Embedded Systems (HPES) , Smart Devices Embedded Systems Design, Concerns: Requirement Analysis, Sensors & Actuators, PCB Design, Human interaction, Communication protocols, Backup, Output Devices & Displays, Timers, interrupts, ADCs and DACs, PWMs, Memory (Flash, SRAM), EPROM, EEPROM, Matrix Keyboards, Motor Control: DC Servo, Stepper motors, Encoders, Introduction to Control Theory, Feed-Back Control / Loops, PID, Industry standard bus types (I^2C, SPI, OneWire, SMBus, CAN bus), RS 232 (Serial), USB, Control over BT/Wi-Fi , High Performance Embedded Systems (HPES) Architecture, Real Time Operating Systems (RTOS)
CST 448-2	**Software Design Patterns**	Introduction to design patterns , OO Design Principles, Anti-patterns, Introduction of GOF patterns, Types of GOF patterns, Difference between patterns., Creational patterns, Factory pattern, Abstract factory pattern, Singleton pattern Builder pattern, Prototype pattern, Structural pattern, Adaptor pattern, Bridge pattern, Composite pattern, Decorator pattern, Facade pattern, Flyweight pattern, Proxy pattern., Behavioral patterns, Chain of responsibility pattern, Command pattern, Interpreter pattern, Iterator pattern, Mediator pattern, Momento pattern, Observer pattern, State pattern, Strategy pattern, Template pattern, Visitor pattern.
CST 452-2	**Middleware Architecture**	Review of object oriented programming, Introduction to middleware architectures, Overview of network and distributed computing, Distributed objects, Remote Procedure Call (RPC), Remote Method Invocation (RMI), The Common Object Request Broker Architecture (CORBA), MW design patterns, SOA and web services, Application of middleware, Current trends in middleware
CST 436-3	**System Administration and Maintenance**	Introduction to System Administration and Maintenance ,Data center standards, Basic network architecture, Linux/Unix Operating Systems, Server/client installation, server /client configuration, server/client maintenance, Server services, Client services, Network monitoring and monitoring tools, Administrative Activities, Server management,

		Security management, User and group management, Backup management, Disaster recovery, Automation management, User support and education, ,Administrative Domains, Support domains, Introduction to virtualization and cloud computing, Shell Scripting The system administrator code of ethics
CST 435-2	**Computer Networks-III**	Network layer design issues, Routing algorithms, Congestion control algorithms, Quality of service internetworking, The network layer in the internet, The transport service, Elements of transport protocols, The internet transport protocols ,UDP , The internet transport protocol ,TCP , Performance issues, Delay tolerant networking, DNS, the domain name system, The world wide web, content delivery server configurations, Switching and routing , Wireshark, packet tracer, Transport layer, Connection oriented, Connectionless protocols, UDP, TCP, Packet forwarding routing, Routing algorithm, Network devices in layer 2, 3,4.
IIT 449-3	**GIS for Business**	Geographic information and its importance in organizations, Basics of GIS and maps, Decision-making with GIS, Spatial and non-spatial data: Sources, Accuracy, Availability, Costs, Spatial analysis and modeling, Investment in and value of GIS, GIS software and how to use it effectively, Case applications of GIS and spatial data in businesses, Management of GIS in organizations, Ethical issues, The future of geographic information and spatial decision making.