Markup Language (SMIL),

UNIT IV:
Mobile Devices-Server and Management: Mobile Agent, Application Server, Gateways, Portals, Service Discovery, Device Management, Mobile File Systems, Security, **Mobile Ad-hoc and Sensor Networks**: Introduction to Mobile Ad-hoc Network, MANET, Wireless Sensor Networks, Applications **Wireless LAN, Mobile Internet Connectivity, and Personal Area Network:** Wireless LAN (WiFi) Architecture and Protocol Layers, WAP 1.1 and WAP 2.0, Architectures, XHTML-MP (Extensible Hypertext Markup Language Mobile Profile), Bluetooth-enabled Devices Network, Layers in Bluetooth Protocol, Security in Bluetooth Protocol, IrDA, ZigBee

UNIT V:
Mobile Application Languages-XML, Java, J2ME, and JavaCard: Introduction, XML, JAVA, Java 2 Micro Edition (J2ME), JavaCard, **Mobile Operating Systems :** Operating System PalmOS, Windows CE, Symbian OS, Linux for Mobile Devices 530

Books:
1. Mobile Computing, Raj Kamal, Oxford University Press

References:
1. Mobile Communications Jochen Schiller, Addison-Wesley.
2. Handbook of Wireless Networks and Mobile Computing, Stojmenovic and Cacute, Wiley,
3. Mobile Computing Principles: Designing and Developing Mobile
4. Applications with UML and XML, Reza Behravanfar, Cambridge University Press,

Lab Exercise: CSC430 Practical based on CSC429
At least two experiments should carried out on each unit.

Semester-IV:

Subject Reference no	CSC505	Subject Title	Pattern Recognition
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To provide the general mechanism and design of Automatic system recognition.
Prerequisite: Student must have knowledge of Digital image processing, neural networks, function analysis.

UNIT I:
Introduction to Pattern Recognition, Bayesian decision theory: Classifiers, Discriminant functions, Decision surfaces, Normal density and Discriminant functions, discrete features

UNIT II:
Maximum Likelihood and Bayesian Estimation: Parameter estimation methods, Maximum-Likelihood estimation, Bayesian estimation, Bayesian Parameter Estimation, Gaussian Case, General Theory, Problem of Dimensionality, Accuracy, Dimension, and Training Sample Size, Computational

Complexity and Overfitting, Component Analysis and Discriminants, Principal Component Analysis (PCA), Expectation Maximization (EM), Hidden Markov models for sequential pattern classification, First-Order Markov Models, First-Order Hidden Markov Models, Hidden Markov Model Computation, Evaluation, Decoding and Learning.

UNIT III:
Non-parametric : Density estimation, Parzen-window method, Probabilistic Neural Networks (PNNs), K-Nearest Neighbour, Estimation and rules, Nearest Neighbour and Fuzzy Classification. **Linear Discriminant function based classifiers:** Perceptron, Linear Programming Algorithm, Support Vector Machines (SVM)

UNIT IV:
Multilayer Neural Network: Feed Forward Classification, Back Propagation Algorithm, Error Surface
Stochastic Data: Stochastic search, Boltzmann Learning, Evolutionary method and Genetic Programming.

UNIT V:
Non-metric methods for pattern classification: Decision trees, Classification and Regression Trees (CART) and other tree methods, String recognition and Rule Based method. **Unsupervised learning and clustering :** Mixture Densities and Identifiability, Maximum Likelihood estimation, Application Normal Mixture, Unsupervised Bayesian Learning, Data Description and Clustering, Hierarchical Clustering, Graph theory method, Problem of validity, Component analysis

Books Recommended:
1. R.O.Duda, P.E.Hart and D.G.Stork, "Pattern Classification 2nd Edition", John Wiley, 2007
2. Christopher M. Bishop, "Neural Network for Pattern Recognition", Oxford Ohio Press.

References:
1. E. Gose, R. Johansonbargh, "Pattern Recognition and Image Analysis", PHI
2. EthenAlpaydin, "Introduction to Machine Learning", PHI
3. SatishKumar,"Neural Network- A Classroom Approach", McGraw Hill.
4. Dr. Rao&Rao,Neural Network & Fuzzy Logic
5. S.Theodoridis and K.Koutroumbas, "Pattern Recognition", 4th Ed., Academic Press,
6. C.M.Bishop, "Pattern Recognition and Machine Learning", Springer, 2006
Web:1. http://www.rii.ricoh.com/~stork/DHS.html

Lab Exercise: CSC555 Practical based on CSC505
          At least two experiments should be carried out on each unit.

Elective-II

Subject Reference no	CSC-431	Subject Title	Theoretical Computer Science
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs. /Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To understand syntax and semantics of programming languages to build system software.

Prerequisite: Student must aware with discrete mathematical structures, set theory, set operations.

UNIT-I:
Introduction: Strings, Alphabets & Languages, Graphs & Trees, Set Notations, Relations.

UNIT-II:
Finite Automata & Regular Expressions: Definition, Description, Transition Systems, Transition Function, DFA, NFA, Finite Automata with Є-Moves, Regular Expressions, Convert Regular Expression into FA, Construct FA from Regular Expression, Applications of Finite Automata.

UNIT-III:
Regular Expression: Pumping Lemma for Regular Sets, Applications of Pumping Lemma, Closure properties of Regular Sets, Decision Algorithm for regular Sets.

UNIT-IV:
Context Free Grammars: Introduction to Context free grammars, Derivations Trees, Simplification of Context free grammar, Useless Symbols, Є Production, Unit Production, Normal forms for CFG, Chomsky Normal Form (CNF),Greibach Normal Form (GNF).

UNIT-V:
Pushdown Automata: Informal Description, Definitions, Pushdown Automata & Context free languages.
Turing Machines: Basics, Turing Machine Model, Representation of Turing Machines, Language Acceptability by Turing Machines.

Text Books:
    1) Theory of Computer Science, By-K.L.P. Mishra, N. Chandrasekaran.
    2) Introduction to Computer Theory, By-Daniel A. Cohen.

References:
    1) Introduction to Automata theory, Languages & Computations, By-John E. Hopcraft, Jeffery D. Ullman.
    2) Theory of Computer Science, By-Dr. Shirish S. Sane.

Lab Exercise: CSC432 Practical based on CSC431
At least two experiments should be carried out on each unit.

Subject Reference no	CSC433	Subject Title	Decision Support System and Intelligent system
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To design and implement the logic based frameworks for Decision Support and Intelligent systems.
Prerequisite:

UNIT I:
Decision Support and Business Intelligence- Decision Support Systems and Business Intelligence: Opening Vignette: Toyota Uses Business Intelligence to Excel, Changing Business Environments and Computerized Decision Support, Managerial Decision Making, Computerized Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems (DSS), A Framework for Business Intelligence (BI), A Work System View of Decision Support, The Major Tools and Techniques of Managerial Decision Support, Implementing Computer-Based Managerial Decision Support Systems, **Computerized Decision Support, Decision Making, Systems, Modeling, and Support:** Opening Vignette: Decision Making at the U.S. Federal Reserve, Decision Making: Introduction and Definitions, Models, Phases of the Decision Making Process, Decision Making: The Intelligence Phase, Decision Making: The Design Phase, Decision Making: The Choice Phase, Decision Making: The Implementation Phase, How Decisions are Supported, **Decision Support Systems Concepts, Methodologies, and Technologies: An Overview:** Opening Vignette: Decision Support System Cures for Healthcare, DSS Configurations, DSS Description, DSS Characteristics and Capabilities, Components of DSS, The Data Management Subsystem, The Model Management Subsystem, The User Interface (Dialog) Subsystem, The Knowledge-Based Management Subsystem, The User, DSS Hardware, DSS Classifications

UNIT II:
Modeling and Analysis: Opening Vignette: "Winning Isn't Everything... But Losing Isn't Anything:" Professional Sports Modeling for Decision Making, MSS Modeling, Static and Dynamic Models, Certainty, Uncertainty, and Risk, MSS Modeling with Spreadsheets, Decision Analysis with Decision Tables and Decision Trees, The Structure of Mathematical Models for Decision Support, Mathematical Programming Optimization, Multiple Goals, Sensitivity Analysis, What-IF, and Goal Seeking Problem Solving Search Methods, Simulation, Visual Interactive Simulation, Quantitative Software Packages and Model, Base Management, **Business Intelligence Special Introductory Section: The Essentials of Business Intelligence:** A Preview of the Content of Chapters, The Origins and Drivers of Business Intelligence, The General Process of Intelligence Creation and Use, The Major Characteristics of Business Intelligence, Towards Competitive Intelligence and Advantage, The Typical Data Warehouse and BI User Community, Successful BI Implementation, Structure and Components of BI, Conclusion: Today and Tomorrow **Data Warehousing:** Opening Vignette: Continental Airlines Flies High with Its Real-Time Data Warehouse, Data Warehousing Definitions and Concepts, Data Warehousing Process Overview, Data Warehousing Architectures, Data Integration, and the Extraction, Transformation, and Load (ETL) Process, Data Warehouse Development, Real-Time Data Warehouses, Data Warehouse Administration and Security Issues

UNIT III:
Business Analytics and Data Visualization: Opening Vignette: Lexmark International Improves Operations with BI, The Business Analytics Field-An Overview, Online Analytical Processing (OLAP), Reporting and Queries, Multidimensionality, Advanced Business Analytics, Data Visualization, Geographic Information Systems, Real-Time Business Intelligence, Automated Decision Support, and Competitive Intelligence, Business Analytics and the Web: Web Intelligence and Web Analytics, Usage, Benefits, and Success of Business Analytics **Data, Text, and Web Mining:** Opening Vignette: Highmark, Inc., Data Mining Concepts and Applications, Data Mining Techniques and Tools, Data Mining Project Process, Text Mining, Web Mining **Neural Networks for Data Mining:** Opening Vignette: Using Neural Networks to Predict Beer Flavors From Chemical Analysis, Basic Concepts of Neural Networks, Learning in Artificial Neural Networks, Developing Neural Network Systems, A Sample Neural Network Project, Other Neural Networks Paradigms, Applications of Neural Networks, A Neural Network Software Demonstration **Business Performance Management:** Opening Vignette: Cisco and the Virtual Close,

Business Performance Management Overview, Strategize: Where Do We Want to Go? Plan: How Do We Get There? Monitor: How are We Doing? Act and Adjust: What Do We Need to Do Differently? Performance Measurement, Bpm Methodologies, Bpm Architecture and Applications, Performance Dashboards, Business Activity Monitoring (BAM)

UNIT IV:

Collaboration, Communication, Group Support Systems, and Knowledge Management-Collaborative Computing-Supported Technologies and Group Support Systems: Opening Vignette: Collaborative Design at Boein-Rocketdyne, Making Decisions in Groups: Characteristics, Process, Benefits, and Dysfunctions, Supporting Groupwork with Computerized Systems, Tools for Indirect Support of Decision Making, Integrated Groupware Suites, Direct Computerized Support for Decision Making: From GDSS to GSS, Products and Tools for GDSS/GSS and Successful, Implementation, Emerging Collaboration Support Tools: From VoIP to Wikis, Collaborative Efforts in Planning, Design, and the Project Management, Creativity, Idea Generation and Computerized Support **Knowledge Management:** Opening Vignette: Simens Knows What It Knows through Knowledge Management, Introduction to Knowledge Management, Organizational Learning and Transformation, Knowlege Management Activities, Approached to Knowledge Management, Information Technology in Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management, Ensuring the Success of Knowledge Management Efforts, **Intelligent Systems-Artificial Intelligence and Expert Systems:** Opening Vignette: Cigna Uses Business Rules to Support Treatment Request Approval, Concepts and Definition of Artificial Intelligence, The Artificial Intelligence Fields, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, How Expert Systems Work- Inference Mechanisms, Problem Areas Suitable for Expert Systems, Development of Expert Systems, Benefits, Limitations and Success Factors of Expert Systems, Expert Systems on the Web

UNIT V:

Advanced Intelligent Systems: Opening Vignette: Improving Urban Infrastructure Management in the City of Verdum, Machine Learning Techniques, Case-based Reasoning, Genetic Algorithms Fundamentals, Developing Genetic Algorithm Applications, Fuzzy Logic Fundamentals, Natural Language Processing, Voice Technologies, Developing Integrated Advanced System. **Intelligent Systems over the Internet:** Opening Vignette: NetFlix Gains High Customer Satisfaction from DVD Recommendation, Web-Based Intelligent Systems, Intelligent Agents: An Overview, Characteristics of Intelligent Agents, Why Use Intelligent Agents, Classification and Types of Intelligent Agents, Internet-Based Software Agents, DSS Agents and Multi-agents, Semantic Web: Representing Knowledge for Intelligent Agents, Web-Cased Recommendation Systems, Managerial Issues of Intelligent Agents **Implementing Decision Support Systems- Systems Development and Acquisition:** Opening Vignette: Osram Sylvania Thinks Small, Strategizes Big- Develops the InfoNet HR Portal System, What Types of Support Systems Should We Build? The Landscape and Framework of MSS Applications Development, Development Options for MSS Applications, Prototyping: A Practical MSS Development Methodology, Criteria For Selecting a Development Approach, Third-Party Providers of MSS Software Packages and Suites, Connecting to Databases and Other Enterprise Systems, Rise of Web Services, XML, and Service-Oriented Architecture, End-user Developed MSS, Vendor and Software Selection and Management, Putting the MSS Together and Implementation Issues **Integration, Impacts, and the Future of Management Support Systems:** Opening Vignette: Elite-Care Supported by Intelligent Systems, Systems Integration: An Overview, Types of MSS Integration, Integration with Enterprise Systems and Knowledge Management, The Impacts of MSS: An Overview, MSS Impacts on Organizations, MSS Impacts on Individuals, Automating Decision Making and the Manager's Job, Issues of Legality, Privacy, and Ethics, Intelligent and Automated Systems and Employment Levels, Other Societal Impacts and the Digital Divide, The Future of Management Support Systems

Books:
1. Decision Support and Business Intelligence Systems

References:
1. Decision Support Systems, George M. Marakas, 2nd Edition, Pearson Education
2. Decision Support Systems, Janakiraman V.S. and Sarukesi. K., Prentice Hall of India
3. Decision Support System and Management, Lofti, McGraw Hill Inc., International Edition, New Delhi.

Lab Exercise: CSC434 Practical based on CSC433
At least two experiments should be carried out on each unit.

Subject Reference no	CSC435	Subject Title	Data Mining
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective:
To develop an understanding of the strengths and limitations of popular data mining techniques and to be able to identify promising business applications of data mining. Students will be able to actively manage and participate in data mining projects executed by consultants or specialists in data mining. A useful take away from the course will be the ability to perform powerful data analysis.

Prerequisite: Student must aware with Database management systems

UNIT I:
Introduction to Data Mining: Why Mine Data? Commercial Viewpoint, Scientific Viewpoint Motivation, Definitions, Origins of Data Mining, Data Mining Tasks, Classification, Clustering, Association Rule Discovery, Sequential Pattern Discovery, Regression, Challenges of Data Mining, **Data Mining-Data:** What is Data? Attribute Values, Measurement of Length, Types and Properties of Attributes, Discrete and Continuous Attributes, Types of data sets,   Data   Quality,   Data   Preprocessing,   Aggregation, Sampling, Dimensionality Reduction, Feature subset selection, Feature creation, Discretization and Binarization, Attribute Transformation, Density.

UNIT II:
Data Mining: Exploring Data: Data Exploration Techniques, Summary Statistics, Frequency and Mode, Percentiles, Measures of Location: Mean and Median, Measures of Spread: Range and Variance, Visualization, Representation, Arrangement, Selection, Visualization Techniques: Histograms, Box Plots, Scatter Plots, Contour Plots, Matrix Plots, Parallel Coordinates, Other Visualization Techniques, OLAP : OLAP Operations, **Data Mining Classification: Bask Concepts, Decision Trees, and Model Evaluation:** Classification: Definition, Classification Techniques, Tree Induction, Measures of Node Impurity, Practical Issues of Classification, ROC curve, Confidence Interval for Accuracy, Comparing Performance of Two Models, Comparing Performance of Two Algorithms.

UNIT III:

Data Mining Classification: Alternative Techniques: Rule-Based Classifier, Rule Ordering Schemes, Building Classification Rules, Instance-Based Classifiers, Nearest Neighbor Classifiers, Bayes Classifier, Naive Bayes Classifier, Artificial Neural Networks (ANN), Support Vector Machines.

UNIT IV:
Data Mining Association Analysis: Basic Concepts and Algorithms: Association Rule Mining, Frequent Itemset Generation, Association Rule Discovery : Hash tree, Factors Affecting Complexity, Maximal Frequent Horible Closed Itemset, Alternative Methods for Frequent Itemset Generation, FP-growth Algorithm, Tree Projection, Rule Generation, Pattern Evaluation, Statistical Independence, Properties of A Good Measure, Support-based Pruning, Subjective Interestingness Measure.

UNIT V:
Data Mining Cluster Analysis: Basic Concepts and Algorithms: Applications of Cluster Analysis, Types of Clusters, **Clustering Algorithms:** K-means and its variants, Hierarchical clustering, Density-based clustering. Graph-Based Clustering, Limitations of Current Merging Schemes, Characteristics of Spatial Data Sets, Shared Near Neighbor Approach, ROCK (RObust Clustering using linKs), Jarvis-Patrick Clustering, SNN Clustering Algorithm, **Data Mining Anomaly Detection:** Anomaly/Outlier Detection, Importance, Anomaly Detection Schemes, Density-based: LOF approach

REFERENCES:
1. Introduction to Data Mining by Tan, Steinbach, Kumar.
2. Data Mining: Concepts and Techniques by Jiawei Han, MichelineKamber, Morgan Kaufmann Publishers.
3. Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten and Eibe Frank, Morgan Kaufmann, 2nd Edition (2005).
4. Principles of Data Mining: David Hand, HeikkiMannila&Padhraic Smyth, PHP Publication.

Lab Exercise: CSC436 Practical based on CSC435
At least two experiments should be carried out on each unit.

Subject Reference no	CSC437	Subject Title	Cryptography and Network Security
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To study the main security threats of communication networks. To establish certain security mechanisms that avoids or considerably diminishes these threats. To introduce modern cryptography techniques. To study specific cryptography techniques that guarantee security in certain applications (e-mail, e-commerce, web access, etc.). To introduce the most widely known standards for each case.

Prerequisite: Student must aware of data communication principals, computer networks , communication basics and concept of information theory is mandatory.

UNIT I:
Introduction: Security Trends, the OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A model for network security.

UNIT II:
Symmetric Ciphers: Symmetric Cipher Model, Substitution Techniques, Transposition techniques, Steganography, Block Cipher Principles, The data Encryption Standard, Block Cipher Design Principles.

UNIT III:
Public-Key Encryption And Hash Functions: Introduction to Number Theory, Public-Key Cryptography and RSA, Key Management; Other Public –Key Cryptosystems, Message Authentication and Hash Functions, Digital Signatures and Authentication Protocols.

UNIT IV:
Network Security Practice And System Security: Electric Mail Security, IP Security, Web Security

UNIT V:
System Secutity: Intruders, Malicious Software, Firewalls.

Practical:

A) Seminar Presentation: In this a group of 2-3 students is required to read some new materials that are not covered in the class, and then present it in the class| each presentation lasts 20 minutes, including questions. Student also has to write a formal report (about 15 pages) of your presentation material and hand in before the final exam. The total number of presentation projects allowed in this course is 3- the topics will be given by instructor, and students choose topics based on First Coming First Service (FCFS).

B) Programming project: In this project, each student is required to program some existing protocols. Your program has to run correctly to be graded. You have to hand in the documentation of your programming in addition to the code itself.

Text Book:
1. Cryptography and Network Security: Principles and Practice; Fourth or Fifth Edition. By William Stallings, Prentice Hall, Hardcover.
2. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press, hardcover, Published March, 1995. ISBN 0-8493-8521-0.
3. Network Security Essentials: Applications and Standards by William Stallings.Prentice Hall, Hardcover, Published November 1999, 366 pages, ISBN 0130160938.

Lab Exercise: CSC438 Practical based on CSC437
At least two experiments should be carried out on each unit.

Subject Reference no	CSC439	Subject Title	Introduction to MEMS Pro+
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To learn the MEMS Technology for Nanotechnology applications.
Prerequisite:

UNIT-I:
Introduction: history of MEMS, market for MEMS, overview of MEMS processes properties of silicon, a sample MEMS process, **Basics of Microtechnology:** definitions and terminology, a sample process, lithography and etching.MEMS **Biosensors:** Bio Flow Sensors, MEMS Images. Introduction to MEMS Pro design software. **Micromachining:** subtractive processes (wet and dry etching), additive processes (evaporation, sputtering, epitaxial growth). Fundamental Devices and Processes: basic mechanics and electrostatics for MEMS, parallel plate actuators, pull-in point, comb drives.

UNIT-II:
Fundamental Devices and Processes: more electrostatic actuators; MEMS foundries, Cronos MUMPs (multi user MEMS process). **MUMPs Multi User MEMS Process:** JDS Uniphase MUMPs processing sequence and design rules. **MUMPs and SUMMIT:** design rules; applications; micro hinges and deployment actuators.

UNIT-III:
CMOS MEMS: CMOS foundry processes, integrated IC/MEMS, MEMS postprocessing, applications. Cleanroom lab techniques: clean rooms, gowning procedures; safety, fire, toxicity; acids and bases; photolithography. MicroOptoElectroMechanical Systems (MOEMS): micro scanners, digital mirror display, retinal scanning display. Grating light valve, corner cube retroreflector, optical switches, other micro-optical devices.

UNIT-IV:
Thermal Transducers: bimorphs, "heatuators", cilia arrays, Piezoresistivity; **Scanning Probe Microscopy:** scanning tunneling microscope (STM), atomic force microscope (AFM), Scaling Laws **Wireless MEMS:** mechanical and electrical resonators, Q-factor, switches, filters. **Power for MEMS:** thin film batteries, micro fuel cells, energy fields.

UNIT-V:
MEMS Packaging and Assembly: microassembly: serial and parallel, deterministic and stochastic; **Microgrippers:** HexSil process; packaging techniques, **The Future of MEMS:** bioMEMS - neural implants, gene chips, diagnostic chips; MEMS in space; mechanical computers; invisible and ubiquitous computing.

Text Book
1. HSU, TAI RAN, MEMS AND MICROSYSTEMS Design And Manufacture, Tata McGraw-Hill,2002.
2. Mems and Moems Technology and Applications,Rai-Choudhury, Prosenjit; SPIE 2000.
3. Http://jntu.ac.in/dap/syl.html

Lab Exercise: CSC440 Practical based on CSC439
At least two experiments should be carried out on each unit.

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