SCHEME FOR EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
THIRD YEAR, INFORMATION TECHNOLOGY
SEMESTER V
EFFECTIVE FROM SESSION 2024-25 (NEP)

SL. NO.	SUBJECT CODE	SUBJECTS	PERIODS/ WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1	ITUETT1	MACHINE LEARNING	3	0	0	40	60	100	3
2	ITUETT2	DATABASE MANAGEMENT SYSTEMS	3	1	0	40	60	100	4
3	ITUETT3	FORMAL LANGUAGE & AUTOMATA THEORY	3	0	0	40	60	100	3
4	ITUETKX	DEPARTMENT ELECTIVE-III	3	0	0	40	60	100	3
5	ITUETKX	DEPARTMENT ELECTIVE-IV	3	0	0	40	60	100	3
PRACTICAL									
1	ITUELT1	MACHINE LEARNING LAB	0	0	3	25	25	50	1.5
2	ITUELT2	DATABASE MANAGEMENT SYSTEMS LAB	0	0	3	25	25	50	1.5
3	ITUEPV1	MINI PROJECT - II	0	0	4	50	50	100	2
TOTAL CREDITS									**21**

IA- INTERNAL ASSESSMENT, ESE-END SEMESTER EXAMINATION, L-LECTURE, T-TUTORIAL, P-PRACTICAL

LIST OF DEPARTMENT ELECTIVE-III

1	ITUETK1	DIGITAL IMAGE PROCESSING
2	ITUETK2	SOFTWARE TESTING & QUALITY MANAGEMENT
3.	ITUETK3	SOFT COMPUTING

LIST OF DEPARTMENT ELECTIVE-IV

1	ITUETK4	WIRELESS SENSOR NETWORK
2	ITUETK5	HUMAN COMPUTER INTERFACE
3.	ITUETK6	NETWORK SECURITY

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUETT1	3	0	0	3 HOURS	40	60	3

MACHINE LEARNING

Course Objectives:
Students must be able to:

1. Understand the concept of learning and candidate elimination algorithms.
2. Understand the concept of perception and explore on Genetic algorithms
3. Explore on computational learning methods
4. Explore on instance based and case based learning.
5. Explore inductive learning and Reinforcement Learning methods

UNIT I

Introduction: Representation and Learning: Feature Vectors, Feature Spaces, Feature Extraction and Feature Selection, Learning Problem Formulation

Types of Machine Learning Algorithms: Parametric and Nonparametric Machine Learning Algorithms, Supervised, Unsupervised, Semi-Supervised and Reinforced Learning.

Preliminaries: Over fitting, Training, Testing, and Validation Sets, The Confusion Matrix, Accuracy Metrics: Evaluation Measures: SSE, RMSE, R2, confusion matrix, precision, recall, F-Score, Receiver Operator Characteristic (ROC) Curve, Unbalanced Datasets, some basic statistics: Averages, Variance and Covariance, The Gaussian, the bias-variance tradeoff.

UNIT II

Supervised Algorithms

Regression: Linear Regression, Logistic Regression, Linear Discriminant Analysis.

Classification: Decision Tree, Naïve Bayes, K-Nearest Neighbors, Support Vector Machines, evaluation of classification: cross validation, hold out.

UNIT III

Ensemble Algorithms: Bagging, Random Forest, Boosting

Unsupervised Learning:

Cluster Analysis: Similarity Measures, categories of clustering algorithms, k-means, Hierarchical, Expectation-Maximization Algorithm, Fuzzy c-means algorithm.

UNIT IV

Neural Networks: Multilayer Perceptron, Back-propagation algorithm. Training strategies, Activation Functions, Gradient Descent For Machine Learning, Radial basis functions, Hopfield network, Recurrent Neural Networks.

Deep learning: Introduction to deep learning. Convolutional Neural Networks (CNN), CNN Architecture, pre-trained CNN (LeNet, AlexNet).

UNIT V

Reinforcement Learning: overview, example: getting lost, State and Action Spaces, The Reward Function, Discounting, Action Selection, Policy, Markov decision processes, Q-learning, uses of Reinforcement learning

Applications of Machine Learning in various fields: Text classification, Image Classification, Speech Recognition.

TEXT BOOKS:

1. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Second Edition (Chapman & Hall/Cre Machine Learning & Pattern Recognition) (2014)
2. Machine Learning, Tom Mitchell, McGraw-Hill Science/Engineering/Math; (1997).
3. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press (2017)
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction. Second Edition, Springer Series in Statistics. (2009).
5. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer. (2006)
6. An Introduction to Pattern Recognition and Machine Learning, M Narasimha Murty, V Susheela Devi, IISc Press.
7. Uma N. Dulhare, Khaleel Ahmad, Khairol Amali Bin Ahmad, Machine Learning and Big Data: Concepts, Algorithms, Tools and Applications, Scrivener Publishing, Wiley, 2020.

Course Outcomes:

1. Extract features that can be used for a particular machine learning approach in various applications.
2. Compare and contrast pros and cons of various machine learning techniques and to get an insight when to apply particular machine learning approach.
3. Understand different machine learning types along with algorithms.
4. Understand how to apply machine learning in various applications.
5. Apply ensemble techniques for improvement of classifiers.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUETT2	3	1	0	4 HOURS	40	60	4

Database Management Systems

Course Objectives:

1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. To provide overview of database programming and procedural languages
4. To provide the concepts and algorithms for building database management systems.
5. To provide overview of transaction management, database recovery and security.

Unit 1: Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Unit 2: Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Unit 3: Storage strategies: Indices, B-trees, hashing. Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Unit 4: Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Unit 5: Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

Suggested books:

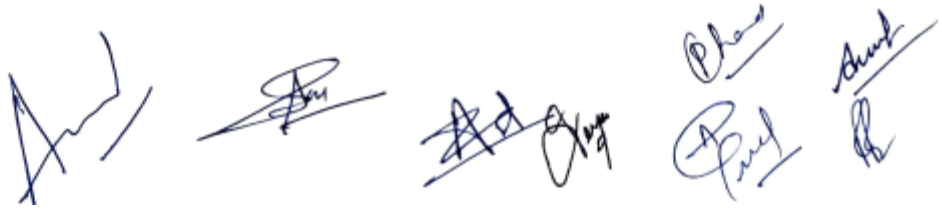
1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

Suggested reference books

1. "Principles of Database and Knowledge – Base Systems", Vol I by J. D. Ullman, Computer Science Press.
2. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education.
3. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.

Course Outcomes:

1. To construct an Entity-Relationship (E-R) model from specifications and transform it to a



relational model.

2. Master the basics of SQL for retrieval and management of data.
3. To construct queries in SQL or Relational Algebra.
4. Be acquainted with the basics of transaction processing and concurrency control.
5. Familiarity with database storage structures and access techniques.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUETT3	3	0	0	3 HOURS	40	60	3

Formal Language & Automata Theory

Course Objectives:

1. Understand basic properties of formal languages and formal grammars.
2. Design and Understand basic properties of deterministic, nondeterministic finite automata, TM, Mealy, PDA and Moore automata.
3. Understand the relation between types of languages and types of finite automata.
4. Design and Understanding the Context free languages and grammars, and also Normalizing CFG.
5. Know the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problem.

Unit-I Automata: Basic machine, FSM , Transition graph, Transition matrix, Deterministic and nondeterministic FSM'S, Equivalence of DFA and NDFA, Mealy & Moore machines, minimization of finite automata, Two-way finite automata. Regular Sets and Regular Grammars: Alphabet, words, Operations, Regular sets, Finite automata and regular expression, MyhillNerode theorem Pumping lemma and regular sets, Application of pumping lemma, closure properties of regular sets.

Unit-II Context –Free Grammars: Introduction to CFG, Regular Grammars, Derivation trees and Ambiguity, Simplification of Context free grammars, Normal Forms (Chomsky Normal Form and Greibach Normal forms).

Unit-III Pushdown Automata: Definition of PDA, Deterministic Pushdown Automata, PDA corresponding to given CFG, CFG corresponding to a given PDA, Context Free Languages: The pumping lemma for CFL's, Closure properties of CFL's, Decision problems involving CFL's.

Unit-IV Turing Machines: Introduction, TM model, representation and languages acceptability of TM Design of TM, Universal TM & Other modification, Church's hypothesis, composite & iterated TM, Turing machine as enumerators, Properties of recursive & recursively enumerable languages, Universal Turing machine

Unit V Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, examples of these problems like satisfy ability problems, vertex cover problem, Hamiltonian path problem, traveling sales man problem, Partition problem etc.

Suggested books

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.

Suggested reference books:

1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
2. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
3. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.

4. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill.

Course Outcomes :

1. Comprehend Knowledge to acquire a full understanding of Automata Theory as the basis of all computer science languages - Model building and have a clear understanding of the Automata theory concepts.
2. Cognitive skills - Be able to design FAs, NFAs, Grammars, languages modeling, small compilers basics - Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.
3. Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.
4. Professional Skill - Perceive the power and limitation of a computer as a computing machine.
5. Attitude - Develop a perception on the importance of computational theory as model building.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUETK1	3	0	0	3 HOURS	40	60	3

DIGITAL IMAGE PROCESSING

Course Objectives:

1. Cover the basic theory and algorithms that are widely used in digital image processing.
2. Expose students to current technologies and issues that are specific to image processing systems.
3. Develop hands-on experience in using computers to process images.
4. Develop critical thinking about shortcomings of the state of the art in image processing.

Unit I: Introduction

Image formation model, Spatial & Gray level resolution, Image enhancement in special domain: Piecewise transformation functions, Histogram equalization, Histogram specification, image averaging, spatial filters- smoothing and sharpening. Laplacian filter, Canny edge detector.

Unit II: Image Enhancement in Frequency Domain & Image segmentation:

2D discrete Fourier transform & its inverse, filtering in frequency domain, Ideal & Gaussian low pass filters, High pass filtering, FFT, Line detection, Edge detection, Edge linking & boundary detection, Thresholding, Region based segmentation.

UNIT III: Morphological Image Processing

Logic operations involving binary image, Dialation & Erosion, Opening & Closing, Applications to Boundary extraction, region filling, connected component extraction.

UNIT IV: Image compression

Coding redundancy- Huffman coding, LZW coding, run length coding, Lossy compression- DCT, JPEG, MPEG, video compression.

UNIT V: Image representation & 3D

Boundary descriptors, Shape numbers, Texture, Projective geometry, Correlation based and feature based stereo correspondence, shape from motion, optical flow.

Text Book

1. Ganzalez and Woods, Digital Image Processing, Pearson education.
2. Sonka and Brooks, Image Processing, TSP ltd,

References Book: -

1. Jain and Rangachar, Machine Vision, MGH.
2. Schalkoff, Digital Image Processing, John Wiley and sons.

Course Outcomes:

After successful completion of the course, student will be able to

1. Describe, analyze and reason about how digital images are represented, manipulated, encoded and processed, with emphasis on algorithm design, implementation and performance evaluation.
2. Design and analysis. Analyze and implement image processing algorithms.
3. Apply principles and techniques of digital image processing in applications related to digital imaging system.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUETK2	3	0	0	3 HOURS	40	60	3

SOFTWARE TESTING AND QUALITY MANAGEMENT

Course Objectives

1. Study fundamental concepts of software testing and its application in various scenarios.
2. Understand white box, block box and other testing's.
3. Understand the importance of software quality and assurance software systems development
4. Understand the quality management, assurance, and quality standard to software.
5. To understand software test automation problems and solutions.

UNIT I

Software Quality: Ethical Basis for software Quality, Total quality Management Principles, Software Processes and Methodologies, Quality Standards, Practices & conventions, Top Down and Bottom-Up Approach.

UNIT II

Software management Reviews and Audits, Enterprise Resource Planning Software, Measurement Theory , Software Quality Metrics, designing Software Measurement Programs , Organizational Learning.

UNIT III

Improving Quality with methodologies: Structured information Engineering , Object-Oriented Software , Reverse Engineering , Measuring Customer Satisfaction Defect Prevention , Reliability Models , Reliability Growth Models.

UNIT IV

Software Quality Engineering: Defining Quality Requirements Management, Complexity Metrics and Models, Management issues for software Quality, Project Tracking and Oversight, Use of CASE tool Technology, Role of Groupware, data Quality Control.

UNIT V

Project Configuration management: Configuration Management Concepts, Configuration Management Process, Document Control, Configuration Management plan of the WAR Project.

List of Books:

1. Stephan Kan, Metrics and Models in Software quality, Addison Wesley.
2. Mark Paulik, The capability Maturity Model-guidelines for improving the software Process, Addison Wesley.
3. Michael, Deutsch, Willis, Ronald r-Software Quality Engineering- A Total Technical and Management approach, Prentice Hall.
4. Ginac, Frank P, Customer Oriented Software Quality Insurance, Prentice Hall.
5. Wilson, Rodney C, Software RX secrets of Engineering Quality Software, Prentice Hall.
6. Pressman, Software Engineering-A practitioner's approach
7. Pankaj Jalote, CMM Project

Course Outcomes

After completion of this course, student will be able to

1. Understand importance of testing techniques in software quality management and assurance.
2. Identify various types of software risks and its impact on different software application.
3. Create test case scenarios for different application software using various testing techniques.
4. Apply different testing methodologies used in industries for software testing.
5. Describe fundamental concepts of software quality assurance.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUETK3	3	0	0	3 HOURS	40	60	3

SOFT COMPUTING

Course Objectives:

1. To introduce the fundamental concepts and techniques of neural networks, including learning rules, activation functions, feedforward and feedback network models, and their applications in various fields.
2. To provide an in-depth understanding of supervised learning, including the perceptron learning algorithm, multilayer neural networks, linear separability, Adaline, Madaline, backpropagation network, and their applications in forecasting, data compression, and image compression.
3. To explore unsupervised learning techniques, including Kohonen SOM, counter propagation, ART, and their applications in pattern and face recognition, intrusion detection, and robotic vision.
4. To provide a comprehensive overview of fuzzy sets and their application in solving engineering problems, including fuzzy rules, fuzzy reasoning, fuzzy relations, and fuzzy inference systems.
5. To introduce genetic algorithms and their basic terminology and operators, including individual, gene, fitness, population, encoding, selection, crossover, mutation, and convergence criteria, and their applications in solving optimization problems like JSPP, TSP, network design routing, and timetabling problem.

Unit I: Introduction to Neural Network:

Concept, biological neural network, evolution of artificial neural network, McCulloch-Pitts neuron models, Learning (Supervise & Unsupervised) and activation function ,Models of ANN Feed forward network and feedback network, Learning Rules- Hebbian, Delta, Perceptron Learning and Windrow-Hoff, winner take all.

Unit II: Supervised Learning:

Perceptron learning,- Single layer/multilayer, linear Separability, Adaline, Madaline, Back propagation network, RBFN. Application of Neural network in forecasting, data compression and image compression.

Unit III: Unsupervised learning:

Kohonen SOM (Theory, Architecture, Flow Chart, Training Algorithm)Counter Propagation (Theory , Full Counter Propagation NET and Forward only counter propagation net),ART (Theory, ART1, ART2). Application of Neural networks in pattern and face recognition, intrusion detection, robotic vision.

Unit IV: Fuzzy Set:

Basic Definition and Terminology, Set-theoretic Operations, Member Function ,Formulation and Parameterization, Fuzzy rules and fuzzy Reasoning, Extension Principal and Fuzzy Relations, Fuzzy if-then Rules, Fuzzy Inference Systems. Hybrid system including neuro fuzzy hybrid, neuro genetic hybrid and fuzzy genetic hybrid, fuzzy logic controlled GA. Application of Fuzzy logic in solving engineering problems.

Unit V: Genetic Algorithm:

Introduction to GA, Simple Genetic Algorithm, terminology and operators of GA (individual, gene, fitness, population, data structure, encoding, selection, crossover, mutation ,convergence criteria). Reasons for working of GA and Schema theorem, GA optimization problem s including JSPP (Job shop scheduling problem), TSP (Travelling salesman problem), Network design routing ,timetabling problem.

Text Book

1. S.N. Shivnandam, "Principle of soft computing", Wiley.
2. S. Rajshekaran and G.A.V. Pai, "Neural Network , Fuzzy logic And Genetic Algorithm", PHI.

References Book: -

1. Jack M. Zurada, "Introduction to Artificial Neural Network System" JAico Publication.
2. Simon Haykins, "Neural Network- A Comprehensive Foudation".
3. Timothy J.Ross, "Fuzzy logic with Engineering Applications", McGraw-Hills.

Course Outcomes:

1. Students will be able to understand the fundamental concepts and techniques of neural networks and their applications in various fields.
2. Students will be able to design and implement supervised learning techniques such as the perceptron learning algorithm, multilayer neural networks, and back propagation networks, and apply them in forecasting, data compression, and image compression.
3. Students will be able to implement unsupervised learning techniques such as Kohonen SOM, counter propagation, and ART, and apply them in pattern and face recognition, intrusion detection, and robotic vision.
4. Students will be able to apply fuzzy sets and their related concepts in solving engineering problems, including fuzzy rules, fuzzy reasoning, fuzzy relations, and fuzzy inference systems.
5. Students will be able to design and implement genetic algorithms and apply them in solving optimization problems like JSPP, TSP, network design routing, and timetabling problem.

SUB CODE	L	T	P	DURATION/WEEK	IA	ESE	CREDITS
ITUETK4	3	0	0	3 HOURS	40	60	3

WIRELESS SENSOR NETWORK

COURSE OBJECTIVES:

1. To learn about Wireless Networks, architectures and technologies, WSN platforms: Hardware and Software.
2. To understand & implement Energy management and WSN layers (MAC, Link, Routing).
3. To perform Sensor data acquisition, processing and handling.
4. To simulate Signal processing, target localization and tracking, self-organization.
5. Case Study of Applications like (health, environmental monitoring, smart home).

UNIT I – FUNDAMENTALS OF SENSOR NETWORKS

Introduction to computer and wireless sensor networks, Motivation for a network of Wireless Sensor nodes- Sensing and sensors-challenges and constraints - node architecture-sensing subsystem, processor subsystem-communication interfaces- prototypes, Application of Wireless sensors

UNIT II- COMMUNICATION CHARACTERISTICS AND DEPLOYMENT MECHANISMS

Wireless Transmission Technology and systems-Radio Technology Primer-Available Wireless Technologies - Hardware- Telosb, Micaz motes- Time Synchronization- Clock and the Synchronization Problem - Basics of time synchronization-Time synchronization protocols - Localization- Ranging Techniques- Range based Localization-Range Free Localization- Event driven Localization

UNIT III- MAC LAYER

Overview-Wireless Mac Protocols-Characteristics of MAC protocols in Sensor networks – Contention free MAC Protocols- characteristics- Traffic Adaptive Medium Access-Y-MAC, Low energy Adaptive Clustering - Contention based MAC Protocols- Power Aware Multi-Access with signalling

UNIT IV- ROUTING IN WIRELESS SENSOR NETWORKS

Design Issues in WSN routing- Data Dissemination and Gathering-Routing Challenges in WSN - Flooding-Flat Based Routing – SAR, Directed Diffusion, Hierarchical Routing- LEACH, PEGASIS - Query Based Routing- Negotiation Based Routing- Geographical Based Routing-Transport layer- Transport protocol Design issues- Performance of Transport Control Protocols.

UNIT V - MIDDLEWARE AND SECURITY ISSUES

WSN middleware principles-Middleware architecture-Existing middleware - operating systems for wireless sensor networks-performance and traffic management - Fundamentals of network security-challenges and attacks - Protocols and mechanisms for security.

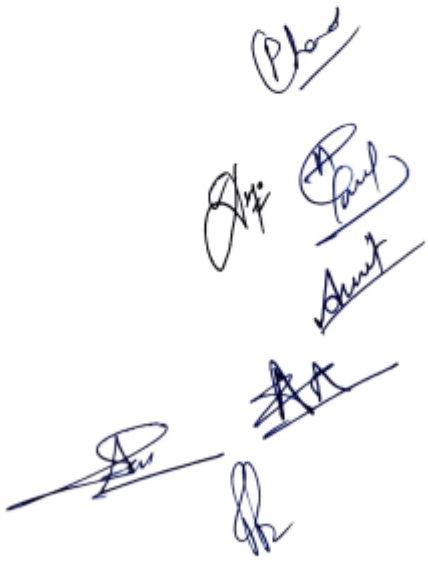
REFERENCES

1. Waltenegus Dargie, Christian Poellabauer , "Fundamentals of Wireless Sensor Networks, Theory and Practice", Wiley Series on wireless Communication and Mobile Computing, 2011
2. Kazem Sohraby, Daniel manoli , "Wireless Sensor networks- Technology, Protocols and Applications", Wiley Inter Science Publications 2010.
3. Bhaskar Krishnamachari, "Networking Wireless Sensors", Cambridge University Press, 2005
4. C.S Raghavendra, Krishna M.Sivalingam, Taiebznati , "Wireless Sensor Networks", Springer Science 2004.

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to-

1. Describe the overview of wireless sensor networks and enabling technologies for wireless sensor networks
2. Apply the design principles of WSN architectures and operating systems for simulating environment situations.
3. Apply various concepts for assignment of MAC addresses.
4. Select the appropriate infrastructure, topology, joint routing and information aggregation for wireless sensor networks.
5. Analyse the sensor network platform and tools state-centric programming.



SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUETK5	3	0	0	3 HOURS	40	60	3

HUMAN COMPUTER INTERFACE

COURSE OBJECTIVES:

1. To learn the foundations of Human Computer Interaction.
2. To become familiar with the design technologies for individuals and persons with disabilities.
3. To be aware of mobile HCI.
4. To learn the guidelines for user interface.
5. To understanding and importance of UI its design and mistakes.

UNIT1: Introduction of the human, the computer, the interaction, Paradigms, Usability of Interactive Systems, Guidelines, Principles, and Theories

UNIT2: Design Process- Interaction design basics, HCI in the software process, Design rules, Implementation support, Evaluation techniques, Universal design, User support

UNIT3: Models and Theories0 Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models, Task analysis, Dialogue notations and design, Models of the system, Modelling rich interaction

UNIT4: Interaction Styles- Direct Manipulation and Virtual Environments, Menu Selection, Form Filling and Dialog Boxes, Command and Natural Languages, Interaction Devices, Collaboration and Social Media Participation

UNIT5: Design Issues- Quality of Service, Balancing Function and Fashion, User Documentation and Online Help, Information Search, Information Visualization

Text Books:

1. "Human Computer Interaction" by Alan Dix, Janet Finlay , ISBN :9788131717035, Pearson Education (2004)
2. "Designing the User Interface - Strategies for Effective Human Computer Interaction", by Ben Shneiderman ISBN : 9788131732557, Pearson Education (2010).

Reference Books:

1. Usability Engineering: Scenario-Based Development of Human-Computer Interaction, by Rosson, M. and Carroll, J. (2002).
2. The Essentials of Interaction Design, by Cooper, et al. , Wiley Publishing(2007).
3. Usability Engineering, by Nielsen, J. Morgan Kaufmann, San Francisco, 1993. ISBN 0-12-518406-9.
4. The Resonant Interface: HCI Foundations for Interaction Design , by Heim, S. , Addison-Wesley. (2007).

5. Usability engineering: scenario-based development of human-computer interaction. By Rosson, M.B & Carroll, J.M. . Morgan Kaufman.(2002)

COURSE OUTCOMES:

Students will try to learn:

1. Design effective dialog for HCI.
2. Design effective HCI for individuals and persons with disabilities.
3. Assess the importance of user feedback.
4. Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
5. Develop meaningful user interface.

5. Usability engineering: scenario-based development of human-computer interaction, By Rosson, M.B & Carroll, J.M. , Morgan Kaufman.(2002)

COURSE OUTCOMES:

Students will try to learn:

1. Design effective dialog for HCI.
2. Design effective HCI for individuals and persons with disabilities.
3. Assess the importance of user feedback.
4. Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
5. Develop meaningful user interface.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUETK6	3	0	0	3 HOURS	40	60	3

NETWORK SECURITY

COURSE OBJECTIVES:

1. To understand the principles and practices of cryptography and network security.
2. To be able to secure a message over insecure channel by various means.
3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4. To understand the practical applications that have been implemented and are in use to provide network security.
5. To understand various protocols for network security to protect against the threats in the networks.

UNIT1: A Model for Network Security Services, Mechanisms, and Attacks, Viruses & Worms, The OSI Security Architecture, symmetric cipher model, substitution techniques Transposition techniques, Steganography.

UNIT2: Block ciphers and the data encryption standard, simplified DES, Block cipher principles. The data Encryption Standard. Differential and Linear Cryptanalysis, Block Cipher Design principles. The AES cipher. Triple DES, blowfish, RC5, Rc4 Stream Cipher.

UNIT3: Principles of public-Key Cryptosystems, public-Key cryptosystems, Requirements for public -Key Cryptosystems, The RSA Algorithm, Key management, key Distribution, Hash Functions SHA, MD5. Diffie-Hellman Key Exchange Algorithm.

UNIT4: WEB & IP Security: Web Security Threats, SSL Architecture, SSL. Record Protocol, Alert Protocol, Handshake Protocol. Transport Layer Security, Secure Electronic Transaction. IP Security.

UNIT5: Intruders: Intrusion Techniques Intrusion Detection, Audit Records Firewall Design principles. Firewall Characteristics, Types of Firewalls

Text Books:

1. William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, Prentice Hall, 4th Edition.
2. Cryptography and Network Security, Atul Kahate, McGraw Hill Education (India) Private Limited; Third edition.

Reference Books:

1. Applied Cryptography: Protocols & Algorithms, Schneier & Bruce, MGH International.

2. Cryptography and Security – by Dr T R Padmanabhan N Harini . Wiley India Pvt Ltd. 2011

COURSE OUTCOMES:

Students will try to learn:

1. Conventional encryption algorithms for confidentiality and their design principles.
2. Public key encryption algorithms and their design principles.
3. Use of message authentication codes, hash functions , digital signature and public key certificates.
4. Network security tools and applications.
5. System-level security issues like threat of and countermeasures for intruders and viruses, and the use of firewalls and trusted systems.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUELT1	0	0	3	3 HOURS	25	25	1.5

Machine Learning Lab

Course Objectives:
This course is designed to enable the students to:
1. Demonstration of different classifiers on different data.
2. Demonstrate ensembling of classifiers for solving real world problems.
3. Make use of real world data to implement machine learning models.

1. Basic Data Preprocessing

a) Installation of python environment/Anaconda IDE for machine learning: installing python modules/Packages like scikit-learn, Keras and Tensorflow etc.

b) Programs involving pandas, Numpy and Scipy libraries.

2. Programs for classification

1. Build models using linear regression and logistic regression and apply it to classify a new instance.
2. Write a program to demonstrate the following classifiers. Use an appropriate data set for building the model. Apply the model to classify a new instance.
    a. Decision tree
    b. K nearest neighbour
    c. Naïve bayes
    d. Support vector machine

3. Demonstration of clustering algorithms using

1. k-means
2. Hierarchical algorithms (agglomerative etc).
3. Interpret the clusters obtained.
4. Demonstrate ensemble techniques like boosting, bagging, random forests etc.
5. Build a classifier, compare its performance with an ensemble technique like random forest.
6. Evaluate various classification algorithms performance on a dataset using various measures like True Positive rate, false positive rate, precision, recall etc.
7. Demonstrate GA for optimization (minimization or maximization problem).
8. Case study on supervised/unsupervised learning algorithm:
    a. Handwritten digits classification using CNN.
    b. Text classification using python libraries.

TEXT BOOKS:

1. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Second Edition (Chapman & Hall/Cre Machine Learning & Pattern Recognition) (2014)
2. Machine Learning, Tom Mitchell, McGraw-Hill Science/Engineering/Math; (1997).
3. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press (2017)
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction. Second Edition, Springer Series in Statistics. (2009).
5. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer. (2006)
6. An Introduction to Pattern Recognition and Machine Learning, M Narasimha Murty, V Susheela Devi, IISc Press.
7. Uma N. Dulhare, Khaleel Ahmad, Khairol Amali Bin Ahmad, Machine Learning and Big Data: Concepts, Algorithms, Tools and Applications, Scrivener Publishing, Wiley, 2020.

Course Outcomes:

Students must be able to:

1. Apply machine learning algorithms: dataset preparation, model selection, model building etc.
2. Evaluate various Machine Learning approaches.
3. Use scikit-learn, Keras and Tensorflow to apply ML techniques.
4. Design and develop solutions to real world problems using ML techniques.
5. Apply unsupervised learning and interpret the results.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUELT2	0	0	3	3 HOURS	25	25	1.5

Database Management Systems Lab

Course Objectives:

This course is designed to enable the students to:

1. Ability to acquire skills in using SQL commands for data definition and data manipulation.
2. To design database schema for a given application and apply normalization.
3. Learn SQL basics for data definition and data manipulation.
4. Ability to develop solutions for database applications using procedures, cursors and triggers.
5. Ability to develop database applications for Industrial orientation.

S.No.	Experiments
1	Concept design with E-R Model.
2	Relational Model.
3	Normalization.
4	Practicing DDL commands.
5	Practicing DML commands.
6	Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.).
7	Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8	Triggers (Creation of insert trigger, delete trigger, update trigger).
9	Procedures.
10	Usage of Cursors.

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

REFERENCES BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education.
3. Introduction to Database Systems, C.J. Date, Pearson Education.
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

Course Outcomes:

At the end of this course the student can answer how to:

1. Design database schema for a given application and apply normalization.
2. Ability to formulate queries using SQL DML/DDL/DCL commands.
3. Apply the normalization techniques for development of application software to realistic problems.
4. Practice various triggers, procedures, and cursors using PL/SQL.
5. Apply normalization techniques for refining of databases.

SCHEME FOR EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
THIRD YEAR, INFORMATION TECHNOLOGY
SEMESTER VI
EFFECTIVE FROM SESSION 2024-25 (NEP)

SL. NO.	SUBJECT CODE	SUBJECTS	PERIODS/ WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1	ITUFTT1	MICROPROCESSOR & MICROCONTROLLER	3	0	0	40	60	100	4
2	ITUFTT2	COMPUTER NETWORKS	3	0	0	40	60	100	3
3	ITUFTKX	DEPARTMENT ELECTIVE-V	3	0	0	40	60	100	3
4	ITUFTKX	DEPARTMENT ELECTIVE-VI	3	0	0	40	60	100	3
5	ITUFTO1	MOOC COURSE - I	3	0	0	-	-	100	3
PRACTICAL									
1	ITUFLT1	MICROPROCESSOR & MICROCONTROLLER LAB	0	0	3	25	25	50	1.5
2	ITUFLT2	COMPUTER NETWORKS LAB	0	0	3	25	25	50	1.5
3	ITUFPV1	PROJECT	0	0	4	50	50	100	2
TOTAL CREDITS									**21**
IA- INTERNAL ASSESSMENT, ESE-END SEMESTER EXAMINATION, L-LECTURE, T-TUTORIAL, P-PRACTICAL									

LIST OF DEPARTMENT ELECTIVE-V

1	ITUFTK1	COMPILER DESIGN
2	ITUFTK2	DISTRIBUTED SYSTEM
3.	ITUFTK3	COMPUTER GRAPHICS

LIST OF DEPARTMENT ELECTIVE-VI

1	ITUFTK4	GRID & CLOUD COMPUTING
2	ITUFTK5	OBJECT ORIENTED ANALYSIS & DESIGN
3.	ITUFTK6	DATA MINING

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUFTT1	3	1	0	4 HOURS	40	60	4

Microprocessor &Microcontroller

Course Objectives:

Students will be able to.

1. Outline the history of computing devices.
2. Describe the architecture of 8086 Microprocessors.
3. Understand 8051 microcontroller concepts, architecture and programming.
4. Compare microprocessors and microcontrollers.
5. Develop programs for microprocessor and microcontrollers.

UNIT 1: Architecture of Microprocessors

Architecture of 8085Microprocessor.Architecture of 8086 Microprocessor. Signals and pins of 8086 microprocessor.

UNIT 2: Assembly Language of 8086

Description of Instructions. Assembly Directives Assembly. Software Programs with Algorithms

UNIT 3: Interfacing with 8086

Interfacing with RAMs, ROMs along with the explanation of timing diagrams. Interfacing with Peripheral ICs like 8255, 8254, 8279, 8259 etc. Architecture of 8087, Interfacing with 8086.

UNIT 4: Architecture of Micro controllers

Architecture of Microcontroller, Family members, Microcontroller Resources, Architecture of 8051 Microcontroller, Internal External memories, Counters &Timers, Synchronous Serial-Cum-Asynchronous Serial Communication USART Interface in Intel 8051, interrupts.

UNIT 5: Assembly language of 8051

Basic Assembly Language Programming in 8051, 8051 family Microcontrollers Instruction set.

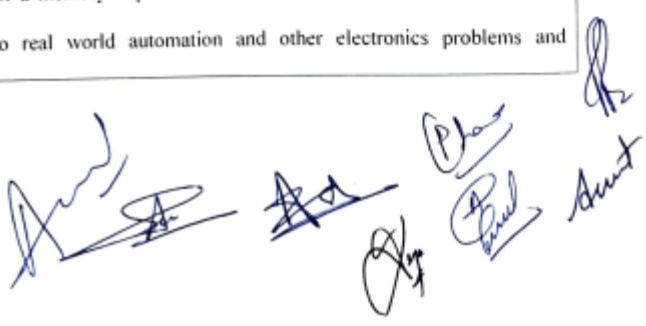
REFERENCES

1. Advanced Microprocessor and peripherals by K M Bhurchandi and A K Ray, McGraw Hill Education (India).
2. Architecture programming, interfacing and system design by Raj Kamal, pearson education.

Course Outcomes :

At the end of the course, students will develop ability to

1. Define the history of microprocessors & describe the architectures of 8085 and 8086 microprocessors.
2. Write programs for 8086 and 8051 & distinguish between the different modules of operation of microprocessors.
3. Interface peripherals to 8086 and 8051.
4. Evaluate the appropriateness of a memory expansion interface based on the address reference with particular application.
5. Apply the above concepts to real world automation and other electronics problems and applications.



SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUFTT2	3	0	0	3 HOURS	40	60	3

Computer Networks

Course Objectives:

1. Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media.
2. Describe the functions of data link layer i.e. error detection, error correction, flow control, access control mechanism.
3. Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.
4. Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.
5. Explain the different protocols used at application layer i.e. HTTP, FTP, TFTP, VoIP, Network Security.

UNIT I - Introduction: OSI and TCP/IP Reference models, Function of layers, Network Topologies, Categories of Network - LAN, WAN, MAN, Line Configuration, Transmission Modes, Networking Devices.

UNIT II - Data link layer: Design issues, framing, error detection and correction, CRC, Hamming Code Method, Elementary Protocol- stop and wait, Sliding Window, HDLC, Ethernet, CSMA/CD.

UNIT III - Network Layer: Design Issues, Forwarding and Routing, Virtual Circuit and Datagram Networks, shortest path routing – Dijkstra's algorithms, Link State Routing, Distance Vector Routing, Internet Protocol (IP), Hierarchical Routing – RIP – OSPF – BGP.

UNIT IV - Transport Layer: Transport Layer Services, Transmission Control Protocol, TCP header, 3 way Handshake, UDP, UDP header, Difference between TCP and UDP, Reliable Data Transfer – Go Back N and Selective Repeat.

UNIT V - Application Layer: Principles of Network Applications, Encryption, Compression, Cryptography: Substitution and Transposition Ciphers, Data functions: translation, Encryption standards (DES), RSA, Email, World Wide Web, file transfer protocol, VoIP, TFTP.

TEXT BOOKS

1. Data Communications and Networking – Behrouz A. Forouzan. TMH.
2. Computer Networks — Andrew S Tanenbaum, Pearson Education/PHI.
3. Data and Computer Communication by William Stalling (Pearson Education).

REFERENCE BOOKS

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.
3. Computer Networking by Ed Tittel (Schaum's series) (TMH).
4. Comer, "Computer Networks and Internets with Internet Applications", Pearson Education.

Course Outcomes :

1. Understand fundamental underlying principles of computer networking.

2. Understand details and functionality of layered network architecture.
3. Apply mathematical foundations to solve computational problems in computer networking.
4. Analyze performance of various communication protocols.
5. Compare routing algorithms.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUFTK1	3	0	0	3 HOURS	40	60	3

Compiler Design

Course Objectives:

1. To learn the process of translating a modern high-level language to executable code.
2. To learn the various parsing techniques.
3. To understand intermediate code generation and run-time environment.
4. To draw the flow graph for the intermediate codes.
5. To apply the optimization techniques to have a better code for code generation.

UNIT 1: Introduction: Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, from regular expressions to finite automata.

UNIT 2: Syntax Analysis (Parser): top-down parsing and bottom-up parsing, syntax directed definition, evaluation and flow of attribute in a syntax tree.

UNIT 3: Symbol Table: Its structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope.

UNIT 4: Intermediate Code Generation: Translation of different language features, different types of intermediate forms. Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc.

UNIT 5: Register allocation and target code generation Advanced topics: Type systems, data abstraction, compilation of Object Oriented features and non-imperative programming languages.

List of Books:

1. A.V.Aho, Ravi Sethi, J.D.Ullman, Compilers tools and Techniques, Addison Wesley.
2. D.M.Dhamdhere, Compiler Construction-Principles and practice Macmillan, India.
3. Tremblay J.P. and Sorenson, P.G. the theory and practice of compiler writing, Mc Graw Hil.
4. Waite W.N. and Goos G., Compiler construction' springer verlag.

Course Outcomes :

By the end of the course, the successful student will be able to do:

1. To understand the structure of a compiler.
2. To gain the knowledge about types of the parser.
3. To understand the concept of Storage Organization.
4. To know about compiler generation tools and techniques.
5. To design a compiler for a simple programming language.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUFTK2	3	0	0	3 HOURS	40	60	3

Distributed System

Course Objectives:

1. To provide hardware and software issues in modern distributed systems.
2. To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
3. To analyse the current popular distributed systems such as peer-to-peer (P2P) systems will also be analysed.
4. To understand classic distributed algorithms for synchronization, consistency, fault-tolerance, etc.
5. To understand how modern distributed systems are designed and engineered.

UNIT -1 INTRODUCTION

Introduction to Distributed System – Goals: - advantages of distributed system over centralized ones, advantages of distributed system over independent PC's, Disadvantages of distributed system. Hardware Concept - Bus based multiprocessors, switched multiprocessors, bus based multi-computers, switched multi-computers. Software Concept – Network operating system and NFS, true Distributed System, multi-processor time sharing system. Design Issues – Transparency, Flexibility, Reliability, Performance and Scalability.

UNIT-2 COMMUNICATION IN DISTRIBUTED SYSTEM

Layered protocol, The client server method - Clients and servers, Remote procedure call – Basic RPC failures, implementation issues, problem areas. Group Communication: - Introduction to Group Communication, design issues, Synchronization and Replication: Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks - Distributed mutual exclusion - Elections - Transactions and Concurrency Control, MPI, RMI.

UNIT-3 DISTRIBUTED FILE SYSTEMS

Introduction, desirable features of a good distributed file system, File Model, file accessing models, filesharing semantics, file caching schemes, file replication, fault tolerance, atomic transactions, design principal, case studies. Resource Management And Process Management :Introduction, Desirable features of a good global scheduling algorithm, Task assignment approach, load balancing approach, process migration, threads. Case studies: HDFS, GFS,

UNIT-4DISTRIBUTED COMPUTING SYSTEMS

Introduction to grid and cluster computing, Beowulf cluster, Globus toolkit, grid Security Infrastructure, OGSA, case studies: crypto currencies and block chain, botnet, IOT, Distributed information systems, distributed pervasive systems, distributed object based system, java beans. Cloud computing, Open Stack

UNIT 5 HIGH PERFORMANCE COMPUTING

Hardware requirements for High performance computing, supercomputing, rack system and design, GPU centric computing, High end CPU and GPU, HPC on commodity hardwares, case studies: Cray Systems

REFERENCE BOOKS

1. Modern operating system – Andrew S. Tanenbaum.
2. Distributed Operating Systems Concepts and Design – Pradeep K. Sinha.

3. Georg Hager and Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall, 2010.
4. IBM Red Book: "Introduction to Grid Computing with Globus", Luis Ferreira et al.

Course Outcomes :

1. To know about Shared Memory Techniques.
2. Have sufficient knowledge about file access.
3. Have knowledge of Synchronization and Deadlock.
4. Compare Distributed File Systems, and Distributed Process Scheduling with Transaction Services and Concurrency Control.
5. Demonstrate different algorithms and techniques for Distributed Agreement, Replicated Data Management.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUFTK3	3	0	0	3 HOURS	40	60	3

Computer Graphics

Course Objectives:

1. The main objective of the course is to introduce students with fundamental concepts and theory of computer graphics.
2. Understand the need of developing graphics application.
3. Learn algorithmic development of graphics primitives like: line, circle, polygon etc.
4. Learn the representation and transformation of graphical images and pictures.
5. It presents the important drawing algorithm, polygon fitting, clipping and 2D transformation curves and an introduction to 3D transformation.

UNIT-I OVERVIEW OF GRAPHICS SYSTEM:

I/O devices, Raster scan & Random scan system, DDA &Bresenhams Line drawing Algorithm,Mid-Point &Bresenhamscircle drawing Algorithm,Midpoint ellipse generating algorithm, Clipping: Sutherland Cohen LineClipping, Polygon clipping: Hodgeman-Sutherland&Weiler-Atherton polygon clipping.2-D & 3-D Transformation.

UNIT-II CURVES &SURFACES:

Conics-Parametric forms for circle, ellipse, parabola, Bezier Curves-Need for cubic parametric curves c0, c1, c2 continuity, Generation though Bernstein polynomials, Condition for smooth joining of 2 segments, Convex Hull property, B-Spline Curves: Knot vectors-uniform and open uniform curves, Uniform. Periodic B-splines, Open B-splines, Uniform B-splines, Non-uniformB-splines, Rational B-spiines. Beta splines.

UNIT-III PROJECTIONS & HIDDEN SURFACE REMOVAL :

Parallel projection on xy plane (including oblique view), Perspective projection-1, 2 and 3 Vanishing points, Reconstruction of 3-D images. Hidden Surface Removal: Back face removal, Floating Horizon method for curved objects, Z-Buffer or Depth Buffer Algorithm, Painters algorithm (Depth sorting method). Binary space partitioning trees, Scan-line algorithm, Warnock's algorithm.

UNIT-IV SHADING & COLOR ISSUES :

Filled Area Primitives,Illumination model for diffused & specular reflection, Computing reflection vector,Gouraud and Phog Shading, Texture mapping, Bump mapping, Handling shadows, Radiosity: Lambert's Law, Basic element, Modeling transparency, Visualization of data sets, volume rendering, Color issues: Additive, Subtractive primaries,Filled Area Primitives.

UNIT-V FRACTALS &ANIMATION:

Fractals: self-similar fractals-fractal dimension, Generation of Terrain-random midpoint displacement, Self-squaring fractals. SolidModeling: Generation through sweep techniques, Constructive sold geometry, B representations, Octrees, Ray Tracing & their Theory, Animation: In-between using rotation and translation, Procedural animation, Morphing, Motion Control (Key framing).

Text Books:

1. Computer graphics, Hearn and Baker, PHI.

2. Computer Graphics, Foley, PE-LPE.

Reference Books:

1. Procedural Elements of Computer graphics, Rogers, McGraw Hill.
2. Computer graphics, Harringtons S., McGraw Hill.
3. Computer Graphics, Schoum Series.

Course Outcomes :

1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.
4. Extract scene with different clipping methods and its transformation to graphics display device.
5. Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUFTK4	3	0	0	3 HOURS	40	60	3

Grid and Cloud Computing

Course Objectives:

1. To uunderstand the architecture, advantages, and disadvantages of cloud computing and study the concepts of computation services, virtualization, and micro-services.
2. To explore the features of major cloud Service Models and platforms.
3. To learn about distributed file systems and Analyse big data for business intelligence.
4. To understand the concepts of edge and fog computing, and explore the integration of IoT and mist computing for practical use cases.
5. To study the architecture, goals, and applications of cluster and grid computing.

UNIT I : Cloud Computing Architecture, Advantages and Disadvantages, Cloud Services, Web-Based Application. Ubiquitous computing, Cloud Computing for end user and Industry 4.0, Infrastructure as a Service, Virtualization, Containerization, Orchestration, Micro-services, RAID, SAN, Computation Services.

UNIT II : Platform as a Service, Microsoft AZURE, Google App Engine, Amazon Web Services, IBM Clouds, DevOps. Software as a Service, IBM Websphere Cast Iron, Cloud Native Application. Spring Boot.

UNIT III: Distributed File System, MapReduce, GFS, Hadoop, HDFS, Bigdata, business intelligence, IBM Infosphere Biginsight, Analytics of BigData.

UNIT IV: Edge and Fog Computing, Multi Access Edge Computing, Computation Offloading, Edge AI, IoT and Mist Computing, use cases, real time processing, DPU, SoC, SoM, Simulators.

UNIT V: Distributed Systems, Cluster and Grid Computing, Architecture and Goals, Applications and Challenges of Grid Computing. IBM Globus Toolkit, Grid Security Infrastructure, Open Grid Service Architecture.

TEXT BOOKS / REFERENCE BOOKS

1. Cloud Computing: Principles and Paradigms", Editors: Rajkumar Buyya, James Broberg,Andrzej M. Goscinski, Wiley, 2011
2. The Self-Taught Cloud Computing Engineer: A comprehensive professional study guide to AWS, Azure, and GCP by Dr Logan Song, Packt Publishing.
3. Fog and Edge Computing: Principles and Paradigms, By Rajkumar Buyya et.al. Wiley Telecom.
4. Cloud Native Spring in Action with Spring Boot and Kubernetes, By Thomas Vitale, Publisher Manning.
5. Understanding Bigdata, by Paul C. Zikopoulos et al. McGraw Hill.
6. "Introduction to Grid Computing with Globus", Luis Ferreira et al. IBM Red Books.

Course Outcomes :

Upon successful completion of this course, students will be able to:

1. Understand Cloud Computing Fundamentals, Computation services and Virtualization.
2. Analyze the features of various cloud services like Infrastructure as a Service (IaaS), Platform as a

Service (PaaS), and Software as a Service (SaaS).

3. Explain the role of distributed file systems in cloud computing, and analyse the importance of big data in business intelligence.
4. Understand the concepts and applications of edge computing, fog computing, and explore the integration of IoT and mist computing for various use cases.
5. Explain the architecture, goals, applications, and challenges of cluster and grid computing.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUFTK5	3	0	0	3 HOURS	40	60	3

OBJECT ORIENTED ANALYSIS & DESIGN

Course Objectives

1. To have clear idea about traditional and modern SW development Methodologies.
2. Discuss the overview of Object oriented methodologies.
3. To introduce the concept of Object-oriented system development lifecycle.
4. To identify objects, relationships, services and attributes.
5. To develop robust object-based models for Systems.

UNIT I - OBJECT MODELING:

Objects and classes, links and association, generalization and inheritance, aggregation, abstract class, candidates keys, constraints.

UNIT II - DYNAMIC MODELING:

Events and states, operations, nested state diagrams and concurrency, advanced dynamic modeling concept, a sample dynamic model.

UNIT III - FUNCTIONAL MODELING:

Data flow diagram, specifying operations, constraints, a sample functional model. OMT (Object modeling techniques) methodologies, SA/SD, JSD

UNIT IV – INTRODUCTION TO UML

Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT V – ARCHITECTURAL MODELING

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

Text Books

1. James Rumbaugh et al " object Oriented Modeling and design" PHI
2. Herbert Schieldt " The complete Reference : Java" TMH
3. E. Balagurusamy " Programming in Java", TMH

Reference Books :

1. Booch Grady, " Object Oriented Analysis & design with application 3/e", Person
2. Bjarne Stroustrup " C++ Programming Language" Addison Wesley

3. E Balagurusami " Object Oriented Programming with C++, TMH

Course Outcomes

On completion of this course the students will be able to

1. Explain and apply basic OOPS concepts.
2. Explain and implement the SW development Methodologies.
3. Ability to analyze and model software specifications.
4. Ability to abstract object-based views for software systems.
5. Ability to deliver robust software components.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUFTK6	3	0	0	3 HOURS	40	60	3

DATA MINING

Course Objectives:

1. To introduce the concepts and principles of data warehousing, including multidimensional data models, OLAP operations, and data warehousing architecture.
2. To familiarize students with data mining and its related areas, including KDD, DBMS, and DM techniques, and the issues and challenges involved in data mining.
3. To enable students to understand association rules and the various methods to discover them, including the apriori algorithm and hierarchical association rules.
4. To introduce clustering techniques and their applications, including partitioning algorithms, hierarchical clustering, and categorical clustering algorithms.
5. To equip students with the knowledge and skills to design and develop decision trees and understand their construction principles, including the CART, ID3, and C4.5 algorithms.

UNIT I

Data ware Housing: What is a data warehouse?, definition, Multidimensional data model, OLAP operation, warehouse schema, data ware housing architecture, warehouse serve, metadata, OLAP, engine, Data warehousing backend process, other features.

Data Mining: what is data mining? KDD Vs. data mining, DBMS Vs DM other related areas, DM techniques, other mining problem, issues & challenges in DM, Dm application areas.

UNIT II

Association rules: Methods to discover association rules, apriori algorithm ,partition algorithm, pincer –search algorithm, Dynamic Item set counting algorithm, FP-tree Growth algorithm, Incremental algorithm, Border algorithm, hierarchical association rule, generalized association rules, Association rules with item constraints.

UNIT III

Clustering Techniques: Introduction, clustering paradigms, partitioning algorithms, k-Medoid Algorithm, CLARA, CLARANS, Hierarchical clustering, DBSCAN, BIRCH, CURE, Categorical clustering algorithms , STIRR, ROCK , CACTUS.

UNIT IV

Decision trees: Tree construction principal, Best spilt splitting indices, splitting criteria, Decision tree construction algorithm, CART, ID3, C4.5, CHAID, Decision tree construction with pre-sorting, rainforest, approximate method, CLOUDS, BOAT, pruning technique, integration of pruning & construction, Hierarchcal associtation rule.

UNIT V

Web Mining: Web mining ,web content mining ,web structure mining ,web usage mining ,text mining , unstructured text , Episode rule discovery for texts , Hierarchy of categories , text clustering , Paging algorithm.

List of Books:

1. Data Mining techniques – Arun K Pujari Universities press
2. Data Mining concepts & techniques – Jiawei han, Micheline kamber Morgan Kaufmann publisher Elsevier India –2001

3. Data Mining methods for knowledge Discovery –Cios, Pedrycz, swiniarski Kluwer academic publishers London –1998

Course Outcome:

1. Students will be able to understand the fundamental concepts and principles of data warehousing and its architecture, including OLAP and metadata.
2. Students will be able to understand data mining and its related areas, including KDD and DBMS, and apply DM techniques to real-world problems.
3. Students will be able to discover association rules and understand the methods used to discover them, including the apriori algorithm and hierarchical association rules.
4. Students will be able to apply clustering techniques to group similar data and understand partitioning algorithms, hierarchical clustering, and categorical clustering algorithms.
5. Students will be able to design and develop decision trees and understand their construction principles, including the CART, ID3, and C4.5 algorithms, and apply them to real-world problems.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUFLT1	0	0	3	3 HOURS	25	25	1.5

Microprocessor & Microcontroller Lab

Course Objectives:

Students will be able to.

1. To expose students to the operation of typical microprocessor (8086) trainer kit.
2. To prepare the students to be able to solve different problems by developing different programs in assembly language.
3. To develop the quality of assessing and analyzing the obtained data.
4. To understand and hands on training of Interfacing of devices.
5. To design interfacing circuits with 8086.

S.No.	Experiments with 8086 Microprocessor
1	To perform addition & subtraction of two 8 – bit hexadecimal numbers.
2	To perform addition & subtraction 16 – bit hexadecimal numbers.
3	To perform addition & subtraction 32 – bit hexadecimal numbers.
4	To perform addition & subtraction of two 8 – bit decimal numbers and store the result in DX register.
5	To perform addition & subtraction of two decimal digits n and m using ASCII code store the result in ASCII format. Where n and m are decimal number with single decimal digits.
6	To perform addition & subtraction of two decimal digits n and m using ASCII code store the result in ASCII format in CX-BX register. Where n and m are decimal number with two decimal digits.
7	To perform multiplication of n and m. Where n and m are hexadecimal numbers.
8	To perform division of 16 – bit number with 8-bit number.
9	To perform multiplication of two 8-bit numbers using ASCII code store the result in ASCII form in DX. Register.
10	To perform division of two 8-bit numbers using ASCII code store the result in ASCII form in DX register.
11	To solve Arithmetic equation 3AX+5DX+BP and store the result in CX register.
12	To solve Arithmetic equation (P*Q)+(R*S).
13	To add only positive number from 100 data bytes.
14	To write a program to add series of 20 bytes.
15	To find positive & negative byte from 100 data bytes.
16	To find largest & smallest byte from block of data.

S.No.	Experiments with 8051 Microcontroller
1	Data transfer/exchange between specified memory locations.
2	Largest/smallest from a series.
3	Sorting (Ascending/Descending) of data
4	Addition / subtraction / multiplication / division of 8/16 bit data.
5	Sum of a series of 8 bit data.
6	Multiplication by shift and add method.

7	Square / cube / square root of 8 bit data.
8	Matrix addition.
9	LCM and HCF of two 8 bit numbers.
10	Code conversion – Hex to Decimal/ASCII to Decimal and vice versa.
Interfacing experiments using 8051 Trainer kit and interfacing modules (At least two Experiments are mandatory)	
11	Time delay generation and relay interface.
12	Display (LED/Seven segments/LCD) and keyboard interface
13	ADC interface..
14	DAC interface with wave form generation.
15	Stepper motor and DC motor interface.
16	Realization of Boolean expression through port.

Reference Books:

1. IBM PC Assembly Language and Programming, P. Abel, 5th Edition, PHI/Pearson Education.
2. Introduction To Assembly Language Programming, Sivarama P.Dandamudi, Springer Int. Edition,2003.
3. The 8088 and 8086 Microprocessors: Programming , Interfacing, Software, Hardware and Application,4th edition,W.A. Triebel,A.Singh, N.K.Srinath, Pearson Education.

Course Outcomes:

On completion of this lab course the students will be able to:

1. Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller.
2. Work with standard microprocessor real time interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters.
3. Troubleshoot interactions between software and hardware.
4. Analyze abstract problems and apply a combination of hardware and software to address the problem.
5. Design & Develop the solutions of problems using 8051 microcontroller.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUFLT2	0	0	3	3 HOURS	25	25	1.5

Computer Networks Lab

Course Objectives:

This course is designed to enable the students to:

1. To understand the working principle of various communication protocols.
2. Understand basic network models and Different transmission media used for data communication.
3. Understand the data link design issues and various data link protocols used for data transmission.
4. Comprehend different routing algorithms used for data transmission from source to destination in a network layer.
5. Know how internet addresses are configured and how internet protocols are used in connecting internet.

S.No.	Experiments
1	To configure the IP address for a computer connected to LAN and to configure network parameters of a web browser for the same computer.
2	a. Installing of internal modem and connecting to Internet. b. To configure WiFi for your PC.
3	Study of Stop and Wait Protocol.
4	Study of Go Back N Protocol.
5	Study of Selective Repeat Protocol.
6	Study of Networking Devices.
7	Study of LAN, MAN and WAN.
8	To practice the color code for different cables.
9	To construct Peer to Peer Topology.
10	To Construct Star Topology.

TEXT BOOKS

1. Data Communications and Networking – Behrouz A. Forouzan. TMH.
2. Computer Networks — Andrew S Tanenbaum, Pearson Education/PHI.
3. Data and Computer Communication by William Stalling (Pearson Education).

REFERENCE BOOKS

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.
3. Computer Networking by Ed Tittel (Schaum's series) (TMH).
4. Comer, "Computer Networks and Internets with Internet Applications", Pearson Education.

Course Outcomes:

At the end of this course the student can answer how to:

1. By learning models students suggest appropriate network model for data communication.
2. Know how reliable data communication is achieved through data link layer.
3. Suggest appropriate routing algorithm for the network.
4. Provide internet connection to the system and its installation.
5. Implement device sharing on network.