Minutes of the Board of studies in CSE & IT, Kakatiya University held on 5/8/25 at 11.00 AM in the computer lab , University College of Engineering, Kakatiya University, Kothagudem.

Members Attended:

S.No.	Name of the Teacher	Member	Signature
1.	Dr.T.Archana, Assistant Professor, CSE, University College of Engineering , Kothagudem	BOS, Chairperson, CSE&IT	
2.	Prof.M.Sadanandam, Professor, CSE, University College of Engineering , Kothagudem	Member	
3.	Dr.N.Ramana, Associate Professor, CSE, KU College of Engineering &Technology, Warangal	Member	
4.	Dr.K.Kishor Kumar, Associate Professor CSE, University College of Engineering , Kothagudem	Member	
5.	Smt. K.Sravanthi, Assistant Professor CSE, University College of Engineering , Kothagudem	Member	
6.	Dr.K.Padmaja, Assistant Professor CSE, University College of Engineering , Kothagudem	Member	

1. Agenda Discussed
   a. B.Tech (Data Science), B.Tech(AI&ML) VII th Semester
      - Approval of Syllabus
2. Resolution:
   a. Approval of B.Tech (Data Science) VIIth Semester Syllabus.
   b. Approval of B.Tech (AI & ML) VIIth Semester Syllabus.

B.Tech
AI & ML
VII
Semester
Syllabus

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (AIML) VII SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction			Lecture hrs/week	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
1.	PCS-701AM	Cloud Computing	3	1	0	4	30	70	4
2.	PCS-702AM	AI & ML Tools	3	1	0	4	30	70	4
3.	PE-III*	Professional Elective –III*	3	1	0	4	30	70	4
4.	PE-IV**	Professional Elective –IV**	3	1	0	4	30	70	4
5.	OE-II***	Open Elective –II ***	3	0	0	3	30	70	3
6.	PCS-702AML	AI & ML Tools Lab	0	0	3	3	25	50	1.5
7.	PCS-PW703AM	Mini Project	0	0	3	3	25	50	1.5
8.	PCS-704AM****	Nasscom / NPTEL Course****	0	0	0	0	-	-	2
		Total	**15**	**4**	**6**	**25**	**200**	**450**	24

***(PE-III)Professional Elective –III**
PE7301CS Image Processing
PE7302CS Block Chain Technology
PE7303CS Social Network Analysis

****(PE-IV)Professional Elective –IV**
PE7401CS Design Patterns
PE7402CS Information Retrieval Systems
PE7403CS Neural Networks

*****(OE-II)Open Elective –II**

OE7201EE Non-Conventional Energy Sources
OE7202ME Basics of Alloy Steel Structures
OE7203EC VLSI Design

******Nasscom Course**

Any Nasscom / NPTEL Course related to core and not covered in syllabus with minimum number of lecture hours 35

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B. Tech. (AIML) VII SEMESTER

PCS-701AM -CLOUD COMPUTING

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT I

Introduction to Cloud Computing, Roots of Cloud Computing , Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud.

UNIT II

Principles of Parallel and Distributed Computing : Eras of computing, Parallel vs. distributed computing. Elements of parallel computing, Hardware architectures for parallel processing Approaches to parallel programming Levels of parallelism. Elements of distributed computing Components of a distributed system Architectural styles for distributed computing, Models for inter process communication.
Virtualization Characteristics of virtualized environments, Virtualization and cloud computing Pros and cons of virtualization and Advantages of virtualization

UNIT III

Cloud Architecture- Layers and Models Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing

UNIT IV

Cloud Platforms: Aneka—Integration of Private and Public Clouds
Introduction , Technologies and Tools for Cloud Computing , Aneka Cloud Platform . Aneka Resource Provisioning Service, Hybrid Cloud Implementation , Visionary thoughts for Practitioners
CometCloud: CometCloud Architecture , Autonomic Behavior of CometCloud , Overview of CometCloud-based Applications , Implementation and Evaluation T-Systems' Cloud-Based Solutions.

UNIT V

Cloud Platforms in Industry: Amazon web services: Computer services, Storage services, Communication services
Google App Engine: Architecture and core concepts, Application lifecycle, Cost model
Microsoft Azure: Azure core concepts, SQL Azure, Windows Azure platform appliance
Cloud Applications: Healthcare: ECG analysis in the cloud. Biology: protein structure prediction, Biology: gene expression data analysis for cancer diagnosis, Geo science: satellite image processing, Social networking, Media applications.

TEXT BOOKS:

1. Cloud Computing (Principles and Paradigms) :Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc.
2. Mastering Cloud Computing: Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, McGraw Hill Education 978-1259029950

REFERENCE BOOKS:

1. Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010.
2. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010.
3. Cloud Computing: Web-Based Applications That Change the Way You Work and Collabora

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B. Tech. (AIML) VII SEMESTER

PCS-702AM -AI & ML TOOLS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT I

Data Processing for AI using NumPy and Pandas

NumPy arrays and memory layout, array creation methods such as zeros, ones, arange, and linspace, array indexing and slicing, broadcasting and vectorized operations, matrix multiplication and transposition, random number generation, statistical functions including mean, standard deviation, and median,

Pandas Series and DataFrame, reading and writing files in formats like CSV, Excel, and JSON, data inspection and exploration using functions like info, describe, and shape, handling missing and duplicate data, filtering and conditional selection, data grouping and aggregation, merging and joining datasets, applying custom functions using apply and lambda, feature scaling and normalization using Pandas.

UNIT II

Classical Machine Learning with Scikit-learn

Overview of machine learning workflows, dataset loading and preparation using common techniques such as data splitting and pipeline creation, supervised learning algorithms:Linear Regression, Logistic Regression, K-Nearest Neighbors, Decision Trees, Random Forests, and Support Vector Machines,

Unsupervised learning: KMeans Clustering, Dimensionality reduction using PCA, Model evaluation metrics: accuracy, precision, recall, F1-score, confusion matrix, ROC curve and AUC, **Data preprocessing**: Label encoding, One-hot encoding, Imputation, Feature selection, Cross-validation and hyperparameter tuning using GridSearchCV

UNIT III

Deep Learning using Keras and TensorFlow

Overview of deep learning and neural network architecture, Keras vs TensorFlow API, Building models using Sequential API, Input layers, hidden layers, and output layers, Activation functions: ReLU, Sigmoid, Softmax, Compiling models with optimizers and loss functions, Training and evaluating models, Visualizing training history using Matplotlib, Regularization techniques: Dropout, L2 regularization, Early stopping, Saving and loading models (HDF5), TensorBoard integration, Functional API for multi-input models, Working with real datasets: MNIST, CIFAR-10, Introduction to transfer learning.

UNIT IV

Applied AI – Text, Image, and Time-Series Processing
Text preprocessing techniques: tokenization, stemming, lemmatization, stopword removal, Word vector representations, Sentiment analysis using Scikit-learn or Keras, Introduction to NLP libraries: NLTK, spaCy, Text classification using Hugging Face Transformers, Image basics and transformations using OpenCV, Building CNNs for image classification with Keras, Image augmentation techniques, Real-time image capture and prediction with OpenCV, Time-series data exploration and visualization, Forecasting with Facebook Prophet, Sequence modeling with LSTM in Keras

UNIT V

AI Model Deployment using Streamlit
Introduction to Streamlit, creating interactive web apps for AI models, Streamlit components: sliders, buttons, input fields, Uploading and displaying datasets or images, displaying model outputs: text, charts, metrics, Integrating trained model with Streamlit apps, Real-time predictions using user input, Handling file uploads and batch inference, Saving/loading models using Pickle, Standalone app execution using streamlit run.

TEXT BOOKS:

1. **Aurelien Geron**, Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, 2nd Ed., O'Reilly
2. **Wes McKinney**, Python for Data Analysis, 2nd Ed., O'Reilly
3. **François Chollet**, Deep Learning with Python, 2nd Ed., Manning

ONLINE REFERENCES:

- https://scikit-learn.org
- https://keras.io
- https://www.tensorflow.org
- https://streamlit.io
- https://pandas.pydata.org
- https://numpy.org
- https://opencv.org
- https://huggingface.co
- https://facebook.github.io/prophet

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B. Tech. (AIML) VII SEMESTER

Professional Elective –III

PE7301CS IMAGE PROCESSING

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT I

Fundamentals Of Image Processing: Fundamental steps in digital image processing, Components of image processing system, A simple image formation model, Image sampling and quantization, Basic relationships between pixels, Introduction to Fourier Transform and DFT – properties of 2D Fourier Transform, FFT.

UNIT II

Image Enhancement In The Spatial And Frequency Domains: Basic gray – level transformations, Histogram processing, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, The basics of filtering in the frequency domain, Image smoothing in frequency domain filters, Image sharpening in frequency domain filters.

UNIT III

Image Segmentation: Fundamentals, Point, Line and edge detection, Thresholding, Region-based segmentation, Segmentation using morphological watersheds, The use of motion in segmentation.

UNIT IV

Image Restoration: A model of image degradation/restoration, Noise models, inverse filtering, wiener filtering, Constrained Least Squares Filtering, Geometric Mean Filter.
Image Compression: Fundamentals, Huffman coding, Arithmetic coding, Golomb coding, LZW coding, Run-length coding.

UNIT V

Morphological Image Processing: Erosion, Dilation, Opening, Closing, The hit-or-miss transformation; Basic morphological algorithms - boundary extraction, hole filling, extraction of connected components, thinning, thickening, skeletons, pruning.
Feature Extraction: Background, Boundary preprocessing, Boundary Feature Descriptors, Region Feature Descriptors, Whole-image features.

TEXT BOOKS:

1. Rafeal C Gonzalez and Richard E.Woods, —Digital Image Processing‖,4th edition, Pearson Education/ PHI, 2018.

REFERENCE BOOKS:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, —Image Processing, Analysis and Machine Vision‖, 4th edition, Cengage, 2015.
2. Alasdair McAndrew, —Introduction to Digital Image Processing with Matlab‖, Thomson Course Technology, 2004 Course Technology Press, Boston, MA, United States, 2004.
3. William K. Prat, —Digital Image Processing‖, 4th edition, Wiley-Interscience, A John Wiley & Sons, Inc., Publication, 2007.

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B. Tech. (AIML) VII SEMESTER

Professional Elective –III

PE7302CS BLOCK CHAIN TECHNOLOGY

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT I

Blockchain: The growth of blockchain technology, Distributed systems, The history of blockchain, Types of blockchain
Consensus: Consensus mechanism, Types of consensus mechanisms, Consensus in blockchain
Decentralization: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization

UNIT II

Symmetric Cryptography: Working with the openSSL command line, Cryptography, Confidentiality, Integrity, Authentication, Non-repudiation, Accountability
Cryptographic Primitives: Keyless primitives, Symmetric cryptography, Data Encryption Standard(DES), Advanced Encryption Standard(AES).
Public Key Cryptography: Mathematics, Asymmetric cryptography, Cryptographic constructs and blockchain technology.

UNIT III

Introducing Bitcoin: Bitcoin-an overview: The beginnings of bitcoin, Egalitarianism versus authorianism, Bitcoin definition, Bitcoin - A users perspective
Cryptographic keys: Private keys in bitcoin, Public keys in bitcoin, Addresses in bitcoin
Transactions: The transaction life cycle, The transaction data structure, Types of scripts, Coinbase transactions, Transaction validation, Transaction bugs, Blockchain, Mining, Mining pools

UNIT IV

Bitcoin Network and Payments: The Bitcoin Network, Wallets, Bitcoin Payments, Innovation in Bitcoin, Advanced protocols, Bitcoin investment and buying and selling
Bitcoin Clients and APIs: Bitcoin client Installation, Experimenting further with bitcoin-cli, Bitcoin programming
Alternative Coins: Introducing altcoins, Theoritical foundations: Alternatives to proof of work (PoW), Proof of stake (PoS), Proof of activity (PoA), Non-outsourceable puzzles

UNIT V

Smart Contracts: Introduction, History, Ricardian contracts, Smart contract templates, Deploying smart contracts

Ethereum: Introduction, The ethereum network, Components of the ethereum ecosystem Transactions and messages, Ether cryptocurrency / tokens (ETC and ETH), The Ethereum Virtual Machine (EVM)

TEXT BOOKS:

1. Imran Bashir, "Mastering Blockchain: *Distributed ledger technology, decentralization, and smart contracts explained*", 2nd ed. United Kingdom: Packt Publishing Limited, 2018.

REFERENCE BOOKS:

1. Narayanan A, Bonneau J, Felten E, Miller A, and Goldfeder S, Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction, 2nd ed., United States: Princeton University Press, 2016.
2. Andreas M. Antonopoulos, Mastering Bitcoin: Programming the Open Blockchain, 2nd ed., United States: O'Reilly Media, Inc., 2018.

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B. Tech. (AIML) VII SEMESTER

Professional Elective –III

PE7303CS SOCIAL NETWORK ANALYSIS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT I

Networks and Society -Introduction, Applications, Preliminaries, Three Levels of Social Network Analysis, Historical Development, Graph Visualization Tools.
Network Measures - Network Basics, Node Centrality, Assortativity, Transitivity and Reciprocity, Similarity, Degeneracy.

UNIT II

Network Growth Models - Properties of Real-World Networks, Random Network Model, Ring Lattice Network Model, Watts–Strogatz Model, Preferential Attachment Model, Price's Model, Local-world Network Growth Model, Network Model with Accelerating Growth, Aging in Preferential Attachment.

UNIT III

Link Analysis – Applications of Link Analysis, Signed Networks, Strong and Weak Ties, Link Analysis Algorithms, Page Rank, Personalized Page Rank, DivRank, SimRank, PathSIM.
Link Prediction -Applications of Link Prediction, Temporal Changes in a Network, Problem Definition Evaluating Link Prediction Methods, Heuristic Models, Probabilistic Models, Supervised Random Walk, Information-theoretic Model, Latest Trends in Link Prediction.

UNIT IV

Cascade Behaviours and Network Effects - Preliminaries and Important Terminologies, Cascade Models, Probabilistic Cascades, Epidemic Models, Independent Cascade Models, Cascade Prediction

UNIT V

Graph Representation Learning - Machine Learning Pipelines, Intuition behind Representation Learning, Benefits of Representation Learning, Criterion for Graph Representation Learning, Graph Representation Learning Pipeline, Representation Learning Methods

TEXT BOOKS:

1. Tanmoy Chakraborty, "Social Network Analysis", Wiley India Pvt. Ltd., 2021

REFERENCE BOOKS:

1. Albert-Laszlo Barabasi, "Network Science", Cambridge University Press, 2016
2. Stanley Wasserman, Katherine Faust, "Social Network Analysis: Methods and Applications", Cambridge University Press, 1994.

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B. Tech. (AIML) VII SEMESTER

Professional Elective –IV

PE7401CS DESIGN PATTERNS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT I

Introduction: What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT II

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation.

UNIT III

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton.

UNIT IV

Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy.

UNIT V

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, Strategy, Template Method, Visitor.
Conclusion: What to Expect from Design Patterns, The Pattern Community.

TEXT BOOKS:

1. Design Patterns:Elements of Reusable Object Oriented Software, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides Pearson Education.

REFERENCE BOOKS:

1. Head First Design Patterns By Eric Freeman-Oreilly-spd.
2. JAVA Enterprise Design Patterns Vol-III By Mark Grand ,Wiley DreamTech.
3. Design Patterns Alan Shalloway,Pearson Education.
4. Meta Patterns designed Wolf gang , Pearson.

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B. Tech. (AIML) VII SEMESTER

Professional Elective –IV

PE7402CS INFORMATION RETRIEVAL SYSTEMS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses
Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction
Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models

UNIT III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages
Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

UNIT IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext
Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

UNIT V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems
Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

TEXT BOOKS:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

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B. Tech. (AIML) VII SEMESTER

Professional Elective –IV

PE7403CS NEURAL NETWORKS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT I

Introduction: What is a Neural Network? Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.

Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive Learning, Boltzmann Learning, Credit Assignment Problem, Learning with a Teacher, Learning without a Teacher, Memory, Adaptation.

UNIT II

Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment.

Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection.

UNIT III

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence of Back Propagation Learning, Supervised Learning viewed as an optimization problem, Convolutional networks.

UNIT IV

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification, Contextual Maps.

UNIT V

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm.
Hopfield Models – Hopfield Models, Computer Experiment, Cohen Grossberg Theorem.

TEXT BOOKS:

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition

REFERENCE BOOKS:

1. Artificial Neural Networks - B. Yegnanarayana Prentice Hall of India P Ltd 2005.
2. The Essence of Neural Networks R. Callan Prentice Hall Europe, 1999.
3. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

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B. Tech. (AIML) VII SEMESTER

Open Elective –II

OE7201EE NON-CONVENTIONAL ENERGY SOURCES

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
3	0	0	3	External Marks :50

UNIT I

Review of Conventional and Non-Conventional energy sources - Need for non-conventional energy sources Types of Non- conventional energy sources - Fuel Cells - Principle of operation with special reference to H_2O_2 Cell - Classification and Block diagram of fuel cell systems - Ion exchange membrane cell - Molten carbonate cells - Solid oxide electrolyte cells - Regenerative system- Regenerative Fuel Cell - Advantages and disadvantages of Fuel Cells-Polarization - Conversion efficiency and Applications of Fuel Cells.

UNIT II

Solar energy - Solar radiation and its measurements - Solar Energy collectors -Solar Energy storage systems - Solar Pond - Application of Solar Pond - Applications of solar energy.

UNIT III

Wind energy- Principles of wind energy conversion systems - Nature of wind - Power in the Wind- Basic components of WECS -Classification of WECS -Site selection considerations -Advantages and disadvantages of WECS -Wind energy collectors -Wind electric generating and control systems - Applications of Wind energy -Environmental aspects.

UNIT IV

Energy from the Oceans - Ocean Thermal Electric Conversion (OTEC) methods - Principles of tidal power generation -Advantages and limitations of tidal power generation -Ocean waves - Wave energy conversion devices -Advantages and disadvantages of wave energy - Geo-Thermal Energy - Types of Geo-Thermal Energy Systems - Applications of Geo-Thermal Energy.

UNIT V

Energy from Biomass - Biomass conversion technologies / processes - Photosynthesis - Photosynthetic efficiency - Biogas generation - Selection of site for Biogas plant - Classification of Biogas plants - Details of commonly used Biogas plants in India - Advantages and disadvantages of Biogas generation -Thermal gasification of biomass -Biomass gasifiers.

TEXT BOOKS:

1. Rai G.D, Non-Conventional Sources of Energy, Khandala Publishers, New Delhi, 1999.
2. .M. El-Wakil, Power Plant Technology. McGraw Hill, 1984.

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B. Tech. (AIML) VII SEMESTER

Open Elective –II

OE7202ME BASICS OF ALLOY STEEL STRUCTURES

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
3	0	0	3	External Marks :50

UNIT I

Introduction: Level of structures, structure property relationship, Defects in materials, Strengthening Mechanisms.

UNIT II

The Iron carbon systems: Definition of phase, phase diagram. Iron Carbon phase diagram. Definition of phases in Fe-C system. Concept of steel and Cast Iron. effect of alloying elements on steel

UNIT III

Heat Treatment of Steels: Annealing, Normalizing, Hardening and tempering. Thermo Mechanical Treatments. Surface Heat Treatments.

UNIT IV

Steels: Plain Carbon Steels: Low-carbon Mild steels, Medium Carbon Steels, High Carbon Steels, properties and applications of Plain Carbon Steels. High Strength Steels, Tool Steels, Creep Resistance Steel

UNIT V

Stainless steels: Composition, properties and applications of Austenitic Stainless steel, Ferritic Stainless steel, Martensitic Stainless steel, Precipitation Hardnened Stainless steel.

TEXT BOOKS:

1. Introduction to Physical Metallurgy – SH Avner, TATA Mc GRAW HILL ,1997
2. Alloys Steels – Wilson

REFERENCE BOOKS:

1. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007

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B. Tech. (AIML) VII SEMESTER

Open Elective –II
OE7203EC VLSI DESIGN

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
3	0	0	3	External Marks :50

UNIT I

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS
Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit ωo; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT II

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT III

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

UNIT IV

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.
Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT V

Programmable Logic Devices: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.
CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques, Contemporary Topics.

TEXT BOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
3. VLSI Design – M. Michael Vai, 2001, CRC Press

REFERENCE BOOKS:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K .Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
5. Introduction to VLSI – Mead & Convey, BS Publications, 2010.

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B. Tech. (AIML) VII SEMESTER

PCS-702AML AI & ML TOOLS LAB

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
0	0	3	1.5	External Marks :50

List of Experiment

Experiment 1:Getting Started with Jupyter and Basic Data Exploration

a. Set up the Python working environment by configuring JupyterNotebookand installing the necessary libraries such as NumPy, Pandas, Scikit-learn, and TensorFlow.
b. Import a real-world dataset in CSV format and display the first few rows to get an overview of the data and the kind of information it contains.
c. Examine the dataset to understand how many rows and columns it has, and identify the type of data stored in each column, such as numbers, text, or categories.
d. Generate summary statistics for the numerical columns, including values like the average, minimum, maximum, and standard deviation to understand the data distribution.
e. Check if the dataset contains any missing values, and apply suitable methods to handle them, such as filling, replacing, or removing those entries.
f. Detect any duplicate rows in the dataset and remove them to maintain accuracy and avoid redundancy in further analysis.

Experiment 2:Building and Evaluating Supervised Machine Learning Models

a. Load a labeled dataset containing structured data suitable for classification tasks.
b. Split the dataset into training and testing subsets using an appropriate ratio.
c. Train a classification model using at least two supervised algorithms such as Logistic Regression and Decision Tree.
d. Make predictions on the test data and evaluate the accuracy of each model.
e. Compare the results of the models and determine which performs better on the given dataset.
f. Visualize the classification results using confusion matrix and classification report.

Experiment 3:Dimensionality Reduction and Clustering with PCA and K-Means

a. Load a dataset with multiple numerical features for analysis and clustering, such as the Iris dataset available from Scikit-learn.
b. Apply dimensionality reduction using Principal Component Analysis (PCA) to reduce the number of features.
c. Visualize the reduced data in two dimensions to observe patterns or groupings.

d. Perform clustering on the reduced dataset using the K-Means algorithm.
e. Determine the optimal number of clusters using a suitable method such as the elbow technique.
f. Plot the final cluster assignments and interpret the grouping of data points.

Experiment 4:Model Evaluation and Tuning using Support Vector Machines

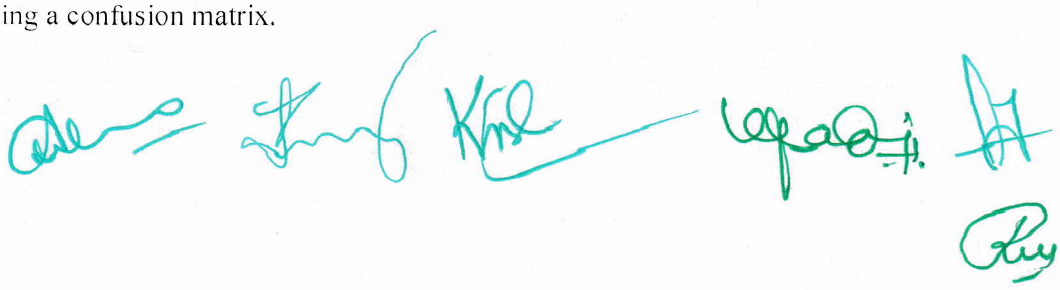
a. Load a classification dataset such as the **Breast Cancer Wisconsin dataset** available from Scikit-learn.
b. Preprocess the dataset by handling missing values and scaling numerical features.
c. Train a Support Vector Machine (SVM) classifier on the training data.
d. Evaluate the model using metrics such as accuracy, precision, recall, and F1-score.
e. Perform hyperparameter tuning using GridSearchCV to find the best combination of kernel and regularization parameters.
f. Compare the performance of the tuned model against the initial model using the same evaluation metrics.

Experiment 5: Text Classification using Feedforward Neural Networks (IMDB Dataset)

a. Load the **IMDB movie review dataset** using the Keras datasets module for binary sentiment classification.
b. Preprocess the text data by padding the sequences to ensure uniform input length.
c. Build a feedforward neural network using the Keras Sequential API with embedding, dense, and dropout layers.
d. Choose suitable activation functions and compile the model with an appropriate loss function and optimizer.
e. Train the model on the training dataset and validate it using the test dataset.
f. Evaluate and visualize the model's training and validation performance over epochs.

Experiment 6: Image Classification with CNN using Fashion MNIST

a. Load the Fashion MNIST dataset using the Keras datasets module, which contains grayscale images of clothing items categorized into 10 classes.
b. Preprocess the image data by reshaping and normalizing pixel values to fall within a standard range.
c. Build a Convolutional Neural Network (CNN) using the Keras Sequential API, including convolutional, pooling, and dense layers.
d. Compile the CNN model using an optimizer, loss function, and evaluation metric suitable for multi-class classification.
e. Train the model using the training dataset and evaluate its accuracy on the test dataset.
f. Visualize sample predictions along with their true labels and assess the model's performance using a confusion matrix.



Experiment 7:Transfer Learning with Pre-trained CNN Models on CIFAR-10

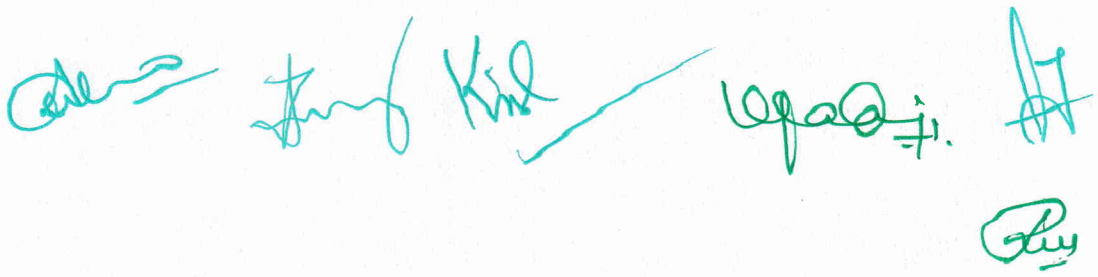
a. Load the CIFAR-10 dataset using the Keras datasets module, which contains colored images across 10 object categories.
b. Preprocess the dataset by resizing and normalizing the images to match the input requirements of the pre-trained model.
c. Load a pre-trained model such as MobileNetV2 or VGG16 from Keras Applications without the top layer.
d. Add custom classification layers on top of the pre-trained base for CIFAR-10 classification.
e. Compile and train the model using a subset of the CIFAR-10 training data while freezing the base layers.
f. Evaluate the model performance on the test dataset and analyze prediction accuracy across all classes.

Experiment 8:Multi-Class Text Classification with Reuters Dataset

a. Load the **Reuters newswire topics dataset** using the Keras datasets module, which contains news articles categorized into multiple classes.
b. Preprocess the text data by converting words into sequences and padding them to ensure consistent input length.
c. Build a multi-class text classification model using the Keras Sequential API with embedding, dense, and dropout layers.
d. Compile the model using a suitable loss function and optimizer for multi-class classification.
e. Train the model using the training dataset and evaluate its performance on the test dataset.
f. Display training and validation accuracy, and generate a confusion matrix to analyze class-wise performance.

Experiment 9:Image Augmentation and Real-Time Prediction with OpenCV

a. Load the **CIFAR-10 dataset** using the Keras datasets module, which contains colored images categorized into 10 object classes.
b. Apply image preprocessing techniques such as resizing, normalization, and reshaping to prepare the data for training.
c. Use Keras ImageDataGenerator to apply real-time image augmentation techniques such as rotation, flipping, and zooming.
d. Build a Convolutional Neural Network (CNN) model using the Keras Sequential API for image classification.
e. Train the model using the augmented images and evaluate its accuracy on the test set.
f. Integrate the trained model with **OpenCV** to capture real-time image input from the webcam and predict the class of the captured image.



Experiment 10: Time-Series Forecasting

1. Load a time-series dataset such as the **Monthly Airline Passenger Numbers** (available in statsmodels module) dataset, containing date and value columns.
2. Convert the date column to a datetime format and ensure the data is sorted chronologically.
3. Prepare the dataset in the format required by Facebook Prophet, renaming columns appropriately.
4. Train a forecasting model using Prophet on the historical data.
5. Generate future forecasts and visualize the predicted values along with confidence intervals.
6. Plot trend and seasonality components separately to interpret the time-series behavior.

Experiment 11:Interactive Web App for Single Prediction using Streamlit

a. Build a machine learning model (e.g., Logistic Regression) using a dataset such as the Breast Cancer dataset from Scikit-learn.
b. Save the trained model using a suitable serialization method such as Pickle.
c. Create a new Python script using Streamlit to collect user input through sliders, radio buttons, or text fields.
d. Load the saved model inside the Streamlit script and use it to make predictions based on user input.
e. Display the prediction result in a user-friendly format along with model confidence or classification label.
f. Run the Streamlit application and test it with different inputs to verify its functionality.

Experiment 12:Batch Prediction and Visualization in Streamlit Web Application

a. Build and train a classification model using a dataset such as the **Iris dataset** from Scikit-learn.
b. Save the trained model using Pickle for reuse during deployment.
c. Create a Streamlit application that allows users to upload a CSV file containing multiple data samples.
d. Read the uploaded CSV file within the app and perform any necessary preprocessing before prediction.
e. Use the loaded model to perform batch predictions on the uploaded dataset.
f. Display the predicted class labels along with input data using tables, charts, or bar graphs for visualization.