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
Data
Science
VII
Semester
Syllabus

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

B. Tech. (Data Science) 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-701DS	Cloud Computing	3	1	0	4	30	70	4
2.	PCS-702DS	Data Science 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-702DSL	Data Science Tools Lab	0	0	3	3	25	50	1.5
7.	PCS-PW703DS	Mini Project	0	0	3	3	25	50	1.5
8.	PCS-704DS****	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 Web Mining
PE7303CS Natural Language Processing

****(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

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL 506009
Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) VII SEMESTER

PCS-701DS -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

Faculty of Engineering & Technology
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Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) VII SEMESTER

PCS-702DS –DATA SCIENCE TOOLS

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

UNIT I

Introduction to NumPy
Understanding Data Types in Python, The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions,
Computation on Arrays: Broadcasting, Comparisons, Masks, and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data: NumPy's Structured Arrays

UNIT II

Data Manipulation with Pandas.
Installing and Using Pandas ,Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas,
Handling Missing Data, Hierarchical Indexing, Combining Datasets: Concat and Append, Combining Datasets: Merge and Join,
Aggregation and Grouping

UNIT III

Data Manipulation with Pandas.
Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance Pandas: eval() and query()

UNIT IV

Visualization with Matplotlib
Importing Matplotlib,Simple Line Plots,Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms,
Binnings, and Density, Customizing Plot Legends, Colorbars, Multiple Subplots, Text and Annotation,

UNIT V

Visualization with Matplotlib
Customizing Ticks, Customizing Matplotlib: Configurations and Stylesheets, Three-Dimensional Plotting in Matplotlib,
Geographic Data with Basemap, Visualization with Seaborn, Matplotlib Resources ,Other Python Graphics Libraries

TEXT BOOKS:

1. Python Data Science Handbook, Essential Tools For Working With Datay Jake VanderPlas, O'REILLY publications.

REFERENCE BOOKS:

1. Learn Data Science Using Python Engy Founda , Apress publications
2. An Introduction To Data Science With Python, Jeffry S.Saltz, Jeffery M.Stanton, SAGE publications, Inc., 2024

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL 506009
Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) 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.

Faculty of Engineering & Technology
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Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) VII SEMESTER

Professional Elective –III

PE7302CS WEB MINING

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

UNIT I

Introduction: World Wide Web, History of the Web and the Internet, What is Data Mining? What is Web Mining? Introduction to Association Rule Mining, Supervised Learning & amp; Unsupervised Learning. Information Retrieval and Web Search: Basic Concepts of Information Retrieval, Information Retrieval Models, Relevance Feedback, Evaluation Measures, Text and Web Page Pre-Processing, Inverted Index and Its Compression, Latent Semantic Indexing, Web Search, Meta-Search: Combining Multiple Rankings, Web Spamming.

UNIT II

Social Network Analysis: Introduction, Co-Citation and Bibliographic Coupling, Page Rank. HITS Algorithm, Community Discovery.
Web Crawling: A Basic Crawler Algorithm, Implementation Issues, Universal Crawlers, Focused Crawlers, Topical Crawlers, Evaluation, Crawler Ethics and Conflicts.

UNIT III

Structured Data Extraction: Wrapper Generation, Preliminaries, Wrapper Induction, Instance-Based Wrapper Learning, Automatic Wrapper Generation: Problems, String Matching and Tree Matching, Building DOM Trees, Extraction Based on a Single List Page, Extraction Based on Multiple Pages.

UNIT IV

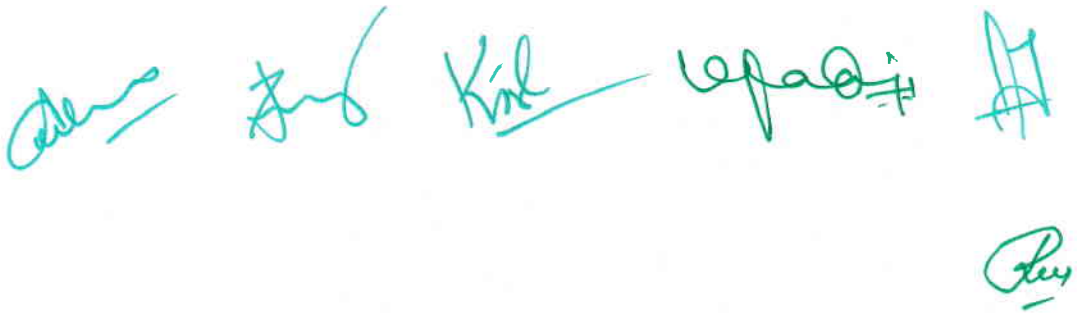
Information Integration: Introduction to Schema Matching, Pre-Processing for Schema Matching, Schema -Level Matching, Domain and Instance-Level Matching, Combining Similarities, 1: m Match, Integration of Web Query Interfaces, Constructing a Unified Global Query Interface. Opinion Mining and Sentiment Analysis: The Problem of Opinion Mining, Document Sentiment Classification, Sentence Subjectivity and Sentiment Classification, Opinion Lexicon Expansion, Aspect- Based Opinion Mining, Opinion Search and Retrieval, Opinion Spam Detection.

UNIT V

Web Usage Mining: Data Collection and Pre-Processing, Data Modeling for Web Usage Mining, Discovery and Analysis of Web Usage Patterns, Recommender Systems and Collaborative Filtering, Query Log Mining, Computational Advertising.

TEXT BOOKS:

1. "Mining the Web: Discovering Knowledge from Hypertext Data ", Soumen Chakrabarti Morgan Kaufmann , first edition.



Faculty of Engineering & Technology

KAKATIYA UNIVERSITY, WARANGAL 506009

Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) VII SEMESTER

Professional Elective –III

PE7303CS NATUARAL LANGUAGE PROCESSING

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

UNIT I

Natural Language processing (NLP) : Introduction, Applications or Use cases of NLP, Components of NLP, Steps in NLP, Finding the Structure of Words: Words and Their Components, Lexemes, Morphemes, Morphology, Problems in morphological processing, Typology, Morphological Typology, **Natural Language Processing with python NLTK package (Text Preprocessing Tasks):** Word Tokenization, Sentence Tokenization, Filtering Stop words, Stemming, Tagging Parts of Speech, Lemmatization, Chunking, Chinking, Named Entity Recognition, Term Frequency and Inverse Document Frequency (TF-IDF).

UNIT II

Syntax Analysis: Parsing Natural Language, Tree banks: A Data-Driven Approach to Syntax, **Representation of Syntactic Structure:** Syntax Analysis using Dependency Graph, Syntax Analysis using Phrase Structure Trees, **Parsing Algorithms:** Shift Reduce Parsing, Hyper Graphs and Chart Parsing (CYK Parsing), **Models for ambiguity Resolution in Parsing**: Probabilistic Context Free Grammar, Generative Models, Discriminative models for Parsing

UNIT III

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems.

UNIT IV

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT V

Predicate-Argument Structure, Meaning Representation Systems, Software.
Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure.

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice–Daniel M.Bikel and Imed Zitouni, Pearson Publication.

REFERENCE BOOKS:

1. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S.Tiwary.
2. Speech and Natural Language Processing-Daniel Jurafsky & James H Martin, Pearson Publications.

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL 506009
Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) 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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KAKATIYA UNIVERSITY, WARANGAL 506009
Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) 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.

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL 506009
Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) 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.

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL 506009
Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) 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.

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL 506009
Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) 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

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL 506009
Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) 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.

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL 506009
Department of Computer Science &Engineering
Department of Information Technology

B. Tech. (Data Science) VII SEMESTER

PCS-702DSL DATA SCIENCE TOOLS LAB

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

List of Experiment

1. Write a program to read 3 subject marks and display pass or failed using class and object.
2. Using a numpy module create an array and check the following: 1. Type of array 2. Axes of array 3. Shape of array 4. Type of elements in array
3. Using a numpy module create array and check the following:
   a. List with type float
   b. 3*4 array with all zeros
   c. From tuple
   d. Random values
4. Using a numpy module create array and check the following:
   a. Reshape 3X4 array to 2X2X3 array
   b. Sequence of integers from 0 to 30 with steps of 5
   c. Flatten array
   d. . Constant value array of complex type
5. Write a NumPy program to generate a matrix product of two arrays
6. Write a NumPy program to create a random array with 1000 elements and compute the average, variance, standard deviation of the array elements.
7. Write a python program to concatenate the DataFrames with two different objects.
8. Demonstrate how to download dataset and how to create DataFrame
9. Write a Pandas program to get the first 3 rows of a DataFrame
10. Write a Pandas program to select the specified columns and rows from a given data frame .
11. Write a Pandas program to select the rows where the score is missing, i.e. is NaN.

12. Write a Pandas program to insert a new column in existing DataFrame.
13. Write a Python programming to display a bar chart using different color for each bar.
14. Write a Python programming to create a pie chart with a title.
15. Write to program to visualize a dataset to gain insights using matplotlib by plotting scatterplots and barcharts.