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Department of COMPUTER SCIENCE ENGINEERING (Data Science)

Circular

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It is informed that the 4th BoS Meeting will be held on 07-02-2025 at 02:00 pm in the Principal's chamber to discuss the following agenda points.

AGENDA

Item-1: Introduction of Board of Studies (BoS) Members.

Item-2: About the Department / Accreditations / Recognitions

Item-3: B.Tech CSE (Data Science); R 22 Regulations

Item-4: B.Tech CSE (Data Science)-IV Year Course Structure and Detailed Syllabus.

Item-6: Any other points with the permission of chair.

Dr. K.Rohit kumar

HoD & Chairman BoS

HOD-CSE (DS)
SREYAS INSTITUTE OF ENGG. & TECH.
Beside Indu Aranya, GSI, Nagole,
Hyderabad-500 068.

Department of COMPUTER SCIENCE ENGINEERING (Data Science)

The Minutes of the Meeting of the 4th Board of Studies (BoS), CSE (Data Science) Department was conducted in hybrid mode on 7th February at 2:00 PM in the Principal's Chamber.

AGENDA:

Item-1: Introduction of Board of Studies (BoS) Members

Item-2: About the Department / Accreditations / Recognitions

Item-3: B.Tech CSE (Data Science), IV Year Course Structure and Detailed Syllabus.

To approve syllabus proposal for IV B.Tech I Semester Theory subjects, taught by Computer Science Engineering (Data Science) Department to Computer Science Engineering (Data Science) students of SIET

Item-4: To approve syllabus proposal for IV B.Tech I Semester Practical subjects, Computer Science Engineering (Data Science) handled by Department to Computer Science Engineering (Data Science) students of SIET.

Item-5: To approve syllabus proposal for IV B.Tech I Semester Theory subjects (Professional Elective-IV), taught by Computer Science Engineering (Data Science) handled by Department to Computer Science Engineering (Data Science) students of SIET

Item-6: To approve syllabus proposal for IV B.Tech I Semester Theory subjects (Professional Elective-V), taught by Computer Science Engineering (Data Science) handled by Department to Computer Science Engineering (Data Science) students of SIET

Item-7: To approve syllabus proposal for IV B.Tech I Semester Theory subjects (Open Elective-II), taught by Computer Science Engineering (Data Science) Department to the students of other branches of SIET

Item-8: To approve Project Stage-I offered to the students of IV B.Tech I Semester students of Computer Science Engineering (Data Science).

Item-9: To approve syllabus proposal for IV B.Tech II Semester Theory subjects, taught by Computer Science Engineering (Data Science) Department to Computer Science Engineering (Data Science) students of SIET.

Item-10: To approve syllabus proposal for IV B.Tech II Semester Theory subjects (Professional Elective-VI), taught by Computer Science Engineering (Data Science) handled by Department to Computer Science Engineering (Data Science) students of SIET

Item-11: To approve syllabus proposal for IV B.Tech II Semester Theory subjects (Open Elective-III), taught by Computer Science Engineering (Data Science) Department to the students of other branches of SIET.

Item-12: To approve Project Stage-II including project seminar offered to the students of IV B.Tech II Semester students of Computer Science Engineering (Data Science)

Item-13: Any other points with the permission of chair.

Points discussed:

Item-1: Introduction of Board of Studies (BoS) Members

- The meeting commenced with a formal introduction of the BoS members.
- The Chairperson welcomed all the members and highlighted their contributions to curriculum development.
- To confirm the minutes of previous BOS meeting and introduce CSE (DS) Department.

Item-2: About the Department / Accreditations / Recognitions

- An overview of the Department's achievements, faculty expertise, research contributions, and student outcomes was presented.

Item-3: Bos Members approved syllabus proposal for IV B.Tech I Semester Theory subjects, taught by Computer Science Engineering (Data Science) Department to Computer Science Engineering (Data Science) students of SIET

S.No.	Course Code	Course Title	L	T	P	Credits
1		Predictive Analytics	3	0	0	3
2		Web and Social Media Analytics	3	0	0	3

Item-4: Bos Members approved syllabus proposal for IV B.Tech I Semester Practical subjects, Computer Science Engineering (Data Science) handled by Department to Computer Science Engineering (Data Science) students of SIET.

S.No.	Course Code	Course Title	L	T	P	Credits
1		Predictive Analytics Lab	0	0	2	1
2		Web and Social Media Analytics Lab	0	0	2	1

Item-5: Dr. D.Vasumathi, Dr.K.Shyamala and Dr.Sunil Bhutada suggested to include subject to the professional Elective -IV **Prompt Engineering with LLMs** that students can choose from.

S.No.	Course Code	Course Title	L	T	P	Credits
1		Quantum Computing	3	0	0	3
2		Data base Security	3	0	0	3
3		Natural Language Processing	3	0	0	3
4		Prompt Engineering with LLMs	3	0	0	3
5		Internet of Things	3	0	0	3

Item-6: Bos Members approved syllabus proposal for IV B.Tech I Semester Theory subjects (Professional Elective-V), taught by Computer Science Engineering (Data Science) handled by Department to Computer Science Engineering (Data Science) students of SIET

S.No.	Course Code	Course Title	L	T	P	Credits
1		Privacy Preserving Data Publishing	3	0	0	3
2		Cyber Security	3	0	0	3
3		Data Science Applications	3	0	0	3
4		Mining Massive Datasets	3	0	0	3
5		Exploratory Data Analysis	3	0	0	3

Item-7: Bos Members approved syllabus proposal for IV B.Tech I Semester Theory subjects (Open Elective-II), taught by Computer Science Engineering (Data Science) Department to the students of other branches of SIET.

S.No.	Course Code	Course Title	L	T	P	Credits
1		Software Testing Methodologies	3	0	0	3
2		Data Analytics	3	0	0	3

Item-8: Bos Members approved Project Stage-I offered to the students of IV B.Tech I Semester students of Computer Science Engineering (Data Science)

S.No.	Course Code	Course Title	L	T	P	Credits
1		Project Stage–I	0	0	6	3

Item-9: Bos Members approved syllabus proposal for IV B.Tech II Semester Theory subjects, taught by Computer Science Engineering (Data Science) Department to Computer Science Engineering (Data Science) students of SIET.

S.No.	Course Code	Course Title	L	T	P	Credits
1		Organizational Behavior	3	0	0	3

Item-10: Bos Members approved syllabus proposal for IV B.Tech II Semester Theory subjects (Professional Elective-VI), taught by Computer Science Engineering (Data Science) handled by Department to Computer Science Engineering (Data Science) students of SIET

S.No.	Course Code	Course Title	L	T	P	Credits
1		Data Stream Mining	3	0	0	3
2		Web Security	3	0	0	3
3		Deep Learning	3	0	0	3
4		Block chain Technology	3	0	0	3
5		Parallel and Distributed Computing	3	0	0	3

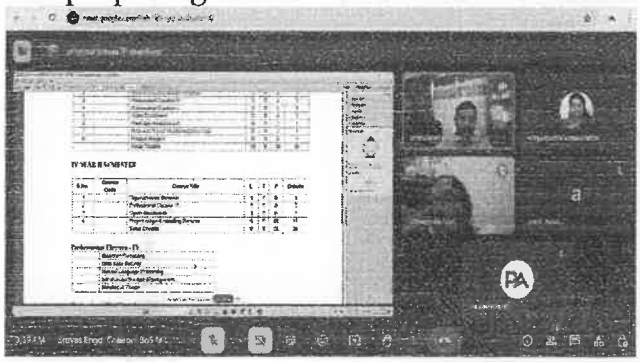
Item-11: Bos Members approved syllabus proposal for IV B.Tech II Semester Theory subjects (Open Elective-III), taught by Computer Science Engineering (Data Science) Department to the students of other branches of SIET.

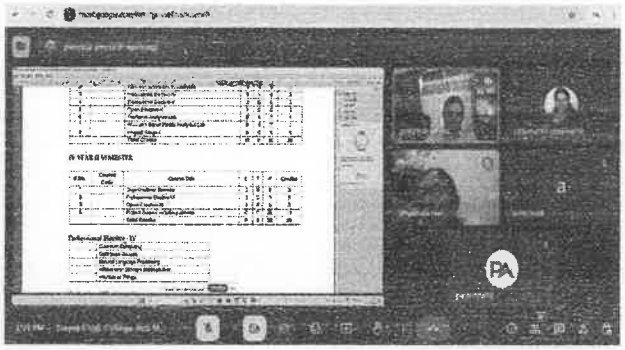
S.No.	Course Code	Course Title	L	T	P	Credits
1		Introduction to social media mining	3	0	0	3
2		Data Visualization using Python	3	0	0	3

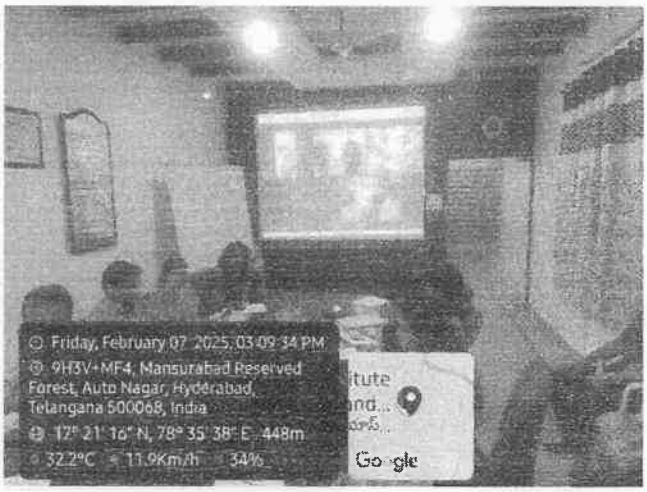
Item-12: Bos Members approved Project Stage-II including project seminar offered to the students of IV B.Tech II Semester students of Computer Science Engineering (Data Science).

S.No.	Course Code	Course Title	L	T	P	Credits
1		Project Stage–II including Seminar	0	0	22	11

Item-13 : Since there was no more points to discuss ,the BoS Chairman concluded the meeting after proposing vote of thanks to all BoS members.







Department of COMPUTER SCIENCE ENGINEERING (Data Science)

4th Board of Studies - Members

S.No	Name	Designation	Position	Signature
1	Dr.Kallepalli Rohit kumar	HoD of CSE (DS), SIET	Chairman	
2	**Dr.D.Vasumathi**	**Prof of CSE, JNTUH, UCES**	**University Nominee**	7/2/25
3	Dr.Varsha Srivastava	Staff Scientist & Head CDFD-Hyd	Scientist,CDFD	
4	Dr. U.M.Fernandes Dimlo	Prof, HoD of CSE, SIET	Specialized Faculty-1	
5	Dr. A.Swathi	HoD of CSE (AI&ML), SIET	Specialized Faculty-2	
6	Mr.Vasamsetti Teja	Associate Software Engineer-ACCENTURE-Hyd	Alumni Student	
7	**Dr. K.Shyamala**	**Professor, Department of CSE, Osmania University**	**Subject Expert-1**	7/2/25
8	**Dr.Sunil Bhutada**	**Professor & Head-Department of IT, Sreenidhi Institute of Science & Technology-Hyderabad**	**Subject Expert-2**	
9	Dr. G.Naga Ramadevi	Prof, SIET	Faculty	
10	Dr.G.J.Bharat kumar	Prof, SIET	Faculty	
11	Dr. N.Padma Joshi	Associate Prof, SIET	Faculty	
12	Dr.B.kiranmai	Associate Prof, SIET	Faculty	

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B.Tech.in COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

COURSE STRUCTURE & SYLLABUS (R22 Regulations)

Applicable from AY 2022-23 Batch

IV YEAR I SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1		Predictive Analytics	3	0	0	3
2		Web and Social Media Analytics	3	0	0	3
3		Professional Elective-IV	3	0	0	3
4		Professional Elective-V	3	0	0	3
5		Open Elective-II	3	0	0	3
6		Predictive Analytics Lab	0	0	2	1
7		Web and Social Media Analytics Lab	0	0	2	1
8		Project Stage-I	0	0	6	3
		Total Credits	**15**	**0**	**10**	**20**

IV YEAR II SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1		Organizational Behavior	3	0	0	3
2		Professional Elective-VI	3	0	0	3
3		Open Elective-III	3	0	0	3
4		Project Stage-II including Seminar	0	0	22	11
		Total Credits	**9**	**0**	**22**	**20**

Professional Elective - IV

	Quantum Computing
	Data base Security
	Natural Language Processing
	Prompt Engineering with LLMs
	Internet of Things

Professional Elective – V

	Privacy Preserving Data Publishing
	Cyber Security
	Data Science Applications
	Mining Massive Datasets
	Exploratory Data Analysis

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Professional Elective – VI

	Data Stream Mining
	Web Security
	Deep Learning
	Block chain Technology
	Parallel and Distributed Computing

Open Elective – II

1. Software Testing methodologies
2. Data Analytics

Open Elective – III

1. Introduction to social media mining
2. Data Visualization using Python

1 2 3 4

5 6 7 8

9 10 11 12

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PREDICTIVE ANALYTICS

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

Prerequisite:

1. Data Science / Data analytics

Course Objectives:

- To learn the basics and applications of predictive analytics using different techniques

Course Outcomes:

- Understand the processing steps for predictive analytics
- Construct and deploy prediction models with integrity
- Explore various techniques (machine learning/data mining, ensemble) for predictive analytics.
- Apply predictive analytics to real world examples.

UNIT-I

Introduction –types of analytics, applications of predictive analytics, overview of predictive analytics. Setting up the problem - processing steps, business understanding, objectives, data for predictive modeling, columns as measures, target variables, measures of success for predictive models.

UNIT- II

Prediction effect, deployment of prediction model, ethics and responsibilities The Data effect

UNIT- III

Machine Learning for prediction

Predictive modeling-decision trees, logistic regression, neural network, kNN, Bayesian method,

Regression model

Assessing Predictive models - Batch Approach to Model Assessment, Percent Correct Classification, Rank-Ordered Approach to Model Assessment, Assessing Regression Models

UNIT-IV

Ensemble effect

Model ensembles–motivation, wisdom of crowds, Bagging, Boosting, Random forests, stochastic gradient boosting, heterogeneous ensembles.

UNIT-V

Case studies: Survey analysis, question answering- challenges in text mining, persuasion by the numbers

TEXT BOOKS:

1. Eric Siegel, Predictive analytics-the power to predict who will Click, buy, lie, ordie, JohnWiley & Sons, 2013.
2. Dean Abbott, Applied Predictive Analytics - Principles and Techniques for the Professional Data Analyst, 2014.

1) 2) 7/2/25 3) 4) 5)

6) 7) 8) 9) Rhamadevi 10)

11) 12)

REFERENCE BOOKS:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning-Data Mining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.
2. G.James, D.Witten, T.Hastie, R.Tibshirani-An introduction to statistical learning with applications in R, Springer, 2013.
3. E.Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2010.

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WEB AND SOCIAL MEDIA ANALYTICS

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

Course Objectives:

- Exposure to various we band social media analytic techniques.

Course Outcomes:

- Knowledge on decision support systems
- Apply natural language processing concepts on text analytics
- Understand sentiment analysis
- Knowledge on search engine optimization and web analytics

UNIT-I

An Overview of Business Intelligence, Analytics, and Decision Support

Analytics to Manage Vaccine Supply Chain Effectively and Safely, Changing Business Environments and Computerized Decision Support, Information Systems Support for Decision Making, The Concept of Decision Support Systems (DSS), Business Analytics Overview, Brief Introduction to Big Data Analytics

UNIT- II

Text Analytics and Text Mining

Machine Versus MenonJ eopardy: The Story of Watson, Text Analytics and Text Mining Concepts and Definitions, Natural Language Processing, Text Mining Applications, Text Mining Process, Text Mining Tools

UNIT- Iii

Sentiment Analysis

Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis and Speech Analytics

UNIT-IV

Web Analytics, Web Mining

Security First Insurance Deepens Connection with Policy holders, Web Mining Overview, Web Content and Web Structure Mining, Search Engines, Search Engine Optimization, Web Usage Mining (Web Analytics), Web Analytics Maturity Model and Web Analytics Tools

UNIT-V

Social Analytics and Social Network Analysis

Social Analytics and Social Network Analysis, Social Media Definitions and Concepts, Social Media Analytics

Prescriptive Analytics-Optimization and Multi-Criteria Systems:

Multiple Goals, Sensitivity Analysis, What-If Analysis, and Goal Seeking

TEXT BOOK:

1. Ramesh Sharda, DursunDelen, EfraimTurban, Business Intelligence and Analytics: Systems for Decision Support, Pearson Education

REFERENCE BOOKS:

1. Rajiv Sabharwal, Irma Becerra-Fernandez, "Business Intelligence- Practice, Technologies and Management", John Wiley 2011.
2. Lariss T.Moss, ShakuAtre, "Business Intelligence Roadmap", Addison-Wesley It Service.
3. YuliVasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

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QUANTUM COMPUTING (Professional Elective–IV)

B.Tech .IV Year I Sem. **L T P C**
3 0 0 3

Course Objectives

- To introduce the fundamentals of quantum computing
- The problem-solving approach using finite dimensional mathematics

Course Outcomes

- Understand basics of quantum computing
- Understand physical implementation of Qubit
- Understand Quantum algorithms and their implementation
- Understand The Impact of Quantum Computing on Cryptography

UNIT-I

History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

UNIT- II

Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

UNIT- III

Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

UNIT-IV

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

UNIT-V

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

TEXT BOOK:

1. Nielsen M.A., Quantum Computation and Quantum Information, Cambridge.

REFERENCE BOOKS:

1. Quantum Computing for Computer Scientists by NosonS.Yanofsky and MircoA.Mannucci
2. Benenti G., CasatiG. And StriniG., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II.
3. Basic Tools and Special Topics, World Scientific. Pittenger A.O. ,An Introduction to Quantum Computing Algorithms.

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DATA BASE SECURITY (Professional Elective–IV)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

Course Objectives:

- To learn the security of databases
- To learn the design techniques of database security
- To learn the security software design

Course Outcomes:

- Identify database security problems
- Implement different security models
- Provide security for software design
- Protect object-oriented systems
- Handle security issues for active databases

UNIT-I

Introduction: Introduction to Databases Security, Problems in Databases Security, Controls, Conclusions

Security Models-1: Introduction Access Matrix Model,Take-GrantModel, ActenModel, PNModel.

UNIT- II

Security Models -2: Hartson and Hsiao's Model, Fernandez's Model, Bussolati and Martella's Model for Distributed databases, Bell and LaPadula's Model, Biba's Model, Dion's Model, Sea View Model, Jajodia and Sandhu's Model, The Lattice Model for the Flow Control.

UNIT- III

Security Mechanisms: Introduction User Identification/Authentication, Memory Protection, Resource Protection, Control Flow Mechanisms, Isolation Security Functionalities in Some Operating Systems Trusted Computer System Evaluation Criteria

Security Software Design: Introduction of A Methodological Approach to Security Software Design Secure Operating System Design Secure DBMS Design Security Packages Database Security Design

UNIT-IV

Statistical Database Protection &Intrusion Detection Systems : Introduction Statistics Concepts and Definitions Types of Attacks Inference Controls Evaluation Criteria for Control Comparison. Introduction IDES System RETISS System ASES System Discovery

UNIT-V

Models For the Protection of New Generation Database Systems : Introduction A Model for the Protection of Frame Based Systems A Model for the Protection of Object-Oriented Systems SORION Model for the Protection of Object-Oriented Data bases, The Orion Model ,Jajodia and Kogan's Model-A Model for the Protection of Active Databases Conclusions

TEXT BOOK:

1. Data base Security by Castano *Pearson Edition(*1/e)

REFERENCE BOOKS:

1. Data base security by alfredbasta, melissazgola, CENGAGE learning.
2. Data base Security and Auditing: Protecting Data Integrity and Accessibility,1s Edition, Hassan Afyouni, THOMSON Edition.

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NATURAL LANGUAGE PROCESSING (Professional Elective–IV)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

Prerequisites

- Data structures and compiler design

Course Objectives:

- Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes:

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NL Algorithms, and design different language modeling Techniques.

UNIT-I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches, Features

UNIT- II

Syntax I: Parsing Natural Language, Treebank: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms

UNIT–III

Syntax II: Models for Ambiguity Resolution in Parsing, Multilingual Issues

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense

UNIT-IV

Semantic Parsing II: Predicate-Argument Structure, Meaning Representation Systems

UNIT-V

LanguageModeling: Introduction,N-GramModels,LanguageModelEvaluation,Bayesianparameter estimation, Language Model Adaptation, Language Models- class based, variable length, Bayesian topic based, Multilingual and Cross Lingual Language Modeling

TEXT BOOK:

1. Multilingual natural Language Processing Applications: From Theory to Practice-DanielM. Bikel and ImedZitouni,Pearson Publication

REFERENCE BOOKS:

1. Speech and Natural Language Processing-Daniel Jurafsky&JamesHMartin, Pearson Publications.
2. Natural Language Processing and Information Retrieval: TanvierSiddiqui, U.S.Tiwary.

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PROMPT ENGINEERING WITH LLMs (Professional Elective–IV)

B.Tech .IV Year ISem. **L T P C**
3 0 0 3

Course Objectives:

- Understand the principles and techniques of prompt engineering, including the designs of effective prompts.
- Explore the capabilities of large language models for text and image generations and to leverage the creation of engaging content
- Gain practical experience in crafting prompts and generating text and images using AI tools and platforms

Course Outcomes:

- Design clear, concise, and relevant prompts following the standard principles of prompt engineering
- Utilize LLMs to generate text and image for designing more effective content and design
- Analyse existing prompts and make strategic combinations for enhanced prompts

UNIT-I:
Introduction to Large Language Models, Fundamentals of Text Generation Models, Importance and Capabilities of Large Language Models, Evolution and Development of Language Models: A Brief History, Overview of Major LLMs in the Market, Introduction to Prompt Engineering, Fundamentals of Prompting, Five Principles of Effective Prompting, Types and Components of Prompts, Role of Personality in Prompting, Strategic Combinations for Optimized Prompting, Challenges and Limitations of Prompt Engineering

UNIT-II:
Principles and Techniques of Prompt Engineering, Best Practices for Text Generation, Methods for Structuring Effective Prompts, Techniques for Context-Aware Prompting, Role-based and Instructional Prompting, Style and Tone Adaptation in Prompting, Evaluating and Refining Prompts for Optimal Output

UNIT-III:
Applications of LLMs in Content Generation, AI-Assisted Copywriting and Content Creation, Generating Social Media Content and Video Scripts, AI for Personalized Messaging and Communication, Techniques for Crafting Effective Prompts for:Surveys and Data Collection, Research and Academic Applications, Ethical Considerations in AI-Generated Content

UNIT-IV:
Introduction to Diffusion Models for Image Generation, Basics of AI-Based Image Generation, Principles of Designing Effective Image Prompts, Overview of Image Generation Models:OpenAI DALL·E, Midjourney,Stable Diffusion,Google Gemini. Comparative Analysis of Image Generation Models, Understanding Negative Prompts and Reverse Prompt Engineering, Refining and Optimizing Image Prompts

UNIT-V:
Advanced Applications and Ethical Considerations, AI in Automated Blog Writing and Research, Structuring AI-Powered Content Generation Workflows, Overview of AI-Powered User Interface Design, Ethical and Societal Implications of AI in Content and Image Generation

TEXT BOOKS:

1. Prompt Engineering for LLMs by John Berryman, Albert Ziegler Publisher(s): O'Reilly Media, Inc.
2. LLM Prompt Engineering For Developers: The Art and Science of Unlocking LLMs' True Potential ,Aymen El Amri,

REFERENCE BOOKS:

[1]. James Phoenix, Mike Taylor, "Prompt Engineering for Generative AI", O'Reilly,

[2]. Gilbert Mizrahi, "Unlocking the Secrets of Prompt Engineering: Master the Art of Creative Language Generation to Accelerate Your Journey from Novice to Pro",

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INTERNET OF THINGS (Professional Elective–IV)

B.Tech .IV Year I Sem. **L T P C**
3 0 0 3

Pre-Requisites: Computer organization, Computer Networks

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Identify the applications of IoT in Industry.

UNIT - I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Deployment Templates
Domain Specific IoTs - Home automation, Environment, Agriculture, Health and Lifestyle

UNIT - II

IoT and M2M - M2M, Difference between IoT and M2M, SDN and NFV for IoT,
IoT System Management with NETCOZF, YANG- Need for IoT system Management, Simple Network management protocol, Network operator requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG

UNIT - III

IoT Systems – Logical design using Python-Introduction to Python - Python Data types & Data structures, Control flow, Functions, Modules, Packaging, File handling, Data/Time operations, Classes, Exception, Python packages of Interest for IoT

UNIT - IV

IoT Physical Devices and Endpoints - Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry PI with Python, Other IoT devices.

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs, WAMP-AutoBahn for IoT, Xively Cloud for IoT, Python web application framework -Django, Designing a RESTful web API

UNIT V

Case studies- Home Automation, Environment-weather monitoring-weather reporting- air pollution monitoring, Agriculture.

TEXT BOOK:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities.

REFERENCE BOOK:

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD).

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PRIVACY PRESERVING DATA PUBLISHING (Professional Elective–V)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

Prerequisites

- A course on "Data Mining".

Course Objectives

- The aim of the course is to introduce the fundamental also of Privacy Preserving Data Mining Methods
- The course gives an overview of-Anonymity and its Measures, Multiplicative Perturbation for Privacy-Preserving Data Mining, techniques for Utility-based Privacy Preserving Data

Course Outcomes

- Understand the concepts of Privacy Preserving Data Mining Models and Algorithms
- Demonstrate a comprehensive understanding of different tasks associated in Inference Control Methods for Privacy-Preserving Data Mining
- Understand the concepts of Data Anonymization Methods and its Measures
- Evaluate and Appraise the solution designed for Multiplicative Perturbation
- Formulate, Design and Implement the solutions for Utility-based Privacy Preserving Data

UNIT-I

Introduction, Privacy-Preserving Data Mining Algorithms, The Randomization Method, Group Based Anonymization, Distributed Privacy-Preserving Data Mining

UNIT-II

Interface Control Methods

Introduction, A Classification of Microdata Protection Methods, Perturbative Masking Methods, Non-Perturbative Masking Methods, Synthetic Microdata Generation, Trading off Information Loss and Disclosure Risk.

UNIT-III

Measure of Anonymity

Data Anonymization Methods, A Classification of Methods, Statistical Measure of Anonymous, Probabilistic Measure of Anonymity, Computational Measure of Anonymity, reconstruction Methodsfor Randomization, Application of Randomization

UNIT-IV

Multiplicative Perturbation

Definition of Multiplicative Perturbation, Transformation Invariant Data Mining Models, Privacy Evaluation for Multiplicative Perturbation, Attack Resilient Multiplicative Perturbation, Metrics for Quantifying Privacy Level, Metrics for Quantifying Hiding Failure ,Metrics for Quantifying Data Quality.

UNIT-V

Utility-Based Privacy -Preserving Data

Types of Utility-Based Privacy Preserving Methods, Utility-Based Anonymization Using Local Recording, The Utility-Based Privacy Preserving Methods in Classification Problems, Anonymization Merginal: Injection Utility into Anonymization Data Sets.

TEXT BOOK

1.Privacy- Preserving Data Mining: Models and Algorithms Edited by CharuC. Aggarwal and S.Yu, Springer

REFERENCE BOOKS:

1. CharuC. Agarwal, Datamining: The Textbook, 1stEdition, Springer.
2. HanandM. Kamber, Data Mining: Concepts and Techniques, 3rdEdition,Elsevier.
3. Privacy Preserving DataMining by Jaideep Vaidya, YuMichaelZhu and ChirstopherW. Clifton, Springer

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Cyber Security **(Professional Elective–V)**

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

Prerequisites: NIL

Course objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes:

- The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance - Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains-medical, financial, etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCE BOOKS:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

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DATA SCIENCE APPLICATIONS (Professional Elective–V)

B.Tech .IV Year I Sem. **L T P C**
3 0 0 3

Course Objective:

- To give deep knowledge of data science and how it can be applied in various fields to make life easy.

Course Outcomes:

- Correlate data science and solutions to modern problems.
- Decide when to use which type of technique in data science.

UNIT-I

Data Science Applications in various domains, Challenges and opportunities, tools for data scientists Recommender systems-Introduction, methods, application, challenges.

UNIT- II

Time series data-stock market index movement forecasting.
Supply Chain Management-Real world case study in logistics

UNIT- III

Data Science in Education, social media

UNIT-IV

Data Science in Healthcare, Bioinformatics

UNIT-V

Case studies in data optimization using Python.

TEXTBOOKS:

1. Aakanksha Sharaff, G.K.Sinha, "Data Science and its applications",CRCPress,2021.
2. Q.A.Menon,S.A.Khoja,"Data Science: Theory, Analysis and Applications",CRCPress,2020

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MINING MASSIVE DATA SETS (Professional Elective–V)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

Prerequisites:

1. Students should be familiar with Data mining, algorithms, basic probability theory and Discrete math.

Course Objectives:

1. This course will cover practical algorithms for solving key problems in mining of massive datasets.
2. This course focuses on parallel algorithmic techniques that are used for large datasets.
3. This course will cover stream processing algorithms for data streams that arrive constantly, page ranking algorithms for web search, and online advertisement systems that are studied in detail.

Course Outcomes:

1. Handle massive data using Map Reduce.
2. Develop and implement algorithms for massive data sets and methodologies in the context of data mining.
3. Understand the algorithms for extracting models and information from large data sets
4. Develop recommendation systems.
5. Gain experience in matching various algorithms for particular classes of problems.

UNIT-I

Data Mining-Introduction-Definition of Data Mining-Statistical Limits on Data Mining,
Map Reduce and the New Software Stack-Distributed File Systems, Map Reduce, Algorithms Using Map Reduce.

UNIT- II

Similarity Search: Finding Similar Items-Applications of Near-Neighbor Search, Shingling of Documents, Similarity-Preserving Summaries of Sets, Distance Measures.
Streaming Data: Mining Data Streams-The Stream Data Model, Sampling Data in a Stream, Filtering Streams

UNIT- III

Link Analysis-Page Rank, Efficient Computation of Page Rank, Link Spam
Frequent Item sets-Handling Larger Data sets in Main Memory, Limited-Pass Algorithms, Counting Frequent Items in a Stream.
Clustering-The CURE Algorithm, Clustering in Non-Euclidean Spaces, Clustering for Streams and Parallelism

UNIT-IV

Advertising on the Web-Issues in On-Line Advertising, On-Line Algorithms, The Matching Problem, The Adwords Problem, Adwords Implementation.
Recommendation Systems-A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction, The Netflix Challenge.

UNIT- V:

Mining Social-Network Graphs-Social Networks as Graphs, Clustering of Social-Network Graphs, Partitioning of Graphs, Sim rank, Counting Triangle.

TEXT BOOKS:

1. Jure Leskovec, Anand Rajaraman, Jeff Ullman, Mining of Massive Datasets,3rd Edition.

Reference Books:

1. Jiawei Han & Micheline Kamber, Data Mining-Concepts and Techniques 3rd Edition Elsevier.
2. Margaret H Dunham, Data Mining Introductory and Advanced topics, PEA.
3. IanH.Witten and EibeFrank, DataMining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann.

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EXPLORATORY DATA ANALYSIS (Professional Elective–V)

B.Tech. IV Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- Analysis of data, exploring various models in exploratory data analysis, question answering and predictive analysis

Course Outcomes:

- Apply the Epicycle of Analysis process effectively.
- Articulate and refine data-related questions using the Epicycle approach.
- Conduct Exploratory Data Analysis(EDA).
- Develop the skills necessary to use formal modeling techniques for data inference.

UNIT–I

Epicycles of Analysis: Setting the Scene, Epicycle of Analysis, Setting Expectations, Collecting Information, Comparing Expectations to Data, Applying the Epicycle of Analysis process.

UNIT–II

Stating and Refining the Question: Types of Questions, Applying the Epicycle to stating and Refining Your Question, Characteristics of good Question, Translating a Question into a Data Problem, Case Study.

UNIT-III

Exploratory Data Analysis: Formulate your question, read in your data, Checking Packaging, look at the top and bottom of the data, always be checking, validate with at least one External Source, make a plot, Try the Easy Solution First.

UNIT–IV

Using Models to Explore your data: Models as Expectations, Reacting to Data Refining Our Expectations, Examining Linear Relationships, Stopping Criteria.

Inference: Identify the population, Describe the sampling process, Describe the Model for the population, Factors Affecting the Quality of Inference, Case Study.

UNIT–V

Formal Modeling: Goals of Formal Modeling, General Framework, Associational Analysis, Prediction Analysis, and Summary

TEXT BOOK:

1. "The Art of Data Science: A Guide for Anyone Who Works with Data" by Roger D. Peng and Elizabeth Matsui.

REFERENCE BOOKS:

1. "Exploratory Data Analytics "by John Tukey.
2. "Python for Data Analysis "by Wes McKinney

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SOFTWARE TESTING METHODOLOGIES (Open Elective- II)

B.Tech. IV Year I Sem. **L T P C**

3 0 0 3

Prerequisites :

1. Software Engineering

Course Objectives:

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using the latest tools.

Course Outcomes:

- Understand purpose of testing and path testing
- Understand strategies in data flow testing and domain testing.
- Develop logic-based test strategies.
- Understand graph matrices and its applications.
- Implement test cases using any testing automation tool.

UNIT – I

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT – II

Transaction Flow Testing: transaction flows, transaction flow testing techniques.
Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing. Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT-III

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT-IV

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT-V

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter/selenium/SoapUI/Catalon).

TEXT BOOKS:

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools - Dr. K. V. K. K. Prasad, Dreamtech

REFERENCE BOOKS:

1. The craft of software testing - Brian Marick, Pearson Education.
2.Software Testing Techniques - SPD(Oreille)
3. Software Testing in the Real World - Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing - Meyers, John Wiley.

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DATA ANALYTICS (Open Elective – II)

B.Tech .IV Year I Sem. **L T P C**

3 0 0 3

Prerequisites

1. A course on "Database Management Systems".

2. Knowledge of probability and statistics.

Course Objectives:

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

Course Outcomes: After completion of this course students will be able to

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

UNIT - I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT - II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and Variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT – III

Regression - Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT - IV

Object Segmentation: Regression Vs Segmentation - Supervised and Unsupervised Learning, Tree Building - Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction.

UNIT - V

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Student's Handbook for Associate Analytics - II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

REFERENCE BOOKS:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

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PREDICTIVE ANALYTICS LAB

B.Tech. IV Year I Sem. **L T P C**
0 0 2 1

Course Objectives:

- To learn the basics and applications of predictive analytics using different techniques

Course Outcomes:

- Understand the processing steps for predictive analytics
- Construct and deploy prediction models with integrity
- Explore various techniques (machine learning/data mining, ensemble) for predictive analytics.
- Apply predictive analytics to real world examples.

List of Experiments: Following experiments to be carried out using Python/SPSS/SAS/R/PowerBI

1. Simple Linear regression
2. Multiple Linear regression
3. Logistic Regression
4. CHAID
5. CART
6. ARIMA-stock market data
7. Exponential Smoothing
8. Hierarchical clustering
9. Ward's method of clustering
10. Crowd source predictive analytics-Netflix data

TEXT BOOKS:

1. Eric Siegel, Predictive analytics-the power to predict who will Click, buy, lie, ordie, John Wiley & Sons, 2013.
2. Dean Abbott, Applied Predictive Analytics - Principles and Techniques for the Professional Data Analyst, 2014.

REFERENCE BOOKS:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning-Data Mining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.
2. G.James,D.Witten,T.Hastie,R.Tibshirani-An introduction to statistical learning with applications in R, Springer, 2013
3. E.Alpaydin, Introduction to Machine Learning, Prentice HallofIndia,2010

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WEB AND SOCIALMEDIA ANALYTICS LAB

B.Tech. IV Year I Sem. **L T P C**
0 0 2 1

Course Objectives:

- Exposure to various web and social media analytic techniques.

Course Outcomes:

- Knowledge on decision support systems
- Apply natural language processing concepts on text analytics
- Understand sentiment analysis
- Knowledge on searching in optimization and web analytics

List of Experiments

1. Preprocessing text document using NLTK of Python
   a. Stop word elimination
   b. Stemming
   c. Lemmatization
   d. POS tagging
   e. Lexical analysis
2. Sentiment analysis on customer review on products
3. Web analytics
   a. Web usage data(web server log data, click stream analysis)
   b. Hyperlink data
4. Search engine optimization-implement spam dexing
5. Use Google analytics tools to implement the following
   a. Conversion Statistics
   b. Visitor Profiles
6. Use Google analytics tools to implement Traffic Sources.

Resources:

1. Stanford core NLP package
2. GOOGLE.COM/Analytics

TEXT BOOK:

1. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics: Systems for Decision Support, Pearson Education

REFERENCE BOOKS:

1. Rajiv Sabherwal,IrmaBecerra-Fernandez,"BusinessIntelligence-Practice,Technologies and Management", John Wiley 2011.
2. LarissT.Moss,ShakuAtre,"BusinessIntelligenceRoadmap",Addison-WesleyitService.
3. Yuli Vasiliev," Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

ORGANIZATIONAL BEHAVIOUR

B.Tech.IV Year II Sem. **L T P C**
3 0 0 3

Course Objectives:

- This course demonstrates individual, group behavior aspects: The dynamics of organizational climate, structure and its impact on Organizations.

Course Outcomes:

- Students understand their personality, perception and attitudes for overall development and further learn the importance of group behavior in the organizations.

UNIT-I Organizational Behaviour

Definition, need for and importance of organizational behaviour-Nature and scope-Framework- Organizational behavior models.

UNIT-II Individual Behaviour

Personality- types- Factors influencing personality- Theories- Learning- Types of learners- The learning process - Learning theories - Organizational behaviour modification, Misbehaviour - Types - Management Intervention. Emotions-Emotional Labour- Emotional Intelligence- Theories. Attitudes - Characteristics - Components - Formation - Measurement- Values. Perceptions - Importance - Factors influencing perception - Interpersonal perception- Impression Management. Motivation - importance - Types - Effects on work behavior.

UNIT-III Group Behaviour

Organization structure–Formation–Groups in organizations–Influence–Group dynamics–Emergence of informal leaders and working norms-Group decision making techniques-Team building-Interpersonal relations -Communication-Control.

UNIT-IV Leadership and Power

Meaning-Importance-Leadership styles-Theories of leadership-Leaders Vs Managers-Sources of power-Power centers-Power and Politics.

UNIT-V Dynamics of Organizational Behaviour

Organizational culture and climate–Factors affecting organizational climate–Importance. Job satisfaction–Determinants–Measurements–Influence on behavior. Organizational change–Importance-Stability Vs Change-Proactive Vs Reaction change-the change process-Resistance to change - Managing change. Stress - Work Stressors - Prevention and Management of stress - Balancing work and Life. Organizational development - Characteristics - objectives -. Organizational effectiveness

TEXT BOOKS:

1. Stephen P. Robins, Organizational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.
2. FredLuthans, Organizational Behavior, McGraw-Hill, 11th Edition,2001.

REFERENCE BOOKS:

1. Schermerhorn, Huntand Osborn, Organizational behavior, john Wiley, 9th Edition,2008.
2. UdaiPareek, Understanding organizational Behaviour, 2nd Edition, Oxford Higher Education, 2004.

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DATA STREAM MINING(Professional Elective–VI)

B.Tech .IV Year II Sem. **L T P C**
3 0 0 3

Prerequisites

- A basic knowledge of "Data Mining"

Course Objectives

- The aim of the course is to introduce the fundamentals of Data Stream Mining.
- The course gives an overview of-Mining Strategies, methods and algorithms for data stream mining.

Course Outcomes

- Understand how to formulate acknowledge extraction problem from data streams.
- Ability to apply methods/algorithms to new data stream analysis problems.
- Evaluate the results and understand the functioning of the methods studied.
- Demonstrate decision tree and adaptive Hoeffding Tree concepts

UNIT-I

MOA Stream Mining, Assumptions, Requirements, Mining Strategies, Change Detection Strategies, MOA Experimental Settings, Previous Evaluation Practices, Evaluation Procedures for Data Streams, Testing Framework, Environments, Data Sources, Generation Speed and Data Size, Evolving Stream Experimental Setting.

UNIT-II

Hoeffding Trees, The Hoeffding Bound for Tree Induction, The Basic Algorithm, Memory Management, Numeric Attributes, Batch Setting Approaches, Data Stream Approaches.

UNIT-III

Prediction Strategies, Majority Class, Naïve Bayes Leaves, Adaptive Hybrid, Hoeffding Tree Ensembles, Data Stream Setting, Realistic Ensemble Sizes.

UNIT-IV

Evolving Data Streams, Algorithms for Mining with Change, A Methodology for Adaptive Stream Mining, Optimal Change Detector and Predictor, Adaptive Sliding Windows, Introduction, and Maintaining Updated Windows of Varying Length.

UNIT-V

Adaptive Hoeffding Trees, Introduction, Decision Trees on Sliding Windows, Hoeffding Adaptive Trees, Adaptive Ensemble Methods, New methods of Bagging using trees of different size, New method of bagging using ADWIN, Adaptive Hoeffding Option Trees, Method performance.

TEXT BOOK:

1. DATA STREAMMINING: A Practical Approach by Albert Bifet and Richard Kirkby.

REFERENCE BOOKS:

1. Knowledge discovery from data streams by GamaJoão.ISBN:978-1-4398-2611-9
2. Machine Learning for Data Streams by AlbertBifet,Ricard Gavalda;MITPress,2017

WEB SECURITY (Professional Elective–VI)

B.Tech.IV Year II Sem. **L T P C**
3 0 0 3

Course Objectives:

1. Give an Overview of information security
2. Give an over view of Access control of relational databases

Course Outcomes: Students should be able to

1. Understand the Web architecture and applications
2. Understand client side and service side programming
3. Understand how common mistakes can be by passed and exploit the application
4. Identify common application vulnerabilities

UNIT-I

The Web Security, The Web Security Problem, Risk Analysis and Best Practices Cryptography and the Web: Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification

UNIT- II

The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Antitheft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications

UNIT- III

Database Security: Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems

UNIT-IV

Security Re-engineering for Databases: Concepts and Techniques, Database Watermarking for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities

UNIT-V

Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy-enhanced Location Based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

TEXT BOOKS:

1. WEB Security, Privacy and Commerce Simson Garfinkel, Gene Spafford, O'Reilly.
2. Handbook on Database security applications and trends Michael Gertz,Sushil Jajodia

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Deep Learning (Professional Elective–VI)

B.Tech. IV Year II Sem. **L T P C**
3 0 0 3

Course Objectives:

- To understand deep Learning algorithms and their applications in real-world data

Course Outcomes:

- Understand machine learning basics and neural networks
- Understand optimal usage of data for training deep models
- Apply CNN and RNN models for real-world data
- Evaluate deep models
- Develop deep models for real-world problems

UNIT -I

Machine Learning Basics

Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning

Deep Feedforward Networks Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

UNIT -II

Regularization for Deep Learning

Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, MultiTask Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier, Optimization for Training Deep Models, Learning vs Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates.

UNIT-III

Convolutional Networks

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features

UNIT -IV

Recurrent and Recursive Nets

Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for

Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-term Dependencies, Explicit Memory

UNIT -V

Practical Methodology

Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

TEXT BOOK:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.

REFERENCE BOOKS:

1. The Elements of Statistical Learning. Hastie, R. Tibshirani, and J. Friedman, Springer.
2. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.
3. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.
4. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
5. Golub, G., H., and Van Loan, C.,F., Matrix Computations, JHU Press, 2013.
6. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

BLOCKCHAIN TECHNOLOGY (Professional Elective–VI)

B.Tech. IV Year II Sem. **L T P C**
3 0 0 3

Prerequisites

1. Knowledge in information security and applied cryptography.
2. Knowledge in Computer Networks.

Course Objectives:

- To learn the fundamentals of Blockchain and various types of blockchain and consensus mechanisms.
- To understand the public block chain system, Private blockchain system and consortium blockchain.
- Able to know the security issues of blockchain technology.

Course Outcomes:

- Understanding concepts behind cryptocurrency
- Applications of smart contracts in decentralized application development
- Understand frame works related to public, private and hybrid blockchain
- Create blockchain for different application case studies

UNIT-I

Fundamentals of Blockchain: Introduction, Origin of Block chain, Blockchain Solution, Components of Block chain, Block in a Blockchain, The Technology and the Future.
Block chain Types and Consensus Mechanism: Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol.
Cryptocurrency–Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

UNIT- II

Public Blockchain System: Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Block chain.
Smart Contracts: Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

UNIT- III

Private Blockchain System: Introduction, Key Characteristics of Private Blockchain, Need of Private Blockchain, Private Block chain Examples, Private Blockchain and Open Source, E- commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.
Consortium Blockchain: Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Blockchain, Hyper ledger Platform, Overview of Ripple, Overview of Corda.
Initial Coin Offerings: Introduction, Blockchain Fund raising Methods, Launching an ICO, Investing nan ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

UNIT-IV

Security Block chain: Introduction, Security Aspects In Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.

Applications of Blockchain :Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real Estate, Blockchain In Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

UNIT-V

Blockchain Case Studies :Case Study 1-Retail, Case Study 2-Banking and Financial Services, Case Study 3-Healthcare, CaseStudy4-Energy and Utilities.

Blockchain Platform using Python: Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.

Blockchain platform using Hyper ledger Fabric: Introduction, Components of Hyper ledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK.

TEXT BOOK:

1. Blockchain Technology, Chandramouli Subramanian, Asha A. George, Abhilasj K A and Meena Karthikeyan, Universities Press.

REFERENCE BOOKS:

1. Michael Juntao Yuan, Building Blockchain Apps,Pearson,India.
2. Block chain Blueprint for Economy, Melanie Swan, SPDO'reilly.
3. Block chain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gaur, Pearson.

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PARALLEL AND DISTRIBUTED COMPUTING (Professional Elective–VI)

B.Tech.IV Year II Sem. **L T P C**
3 0 0 3

Course Objectives:

- To learn core ideas behind parallel and distributed computing.
- To explore the methodologies adopted for parallel and distributed environments.
- To understand the networking aspects of parallel and distributed computing.
- To provide an overview of the computational aspects of parallel and distributed computing.
- To learn parallel and distributed computing models.

Course Outcomes:

- Explore the methodologies adopted for parallel and distributed environments.
- Analyze the networking aspects of Distributed and Parallel Computing.
- Explore the different performance issues and tasks in parallel and distributed computing.
- Tools usage for parallel and distributed computing.
- Understand high performance computing techniques.

UNIT-I

Parallel and Distributed Computing– Introduction- Benefits and Needs- Parallel and Distributed Systems- Programming Environment- Theoretical Foundations- Parallel Algorithms–Introduction- Parallel Models and Algorithms- Sorting- Matrix Multiplication

UNIT- II

Architecture of Parallel and Distributed Systems, Parallel Operating Systems.

UNIT- III

Management of Resources in Parallel Systems-Parallel Database Systems and Multimedia Object Servers.

UNIT-IV

Networking Aspects of Distributed and Parallel Computing-Process-Parallel and Distributed Scientific Computing.

UNIT-V

Multimedia Applications for Parallel and Distributed Systems

TEXT BOOK:

1. JacekBłażewicz,etal.,"Handbookonparallelanddistributedprocessing",SpringerScience& Business Media, 2013.

REFERENCE BOOKS:

1. George F. Coulouris, Jean Dollimore, and Tim Kindberg, "Distributed systems: concepts and design", Pearson Education, 2005.
2. Gregor Kosec and Roman Trobec, "Parallel Scientific Computing: Theory ,Algorithms, and Applications of Mesh Based and Meshless Methods", Springer, 2015.
3. Andrew S. Tanenbaum, and Maarten Van Steen, "Distributed Systems: Principles and Paradigms". Prentice-Hall, 2007.

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INTRODUCTION TO SOCIAL MEDIA MINING (Open Elective–III)

B.Tech. IV Year II Sem. **L T P C**
3 0 0 3

Prerequisites

1. Data Analytics.

Course Objectives

- The purpose of this course is to provide the students with knowledge of social media mining principles and techniques.
- This course is also designed to give an exposure of the frontiers of social media mining (Facebook, twitter)
- To introduce new technology for data analytics and introduce community Analysis
- To introduce various Recommendation algorithms

Course Outcomes

- Understand social media and its data.
- Apply mining technologies on twitter, Facebook, LinkedIn and Google.
- Learn about community
- Apply various Recommendation Algorithms
- Analyze the Behavior of people

UNIT-I

Introduction

Social Media Mining, New Challenges for Mining

Graph Essentials

Graph Basics, Graph Representation, Types of Graphs, Connectivity in Graphs, Special Graphs, Graph Algorithms

UNIT- II

Network Measures

Centrality, Transitivity and Reciprocity, Balance and Status, Similarity.

Network Models

Properties of Real- World Networks, Random Graphs, Small-World Model, Preferential Attachment Model

UNIT- III

Data Mining Essentials

Data, Data Preprocessing, Data Mining Algorithms, Supervised Learning, Unsupervised Learning

Community Analysis

Community Detection, Community Evaluation, Community Evaluation

UNIT-IV

Information Diffusion in Social Media

Herd Behavior, Information Cascades, Diffusion of innovations, Epidemics

Influence and Homophily

Measuring Assortativity, Influence, Homophily, Distinguishing Influence and Homophily

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UNIT-V

Recommendation in Social Media

Challenges, Classical Recommendation Algorithms, Recommendation Using Social Context, Evaluating Recommendations

Behavior Analytics

Individual Behavior, Collective Behavior.

TEXT BOOK:

1. Social Media Mining(An Introduction), Reza Zafarani, Mohammad Ali Abbasi,Huan Liu, Cambridge University Press, Draft Version: April 20, 2014

REFERENCE BOOKS:

1. Mining the Social Web, 2nd Edition Data Mining Face book, Twitter, LinkedIn, Google+, GitHub, and More By Matthew A. Russell Publisher: O'Reilly Media.
2. Social Media Mining with R[Kindle Edition]NATHANDANNEMANRICHARDHEIMANN

DATA VISUALIZATION USING PYTHON (Open Elective–III)

B.Tech.IV Year II Sem. **L T P C**
3 0 0 3

Course Objectives:

- Learn data wrangling techniques
- Introduce visual perception and core skills for visual analysis

Course Outcomes:

- Perform data wrangling
- Explain principles of visual perception
- Apply cores kills for visual analysis
- Apply visualization techniques for various data analysis tasks
- Evaluate visualization techniques

UNIT-I

An Introduction to Data Visualization in Python, Types of Plots- statistical plots, Images, Networks/ Graphs, Geographical, 3D and Interactive, Grids and Meshes

UNIT- II

Manipulating and visualizing data with Pandas: defining data frames, Creating and manipulating data frames, visualization with pandas

Matplotlib: Features of matplotlib, Anatomy and Customization of matplotlib plot, Plotting and plot customization, Customizing a plot, Visualization examples,

UNIT- III

Seaborn: Features of seaborn, Creating plots with seaborn, Visualization examples

Altair: Altair's declarative API, creating an Altair Chart and Plot, Changing mark/Plot Types, Global Configuration,Encodingarguments,AltairDatatypes,CreatingTitles,Properties,Tooltips,SavingAltair Charts, Making Plots Interactive, Visualization Examples,

UNIT-IV

Plotly: Plotly and JSON, Online and Offline plotting, Structure of Plotly Plot, Graph Objectives VS Dictionaries, Plotly Express, updating plots- Adding and Updating Traces, Creating Subplots, Drop-Down Menus, Dash Interactivity, Example Plots

UNIT-V

CGPlot2/Plotnine: The Grammar of Graphics, Creating Plots, Changing Geoms, Stats, Faceting, Coordinates, Annotations, Scaling, Themes, Legends, and Palettes, Visualization Examples.

TEXT BOOKS:

1. Daniel Nelson, Data Visualization in Python
2. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick A K Peters Ltd.

REFERENCE BOOKS:

1. Jacqueline Kazil and Katharine Jarmul, Data Wrangling with Python: Tips and Tools to Make Your Life Easier, O'Reilly.
2. E.Tufte, The Visual Display of Quantitative Information, Graphics Press.