VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

ACCREDITED BY NAAC WITH 'A++' GRADE

Ibrahimbagh, Hyderabad-31

Approved by A.I.C.T.E., New Delhi and

Affiliated to Osmania University, Hyderabad-07

Sponsored

by

VASAVI ACADEMY OF EDUCATION

Hyderabad

SCHEME OF INSTRUCTION AND SYLLABI UNDER CBCS FOR B.E. (CSE) VII and VIII Semesters

With effect from 2025-26

(For the batch admitted in 2022-23)

(R-22)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Phones: +91-40-23146020, 23146021

Fax: +91-40-23146090

Institute Vision

Striving for a symbiosis of technological excellence and human values

Institute Mission

To arm young brains with competitive technology and nurture holistic development of the individuals for a better tomorrow

Department Vision

To be a center for academic excellence in the field of Computer Science and Engineering education to enable graduates to be ethical and competent professionals

Department Mission

To enable students to develop logic and problem solving approach that will help build their careers in the innovative field of computing and provide creative solutions for the benefit of society.

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B.E (CSE) Program Educational Objectives (PEO's)	
Graduates should be able to utilize the knowledge gained from their academic program to:	
PEO I	Solve problems in a modern technological society as valuable and productive engineers.
PEO II	Function and communicate effectively, both individually and within multidisciplinary teams.
PEO III	Be sensitive to the consequences of their work, both ethically and professionally, for productive professional careers.
PEO IV	Continue the process of life-long learning.

B.E. (CSE) PROGRAM OUTCOMES (PO's) Engineering Graduates will be able to:	
PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

P1O	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
P11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
P12	**Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

B.E (CSE) PROGRAM SPECIFIC OUTCOMES (PSO's)	
PSO 1	Graduates will have knowledge of programming and designing to develop solutions for engineering problems.
PSO 2	Graduates will be able to demonstrate an understanding of system architecture, information management and networking.
PSO 3	Graduates will possess knowledge of computer science and engineering in the areas of Cloud Computing & Data Analytics and apply them in appropriate domains.

With effect from the Academic Year 2025-26

SCHEME OF INSTRUCTION AND EXAMINATION(R-22)
FOR B.E 2022-23 ADMITTED BATCH VII SEMESTER (A.Y. 2025-26)

B.E (CSE) VII Semester								
Course Code	**Name of the Course**	**Scheme of Instruction**			**Scheme of Examination**			
		Hours per Week			**Duration in Hrs**	**Maximum Marks**		**Credits**
		L	**T**	**P/D**		**SEE**	**CIE**	
THEORY								
UI22PC710CS	Cloud Computing	3	-	-	3	60	40	3
UI22PC720CS	Data Mining	3	-	-	3	60	40	3
UI22PE7X0CS	Professional Elective-I	3	-	-	3	60	40	3
UI22PE7X0CS	Professional Elective-II	3	-	-	3	60	40	3
PRACTICALS								
UI22PC711CS	Cloud Computing Lab	-	-	2	3	50	30	1
UI22PC721CS	Data Mining Lab	-	-	2	3	50	30	1
UI22PE7X1CS	Professional Elective-I Lab	-	-	2	3	50	30	1
UI22PE7X1CS	Professional Elective-II Lab	-	-	2	3	50	30	1
UI22PW729CS	Project Seminar	-	-	2	-	-	30	1
	NPTEL Course	-	-	-	-	-	-	2
Library / Sports / Mentor Interaction		-	-	-	-	-	-	-
	TOTAL	**12**	**0**	**10**	**-**	**440**	**310**	**19**
	GRAND TOTAL	**22**				**750**		
Student should acquire one NPTEL course certification of 8 weeks duration (2 credits) during I Sem to VI Sem								

With effect from the Academic Year 2025-26

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

CLOUD COMPUTING

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week):3:0:0	SEE Marks :60	Course Code: **UI22PC710CS**
Credits :3	CIE Marks :40	Duration of SEE : 3Hours

COURSEOBJECTIVES	**COURSEOUTCOMES** On completion of the course, students will be able to
1 Explain distributed system and cloud models 2 Apply distributed computational model and understand the need for cloud computing.	1 Explain distributed system models and cloud service & deployment models. 2 Analyze the need for virtualization in a cloud environment and apply it in compute, Memory and storage levels 3 Explain Container based virtualization and orchestration of containers using Kubernetes 4 Explain distributed computation model on large datasets using parallel and distributed programming approaches over cloud platforms 5 Explain the role of trust, load balancing and security in cloud

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3	3		2							2	3	2	2
CO2	2	3	3	2	3							2	3	2	2
CO3	2	2	2		1							2	3	2	2
CO4	3	3	3	3	3							2	3	3	2
CO5	1	3	3	3	3		3	2				2	3	2	2

UNIT I:

Distributed System Models & Enabling technology: Scalable computing over the internet, Technologies for network-based system, System models for distributed & cloud, Software environments for distributed & Cloud.

Introduction to Cloud Computing: Cloud Computing in a Nutshell, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Resource Management, Basic Principles of Cloud Computing, Service Models, Challenges and Risks.

SLA Management in the cloud: Types of SLA, Life cycle of SLA, SLA management in cloud.

UNIT II:

Virtual Machines and Virtualization of Cluster and Data Centers: Levels of Virtualization, Virtualization Structures/Tools and Mechanisms-KVM, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Centre Automation.

UNIT III:

Container based Virtualization: Creating and running containers-Docker, Deploying a Kubernetes Cluster, Managing virtual machines on Kubernetes cluster-Kubervirt, AWS Lambda and Azure function.

UNIT IV:

Cloud Programming & Software Environments: Features of Cloud & Grid, Parallel & Distributed programming paradigms, Map-Reduce, HDFS, Programming support of Google Cloud, Google File System, Big Table, Amazon AWS & Azure.

Case Study: OpenStack & Aneka

UNIT V:

Trust Management and Security: Trust, Reputation and Security Management in P2P Systems, Load Balancing- HAProxy, Data Security, Identity and Access Management in cloud. Consensus and related problems. Edge Computing, Multi cloud and Federated cloud

Learning Resources:

1. Kai Hwang. Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing, From parallel processing to the internet of things", Elsevier, 2012.
2. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair,

"DISTRIBUTED SYSTEMS Concepts and Design", Fifth Edition, Addison-Wesley, 2012.
3. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, "Cloud Computing: principles and paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing (c) 2011.
4. Brendan Burns, Joe Beda, and Kelsey Hightowe: "Kubernetes: Up and Running" 2nd Edition, Oreilly, 2019
5. Raluca Ada Popa, Catherine M.S. Redfiled, NickolaiZeldovich, and Hari Balakrishnan, "Crypt DB" Protecting confidentiality with encrypted Query Processing" 23rd ACM Symposium on Operating Systems principles (SOSP 2011), Cascais, Portugal October 2011.
6. Craig Gentry,A fully Homomorhic Encryption Scheme, Doctoral Dissertation, September 2009
7. Ajay D. Kshemkalyani and Mukesh Singhal,Distributed Computing: Principles, Algorithms, and Systems, Cambridge, 2008
8. https://onlinecourses.nptel.ac.in/noc18_cs45/
9. https://cloud.google.com/load-balancing/docs/
10. https://docs.microsoft.com/en-us/azure/load-balancer/load-balancer-overview
11. https://www.docker.com/resources/what-container
12. http://www.haproxy.org/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 1 Hour 30 Minutes

With effect from the Academic Year 2025-26

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Department of Computer Science & Engineering

DATA MINING

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks:60	Course Code:**UI22PC720CS**
Credits : 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 Identify the steps involved in KDD, understand various data pre-processing techniques and data mining functionalities	1 Explain the steps in KDD, Identify various pre-processing techniques and compute similarity among data objects
2 Learn different classification, Clustering and Association rule mining techniques	2 Construct Multidimensional data models to represent data cubes and perform characterization & generalization tasks on data cubes 3 Compute associations and correlations among items by mining frequent patterns from transactional databases 4 Build model to classify unknown data objects 5 Build clusters using clustering techniques and evaluate clusters formed

CO-PO and CO-PSO mapping

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1					1						1		2
CO2	3	2	1				3					1	1		2
CO3	3	2	1				2					1	2		3
CO4	3	2	1				2					1	1		3
CO5	3	2	1				2					1	1		3

UNIT-I:

Introduction: Fundamentals of Data Mining, Kinds of Patterns can be mined, Technologies Used, Applications and Issues in Data Mining

Types of Data: Attribute types, Basic Statistical descriptions of Data, Measuring data Similarity and Dissimilarity

UNIT-II:

Data Preprocessing: Need of Preprocessing, Data Cleaning, Data Integration, Data Reduction, Data Transformation

Data Warehouse and OLAP: Data Warehouse, Data Warehouse Modeling, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-oriented induction

UNIT-III:

Mining Frequent Patterns, Associations and Correlations: Market Basket Analysis, Association rule mining, Frequent Item set mining methods, Pattern Evaluation methods, Constraint based frequent pattern mining, Mining Multilevel and Multidimensional patterns

UNIT-IV:

Classification: General approach to classification, Rule-based classification, Model evaluation and Selection, Techniques to Improve Classification Accuracy, Lazy Learners- KNN classifiers, Other Classification methods- Fuzzy set approaches, Rough set approach , Classification using Frequent patterns, Support Vector Machines

UNIT-V:

Cluster Analysis: Basic Clustering methods, Partitioning methods, Density –Based Methods, Grid-based methods, and Evaluation of Clustering, Outlier Analysis and Detection methods

Advanced Data Mining Techniques: Mining sequence data, Time-series data, Mining Graphs and Networks, Mining Multi-media

Learning Resources:

1. Jiawei Han & Micheline Kamber and Jain Pei ,Data Mining Concepts and Techniques , Third Edition(2011), India.
2. Pang-Ning Tan, Vipin Kumar, Michael Steinbach, "Introduction to Data Mining", (2017),Pearson Education,
3. Margaret H Dunham, Data Mining Introductory and advanced topics , Pearson education
4. Arun K Pujari ,Data Mining Techniques, (2017) ,University Press
5. Sam Anahory , Dennis Murray ,Data Warehousing in the Real World, Pearson Education

6. Paulraj Ponnaiah, Data Warehousing Fundamentals, Wiley Student ed.
http://web.stanford.edu/class/cs345a/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 1 Hour 30 Minutes

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

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Department of Computer Science & Engineering

AGENTIC AI
(Professional Elective-I)

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week):3:0:0	SEE Marks:60	Course Code: **UI22PE710CS**
Credits : 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. To introduce students to the foundations and evolution of Agentic AI, characteristics, and use cases of autonomous agents. 2. To equip students with the skills to design, implement, and optimize agentic systems, focusing on architecture, interaction patterns, memory management, and performance enhancement through reflection and self-governance mechanisms.	1. Understand the fundamentals of Agentic AI, characteristics, types of agents, applications and multi-agent systems. 2. Implement reflective reasoning and performance monitoring in AI agents using Crew AI, enabling self-explanation and system transparency. 3. Understand the coordinator-worker-delegator -CWD Model and Agent Roles 4. Develop and optimize agentic workflows by employing state-space modeling, memory architecture, and integration strategies for both sequential and parallel processing. 5. Build Retrieval-Augmented Generation (RAG) Systems with Lang Chain.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	1	2								1		3
CO2	3	3	2	1	2								2		3
CO3	2	2	3	2	3								2		3
CO4	2	3	2	3	3								2		3
CO5	3	2	3	2	3								2		3

Unit-I

Introduction to Agentic AI, Traditional AI Vs Agentic AI and Generative AI, Capabilities of Agentic AI, Benefits and Agentic AI Use cases, Autonomous Agents, Reviewing Intelligent agents and their characteristics, Exploring the architecture of agentic systems, Deliberative architectures, Reactive architectures, Hybrid architectures, multi-agent systems (MASs), Definition and characteristics of MAS, Interaction mechanisms in MASs

Unit-II

Reflection in agents, implementing reflective capabilities, Traditional reasoning, Meta-reasoning with AI agents and Crew AI framework, Performance monitoring, Self-explanations transparency with AI agents, Learning and refinement with AI agents.

Unit-III

Understanding the coordinator-worker-delegator (CWD) model, designing agents with role assignments, Communication and collaboration between agents, Implementing the CWD approach in generative AI systems.

Unit-IV

Effective Agentic System Design Techniques, Focused system prompts and instructions for agents, State spaces and environment modeling, Integration and interaction patterns, Monitoring and adaptation, Agent memory architecture and context management, Sequential and parallel processing in agentic workflows, Workflow optimization,

Unit-V

Introduction to Large Language Models, Retrieval-Augmented Generation (RAG) Model, Agentic AI tools and frameworks- Lang Chain: Modular agent design, RAG integration, Lang Graph: low-level orchestration framework for building, managing, and deploying stateful agents and Lang Smith.

Textbooks:

1. Building Agentic AI Systems: Create intelligent, autonomous AI agents that can reason, plan, and adapt by Anjanava Biswas, Wrick Talukdar, Matthew R Scott, Packt Publication, April 2025
2. Artificial Intelligence: A Modern Approach, Authors: Stuart Russell, Peter Norvig, 4th Edition, Pearson, 2021.

3. Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations, Yoav Shoham, Kevin Leyton-Brown, 1st Edition, Cambridge University Press, 2009

Learning Resources:

1. "Introduction to Agentic AI for Executives: Fundamental Concepts, Practical Applications, Implementation Strategies, and Future Trends", Dr. Ivan Del Valle, Paperback, 208 pages, 2024
2. Agentic Artificial Intelligence: Harnessing AI Agents to Reinvent Business, Work, and Life", Pascal Bornet, Jochen Wirtz, Thomas H. Davenport, Nandan Mullakara, Brian Evergreen, David De Cremer, Phil Fersht, Rakesh Gohel, Shail Khiyara, Pooja Sund, Irreplaceable Publishing, 2025
3. Agentic AI: Build Your First Autonomous Agent System—A Practical Hands-On Guide", Leandro Calado, Kindle eBook (111 pages), 2025
4. https://konverge.ai/pdf/Ebook-Agentic-AI.pdf
5. https://www.pwc.com/m1/en/publications/documents/2024/agentic-ai-the-new-frontier-in-genai-an-executive-playbook.pdf
6. https://www.udemy.com/course/the-complete-agentic-ai-engineering-course/?srsltid=AfmBOooNSYbinopPhhXaVkBuKqP0ngm-ZkWIA5b2sBLMvIhLHPgzlmi1&couponCode=ST16MT230625G1
7. https://python.langchain.com/docs/tutorials/rag/

The break-up of CIE: Internal Tests + Assignments + Quizzes

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2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

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Department of Computer Science & Engineering

DEEP LEARNING
(Professional Elective-I)

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P(Hrs./week):3:0:0	SEE Marks : 60	Course Code:**UI22PE730CS**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVE	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Understand issues and Techniques involved in the creation of Deep Learning Models.	1. Identify the deep learning algorithms which are appropriate for various types of learning tasks in various domains. Apply regularization technique to generalize the model. 2. Design deep learning systems by applying convolution, pooling operations in convolution neural network. 3. Implement sequence modelling algorithms to solve real-world problems. 4. Ability to apply Optimization strategies for large scale applications and Generative Models 5. Understand Transformer Architecture and apply the transformer models using deep learning framework.

CO-PO and CO-PSO mapping															
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CO1	2		2	1									1		3
CO2	2	2	2	2	2								1		3
CO3	3	2	3	2	2								2		3
CO4	3	2	2	2	1								2		3
CO5	3	2			2								2		3

UNIT I:

Introduction: Introduction to DL, **Regularization for Deep Learning**: Parameter Norm Penalties, Norm Penalties as constrained optimization, Regularization and under Constrained problem, Dataset Augmentation, Noise Robustness, Semi Supervised Learning, Multitask Learning, Early stopping, Bagging and other ensemble methods, Dropouts, Transfer Learning.

UNIT II:

Convolutional Networks: The Convolution Operations, Motivation, Pooling, Convolution and Pooling as an infinitely strong prior, Variants of Basic Convolution Function, Structured outputs, Data Types, Efficient Convolution Algorithms, Random or unsupervised features.

UNIT III:

Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder Decoder Sequence-to –Sequence Architecture, Deep Recurrent Networks, Recursive Neural Network, The Long-Term short memory (LSTM).

UNIT IV:

Optimization for Learning Deep Models: How learning Differs from pure optimization, Challenges in Neural Network Optimization, Basic Algorithms- SGD, Momentum, Nesterov Momentum, Parameter initialization strategy, Algorithm with adaptive Learning Rates- AdaGrad, RMSProp, Adam.

Generative Models -Generative Adversarial Network (GAN'S) and Variational Autoencoders (VAE)

UNIT V:

Transformers- A Self-Attention, Network parameters, scaled Self attention, Multi- head Attention, Transformer Layers, Transformer Language Models, Decoder Transformer, Sampling Strategies, Encoder Transformer, Sequence to sequence transformer, Large Language Models.

Learning Resources:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning: Adaptive Computations and Machine Learning Series, 2016 edition, An MIT Press Book
2. Eugene Charniak, Introduction to Deep Learning, 2019 Edition.
3. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006
4. Raúl Rojas, Neural Networks : A Systematic Introduction, Springer, 1996
5. Michael Nielsen, Neural Networks and Deep Learning, Determination Press , 2015

6. https://www.bishopbook.com-Deep Learning Foundations and Concepts
7. https://nptel.ac.in/courses/106106184
8. https://www.deeplearning.ai/program/deep-learning-specialization/
9. https://www.coursera.org/specializations/deeplearning?action=enroll&utm_campaign=WebsiteCoursesDLSTopButton&utm_medium=institutions&utm_source=deeplearningai
10. https://www.udemy.com/course/basics-of-deep-learning/
11. https://www.udemy.com/course/tensorflow-20-recurrent-neural-networks-lstms-grus/
12. http://neuralnetworksanddeeplearning.com/

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Department of Computer Science & Engineering

CRYPTOGRAPHY AND NETWORK SECURITY
(Professional Elective-I)

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks:60	Course Code:**UI22PE720CS**
Credits : 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVE	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Learn fundamentals in cryptography and understand the need of cryptographic algorithms to design network security protocols.	1. Understand the basic fundamentals in cryptography and vulnerability scenarios. 2. Demonstrate the flow of constructing the Block ciphers and stream ciphers. 3. Grasp the significance of hash function, message authentication code constructions. 4. Grasp the significance of security constructions of TLS and Email security. 5. Appreciate the security constructions of wireless network and Internet.

CO-PO and CO-PSO mapping															
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CO1	3	2	1										2	3	1
CO2	3	3	1										2	1	
CO3	3	3	1										2	2	1
CO4	3	1											3	1	1
CO5	3	3	2										2	1	2

UNIT I: Computer and network security concepts & Examples of Vulnerabilities:

Introduction: Security attacks, security services; mechanisms, Symmetric Cipher Model, Substitution Techniques, Transportation Techniques, Cryptanalysis.

Examples of Vulnerabilities: Cyber threats and their defense(Phishing Defensive measures, web based attacks, SQL injection and Defense techniques), Buffer overflow & format string vulnerabilities, TCP session hijacking(ARP attacks, route table modification) UDP hijacking (man-in-the-middle attacks).

UNIT II: Symmetric and Asymmetric Key Cryptography

Symmetric key cryptography:Traditional Block Cipher Structure, DES, Block Cipher Design Principles, Triple DES, AES-Structure, Transformation functions, Key Expansion, Blowfish, CAST-128, IDEA, Block Cipher, Modes of Operations, Stream Cipher, RC4.

Public Key Cryptography: Principles, public key cryptography algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Man in middle attack, Elgamal encryption and decryption, Introduction to Elliptic Curve Cryptography.

UNIT III : Cryptographic Hash Functions & Digital Signatures

Cryptographic Hash functions: Application of Cryptographic hash Functions, Requirements, Security, Secure Hash Algorithm,

Message Authentication Functions: Requirements, Security, HMAC & CMAC.

Digital Signatures: Digital Signatures, Elgamal Distial Signature scheme, NIST Digital Signature Algorithm.

Key management and distribution: Symmetric key distribution methods, Distribution of public keys, X.509 certificates, Public key infrastructure.

User Authentication: Remote user authentication principles, Kerberos.

UNIT IV: Transport Layer Security and Email Security

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Shell (SSH)

Electronic Mail Security: Internet mail architecture, Email formats, Email threats, Comprehensive Email security, Pretty Good Privacy (PGP) and S/MIME.

UNIT V: Wireless Network security & IP security, Intrusion detection

Wireless Network Security: Wireless security, Mobile device security, IEEE 802.11 Wireless LAN overview, IEEE 802.11i Wireless LAN security.

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Internet Key exchange.

Intrusion detection: Overview, Approaches for IDS/IPS, Signature based IDS, Host based IDS/IPS, Machine learning approaches to intrusion detection.

Learning Resources:

1. Cryptography & Network Security: Principles and Practices, William Stallings, PEA, Sixth edition.
2. Network Security and Cryptography, Bernard Menezes, CENGAGE Learning, Second Edition.
3. Cryptography and Network security, Behrouz Forouzhan, Debdeep Mukhopadyay, Third Edition.
4. Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, Wiley Dreamtech.

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Department of Computer Science & Engineering

BLOCKCHAIN TECHNOLOGY
(Professional Elective-I)

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week):3:0:0	SEE Marks:60	Course Code:**UI22PE740CS**
Credits : 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 To provide understanding and significance of 2 Blockchain. To familiarize with platforms such as Ethereum, Hyperledger Fabric involved in building 3 Blockchainapplications. To impart knowledge about the applications of Blockchain in various sectors.	1 Understand the significance of Blockchain technology and its associated components. 2 Understand the need for consensus protocols in Blockchain. 3 Experience the Ethereum and Solidity Programming 4 Understand the basics of Hyperledger fabric. 5 Incorporate Blockchain in financial software Systems and supply chain environments.

CO-PO and CO-PSO mapping

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3	2												
CO2	2	2	2												
CO3	3	2	2	2								2	1		
CO4	3	2	2									1		1	
CO5	3	3	3	2								2			1

UNIT - I

Introduction: Overview of distributed systems; Introduction to Blockchain; Properties of Blockchain; Evolution of Blockchain, Components of Blockchain Ecosystem, Hash Functions, Merkle Trees; Types of Blockchain; Blockchain Platforms.

Cryptography: Privacy and Security on Blockchain.

UNIT - II

Distributed consensus: Consensus algorithms, Consensus in a Bitcoin network, Proof of Work (PoW), Proof of Stake, Proof of Burn, Proof of Elapsed Time; Consensus models for permissioned block chain, Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, BFT over Asynchronous systems.

UNIT - III

Ethereum: Introduction to Ethereum Smart Contracts; Mining in Ethereum; Consensus mechanism in Ethereum; Technologies that support Ethereum;

Ethereum Programming Languages-Solidity-Basic Syntax,Types, Variables, Variables Scope, Operators, Loops, Decision Making, Strings, Arrays, Enums, Structs, Mapping, Conversions , Ether Units, Solidity Functions, Solidity Common Patterns – Restricted Access, Withdrawal Pattern, Contracts, Inheritance, Constructors, Abstract Contracts, Interfaces, Interfaces, Events, Error Handling.

UNIT – IV

Hyperledger Fabric: Introduction to Hyperledger Fabric; Hyperledger Fabric architecture; Consensus in Hyperledger Fabric; Hyperledger API and Application Model;

UNIT – V

Use Case I: Blockchain in Financial Software and Systems (FSS): Settlements, KYC, Insurance.

Use case II: Blockchain in trade/supply chain:- Tuna fish Problem

Use Case III: Blockchain for Government: Digital identity, land records and other kinds of record keeping between government entities.

Learning Resources:

1. Imran Bashir, "Mastering Blockchain : A deep dive into distributed ledgers, consensus protocols,smart contracts, DApps, cryptocurrencies, Ethereum, and more", Packt Publishing,Third Edition,

2020,
2. Mark Gates, "Blockchain: Ultimate guide to understanding blockchain, bitcoin, cryptocurrencies, smart contracts and the future of money", Wise Fox Publishing and Mark Gates, 2017.
3. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Blockchain with Hyperledger: Building decentralized applications with Hyperledger Fabric and Composer", 2018.
4. Arshdeep Bahga, Vijay Madisetti, "Blockchain Applications: A Hands-On Approach", Arshdeep Bahga, Vijay Madisetti publishers 2017.

Suggested Reading:

1. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media,Inc., 2014.
2. Melanie Swa, "Blockchain", O'Reilly Media, 2014.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs47/preview
2. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
3. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits, 2017 https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.htm
4. https://www.udemy.com/blockchain-and-bitcoin-fundamentals/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 1 Hour 30 Minutes

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

ACCREDITED BY NAAC WITH 'A++' GRADE

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

NATURAL LANGUAGE PROCESSING
(Professional Elective-II)

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks:60	Course Code: **UI22PE750CS**
Credits : 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Learn the concepts of Natural Language processing. 2. Gain knowledge understanding of relevant terminology, concepts in Natural Language Processing.	1. Apply N-grams for language modeling. 2. Apply FNNs for language modeling and HMM algorithm for part of speech tagging a given text. 3. Apply Text classification and summarization 4. Understand working of machine translation application. 5. Analyse syntax of sentences using parsing techniques.

CO-PO and CO-PSO mapping

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2												2	2
CO2	3	2												2	2
CO3	3	2												2	2
CO4	3	2												2	2
CO5	3	2												2	2

UNIT-I

Introduction: Knowledge in Speech and Language processing, Ambiguity, Models and algorithms, Text Normalization, Minimum Edit Distance, N-Grams, Smoothing.

UNIT-II:

Vector Semantics and Embeddings: Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector, Applications of the TF-IDF vector model, Word2Vec, HMM Part-of-Speech Tagging, Named Entity Recognition, Word Disambiguation.

UNIT-III:

NLP CLASSIFIERS

Applications, Text classification systems, LSTMs for Text classification, Text classification with Large, pre-Trained Language Models, Text Summarization, Recommender Systems for Textual Data.

UNIT-IV:

Machine Translation: Language Divergences and Typology, Machine Translation using Encoder-Decoder, Details of the Encoder-Decoder Models, Constituency, CKY Parsing: A Dynamic Programming Approach

UNIT-V:

Transformers and Large Language Models:

Large Language Models, Multimodal transformers, Vision and language transformers, Bidirectional Transformer Encoders.

Learning Resources:

1. Daniel Jurafsky and James H. Martin, "*Speech and Language Processing*", (3rd ed.)
2. Allen, James, "*Natural Language Understanding*", Second Edition, Benjamin/ Cumming, 1995.
3. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana, "*Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems*", O'REILY,2020.
4. https://www.bishopbook.com/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 1 Hour 30 Minutes

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

CYBER SECURITY
(Professional Elective-II)

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks:60	Course Code: **UI22PE760CS**
Credits : 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Learn the fundamentals of Cyber Security 2. Gain understanding of relevant terminology, concepts in Cyber Security.	1. Understand Cyber Security Fundamentals. 2. Gain knowledge about attacker techniques and motivation 3. Gain knowledge about exploitations used by the attackers 4. Understand the various kinds of malicious codes. 5. Gain knowledge about defense and analysis techniques.

CO-PO and CO-PSO mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2												
CO2	3	1	1												
CO3	2		2												
CO4	2		1												1
CO5	2		1												1

UNIT-I

Cyber Security Fundamentals:

Network and Security Concepts – Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The DNS, Firewalls.

OS Security Concepts, Microsoft Windows Security Principles – Window Tokens, Window Messaging, Windows Program Execution, The Windows Firewall.
Digital certificates – Concept and implementation details.

UNIT-II:
Attacker Techniques and Motivations:
Usage of Proxies by Attackers, Tunneling techniques.

Fraud Techniques – Phishing, Smishing, Vishing, Mobile malicious code, Rogue antivirus, Click fraud and Ransomware.
Threat Infrastructure – Botnets, Fast-Flux, Advanced Fast-Flux.

UNIT-III:
Exploitation:
Techniques to gain a foothold- Shell code, Integer overflow vulnerabilities, Stack based buffer overflow, Format string vulnerabilities, SQL injection, Malicious PDF files, Race conditions, Web exploit tools, Dos Conditions, Brute Force and dictionary attacks.
Misdirection, Reconnaissance, and Disruption Methods – Cross site scripting, Social Engineering, WarXing, DNS Amplification attacks

UNIT IV:
Malicious Code:
Self-replicating malicious code – worms and viruses.
Evading detection and Elevating Privileges – Obfuscation, VM Obfuscation, Persistent software techniques, Rootkits, Spyware, Attacks against privileged user accounts and escalation of privileges, token kidnapping, VM detection.
Stealing information and exploitation – Form grabbing, Man-in-the- middle attacks, DLL injections, Browser Helper objects.

UNIT V:
Defense and Analysis techniques:
Memory Forensics – Importance and capabilities of memory forensics, Memory analysis frameworks, Dumping physical memory, Installing and using volatality, Finding hidden processes, Volatality Analyst Pack.
Honeypots, Malicious code naming, Automated Malicious Code Analysis Systems: Passive Analysis, Active Analysis.

Intrusion Detection Systems
Need of Cyber laws: the Indian Context
Case Study: Cyber Security Breaches and Lessons Learned

Learning Resources:

1. James Graham, Richard Howard, Ryan Olson, "Cyber Security Essentials", CRC Press, 2016.
2. Nina Godbole and Sunit Belapure, "Cyber Security", Wiley India, 2012.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

ROBOTIC PROCESS AUTOMATION
SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code :**UI22PE780CS**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1. Apply knowledge of basic concepts of Robotic Process Automation 2. Build on these concepts and get introduced to key RPA Design and Development strategies and methodologies in context of UiPath products. Develop flow charts.	1 Understand Robotic Process Automation technology. 2 Apply UiPath programming techniques to deploy robot configurations 3 Explore various data extraction techniques and perform integrations with various popular applications 4 Design and develop a programmed robot that includes logging and exception handling 5 Deploy and control Bots with UiPath Orchestrator.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1					1						1		2
CO2	3	2	1				3					1	1		2
CO3	3	2	1				2					1	2		3
CO4	3	2	1				2					1	1		3
CO5	3	2	1				2					1	1		3

UNIT-I:

Introduction: What is Robotic Process Automation (RPA), Scope & techniques of Automation, Benefits of RPA, Components of RPA, RPA Platforms, UiPath Studio, Installation of UiPath Studio, Learning UiPath Studio

UNIT-II:

Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making.

Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations

Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events

Recording and advanced UI Interaction

Basic recording, Desktop recording, Web recording, Citrix, Screen Scraping, When to use OCR, Types of OCR available, How to use OCR Avoiding typical failure points.

UNIT-III:

Plugins and Extensions: Terminal plugin, Java plugin, Java plugin with UiPath Studio, Citrix automation, Citrix environment, Mail plugin, PDF plugin, Web integration, Excel and Word plugins, Credential management Extensions

Handling User Events and Assistant Bots: What are assistant bots, Monitoring system event triggers: Hotkey trigger, Mouse trigger, System trigger, Monitoring image and element triggers, Launching an assistant bot on a keyboard event

UNIT-IV:

Exception Handling, Debugging, and Logging: Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots Debugging techniques, Setting breakpoints, Slow step, Highlighting, Break, Collecting crash dumps: Enabling crash dumps, Disabling crash dumps, Error reporting: Enterprise Edition customers, Community Edition users.

Managing and Maintaining the Code: Project organization, Picking an appropriate layout for each workflow, Breaking the process into smaller parts, Using exception handling, Making your workflow readable, Keeping it clean, Nesting workflows, Reusability of workflows, Templates, Commenting techniques, State Machine, When to use Flowcharts State Machines or Sequences.

UNIT-V: Deploying and Maintaining the Bot: Publishing using publish utility, Overview of Orchestration Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots, License management, Activating and uploading a license to Orchestrator, Publishing

and managing updates, Packages, Managing packages

Learning Resources:

1. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: OReilly Publishing, 2018, ISBN: 9781788470940
2. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018
3. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018
4. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation, 1st Edition, Consulting Opportunity Holdings LLC, 2018
5. https://www.uipath.com/rpa/robotic-process-automation
6. https://www.udemy.com/robotic-process-automation/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

CLOUD COMPUTING LAB

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks:50	Course Code: **UI22PC711CS**
Credits : 1	CIE Marks:30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 Implement distributed transactions 2 Install, configure and deploy applications using various cloud platforms	1 Launch and run highly available cloud services using AWS (Amazon web Services) 2 Create a virtual machine in a private cloud using OpenStack 3 Create and deploy an application on a Docker container 4 Implement a distributed application using MapReduce programming model 5 Demonstrate cloud security, load balancing and auto scaling features

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3											3	2	3
CO2	2	3											3	2	3
CO3	2	3											3	2	3
CO4	2	3											3	2	3
CO5	2	2											3	2	3

Programming Exercises:

1. Hosting a static website in Amazon S3 Bucket.
2. Create a virtual machine using Amazon EC2.
3. Adding storage to EC2 using amazon EFS.
4. Create an Amazon RDS database and perform CRUD operations.
5. Deploy a Node.js application on a Docker Container

6. Running Containers on Amazon Elastic Kubernetes Service (Amazon EKS).
7. Implement a serverless architecture using Amazon Lambda
8. Build a Virtual Private Cloud to produce a customized network.
9. Streaming dynamic content using Amazon CloudFront.
10. Implement a distributed application on Hadoop framework to count word frequency with MapReduce.
11. Demonstrate Identity and access management for controlling account access.
12. Implement Elastic load balancing and auto scaling service.

Learning Resources:

1. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, DISTRIBUTED SYSTEMS Concepts and Design, Fifth Edition, Addison-Wesley, 2012.
2. Kai Hwang. Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing from parallel processing to the internet of things", Elsevier, 2012.
3. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, "Cloud Computing: principles and paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing (c) 2011.
4. Raluca Ada Popa, Catherine M.S. Redfiled, NickolaiZeldovich, and Hari Balakrishnan, "Crypt DB" Protecting confidentiality with encrypted Query Processing" 23rd ACM Symposium on Operating Systems principles (SOSP 2011), Cascais, Portugal October 2011.
5. Craig Gentry, A fully Homomorhic Encryption Scheme, Doctoral Dissertation, September 2009.
6. Ajay D. Kshemkalyani and Mukesh Singhal, Distributed Computing: Principles, Algorithms, and Systems, Cambridge, 2008.
7. https://www.virtualbox.org/wiki/Documentation
8. https://cloud.google.com/docs
9. https://docs.aws.amazon.com/
10. https://docs.microsoft.com/en-us/azure/?product=featured
11. https://wiki.openstack.org/wiki/Documentation
12. http://www.manjrasoft.com/aneka_architecture.html
13. https://www.docker.com/resources/what-container
14. http://www.haproxy.org/

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test : 2Hours			

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

ACCREDITED BY NAAC WITH 'A++' GRADE

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

DATA MINING LAB

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks:50	Course Code**: UI22PC721CS**
Credits : 1	CIE Marks:30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 Understand insights of the data by performing exploratory data analysis 2 Implement various data mining functionalities	1 Implement Multidimensional data models 2 Implement Association rule mining algorithms and Clustering algorithms 3 Implement Classification algorithms 4 Implement Association rule mining algorithms , Classification algorithms and Clustering algorithms with modern data mining tool WEKA 5 Develop a solution by using data mining techniques to solve a real world problem

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	-	2	2	-	-	-	-	-	-	-	3	-	2
CO2	3	3	-	3	2	-	-	-	-	2	-	-	3	-	3
CO3	3	3	2	3	3	-	-	-	-	2	-	-	3	2	3
CO4	3	3	3	3	3	-	-	-	2	2	-	-	3	2	3
CO5	3	3	3	3	3	2	1	2	3	3	3	3	3	2	3

Programming Exercise:

All the experiments need to be implemented on standard datasets taken from UCI repository, Kaggle etc.
Select a problem from Kaggle challenge or SIGKDD

1. Implement similarity and dissimilarity measures on different type of attributes
2. Exploratory analysis of data (Box plot, Histograms, Scatter plots, Correlation)
3. Implement Data Pre-processing techniques.
   i. Data cleaning techniques (missing data imputation, outlier detection, etc.)
   ii. Data transformation (scaling, normalization, etc.)
   iii. Feature selection and engineering
4. Implement Dimensionality reduction by using PCA and SVD techniques.
5. Implement the following classification methods
   i. SVM
   ii. Bagging
   iii. Boosting
6. Implement Apriori and FP-Growth algorithms to generate frequent Item Sets
7. Implement the following clustering algorithms
   i. K-means
   iii. DB-SCAN
8. Implement anomaly detection methods
9. Implement data pre-processing, classification, clustering by using WEKA tool
10. Develop a model to solve the problem and present the solution. Submit a report of the project implemented.

Learning Resources:

1. Jiawei Han & Micheline Kamber and Jain Pei ,Data Mining Concepts and Techniques , Third Edition(2011), India.
2. Pang-Ning Tan, Vipin Kumar,Michael Steinbach, "Introduction to Data Mining", (2017),Pearson Education,
3. Margaret H Dunham, Data Mining Introductory and advanced topics , Pearson education
4. Arun K Pujari ,Data Mining Techniques, (2017) ,University Press
5. Sam Anahory , Dennis Murray ,Data Warehousing in the Real World, Pearson Education

6. PaulrajPonnaiah, Data Warehousing Fundamentals, Wiley Student ed. http://web.stanford.edu/class/cs345a/

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 Hours			

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

AGENTIC AI LAB

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P(Hrs./week):0:0:2	SEE Marks:50	Course Code : **UI22PE711CS**
Credits : 1	CIE Marks:30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. To develop hands-on skills in designing and implementing intelligent agents using foundational Agentic AI concepts. 2. To explore the use of modern AI tools and frameworks for building, deploying, and evaluating agent-based systems.	1. Understand the differences between traditional AI and agentic approaches. 2. Design and implement basic intelligent agents with reactive, deliberative, and hybrid behaviors. 3. Demonstrate communication, coordination, and memory in multi-agent and role-based systems. 4. Apply LLMs and RAG models for agent reasoning and information retrieval. 5. Use agentic AI tools like LangChain, LangGraph, and LangSmith for building and monitoring simple workflows

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2								1		1	2		1
CO2	3	3	2		2								3	2	2
CO3	3	2	3	2	2				1				3	2	2
CO4	2		2		3						1	1	2		3
CO5	2	2	3	2	3				1	1	2	2	3	2	3

Lab Experiments

1. **Comparison of Traditional AI vs Agentic AI Approaches**
   Implement a rule-based system and a goal-driven agent to solve a basic task (e.g., reaching a goal in a grid).
2. **Simulate a Reactive vs Deliberative Agent**
   Observe how agents with different architectures respond to changing environments.
3. **Create a Simple Multi-Agent System**
   Design two or more agents to perform tasks collaboratively or competitively (e.g., resource collection).
4. **Agent Role Assignment using CWD Model**
   Implement the Coordinator-Worker-Delegator model using basic print/log statements to show role communication.
5. **Develop a Focused Prompt for an LLM Agent**
   Use a language model to answer a domain-specific query using a well-crafted prompt.
6. **Build a Basic RAG-Based Q&A Bot**
   Retrieve information from a local text file and generate responses using OpenAI/Hugging Face LLM.
7. **Simulate Agent Memory with Short-Term Context**
   Implement a chatbot that remembers previous two user interactions.
8. **Design an Agent with Performance Monitoring**
   Tranumber of successful/failed attempts by the agent in a given task.
9. **Sequential Agent Task Execution using LangChain**
   Create a chain of two steps (e.g., search + summarize) using LangChain.
10. **Monitor and Log Agent Actions using LangSmith**
    Use LangSmith to log and inspect the steps taken by an agent on a simple task.

Learning Resources:

1. "Introduction to Agentic AI for Executives: Fundamental Concepts, Practical Applications, Implementation Strategies, and Future Trends", Dr. Ivan Del Valle, Paperback, 208 pages, 2024
2. Agentic Artificial Intelligence: Harnessing AI Agents to Reinvent Business, Work, and Life", Pascal Bornet, Jochen Wirtz, Thomas H. Davenport, Nandan Mullakara, Brian Evergreen, David De Cremer, Phil Fersht, Rakesh Gohel, Shail Khiyara, Pooja Sund, Irreplaceable Publishing, 2025

3. Agentic AI: Build Your First Autonomous Agent System—A Practical Hands-On Guide", Leandro Calado, Kindle eBook (111 pages), 2025
4. https://konverge.ai/pdf/Ebook-Agentic-AI.pdf
5. https://www.pwc.com/m1/en/publications/documents/2024/agentic-ai-the-new-frontier-in-genai-an-executive-playbook.pdf
6. https://www.udemy.com/course/the-complete-agentic-ai-engineering-Course/?srsltid=AfmBOooNSYbinopPhh XaVkBuKqP0ngm-ZkWIA5b2sBLMvIhLHPgzlmi1&coupon Code=ST16MT230625G1

https://python.langchain.com/docs/tutorials/rag/

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 Hours			

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

DEEP LEARNING LAB

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P(Hrs./week):0:0:2	SEE Marks:50	Course Code : **UI22PE731CS**
Credits : 1	CIE Marks:30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1.Understand issues and techniques involved in the creation of intelligent systems	1 Understanding basics of Deep Learning Libraries 2 Implement the real time applications. 3 Build a model for Classification. 4 Build a model to predict the real world applications using CNN. 5 Develop a model for prediction using RNN.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2		2	1									1		3
CO2	2	2	2	2	2								1		3
CO3	3	2	3	2	2								2		3
CO4	3	2	2	2	1								2		3
CO5	3	2			2								2		3

Programming Exercise:

1. Install and work on simple operations on python libraries like Tensorflow, Keras, PyTorch.
2. Human Face Recognition on Real Time(Video) and Image(JPEG) using OpenCV and Haarcascade.
3. Data preprocessing techniques for training a deep learning model.

Reading the Dataset, Handling Missing Data, Conversion to the Tensor Format

4. Building Python GUI Application with Tkinter.
5. Build a Model to binary classify a given image using deep learning model.
6. Apply dimensionality reduction techniques using PCA on dataset.
7. Develop a CNN for MNIST Handwritten Digit Classification.
8. Build a Model to classify the images of Clothing using Fashion MNIST Dataset.
9. Build a Model for Multi Class Classification for CIFAR-10 Dataset.
10. Build a Model to predict Stock Price Predictions using LSTM.

Learning Resources:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning: Adaptive Computations and Machine Learning Series, 2016 edition, An MIT Press Book
2. Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly Media, 2017
3. Eugene Charniak, Introduction to Deep Learning, 2019 Edition.
4. Michael Nielsen,"Neural Networks and Deep Learning", Determination Press 2015
5. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006
6. Raúl Rojas, Neural Networks : A Systematic Introduction, Springer, 1996
7. https://nptel.ac.in/courses/106106184
8. https://www.deeplearning.ai/program/deep-learning-specialization/
9. https://www.coursera.org/specializations/deeplearning?action=enroll&utm_campaign=WebsiteCoursesDLSTopButton&utm_medium=institutions&utm_source=deeplearningai
10. https://www.udemy.com/course/basics-of-deep-learning/
11. https://www.udemy.com/course/tensorflow-20-recurrent-neural-networks-lstms-grus/

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 Hours			

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

ACCREDITED BY NAAC WITH 'A++' GRADE

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

CRYPTOGRAPHY AND NETWORK SECURITY LAB

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks:50	Course Code**: UI22PE721CS**
Credits : 1	CIE Marks:30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Implement cryptographic algorithms 2. Implement Network security protocols.	1. Implement symmetric key and asymmetric key algorithms 2. Implement hash and digital signature algorithms. 3. Understand the openSSL libraries and their usage 4. Run the wireshark, Snort network packet analyzers to understand the packet transfers. 5. Run the NMAP to understand the ports usage in communication.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	1									3		
CO2	3	2	2	2									2	2	
CO3	3	3	3	2									2	2	
CO4	3	3	2	2									2	2	2
CO5	3	3	2	2									2	2	2

Lab experiments:

1) Implement Miller Rabin, Chinese remaindering theorem, Modular exponentiation, Euler totient.

2) Implement SQL injection remedies.
3) Implement DES, triple DES encryption algorithms.
4) Implement Blowfish, IDEA, RC4 Algorithms.
5) Implement simplified AES encryption algorithm.
6) Implement RSA algorithm.
7) Implement Diffie Hellman key exchange algorithm.
8) Implement SHA algorithm.
9) Implement HMAC/CMAC Algorithms.
10) Implement NIST digital signature.
11) Implement ElGamal digital signature algorithm.
12) Working with Sniffers for monitoring network communication using a)Wire shark b) Snort c) tcp dump.
13) Using open SSL for web server - browser communication.
14) Using NMAP for ports monitoring.

Learning Resources:

1. Cryptography & Network Security: Principles and Practices, William Stallings, PEA, Sixth edition.
2. Network Security and Cryptography, Bernard Menezes, CENGAGE Learning, Second Edition.
3. Cryptography and Network security, Behrouz Forouzhan, Debdeep Mukhopadyay, Third Edition.
4. Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, Wiley Dreamtech.

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 Hours			

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VASAVI COLLEGE OF ENGINEERING(Autonomous)

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

BLOCKCHAIN TECHNOLOGY LAB

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks:50	Course Code:**UI22PE741CS**
Credits : 1	CIE Marks:30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 Understanding Block chain Fundamentals and creating basic blocks. 2 Able to Develop Block chain Applications in a structured manner	1 Learn how to implement cryptographic functions for secure key generation and transaction validation. 2 Learn how to create a blockchain. 3 Learn how to get tokens from metamask and transfer from one account to another 4 Students will become familiar with solidity programming 5 Learn to Design and Implement Blockchain Applications.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3			2										
CO2	3	3	2		3										
CO3	2				3	2		1							
CO4	3	2			3										
CO5	3	3	3		3			2				2			

Lab experiments:

1. Write the following programs for Blockchain in Python:
   A. A simple client class that generates the private and public keys by using the built in Python RSA algorithm and test it.

B. A transaction class to send and receive money and test it.
C. Create multiple transactions and display them.

2. Write the following programs for Blockchain in Python:
   A. Create a blockchain, a genesis block and execute it.
   B. Create a mining function and test it.
   C. Add blocks to the miner and dump the blockchain.
3. Install and configure Metamask and get free tokens to Metamask Wallet. Transfer tokens from one account to another.
4. Implement and demonstrate the use of the following in Solidity: A. Variable, Operators, Loops, Decision Making, Strings,
5. Implement and demonstrate the use of the following in Solidity: Arrays, Enums, Structs, Mappings,
6. Implement and demonstrate the use of the following in Solidity: Conversions, Ether Units Special Variables.
7. Implement Functions, Function Modifiers, View functions, Pure Functions
8. Implement Fallback Function, Function Overloading, Mathematical functions, Cryptographic functions.
9. Implement and demonstrate the use of the following in Solidity: Withdrawal Pattern, Restricted Access.
10. Implement and demonstrate the use of the following in Solidity :Inheritance, Constructors, Abstract Contracts, Interfaces.
11. Implement and demonstrate the use of the following in Solidity : Events, Error handling.
12. Build Dapps .

Learning Resources:

1. Kevin Solorio, Randall Kanna, David H. Hoover,Hands-On Smart Contract Development with Solidity and Ethereum: From Fundamentals to Deployment [1 ed.] O'RELLY
2. Chris Dannen Introducing Ethereum and Solidity: Foundations of Cryptocurrency and Blockchain Programming for Beginners, Apress;
3. https://soliditylang.org/
4. https://www.tutorialspoint.com/solidity/index.htm

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 Hours			

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

NATURAL LANGUAGE PROCESSING LAB

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks:50	Course Code**:UI22PE751CS**
Credits : 1	CIE Marks:30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Demostrate N-gram, Neural Language Models and HMM	1. Implement the word tokenization and Minimum Edit Distance algorithm 2. Compute cosine similarity between the words 3. Implement the N-gram and Neural language models 4. Implement HMM for POS tagging. 5. Implement parsing algorithms for grammar checking

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1				3	3										3
CO2				3	3										3
CO3				3	3										3
CO4				3	3										3
CO5				3	3										3

The following experiments are to implemented using Python library nltk and spaCY and without using the library wherever applicable. And each student is expected to develop and submit a mini project in the area of NLP at the end of the course.

1. Implement a word tokenization using UNIX utilities
2. Implement a word tokenization using regular expressions
3. Implement Minimum Edit Distance (MED) algorithm for spelling correction
4. Implement n-gram language model
5. Implement Laplace smoothed n-gram language model.
6. Compute cosine similarity between the words using term-document matrix
7. Compute cosine similarity between the words using term- term-term matrix
8. Compute tf-idf matrix for the given document set
9. Implement language model using Feed forward Neural Network
10. Implement PO Stagging using HMM
11. Implement language model using Transformer
12. Implement CKY parsing algorithm

Learning Resources:

1. DanielJurafsky&JamesH.Martin,"SpeechandLanguageProcessing", 3rd edition,PearsonEducation. (https://web.stanford.edu/~jurafsky/slp3/)
2. James Allan, Natural Language Understanding, 2ndedition(1995), Pearson Education
3. Charnaick, Eugene, Statistical Language Learning, MIT Press, 1993
4. Christopher D.Manning, HinrichSchutze, Foundations of Statistical Natural Language Processing, (1999),The MIT Press.
5. Tanveer Siddiqui, US Tiwary, Natural Language Processing and I Retrieval, (2008), Oxford University Press.

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 Hours			

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

CYBER SECURITY LAB

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P(Hrs./week):0:0:2	SEE Marks:50	Course Code : **UI22PE761CS**
Credits : 1	CIE Marks:30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1. Understand the core principles of cyber security, 2.Analyze common attacker techniques and exploitation methods 3. Explore operating system security concepts, 4. Study malicious code behaviors 5. Apply forensic and defense techniques,	1. Demonstrate understanding of core cyber security concepts, including information assurance, cryptography, and network security mechanisms. 2. Identify and describe various attacker tools, techniques, and motivations used in modern cyber attacks. 3. Analyze different types of vulnerabilities and exploits, such as buffer overflows, injection attacks, and misdirection methods. 4. Explain the behavior of malicious software and methods for evading detection and privilege escalation. 5. Apply memory forensics and intrusion detection techniques to detect, analyze, and respond to cyber security threats.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
Co1	3	2	-	-	-	-	-	-	-	2	-	-	3	2	-
CO2	3	3	2	-	-	-	-	-	-	2	-	-	3	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO5	3	3	3	-	-	-	-	-	-	2	-	-	3	3	2

Lab Exercises

1. Network Scanning and Information Gathering: Perform host discovery, port scanning, and service enumeration.
   Tools: Nmap, Netcat, Wireshark
2. Cryptography – Symmetric and Asymmetric Encryption
   : Encrypt and decrypt messages using AES (Symmetric) and RSA (Public Key).
   Tools: OpenSSL, Python (PyCryptodome)
3. Windows OS Security Configuration:
   Simulate DNS spoofing and analyze traffic.
   Tools: Ettercap, Wireshark, Kali Linux
4. DNS Spoofing and Packet Inspection: Simulate DNS spoofing and analyze traffic.
   Tools: Ettercap, Wireshark, Kali Linux
5. Email Phishing and Spoofing Detection: Create a phishing email scenario and analyze email headers.
   Tools: Social Engineering Toolkit (SET), Thunderbird, Wireshark
6. SQL Injection Attack: Demonstrate SQL injection on a vulnerable web app and understand input sanitization.
   Tools: DVWA (Damn Vulnerable Web App), SQLMap
7. **Buffer Overflow Exploit:** Illustrate a basic stack-based buffer overflow attack in C.
   Tools: Linux (GDB), C compiler
8. Malware Behavior Analysis: Upload a malware sample and review static and dynamic analysis reports.
   Tools: VirusTotal, Hybrid Analysis, Any.run
9. Memory Forensics with Volatility: Extract and analyze information from a memory dump.
   Tools: Volatility Framework, Memory Dump files
10. Intrusion Detection Using Snort: Configure Snort IDS, create custom rules, and monitor traffic.
    Tools: Tools: Snort, Wireshark, Kali Linux

Learning Resources:

1. **Computer Security: Principles and Practice" by William Stallings & Lawrie Brown**
    - Comprehensive coverage of OS, network, and cryptography concepts.
2. **"Cryptography and Network Security" by William Stallings**
    - Excellent for symmetric, public key encryption, and real-world crypto protocols.
3. **"The Web Application Hacker's Handbook" by Dafydd Stuttard & Marcus Pinto**
    - Ideal for learning web application attacks like SQL injection and XSS.
4. **"Practical Malware Analysis" by Michael Sikorski & Andrew Honig**
    - A practical guide to dissecting malware and understanding its behavior.> ,/n

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 Hours			

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

IBRAHIMBAGH, HYDERABAD 500031

Department of Computer Science & Engineering

ROBOTIC PROCESS AUTOMATION LAB

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 50	Course Code :**UI22PE 811CS**
Credits : 3	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1 Apply knowledge of basic concepts of Robotic Process Automation	1 Understand Robotic Process Automation technology.
2 Build on these concepts and get introduced to key RPA Design and Development strategies and methodologies in context of UiPath products. Develop flow charts.	2 Apply UiPath programming techniques to deploy robot configurations
	3 Explore various data extraction techniques and perform integrations with various popular applications
	4 Design and develop a programmed robot that includes logging and exception handling
	5 Deploy and control Bots with UiPath Orchestrator.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
Co1	3	3	-	2	2	-	-	-	-	-	-	-	3	-	2
CO2	3	3	-	3	2	-	-	-	-	2	-	-	3	-	3
CO3	3	3	2	3	3	-	-	-	-	2	-	-	3	2	3
CO4	3	3	3	3	3	-	-	-	2	2	-	-	3	2	3
CO5	3	3	3	3	3	2	1	2	3	3	3	3	3	2	3

List of experiments:

1. Write a program to demonstrate arguments and control flow.
2. Write a program to perform if-activity,switch- activity.

3. Write a program to create a Flowchart and Sequence activity on Scalar variables.
4. Write a program to create a Sequence activity on Collection variables.
5. Write a program to build a data table.
6. Write a program to create a simple calculator using a workflow and arguments.
7. Write a program to open Notepad, write some data into it, and then copy the data to the clipboard.
8. Write a program to perform the following operations on an Excel file.
9. Write a program to read an Excel file and creating a data table by using data from the Excel file
10. Write a program for acting on controls using mouse and keyboard activities.
11. Write a program to perform screen scraping using OCR.
12. Write a program to extract data from a PDF document.

Learning Resources:

1. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: OReilly Publishing, 2018, ISBN: 9781788470940
2. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018
3. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018
4. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation, 1st Edition, Consulting Opportunity Holdings LLC, 2018
5. https://www.uipath.com/rpa/robotic-process-automation
6. https://www.udemy.com/robotic-process-automation/

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 Hours			

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

PROJECT SEMINAR

SYLLABUS FOR B.E. VII-SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks : --	Course Code:**UI22PW729CS**
Credits : 1	CIE Marks : 30	Duration of SEE : --

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 Select a Problem by reviewing Literature 2 Present the selected topic effectively in oral & written form	1 Select a problem related to Computer science area by reviewing the Literature 2 Analyze the existing solutions for the problem identified 3 Identify the gaps in the existing solutions 4 Present the analysis of the identified problem 5 Design a Document according to the format

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
Co1	3						2					2			2
CO2	1	2					2		2						2
CO3	2	1							3						2
CO4							1		3	2					
CO5	2						1	1	2	2					1

Oral presentation is an important aspect of Engineering education. The objective of the Project seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his/her specialization of the Project.

Project Seminar topics may be chosen by the students with advice from the faculty members. Students are to be exposed to the following aspects of a seminar presentation.

- Problem Definition and Specification
- Literature survey
- Broad Knowledge of available techniques to solve a particular problem
- Organization of the material
- Presentation

Each student is required to :

1. Submit a one page synopsis before the seminar talk.
2. Give a 20 minute presentation followed by a 10 minute discussion.
3. Submit a report on the seminar topic with a list of references.

Seminars are to be scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged. For award of the Sessional marks, students are to be judged by at least two faculty members on the basis of an oral and written presentation as well as their involvement in the discussions.

With effect from the Academic Year 2025-26

SCHEME OF INSTRUCTION AND EXAMINATION (R-22)
FOR B.E 2022-23 ADMITTED BATCH VIII SEMESTER (A.Y 2025-26)

B.E (CSE) VIII Semester								
Course Code	Name of the Course	Scheme of Instruction			Duration in Hrs	Scheme of Examination		
		Hours per Week				Maximum Marks		Credits
		L	T	P/D		SEE	CIE	
THEORY								
UI22PE8X0CS	Professional Elective – III	3	-	-	3	60	40	3
UI22PE8X0CS	Professional Elective – IV	3	-	-	3	60	40	3
PRACTICALS								
UI22PW819CS	Project / Internship	-	-	12	Viva-Voce	50	50	6
	TOTAL	**6**	**-**	**12**		**170**	**130**	**12**
	GRAND TOTAL	**18**				**300**		

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING (Autonomous)

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Department of Computer Science & Engineering

REINFORCEMENT LEARNING
(Professional Elective-III)

SYLLABUS FOR B.E. VIII-SEMESTER

L:T:P (Hrs./week):3:0:0	SEE Marks:60	Course Code:**UI22PE810CS**
Credits : 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVE	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Understand issues and techniques involved in the reinforcement learning	1. Illustrates various elements of reinforcement techniques. 2. Model a control task in the framework of MDPs. 3. Compute optimal values and policies using complete environment knowledge 4. Apply Monte Carlo method for prediction. 5. Apply Temporal-Difference(TD) learning for prediction and Understand the On-policy Prediction with Approximation

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2											2	2	2
CO2	3	2											2	2	2
CO3	3	2											2	2	2
CO4	3	2											2	2	2
CO5	3	2											2	2	2

UNIT – I

The Reinforcement Learning Problem: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Example.

Multi-arm Bandits: An k-Armed Bandit Problem, Action-Value Methods, The 10-armed Testbed, Incremental Implementation, Tracking a Nonstationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandits algorithms.

UNIT – II

Finite Markov Decision Processes: The Agent–Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notation for Episodic and Continuing Tasks, Policies and value functions, Optimal Policies and Optimal Value Functions, Optimality and Approximation.

UNIT – III

Dynamic Programming: Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming

UNIT – IV

Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy Prediction via Importance Sampling, Incremental Implementation, Off-Policy Monte Carlo Control.

UNIT – V

Temporal-Difference (TD) Learning: TD Prediction, Advantages of TD Prediction Methods, Optimality of TD(0), Sarsa: On-Policy TD Control, Q-Learning: Off-Policy , Expected Sarsa.

On-policy Prediction with Approximation: Value Function Approximation, The Prediction objective, Stochastic-gradient and Semi – gradient Methods.

Learning Resources:

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning: An Introduction", 2nd Edition. MIT Press, 2018
2. Kyriakos G. Vamvoudakis, Yan Wan, Frank L. Lewis, Derya Cansever,"Handbook of ReinforcementLearning and Control (Studies in Systems, Decision and Control, 325)", 1st Edition.
3. Nimish Sanghi,"Deep Reinforcement Learning with Python: With PyTorch, TensorFlow and OpenAI Gym", 1st Edition.
4. Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, Jan

Peters."Reinforcement Learning Algorithms: Analysis and Applications", 1st Edition.

5. https://nptel.ac.in/courses/106106143
6. https://www.coursera.org/specializations/reinforcement-learning

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 1 Hour 30 Minutes

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

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Department of Computer Science & Engineering

ADVANCED DATABASES
(Professional Elective-III)

SYLLABUS FOR B.E. VIII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks:60	Course Code:**UI22PE820CS**
Credits : 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 Apply knowledge of advanced database management techniques to provide solution for a database intensive problem.	1 create and query tables in object relational and object oriented databases 2 create, query and process data in XML files 3 describe query processing mechanisms and query optimization 4 explain inter query, intra query parallelism and distributed database processing techniques 5 apply performance tuning methods and describe data representation in spatial, geographical and temporal databases

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2											2	2	2
CO2	3	2											2	2	2
CO3	3	2											2	2	2
CO4	3	2											2	2	2
CO5	3	2											2	2	2

UNIT-I: Object Based Databases: Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational.

UNIT-II: XML: Motivation, Structure of XML data, XML Document Schema, Querying and Transformation, Application program Interfaces to XML, Storage of XML Data, XML applications.

UNIT-III: Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions.

Query Optimization: Overview, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation Plans, Materialized Views.

UNIT-IV: Parallel Databases: Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Interoperation Parallelism, Interoperation Parallelism.
Distributed Databases: Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Heterogeneous Distributed Databases, and Cloud-Based Databases.

UNIT-V: Advanced Application Development: Performance Tuning, Performance Benchmarks, Other Issues in Application Development, Standardization.
Spatial and Temporal Data and Mobility: Motivation, Time in Databases, Spatial and Geographic Data, Multimedia Databases, Mobility and Personal Databases.

Learning Resources:

1. Abraham Silberschatz, Henry F Korth, Sudharshan S, Database System Concepts, 6th Edition(2011), McGraw-Hill International Edition.
2. RamezElmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems, 4th Edition(2006), Pearson Education.
3. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System , 8th Edition(2006) Pearson Education.
4. Raghu Ramakrishna, and Johannes Gehrke, Database Management Systems, 3rd Edition(2003), McGraw Hill.
5. http://nptel.ac.in/courses/106106093/

With effect from the Academic Year 2025-26

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 1 Hour 30 Minutes

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING(Autonomous)

ACCREDITED BY NAAC WITH 'A++' GRADE

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

DATA AND VISUAL ANALYTICS IN AI
(Professional Elective-III)

SYLLABUS FOR B.E. VIII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks:60	Course Code:**UI22PE840CS**
Credits : 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. To explore statistical analysis methods and machine learning algorithms for data analysis. 2. To gain proficiency in data visualization techniques to communicate insights effectively. 3. To apply AI-driven approaches for advanced analytics tasks such as predictive modelling and clustering. 4. To explain techniques and algorithms for creating effective visualizations based on principles from graphic design. 5. To introduce several industry-standard software tools to create a compelling and interactive visualization of various types of data.	1. Understand the key techniques and theory used in visualization, including data models, graphical perception, and techniques for visual encoding and interaction. 2. Apply knowledge to a number of common data domains and corresponding analysis tasks, including multivariate data, networks, text, and cartography. 3. Describe big data and use cases from selected business domains. 4. Explain NoSQL big data management and other technologies such as Hadoop and HDFS. 5. Practical experience building and evaluating visualization systems.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1					1						1		2
CO2	3	2	1				3					1	1		2
CO3	3	2	1				2					1	2		3
CO4	3	2	1				2					1	1		3
CO5	3	2	1				2					1	1		3

UNIT – I (3 Lectures)

Introduction: Data for Graphics, Design principles, Value for visualization, Categorical, time series, and statistical data graphics, Introduction to Visualization Tools.

UNIT – II (8 Lectures)

Graphics Pipeline: Introduction, Primitives: vertices, edges, triangles, Model transforms: translations, rotations, scaling, View transform, Perspective transform, window transform.

Aesthetics and Perception: Graphical Perception Theory, Experimentation, and the Application, Graphical Integrity, Layering and Separation, Color and Information, Using Space Effectively.

UNIT – III (8 Lectures)

Visualization Design: Visual Display of Quantitative Information, Data-Ink Maximization, Graphical Design, Exploratory Data Analysis, Heat Map.

UNIT – IV (13 Lectures)

Multidimensional Data: Query, Analysis and Visualization of Multi-dimensional Relational Databases, Interactive Exploration, tSNE.

Interaction: Interactive Dynamics for Visual Analysis, Visual Queries, Finding Patterns in Time Series Data, Trend visualization, Animation, Dashboard, Visual Storytelling

UNIT – V (10 Lectures)

Collaboration: Graph Visualization and Navigation, Online Social Networks, Social Data Analysis, Collaborative Visual Analytics, Text, Map, Geospatial data.

Laboratory:

Visualization Design, Exploratory data analysis, Interactive Visualization Tools like Tableau, Gephi, D3, etc. Mini Project

Text Books:

1. E. TUFTE (2001), The Visual Display of Quantitative Information, Graphics Press, 2nd Edition.
2. J. KOPONEN, J. HILDÉN (2019), Data Visualization Handbook, CRC Press.

Reference Books:

1. M. LIMA (2014), The Book of Trees: Visualizing Branches of Knowledge, Princeton Architectural Press.
2. R. TAMASSIA (2013), Handbook of Graph Drawing and Visualization, CRC Press.
3. S. MURRAY (2017), Interactive Data Visualization for the Web, O'Reilly Press, 2nd Edition.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 1 Hour 30 Minutes

With effect from the Academic Year 2025-26

VASAVI COLLEGE OF ENGINEERING (Autonomous)

ACCREDITED BY NAAC WITH 'A++' GRADE

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

BIG DATA ANALYTICS
(Professional Elective-IV)

SYLLABUS FOR B.E. VIII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code :**UI22PE850CS**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1. To understand the need of Big Data, challenges and different analytical architectures. 2. To understand Hadoop Architecture and its ecosystems. 3. To understand processing of Big Data with advanced architectures like Spark.	1. Demonstrate knowledge of Big Data, Data Analytics, challenges and their solutions in Big Data. 2. Discuss about Hadoop Framework and eco systems. 3. Understand and work on NoSQL environment and MongoDB. 4. Explain and Analyse the Big Data using Map-reduce programming in Both Hadoop and Spark framework. 5. Demonstrate spark programming with Python/R programming languages.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1					1						1		2
CO2	3	2	1				3					1	1		2
CO3	3	2	1				2					1	2		3
CO4	3	2	1				2					1	1		3
CO5	3	2	1				2					1	1		3

UNIT-I:

Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured - Sources of data. Big Data Evolution -Definition of big data-Characteristics and Need of big data-Challenges of big data.

Big data analytics: Overview of business intelligence, Data science and Analytics– Big Data Analytics - Typical Analytical Architecture – Classification of analytics.

UNIT-II:

Big data technologies and Databases: Hadoop – Requirement of Hadoop Framework - Design principle of Hadoop –Comparison with other system (SQL,RDBMS) - Hadoop Components – Architecture -Hadoop 1 vs Hadoop 2 – HDFS.

MapReduce and YARN framework: Introduction to MapReduce , Processing data with Hadoop using MapReduce, Introduction to YARN, Architecture, Managing Resources and Applications with Hadoop YARN.

UNIT-III:

Big data technologies and Databases: NoSQL: Introduction to NoSQL - Features and Types- Advantages &Disadvantages -Application of NoSQL. NewSQL: Overview of NewSQL - Comparing SQL, NoSQL and NewSQL.

Mongo DB: Introduction – Features – Data types – Mongo DB Query language – CRUD operations – Arrays – Functions: Count – Sort – Limit – Skip – Aggregate – Map Reduce. Cursors – Indexes – Mongo Import – Mongo Export. Cassandra: Introduction – Features – Data types – CQLSH – Key spaces – CRUD operations – Collections – Counter – TTL – Alter commands – Import and Export – Querying System tables.

UNIT-IV:

Hadoop Frame Work: Map Reduce Programming: I/O formats, Map side join-Reduce Side Join-Secondary Sorting-Pipelining MapReduce jobs.

Spark Frame Work: Introduction to Apache spark-How spark works, Programming with RDDs: Create RDD- spark Operations-Data Frame.

UNIT-V:

Data Analysis with Spark

Data Exploration: Univariate and Multivariate Analysis. **Data Manipulation**: Feature Extraction- Feature Transform-Feature Selection- **Regression:** Linear Regression.

Classification: Decision Trees-Naïve Bayes Classification- **Clustering:** K-eans.

Learning Resources:

1. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., 2016.
2. Mike Frampton, "Mastering Apache Spark", Packt Publishing, 2015.
3. TomWhite, "Hadoop: The Definitive Guide", O"Reilly, 4th Edition, 2015.
4. Mohammed Guller, "Big Data Analytics with Spark", Apress, 2015.
5. Donald Miner, Adam Shook, "Map Reduce Design Pattern", O"Reilly, 2012.

The break-up of CIE: Internal Tests + Assignments + Quizzes

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2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 1 Hour 30 Minutes

VASAVI COLLEGE OF ENGINEERING(Autonomous)

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

ADHOC AND SENSOR NETWORKS
(Professional Elective-IV)

SYLLABUS FOR B.E. VIII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks:60	Course Code:**UI22PE860CS**
Credits : 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 Understand the design issues and applications of an Ad hoc and sensor network.	1 Compare topologies based on position-based routing approaches. Explain the environment and communication systems in an Adhoc network. 2 Categorize data transmission techniques in MANETs and the network architecture of wireless mesh networks. 3 Demonstrate Cognitive Radio technologies and TCP issues in Ad hoc networks. 4 Explain the design and network issues of a sensor network. 5 Identify the security mechanisms of an ad hoc and sensor network. Integrate MANETs, WLANs, and cellular networks.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1	2										1	1	1
CO2	2	1	2										2	1	2
CO3	3	2	2										2	2	2
CO4	3	3	2										1	2	2
CO5	3	3	2										2	1	2

UNIT-I:

Introduction: Introduction, Application of MANETs, Challenges

Routing in Ad Hoc Networks: Topology Based Routing Protocols – Proactive Routing, Reactive Routing and Hybrid Routing, Position Based Routing - Principles and Issues, Location Services, Forwarding Strategies

UNIT-II: Broadcasting, Multicasting and Geocasting
Wireless Mesh Networks: Introduction, Network Architecture, Challenging technologies
UNIT-III:
Cognitive Radio and Networks: Introduction, Spectrum Access Models, Cognitive Radio Technologies and Challenges, The IEEE 802.22 Standard
TCP over Ad Hoc Networks: TCP protocol overview, Solutions for TCP over Ad hoc

UNIT-IV:
Sensor Networks Design Considerations: Introduction, Design Issues, Localization Scheme, clustering of SNs, MAC layer, The Self-organizing MAC for WSNs and the Eaves-drop-and-Register protocol.
Sensor Networks in Controlled Environment and Actuators: Regularly placed sensors**,** Design Issues, Network Issues
Applications of Sensor Networks: Body Area Network, Habitat monitoring, Health Care Monitoring, Greenhouse monitoring

UNIT-V:
Security in Ad Hoc and Sensor Networks:
Distributed systems security, Secure routing, Cooperation in MANETs, WSN Security.
Integrating MANETs, WLANs and Cellular Networks: Ingredients of a heterogeneous architecture, Protocol Stack, Comparison of the Integrated Architectures

Learning Resources:

1. Carlos de Morais Cordeiro and Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks : Theory and Applications", Second Edition, World Scientific Publishers, 2011
2. Prasant Mohapatra and Sriramamurtyhy, "Ad Hoc Networks: Technologies and Protocols", Springer International Edition, 2009.
3. Kazem Sohraby, Daniel Minoli, TaiebZnati, "Wireless Sensor Networks', A John Wiley & Sons Inc. Publication, 2007.
4. https://nptel.ac.in/courses/106105160/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 1 Hour 30 Minutes

VASAVI COLLEGE OF ENGINEERING(Autonomous)

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

QUANTUM COMPUTING
(Professional Elective-IV)

SYLLABUS FOR B.E. VIII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks:60	Course Code:**UI22PE880CS**
Credits : 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** **On completion of the course, students will be able to**
1. Explain the principles of quantum computing 2. Explain the applications of quantum computing	1. Understand the basic principles of quantum computing 2. Understand the quantum gates and their properties 3. Understand the basic algorithms in quantum computing 4. Understand the basic design of quantum hardware 5. Apply quantum computing principles in machine learning and neural networks.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2	1										2	2	1
CO2	2	2	1										2	2	1
CO3	2	2	1										2	2	1
CO4	2	2	1										2	2	1
CO5	2	2	1										2	2	1

UNIT 1:

Complex Numbers: Basic Definitions, The Algebra of Complex Numbers, The Geometry of Complex Numbers

Complex Vector Spaces: C^n as the Primary Example, Definitions, Properties, and Examples , Basis and Dimension, Inner Products and Hilbert Spaces, Eigenvalues and Eigenvectors, Hermitian and Unitary Matrices, Tensor Product of Vector Spaces

The Leap from Classical to Quantum: Classical Deterministic Systems, Probabilistic Systems, Quantum Systems, Assembling Systems.

UNIT 2:

Basic Quantum Theory: Quantum states, Observables, Measuring, Dynamics, Assembling quantum states

Architecture: Bits and qubits, Classical gates, Reversible gates, Quantum gates: Hadamard gate, Pauli's-X gate, CNOT gate, Toffoli gate, square root of NOT, phase shift gates, Rotation gates.

UNIT 3:

Quantum Algorithms: Deutsch's Algorithm, The Deutsch–Jozsa Algorithm, Simon's Periodicity Algorithm, Grover's Search Algorithm, Shor's Factoring Algorithm.

Cryptography: Quantum Key Exchange: The BB84 Protocol, The B92 Protocol, The EPR Protocol.

UNIT 4:

Information Theory: Classical Information and Shannon, Quantum Information and von Neumann Entropy, Classical and Quantum Data Compression, Error-Correcting Codes.

Quantum Hardware: Goals and Challenge, Implementing a Quantum Computer I: Ion Traps; Implementing a Quantum Computer II: Linear Optics; Implementing a Quantum Computer III: NMR and Superconductors.

UNIT 5:

Quantum Machine learning: Quantum K-Means, Quantum K-Medians, Quantum Hierarchical Clustering, Nearest Neighbours, Support Vector Machines with Grover's Search, Support Vector Machines with Exponential Speedup.

Quantum Neural Networks: Quantum Associative Memory, The Quantum Perceptron, Quantum Neural Networks.

Text books:

1) Quantum Computing for Computer Scientists, by Noson S. Yanosfky, Mirco. A Mannucci, Cambridge University Press.
2) "Quantum Machine Learning- What Quantum Computing Means to Data Mining" by Peter Wittek, Elsevier Insights.
3) Quantum Computation and Quantum Information, M.A. Nielsen and I. Chuang, Cambridge University Press (2010).

Learning resources:

1) https://www.qi.damtp.cam.ac.uk/files/PartIIIQC/Part%20IIC%20QIC/PartIIC%20QIClectures%20Full.pdf
2) https://onlinecourses.nptel.ac.in/noc21_cs103/preview
3) https://archive.nptel.ac.in/courses/115/101/115101092/
4) https://archive.nptel.ac.in/courses/106/106/106106241/
5) https://archive.nptel.ac.in/courses/106/106/106106241/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 1 Hour 30 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)

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IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

PROJECT/ INTERNSHIP

SYLLABUS FOR B.E. VIII-SEMESTER

L:T:P (Hrs./week):0:0:12	SEE Marks:50	Course Code: **UI22PW819CS**
Credits : 6	CIE Marks:50	Duration of SEE : Viva-Voce

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Review the literature to find a problem in Computer science area 2. Design a system for identified problem, analyze , implement and demonstrate the Problem identified	1. Perform literature survey and find a problem in the interested area 2. Analyze the feasibility of selected problem to design a solution 3. Design a system to address the proposed problem 4. Develop a system based on the design ,verify the correctness of the system with exhaustive test cases and provide the conclusion for the proposed system 5. Demonstrate the work done in the project

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2						2				2	3	1		2
CO2		3				2	2				2		2		2
CO3			3			2	2	3			2		1	3	3
CO4			2	3	3		2	3			2		3	3	3
CO5							1	3	3	3	2		1	1	2

The students are required to submit copies of their project report following IEEE standards one week before the last instruction date. The aim of Project is to implement and evaluate the proposal made as part of the literature survey. Students can also be encouraged to do full time internship as part of project.

Project coordinator will coordinate the following:

Grouping of students (maximum of 2 to 3 in a group)
Allotment of projects and project supervisors
Project monitoring at regular intervals

The students placed in internships need to write the new proposal in consultation with industry coordinator and internal project guide within two weeks from the commencement of instruction.

All projects (internship and departmental) will be monitored twice in a semester through student presentation for the award of sessional marks. Sessional marks are awarded by a monitoring committee comprising of faculty members as well the supervisor. The first review of projects for 15 marks is conducted after completion of five weeks. The second review for another 35 marks is conducted after 14 weeks of instruction.

	B. E. CSE List of Professional Electives - Stream wise						
		Artificial Intelligence & Data Engineering		Systems & Networks		Applications	
Sem -VII	PE-I	UI22PE710CS	Agentic AI	UI22PE720CS	Cryptography and Network Security	UI22PE740CS	Blockchain Technology
		UI22PE730CS	Deep Learning				
	PE-II	UI22PE750CS	Natural Language Processing	UI22PE760CS	Cyber Security	UI22PE780CS	Robotic Process Automation
Sem -VIII	PE-III	UI22PE810CS	Reinforcement Learning	UI22PE820CS	Advanced Databases	UI22PE840CS	Data and Visual analytics in AI
	PE –IV	UI22PE850CS	Big Data Analytics	UI22PE860CS	Adhoc and Sensor Networks	UI22PE880CS	Quantum Computing