VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

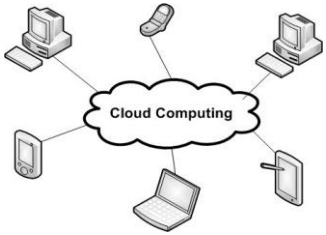
IBRAHIMBAGH, HYDERABAD-500 031

ACCREDITED BY NAAC WITH A++ GRADE

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. (IT) VII and VIII Semesters with effect from 2026-2027 (For the batch admitted in 2023-24) (R-23)



DEPARTMENT OF INFORMATION TECHNOLOGY
+91-40-23146050, 23146051
Fax: +91-40-23146090
Website: www.vce.ac.in

VASAVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

ACCREDITED BY NAAC WITH A++ GRADE

IBRAHIMBAGH, HYDERABAD-500 031

Vision

Striving for a symbiosis of technological excellence and human values.

Mission

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

Quality Policy

Education without quality is like a flower without fragrance. It is our earnest resolve to strive towards imparting high standards of teaching, training and developing human resources.

VASAVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

ACCREDITED BY NAAC WITH A++ GRADE

IBRAHIMBAGH, HYDERABAD-500 031

DEPARTMENT OF INFORMATION TECHNOLOGY

Vision

To be a center of excellence in the emerging areas of Information Technology.

Mission

- Provide a comprehensive learning experience on the latest technologies and applications.
- Equip the stakeholders with latest technical knowledge and leadership skills with collaboration to become competent professionals.
- Motivate innovation and contribute to the societal issues with human values and professional ethics.

VASAVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
ACCREDITED BY NAAC WITH A++ GRADE
IBRAHIMBAGH, HYDERABAD-500 031

Programme Educational Objectives (PEOs) for IT Program

A Graduate of Information Technology will be able to:

PEO1: Pursue higher studies in multidisciplinary areas with research orientation.

PEO2: Develop core IT competencies aligned with emerging industry trends to become global leaders with ethical values.

PEO3: Engage in continuous learning and address the societal problems with sustainable solutions.

Program Specific Outcomes (PSOs) for IT Program

Our students, upon graduation from the program, will be able to

PSO1: Identify and develop software solutions using programming languages, tools and AI/ML concepts.

PSO2: Design, develop and maintain secure stand-alone, embedded and networked systems.

PSO3: Analyze the architectures of autonomous or semi-autonomous intelligent systems and apply to real-time scenarios.

VASAVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
ACCREDITED BY NAAC WITH A++ GRADE
IBRAHIMBAGH, HYDERABAD-500 031

Program Outcomes (POs) for IT Program

At the end of the program, the graduates will demonstrate

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.
4. **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.
5. **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.
6. **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.
7. **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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **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.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-23)
B.E. – INFORMATION TECHNOLOGY : SEVENTH SEMESTER (2026 - 2027)

B.E (IT) VII-SEMESTER								
Course Code	**Course Name**	**Scheme of Instruction**			**Scheme of Examination**			
		Hours per week			**Duration in Hrs**	**Maximum Marks**		**Credits**
		L	**T**	**P/D**		**SEE**	**CIE**	
U23PC710IT	Automata Theory and Compiler Design	3	1	-	3	60	40	4
U23PC720IT	Natural Language Processing	3	-	-	3	60	40	3
U23PC730IT	Cyber Security	3	-	-	3	60	40	3
U23PE7XXIT	Professional Elective - I	3	-	-	3	60	40	3
U23PE7XXIT	Professional Elective – II	3	-	-	3	60	40	3
PRACTICALS								
U23PC711IT	Compiler Design Lab	-	-	2	3	50	30	1
U23PC721IT	Natural Language Processing Lab	-	-	2	3	50	30	1
U23PE7XXIT	Professional Elective – I Lab	-	-	2	3	50	30	1
U23PE7XXIT	Professional Elective – II Lab	-	-	2	3	50	30	1
U23PW719IT	Project Seminar	-	-	2	-	-	30	1
	NPTEL Certification Course: 8 or 12 weeks duration	-	-	-	-	-	-	2
	Library / Sports / Mentor Interaction	**-**	**-**	**-**	-	**-**	**-**	**-**
Total		**15**	**1**	**10**	**-**	**500**	**350**	**23**
Grand Total		**26**			**-**	**850**		

Professional Elective (Theory and Lab) Courses

Professional Elective – I (Theory)	**Professional Elective – II (Theory)**
U23PE710IT: Computer Vision	U23PE740IT: Generative AI
U23PE720IT: Cryptography & Network Security	U23PE750IT: Blockchain
U23PE730IT: Unmanned Autonomous Systems	U23PE760IT: Embedded Systems & IoT
Professional Elective – I (Lab)	**Professional Elective – II (Lab)**
U23PE711IT: Computer Vision Lab	U23PE741IT: Generative AI Lab
U23PE721IT: Cryptography & Network Security Lab	U23PE751IT: Blockchain Lab
U23PE731IT: Unmanned Autonomous Systems Lab	U23PE761IT: Embedded Systems & IoT Lab

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

IBRAHIMBAGH, HYDERBAD-500031

DEPARTMENT OF INFORMATION TECHNOLOGY

AUTOMATA THEORY AND COMPILER DESIGN

SYLLABUS FOR B.E.- VII SEMESTER

L:T:P (Hrs./week):3:1:0	SEE Marks :60	Course Code: **U23PC710IT**
Credits : 4	CIE Marks: 40	Duration of SEE: 3 Hrs

Course Objective:	**Course Outcomes:**
The Objectives of the course:	**At the end of the course student will be able to:**
To introduce the fundamental concepts of formal languages, grammars and automata theory. Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.	1. Understand the fundamental concepts of automata theory, formal languages, compiler phases, and modern compiler techniques including JIT and Ahead-of-Time (AOT) compilation. 2. Apply context-free grammars, pushdown automata, grammar simplification techniques, and top-down parsing methods (Recursive Descent, Predictive, and LL parsing) for syntax analysis. 3. Analyze bottom-up parsing techniques (Shift-Reduce, SLR, CLR, LALR), syntax-directed translation schemes, semantic analysis, and parser generation using YACC. 4. Construct intermediate representations using syntax trees and three-address code, and design Turing Machines for solving language recognition and computation problems. 5. Apply code generation and optimization techniques in compiler design

UNIT 1:

Formal Languages and regular expressions: Introduction, Central Concepts of Automata Theory, Chomsky Hierarchy of Languages, DFA, NFA, NFA to DFA. Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Equivalence of Finite Automata to Regular Expressions.

Introduction to Compilers and Lexical Analysis:

Introduction, Language Processors, the Structure of a Compiler, Cross Compilers ,JIT vs Ahead-of-Time (AOT) Compilation, Overview of LLVM, Overview of MLIR Framework. Lexical Analysis – The Role of Lexical Analyzer,

Input Buffering, Specification of Tokens, Recognition of Tokens, The Lexical-Analyzer Generator-LEX.

UNIT 2:

Context Free Grammars: Definition of Context Free Grammars, Grammars and Languages Generated, Derivations, Parse Trees, Ambiguity in Grammars, and Languages, PDA, Simplification of CFG's

Syntax Analysis: Role of Parser, Top Down Parsing: Recursive Descent Parsing, Predictive Parsing, LL(1)parsing, LL(k) Grammars.

UNIT 3:

Bottom Up Parsing: Reductions, Handle pruning, Shift Reduce Parsing, Conflicts during Shift-Reduce parsing, Introduction to LR Parsing SLR, More Powerful LR Parsers CLR and LALR, Using Ambiguous Grammars, The Parser Generator YACC.

Semantic Analysis: Syntax Directed Translation: Syntax Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax Directed Translation.

UNIT 4:

Intermediate Code Generation: Variants of Syntax Trees, Three-Address Code.

Turing machines: Introduction, Formal Definition and Behavior of TM, Language of a TM, Design of TM's, Turing Machine as a Computer of Integer Functions.

UNIT 5:

Code Optimization: Introduction, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Peephole optimization, Machine Independent Optimizations-The Principal Sources of Optimizations.

Code Generation: Issues in the Design of a Code Generator, Object code forms, A Simple Code Generator, Register Allocation and Assignment.

Learning Resources:

1. John E.Hopcroft, Rajeev Motwani, Jeffery D Ulman, Introduction to Automata Theory Languages And Computation, Third edition, Pearson Education.
2. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman – Compilers: Principles, Techniques &Tools –PearsonEducation, Second Edition, 2007
3. LLVM Techniques, Tips, and Best Practices Clang and Middle-End Libraries: Design powerful and reliable compilers using the latest libraries and tools from LLVM.
4. Leland L Bech, System Software: An Introduction to Systems Programming, Pearson Education Asia, 1997.
5. Kenneth C. Louden, Compiler Construction: Principles and Practice, Thompson Learning, 2003.
6. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education, 2009.

7. John C. Martin, Introduction to Languages and The Theory of computation, Third edition, Tata McGrawHill, 2003.
8. https://nptel.ac.in/courses/106106049/
9. https://nptel.ac.in/courses/106104028/
10. https://llvm.org/docs/
11. https://mlir.llvm.org/

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

NATURAL LANGUAGE PROCESSING

SYLLABUS FOR B.E VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code : **U23PC720IT**
Credits : 3	CIE Marks : 40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The Objectives of the course:	*On completion of the course, students will be able to:*
1. Introduce the fundamental techniques of natural language processing. 2. Demonstrate machine learning and deep learning models for NLP.	1. Understand Probabilistic Models for Natural Language Processing. 2. Apply logistic regression and naïve Bayes to perform sentiment analysis. 3. Understand vector semantics and embeddings**.** 4. Analyze deep learning architectures for sentiment analysis, text generation and named entity recognition. 5. Design NLP applications that perform question-answering and language translation.

UNIT- I

NLP with Probabilistic Models:

Regular Expressions, Text Normalization, Edit Distance: Introduction to NLP, Applications of NLP, Regular Expressions, Words, Corpora, Text Normalization, Minimum Edit Distance.

N-gram Language Models: N-Grams, Evaluating Language Models, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing, Huge Language Models and Stupid Backoff.

Sequence Labeling for Parts of Speech and Named Entities: English Word Classes, Part-of-Speech Tagging, Named Entities and Named Entity Tagging, HMM for Part-of-Speech Tagging, Conditional Random Fields (CRFs).

UNIT- II

NLP with Classification:

Naive Bayes and Sentiment Classification: Naive Bayes Classifiers, Training the Naive Bayes Classifier, Worked example, Optimizing for Sentiment Analysis, Naive Bayes for other text classification tasks, Naive Bayes as a Language Model, Evaluation, Test sets and Cross-validation, Statistical Significance Testing.

Logistic Regression: The sigmoid, Learning in Logistic Regression, The cross-entropy loss function, Gradient Descent, Regularization, Multinomial logistic regression, Interpreting models, Deriving the Gradient Equation.

UNIT- III

NLP with Vector Spaces:

Vector Semantics and Embeddings: Lexical Semantics, Vector Semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector, Pointwise Mutual Information (PMI), Applications of the TF-IDF or PPMI vector models, Word2vec, Visualizing Embeddings, Semantic properties of embeddings, Bias and Embeddings, Evaluating Vector Models.

UNIT- IV

NLP with Sequence Models:

Neural Networks and Neural Language Models: Units, The XOR problem, Feed-Forward Neural Networks, Training Neural Nets, Neural Language Models.

Deep Learning Architectures for Sequence Processing: Language Models Revisited, Recurrent Neural Networks, Managing Context in RNNs: LSTMs and GRUs.

UNIT- V

NLP with Attention Models:

Machine Translation and Encoder-Decoder Models: Self-Attention Networks-Transformers, Language Divergences and Typology, The Encoder-Decoder Model, Encoder-Decoder with RNNs, Attention, Beam Search, Encoder-Decoder with Transformers.

Question Answering: Information Retrieval, IR-based Factoid Question Answering, Entity Linking, Knowledge-based Question Answering, Using Language Models to do QA, Classic QA Models, Evaluation of Factoid Answers.

Chatbots & Dialogue Systems: Chatbots, GUS: Simple Frame-based Dialogue Systems, The Dialogue-State Architecture, Evaluating Dialogue Systems, Dialogue System Design.

Learning Resources :

1. Jurafsky Dan and Martin James H. "Speech and Language Processing", Third Edition, 2018.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, OReilly Media, 2009.
3. James Allen, "Natural Language Understanding", Pearson Education
4. Christopher D Manning and HinrichSchutze, "Foundations of Statistical Natural Language Processing" MIT Press, 1999.
5. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, "NLP: A Paninian Perspective", Prentice Hall, New Delhi
6. https://nptel.ac.in/courses/106/105/106105158/
7. http://www.nptelvideos.in/2012/11/natural-language-processing.html

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

CYBERSECURITY

SYLLABUS FOR B.E VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code:**U23PC730IT**
Credits : 3	CIE Marks : 40	Duration of SEE: 3 Hrs

Course Objectives	**Course Outcomes**
The Objectives of the course:	**At the end of the course student will be able to:**
1. Introduce the basics of Cyber Security cyber crime. 2. Explore essential techniques in protecting Information Systems,	1. Understand the concept of Cyber security and issues and challenges associated with it. 2. Interpret various cybercrimes, their nature, legal remedies and how to report the crimes through available platforms and procedures. 3. Gain knowledge about exploitations used by the attackers 4. understand the basic security aspects related to Computer and Mobiles. They will be able to use basic tools and technologies to protect their devices. 5. Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection

Unit-I Introduction to Cyber security: Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.

Unit- II Cybercrime and Cyber law: Classification of cybercrimes, Common cybercrimes- cyber crime targeting computers and mobiles, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks.

Reporting of cybercrimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences,

Organizations dealing with Cyber crime and Cyber security in India, Case studies.

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

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-themiddle attacks, DLL injections, Browser Helper objects.

Unit-IV Digital Devices Security , Tools and Technologies for Cyber Security: Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.

Unit-V Cyber Laws and Forensics: Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013. Introduction to Cyber Forensics, Need of Cyber Forensics, Cyber Evidence, Documentation and Management of Crime Sense, Image Capturing and its importance, Partial Volume Image, Web Attack Investigations, Denial of Service Investigations, Internet Crime Investigations, Internet Forensics, Steps for Investigating Internet Crime, Email Crime Investigations**.**

Learning Resources:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011).
2. James Graham, Richard Howard, Ryan Olson, "Cyber Security Essentials", CRC Press, 2016.
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER VISION
(Professional Elective-I)
SYLLABUS FOR B.E VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code : **U23PE710IT**
Credits : 3	CIE Marks : 40	Duration of SEE: 3 Hrs

Course Objectives	**Course Outcomes**
The Objectives of the course:	**At the end of the course student will be able to:**
To equip students with foundational and advanced knowledge of computer vision, from traditional techniques to emerging generative approaches, enabling real-world vision system development.	1. Understand fundamental image processing techniques and feature extraction. 2. Apply deep learning for image classification and representation learning. 3. Design systems for object detection and image segmentation. 4. Analyse video content and apply gait recognition techniques. 5. Explore and implement generative models in vision applications.

Unit I: Fundamentals of Image Processing
Image formation and camera models; Colour models and image representation; Image enhancement: spatial and frequency domain techniques; Image filtering and edge detection; Morphological operations and image segmentation basics..

Unit II: Image Classification and Deep Learning Foundations
Feature extraction: SIFT, HOG, and colour histograms; Shallow classifiers: SVMs and decision trees; Neural networks: perceptron and MLP; Convolutional Neural Networks (CNNs); Transfer learning and fine-tuning pre-trained models.

Unit III: Object Detection and Image Segmentation
Traditional detection: sliding window and selective search; Deep learning-based detectors: R-CNN, Fast R-CNN, YOLO, and SSD; Semantic segmentation: FCN and U-Net; Instance segmentation: Mask R-CNN; Evaluation metrics: IoU, mAP.

Unit IV: Video Analytics and Gait Recognition
Motion estimation: optical flow and background subtraction; Activity and action recognition in videos; Tracking algorithms: Kalman filter, mean-shift, and deep tracking; Gait recognition: silhouette-based and model-based approaches; Gait datasets and evaluation methods.

Unit V: Emerging Topics in Vision: Generative and Explainable AI
Generative models: GANs, VAEs, and Diffusion models in image synthesis and enhancement; Vision transformers (ViTs); Explainable AI in vision: saliency maps and Grad-CAM; Zero-shot and few-shot learning in visual tasks; Foundation models and promotable vision systems.

Learning Resources:

1. **Szeliski, Richard.** *Computer Vision: Algorithms and Applications,* 2nd Edition, Springer, 2022.
2. **Goodfellow, Ian, Bengio, Yoshua, and Courville, Aaron.** *Deep Learning,* MIT Press, 2016.
3. **Gonzalez, Rafael C., and Woods, Richard E.** *Digital Image Processing,* 4th Edition, Pearson, 2018.
4. **Forsyth, David A., and Ponce, Jean.** *Computer Vision: A Modern Approach,* 2nd Edition, Pearson, 201-1.
5. **Prince, Simon J.D.** *Computer Vision: Models, Learning, and Inference,* Cambridge University Press, 2012.
6. **Zhou, Wanggang, and Zhang, Liang.** *Gait Recognition: A Survey,* Springer Briefs, 2022.

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:		30
2	No. of Assignments:	03	Max. Marks for each Assignment:		05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:		05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING(Autonomous)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY
SYLLABUS FOR B.E. VII SEMESTER

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 : **U23PE720IT**
Credits : 3	CIE Marks :40	Duration of SEE : 3Hours

Course Objectives	**Course Outcomes**
The Objectives of the course:	*At the end of the course student will be able to:*
Acquire fundamental knowledge on the concepts of number theory, cryptographic techniques like hash functions, digital signature and cryptanalysis.	1. Understand the fundamentals of number theory and security concepts. 2. Demonstrate the knowledge of classical ciphers, block ciphers and stream ciphers 3. Analyse different types of Asymmetric key ciphers. 4. Summarize different message authentication algorithms. 5. Analyse network security protocols like TLS, IPSec

UNIT – I:

Introduction to cryptography, Number Theory: Divisibility and the Division Algorithm, The Euclidean Algorithm , Modular Arithmetic , Prime Numbers Fermat's and Euler's Theorems , Testing for Primality.

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

UNIT – II:

Symmetric Ciphers: Symmetric Cipher Model, Classical Encryption Techniques-,Substitution Techniques ,Transposition Techniques.

Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles. Block Cipher Modes of Operation. DES, The Strength of DES, Triple DES.

Advanced Encryption Standard: AES Structure ,AES Transformation Functions , Stream Ciphers.

UNIT – III:

Asymmetric Ciphers: Public-Key Cryptography and RSA - Principles of Public-Key Cryptosystems, The RSA Algorithm .

Other Public-Key Cryptosystems : Diffie-Hellman Key Exchange, ElGamal Cryptographic System, Elliptic Curve Arithmetic, Elliptic Curve Cryptography .

UNIT – IV:

Cryptographic Hash Functions : Applications of Cryptographic Hash Functions, MD5, Secure Hash Algorithm (SHA),SHA-3.

Message Authentication Codes : Message Authentication Requirements. Message Authentication Functions, MACs Based on Hash Functions: HMAC MACs Based on Block Ciphers: CMAC, Digital Signatures.

UNIT –V:

Transport Level Security: Web Security Considerations, Transport Layer Security

IP Security: IP Security overview, IP Security policy, Encapsulating Security payload

Learning Resources :

1. William Stallings, Cryptography and Network Security, 7th Edition, Pearson Education,2017.
2. https://onlinecourses-archive.nptel.ac.in/noc19_cs28/course.
3. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.
4. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications,2003.

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

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

UNMANNED AUTONOMOUS SYSTEMS

(Professional Elective-I)
Syllabus for B.E VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code : **U23PE730IT**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hrs

COURSE OBJECTIVES The Objectives of the course:	**COURSE OUTCOMES** *On completion of the course, students will be able to*
Practical advances in Artificial Intelligence and its applications to Unmanned vehicles are ushering in a new era of digital automation. In the coming years, drones, robotics and driverless vehicles and artificial intelligence will used to transport goods, perform surveillance, transport people in efficient and safe way. This course will enable the students to under the concepts and technologies that underlie an autonomous vehicle's understanding of itself and the world around it.	1. Concepts of Autonomous and Unmanned Autonomous Systems viz. UAV, UGV, UWV. 2. Understanding of significant elements of UAVs, the basics of flight, navigation, guidance, sensors, design concepts etc., and various AI algorithms useful in building the Autonomous systems. 3. Build/integrate small to medium size UAV/UGV. 4. Concepts of various sensor elements, data collection, processing, and various software tools. 5. Understanding of AI algorithms for autonomous systems, followed by design and development of autonomous systems as a case study system.

Unit I

Introduction to Unmanned Autonomous systems: Introduction to Autonomous Systems: Definition, characteristics-Autonomous Systems, Human Assisted Vs Machine Powered Autonomy, Levels of Autonomy, Autonomous Vs Unmanned Autonomous Systems, Autonomous System Components, operating modes, Autonomous Navigation, Autonomous Systems relation to AI.

Unit II

Unmanned Vehicles: Types of unmanned vehicles (U A/G/W V), Characteristics of U A/G/W Vehicles, Differences, applications to various domains, physical properties and structures of U A/G/W Vehicles, Components of U A/G/W, forces acting on vehicles, kinematics and Dynamics, Operating U A/G/W Vehicles.

Unit III

UAV: Introduction to UAV, Drones and UAV, Classification of UAVs globally; DGCA Classifications of UAV – India Perspective, Types and characteristics of Drones: Fixed wing, Multi-rotor, VTOL, Propulsion and structures of UAV, Physical properties of the atmosphere, Aerodynamics, Materials and characteristics of Aerofoils used in UAVs, Angle of attack, Mach number, Lift and Drag, Structural analysis and tools, CFD analysis and tools, steps to build and integrate the Multi rotor UAVs.

Unit IV

Navigation and guidance: Electronics in UAV, Flight controller Software, Ground Control Software – Ardupilot, PX4, GCS; Protocols - MAVLINK protocol; Data Link; Sensors and Payloads: GPS, IMU, Light Detection and Ranging (LiDAR), Imaging cameras- PAN, MX, and Hyper-spectral sensors; Laser Detection and Range (LiDAR); ultra-sonic detectors; Mission Planning and Control, Case studies: Autonomous Obstacle avoidance - Vision, LiDAR; Communication – UHF,WiFi,Blue tooth, Cellular, 5G.

Unit V

AI Drones: Benefits of Combining AI and Drones, Applications of AI-Powered Drones, Challenges and ethical considerations, Counter/Anti Drone Technologies, Drone Swarm Technologies and Algorithms, Case Studies Drone Swarms, IoT Drones, Edge based AI and integration.

Learning Resources:

1. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.
2. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal
3. DGCA RPAS Guidance Manual, Revision 3 – 2020
4. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Robotics : Control, Sensing, Vision and Intelligence
5. Aaron Martinez, Enrique Fernandez, Learning ROS for Robotics Programming: A practical, instructive, and comprehensive guide to introduce yourself to ROS, the top-notch, leading robotics framework, PACKT publishing, Open Source.
6. John J. Craig, Introduction to Robotics: Mechanics and Control, Addison Wesley publication, Third 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:	2	Max. Marks for each Assignment:	10
3	No. of Quizzes:	0	Max. Marks for each Quiz Test:	0

Duration of Internal Test: **90 Minutes**

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

Generative AI

(Professional Elective-II)

SYLLABUS FOR B.E VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code: **U23PE740IT**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hrs

COURSE OBJECTIVES The Objectives of the course:	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Understand Transformer and LLM architecture. 2. Master Prompt Engineering and In-Context Learning. 3. Adapt models using PEFT and Indic datasets. 4. Optimize Small Language Models for deployment. 5. Evaluate GenAI ethics, safety, and governance.	1. **Apply** prompting and ICL techniques. 2. **Analyze** diffusion and multimodal architectures. 3. **Create** specialized Indic-tuned models. 4. **Evaluate** scaling and optimization techniques. 5. **Design** compliant GenAI deployment systems.

UNIT – I: Text Generation & Foundation Models The Transformer Revolution, limitations of RNN/LSTM architectures, Self-Attention mechanisms, Multi-head Attention, Positional Encoding, Decoding and Sampling strategies, Greedy search, Beam search, Top-K and Top-P (Nucleus) sampling, Temperature scaling, Prompt Engineering and In-Context Learning (ICL) mechanics, Zero-shot and Few-shot learning, Advanced Prompting techniques including Chain-of-Thought (CoT) and Tree-of-Thoughts (ToT), Structured Output generation for JSON and Code, Commercial Model Landscape featuring OpenAI GPT-4o, Anthropic Claude 3.5, and Google Gemini 1.5 Pro, Open Source (OSS) Models including Meta Llama 3.1, Mistral/Mixtral, and xAI Grok-1, Evaluation Metrics including BLEU, ROUGE, METEOR, and LLM-as-a-Judge (G-Eval) frameworks.

UNIT – II: Generative Models for Images & Video Foundations of Diffusion models, Denoising Diffusion Probabilistic Models (DDPM), Latent Diffusion Models (LDM), Text-to-Image architectures and applications, Stable Diffusion (SDXL and SD-Turbo), DALL-E 3, Architecture and mechanics of Vision Transformers (ViT), Image Control and Personalization techniques, In-painting and Out-painting, ControlNet for structural guidance, Video Generation models and evolution, Survey of Sora (OpenAI), Runway Gen-3, and Luma Dream

Machine, Comparative Evaluation metrics including FID Score, CLIP Score, and Human Preference alignment.

UNIT – III: Adaptation, Fine-tuning & Indic AI Supervised Fine-Tuning (SFT) workflows, Instruction tuning, Dataset preparation and curation for domain-specific tasks, Parameter-Efficient Fine-Tuning (PEFT), LoRA (Low-Rank Adaptation), QLoRA (Quantized LoRA), Adapter modules, Model Alignment and Control strategies, Reinforcement Learning from Human Feedback (RLHF), Direct Preference Optimization (DPO), ORPO for safety-aligned tuning, Sovereign AI and the Indic Context, Adaptation of models for Indian regional languages, Case studies on Sarvam AI (OpenHathi) and AI4Bharat Airavata, Function Calling and Tool Use integration, API-based execution in GPT-4o and Claude.

UNIT – IV: Scaling Laws, Efficiency & Small Models (SLMs) Scaling Laws in deep learning, The Chinchilla scaling laws, Compute-optimal training versus Inference-optimal models, Efficient Model Architectures, Mixture-of-Experts (MoE) in Mixtral, Attention-free architectures including Mamba and RWKV, The rise of Small Language Models (SLMs), Microsoft Phi-3, Google Gemma 2, and Llama 3-8B, Model Compression techniques for edge deployment, Post-Training Quantization (GGUF, AWQ, EXL2), Speculative Decoding, Token Merging for faster inference.

UNIT – V: Deployment, Ethics & Governance Local AI Deployment strategies, Running private GenAI using Ollama, vLLM, and LM Studio, Foundations of Retrieval Augmented Generation (RAG), Vector Databases including ChromaDB and FAISS, The RAG-versus-Fine-tuning trade-off analysis, Safety and Ethics in Generative AI, Hallucination detection and mitigation techniques, Red-teaming, Prompt Injection attacks and defenses, Legal and Policy frameworks, AI Bill of Rights, EU AI Act, India's Digital India Act and guidelines for Generative AI governance.

Learning Resources:

1. Vaswani et al. (2017), "Attention is All You Need" (The Foundation).
2. David Foster (2023), "Generative Deep Learning" (O'Reilly).
3. Sebastian Raschka (2024), "Build a Large Language Model (From Scratch)".
4. Sarvam AI (2024), "OpenHathi: Technical Report on Indic Language Adaptation".
5. Lewis et al. (2020), "Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks".

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 Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

BLOCKCHAIN
(Professional Elective-II)
SYLLABUS FOR B.E VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code : **U23PE750IT**
Credits : 3	CIE Marks : 40	Duration of SEE: 3 Hrs

Course Objectives	**Course Outcomes**
The Objectives of the course:	At the end of the course student will be able to:
1. Introduce the fundamental concepts of blockchain and cryptography. 2. Describe blockchain architectures and platforms. 3. 3. Demonstrate applications of blockchain with case studies.	1. Understand the cryptographic primitives and the need for decentralization. 2. Identifying the features and functionalities of Bitcoin and Ethereum's Solidity programming language. 3. Implementing permissioned blockchain networks using Hyperledger fabric. 4. Understanding the DID, blockchain security and interoperability. 5. Identify the applications of blockchain across various sectors like land records, financial services, government, etc.

UNIT-I:
Introduction: Need for decentralization, Decentralization with blockchain, properties of blockchain, Definition, History, Distributed ledger.
Cryptographic primitives: Hash function, properties of hash, SHA 256, Hash pointers, hashchain, Merkle tree, public key cryptography, signatures.
UNIT-II:
Bitcoin: Cryptocurrency Consensus over an open network, PoW, Block header, Transaction flooding, block reward, double spending, scalability and energy consumption.
Ethereum: Ethereum network, Ethereum smart contracts, Ethereum virtual machine, solidity language, deploy and execute contracts.
UNIT-III:
Permissioned blockchain: Distributed Systems, Permissioned Blockchains, Design goals, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system

Hyperledger: Hyperledger foundation projects, fabric architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric.

UNIT-IV:

Identity management: Concept of identity, centralized identity management, decentralized identity management.

Blockchain interoperability: Asset and data transfer, cross chain transfer and exchange of asset,

Blockchain security: 51% vulnerability, private key security.

UNIT-V:

usecases: Identifying good blockchain use cases, and land records and other kinds of record keeping between government entities, financial services, Decentralized marketplace. National Strategy of Blockchain in India

Learning Resources:

Textbooks:

1. Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition, Imran Bashir, Packt Publishing, 2020, ISBN: 9781839213199, book website: **https://www.packtpub.com/product/mastering-blockchain-third-edition/9781839213199**
2. Kube, Nicolas. "Daniel Drescher: Blockchain basics: a non-technical introduction in 25 steps: Apress, 2017, 255 pp, ISBN: 978-1-4842-2603-2." (2018): 329-331.
3. LEE, WM. "Beginning Ethereum Smart Contracts Programming: With Examples in Python." *Solidity, and JavaScripty, Apress, Singapore* (2019).
4. Gaur, Nitin, et al. Blockchain with Hyperledger fabric: Build decentralized applications using Hyperledger fabric 2. Packt Publishing Ltd, 2020.

Online References:

1. NPTEL courses:
   a. Blockchain and its Applications,
   b. Blockchain Architecture Design and Use Cases

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

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

EMBEDDED SYSTEMS and IOT

(Professional Elective-II)
SYLLABUS FOR B.E VII- SEMESTER

L:T:P (Hrs./week):: 3:0:0	SEE Marks : 60	Course Code : **U23PE760IT**
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The Objectives of the course:	*At the end of the course student will be able to:*
1. Explore theoretic aspects of the design and development of an embedded system 2. Familiarize in programming and interfacing concepts related to 8051 and advanced processors. 3. Develop IoT infrastructure for different applications and understand the concepts of Real time systems	1. Apply the architectural features of 8051 microcontroller in writing assembly language and Embedded C programs and explain various concepts related to Real Time systems. 2. Design interfacing circuits for various peripherals with 8051 and understand the architecture features of ARM and write simple programs using it. 3. Understand the architectural of IoT. 4. Develop IoT based real time applications. 5. Understand architectural features of SOC's and Develop Embedded system applications with SOC's.

UNIT – I:

Introduction, Complex Systems and Microprocessor, Embedded System Design Process

Introduction to Real Time systems, Timing constraints, Real Time Task Scheduling, Classification of Real Time scheduling: clock driven, simple priority based, Features of Real time operating system, Case study: VxWorks.

8051 Architecture, signal functions, Instruction set, assembly language programming, Input/output Ports and Circuits, I/O port programming, External Memory interfacing, Counter and Timers: modes of operation, timer programming, Serial communication programming, Interrupts and interrupt programming.

UNIT – II:
Interfacing with 8051, keyboards, LEDs, LCDs, ADC, DAC, stepper motor. ARM architecture - ARM organization and implementation - The ARM instruction set - The thumb instruction set - Basic ARM Assembly language program - ARM CPU cores.

UNIT – III:
Introduction to Internet of Things- Definition & Characteristics of IoT, Sensors and Actuators, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, Wireless sensor Networks and its technologies, IoT Levels & Deployment Templates, Domain specific IoT's

UNIT – IV:
IoT Design Methodology, Case study on IoT system, Basic building blocks of an IoT device, Bus protocols I2C, CAN, SPI, Raspberry Pi board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, IoT Physical Devices and Endpoints Arduino UNO, Introduction to M2M, Differences between IoT and M2M, IoT platforms

UNIT – V:
IoT System On Chip, Embedded platforms for IoT**:** Zynq SOC Architecture, RF SOC architecture, Xilinx Vivado Design Flow, PYNQ open source platform for IoT embedded systems

Learning Resources:

1. Wayne Wolf, "Computers and Components", Elsevier.
2. KennethJ.Ayala, "The8051 Microcontroller", Third Edition, Thomson.
3. Muhammad Ali Mazidi, Janice Gillespie Mazidi, Rolin D. Mc Kinlay, The 8051 Microcontroller and Embedded Systems using Assembly and C, Second Edition, Pearson.
4. David E. Simon, "An Embedded Software Primer", Pearson Education
5. Raj Kamal, "Embedded Systems", Tata McGraw Hill.
6. FrankVahid, TonyGivargis, John Wiley, "Embedded System Design", Wiley Student Edition.
7. W.A. Smith, "ARM Microcontroller Interfacing: Hardware and Software, Eketor, 2010.
8. NPTEL Online Course on Microprocessors and Microcontrollers, Santanu Chattopadhyay.
9. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press.

10. Sirinivas K.G,Siddesh G.M , "Internet of Things" ,2017 Cengage Learning India Pvt Ltd.
11. Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.
12. Jane W. Liu, "Real-Time Systems" Pearson Education, 2001.
13. Krishna and Shin, "Real-TIme Systems," Tata McGraw Hill. 1999.
14. http://www.pynq.io/
15. https://www.xilinx.com/products/silicon-devices/soc/zynq-7000.html
16. http://www.ioe.nchu.edu.tw/Pic/CourseItem/4468_20_Zynq_Architecture.pdf
17. https://www.rfwireless-world.com/ApplicationNotes/IoT-System-On-Chip.html
18. https://www.aldec.com/en/company/blog/185--enabling-tysom-zynq-based-embedded-development-board-for-aws-iot-greengrass

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

COMPILER DESIGN LAB

SYLLABUS FOR B.E. VII SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks : 50	Course Code: **U23PC711IT**
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hours

Course Objectives	**Course Outcomes**
The Objectives of the course:	**At the end of the course student will be able to:**
1. Provide hands-on experience to implement various phases of compiler. 2. Demonstrate LEX and YACC tools.	1. Understand JFLAP and Generate tokens for a given high level language program using lexical analyzer. 2. Use LEX and YACC tools to develop lexical analyzer and parser. 3. Apply various syntax analysis techniques on CFG to build the parsers. 4. Generate optimized code using code optimization techniques. 5. Generate machine code from the intermediate code forms.

LIST OF EXPERIMENTS

1. Understanding of software like JFLAP (Java Formal Languages and Automata Package) for experimenting with formal languages
2. Implementation of Lexical Analyser to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)
3. Implementation of Lexical Analyzer using LEX tool.
4. Implementation of Recursive Descent Parser.
5. Implementation of FIRST() of a given Context-Free Grammar.
6. Implementation of FOLLOW() of a given Context-Free Grammar.
7. Construction of a Predictive parsing Table for a given CFG.
8. Implementation of SLR parsing algorithm.
9. Implementation of Desktop Calculator using LEX and YACC tools.
10. Implementation of code optimization techniques.
11. Implementation of Code Generation.

Virtual Lab: https://afl1-iiith.vlabs.ac.in/

Learning Resources:

1. John E.Hopcroft, Rajeev Motwani, Jeffery D Ulman, Introduction to Automata Theory Languages AndComputation, Third edition, Pearson Education.
2. V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman – Compilers: Principles , Techniques &Tools – Pearson Education, Second Edition, 2007
3. John R Levine, Tony Mason, Dougn Broun, Lex and Yacc, Orielly, 2nd Edition,2009

Online Resources:

1. http://cse.iitkgp.ac.in/~bivasm/notes/LexAndYaccTutorial.pdf
2. https://llvm.org/docs/
3. https://llvm.org/docs/tutorial/?utm_source=chatgpt.com

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: 2Hours			

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

NATURAL LANGUAGE PROCESSING LAB

SYLLABUS FOR B.E. VII SEMESTER

L :T:P (Hrs./week): 0:0:2	SEE Marks: 50	Course Code: **U23PC721IT**
Credits : 1	CIE Marks :30	Duration of SEE: 3 Hours

Course Objective:	**Course Outcomes:**
The course will enable	**At the end of the course student will be able to:**
Demonstrate applying and comparing of various NLP models to real world language problems.	1. Demonstrate the knowledge of NLP frameworks for basics on various architectures, datasets, preprocessing and normalization. 2. Apply existing probabilistic N-gram models to NLP problems. 3. Apply ML models to NLP classification and sentiment analysis. 4. Apply DL models RNN, seq-seq, transformer to various NLP problems.

1. Implement computations of 2-gram and 3-gram models on Text corpus.
2. Implement generative text using N-gram models with smoothing techniques.
3. Implement HMM model for POS Tagging problem.
4. Implement multinomial logistic regression on sentiment analysis.
5. Implement Naïve Bayes on sentiment analysis.
6. Implement or use TF-IDF embeddings for Text corpus.
7. Implement or use word2vec embeddings for Text corpus
8. Use LSTM model for word classification problem.
9. Use LSTM model for language identification problem.
10. Use Encoder-Decoder model for Neural machine translation problem.
11. Use Transformer model for Neural machine translation problem.
12. Use RAG techniques with ChatGPT OpenAI to develop domain specific

chatbots.

Learning Resources:

1. https://pytorch.org/
2. https://chat.openai.com/
3. https://huggingface.co/

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: 2 Hours			

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

DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER VISION LAB

Syllabus for B.E VII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code: **U23PE711IT**
Credits: 3	CIE Marks : 40	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of this course is to provide students with hands-on experience in implementing computer vision algorithms, focusing on traditional techniques, deep learning models, and emerging topics like generative models for vision tasks.	1. Understand and implement basic image processing techniques such as filtering and edge detection. 2. Apply convolutional neural networks (CNNs) for image classification tasks. 3. Implement object detection algorithms, such as YOLO, and evaluate their performance. 4. Demonstrate the use of deep learning models for semantic segmentation and video analytics. 5. Explore generative models like StyleGAN2 for applications in face generation and image inpainting.

1. **Image Filtering and Edge Detection**
   Use case: Enhancing medical scans for tumor edge visibility

   Dataset: BSDS500 I Metric: Edge Precision-Recall I Library: OpenCV, Scikit-Image

2. **Feature Detection and Matching**
   Use case: Panorama stitching in mobile photography

   Dataset: Oxford VGG Affine I Metric: Matching Accuracy I Library: OpenCV

3. **Image Classification using CNNs**

Use case: Classifying defective vs. non-defective parts in factories

Dataset: CIFAR-10 I Metric: Accuracy, Confusion Matrix I Library: PyTorch, Keras

4. **Transfer Learning with Pretrained Models**
   Use case: Plant disease classification for farmers
   Dataset: Oxford 102 Flowers I Metric: Accuracy I Library: PyTorch, HuggingFace
5. **Object Detection using YOLOvX**
   Use case: Real-time traffic object detection in smart cities

   Dataset: COCO/TACO I Metric: mAP, IoU I Library: Ultralytics YOLO
6. **Semantic Segmentation with UNet or DeeplabV3**
   Use case: Autonomous car road segmentation

   Dataset: Cityscapes I Metric: mioU I Library: segmentation_models_pytorch
7. **Video Motion Tracking using Optical Flow**
   Use case: Analyzing player movement in sports videos

   Dataset: KTH Action Dataset I Metric: Flow Accuracy I Library: OpenCV
8. **Gait Recognition using Silhouettes and Keypoints**
   Use case: Contactless security in surveillance systems

   Dataset: CASIA-B I Metric: Recognition Accuracy I Library: OpenPose, Mediapipe
9. **Image Inpainting using Diffusion Models**
   Use case: Restoration of damaged historical photos

   Dataset: CelebA I Metric: PSNR, SSIM I Library: diffusers, PIL
10. **Face Generation or Editing using StyleGAN2**
    Use case: Creating avatars for games and metaverse

    Dataset: FFHQ I Metric: FID Score I Library: stylegan2-pytorch, diffusers

Learning Resources:

11. **Image Processing & Feature Extraction:**
OpenCV documentation: https://docs.opencv.org/
scikit-image: https://scikit-image.orq/

12. **Image Classification with CNNs:**
TensorFlow Tutorials: https://www.tensorflow .orq/tutoriaIs
PyTorch TutoriaIs: https: //pytorch. orq/tutoriaIs/

13. **Object Detection with YOLO and SSD:**
YOLOv4 Implementation: https://qithub.com/AlexeyAB/darknet
TensorFlow Object Detection API:
https://github.com/tensorflow/models/tree/master/research/object_detection

14. **Semantic Segmentation and Video Analytics:**
DeepLab v3 for segmentation:
https://qithub.com/tensorflow/models/tree/master/research/deeplab
OpenCV for video analysis: https://www.opencv.ai/ai-services/intelligent-video-analysis

15. **Generative Models in Vision (StyleGAN2, Image Inpainting):**
StyleGAN2 Implementation: https://github.com/NVlabs/styleqan2
Deep Learning with TensorFlow 2.0 (for GANs):
https://www.tensorflow.org/tutorials/qenerative/dcqan

VASAVI COLLEGE OF ENGINEERING(Autonomous)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

CRYPTOGRAPHY AND NETWORK SECURITY LAB

(Professional Elective-I)

SYLLABUS FOR B.E. VII SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks : 50	Course Code : **U23PE721IT**
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hrs

Course Objectives	**Course Outcomes**
The Objectives of the course:	At the end of the course student will be able
1. Use Wireshark packet sniffertool. 2. Implement different cipher techniques. 3. Analyze the performance of algorithms: DES, RSA, MD5,SHA-1	1. Demonstrate the packet sniffing using opensource tools. 2. Develop code for classical EncryptionTechniques. 3. Build cryptosystems by applying symmetric and public key encryption algorithms. 4. Construct code for authentication algorithms. 5. Develop a signature scheme using Digital signature standard.

List of Experiments

1. Working with Wire shark packet sniffer for monitoring network communication.
2. Implement the following Substitution & Transposition Techniques:
   a) Caesar Cipher
   b) Play fair Cipher
   c) Hill Cipher
   d) Vigenere Cipher
   e) Rail fence
   f) Row & Column Transformation
3. Write a code for a random number generator
   a) Using Python code
   b) Using a secure pseudo-random number generator tool.
4. Implementation and Performance Evaluation following block cipher cryptographic algorithms:
   a) DES
   b) AES

5. Implementation and Performance Evaluation following stream cipher cryptographic
   a) CFB (Cipher Feedback)
   b) OFB (Output Feedback).
6. Implement asymmetric key to generate encryption and decryption on messages using RSA algorithm.
7. Implementation of Diffie-Hellman exchange Algorithm.
8. Implement the following hashing technique algorithm
   a) MD5
   b) SHA-1
9. Implement the Signature Scheme - Digital Signature Standard
10. Demonstrate intrusion detection systems (IDs) using the Snort tool.
11. Implementation of IPsec over the network using VPN tool (cisco / NS3).

Suggested Reading:

1. William Stallings, Cryptography and Network Security, 7th Edition, Pearson Education,2017.
2. Neal Koblitz, A course in number theory and cryptography, Springer.

Online Resources:

https://www.wireshark.org/
https://nptel.ac.in/courses/106105162

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: 2 Hours			

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

Unmanned Autonomous Systems Lab

(Professional Elective-I)

Syllabus for B.E VI-SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks : 50	Course Code : **U23PE731IT**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
Learn the design of UAV vehicles and program to read Telemetry, GPS parameters using UAV Software tools. Also to learn the implement programs to operate Drones using RF Communication sensors.	1. Explore the various hardware and mechanical components used in the development of Unmanned Aerial Vehicles. 2. Understand the Interfaces used for connecting the navigation systems. 3. Write programs to read the telemetry parameters, GPS parameters and other ancillary information using UAV Software development tools: MAVProxy, Dronekit. 4. Write programs to operate the drones using RF Communication sensors, Obstacle avoidance programs.

Experiments

1. Assemble, integrate and demonstrate the Quad copter with all necessary parts.
2. Calibration of UAV(Quadcopter) using Ardupilot Mission planner and demonstrate the calibrated IMU parameters
3. Write a program to read Telemetry parameters using Serial Port using TTC device.
4. Write a program to read GPS coordinates on Raspberry Pi and Arduino micro controller
5. Write a program to send MAVLINK commands to Pixhawk version of Flight Controller
6. Write Software in the Loop (SITL) / MAVproxy
7. Write a program to connect Dronekit for communication and testing various commands
8. Write a program for Copter SITL/MavProxy to the commands such as Flight

9. Use Mission planner for flight path panning and demonstrate the transfer of planning transects to flight controller
10. Arm, take off, change of flight mode parameters, flying machine and geofence using Flight Simulator.
11. Write object avoidance program using the following sensors and test them on UGV(Robot)
    a. Sonar
    b. LiDAR
    c. Camera
12. Write a Program to communicate UAV/UGV using BLE/WiFi/UHF/Cellular devices

Additional Experiments:

13. Write a program for navigation in GPS denied Environments
14. Write a program to communicate IOT-UAV/UGV using text and voice commanding for Swarm
15. LiDAR & MX Python program to extract GPS & Spectral information.

Programming Languages

- Python
- C

Software Tools

- Ardupilot Mission Planner
- SITL / MAVproxy
- ROS : Robotic Operating System
- ChibiOS or latest Embedded RTOS

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: 2Hours			

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

Generative AI Lab

Syllabus for B.E VII-SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks : 50	Course Code: **U26PE741IT**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of this course is to explore hands-on Generative AI tools for content generation, image creation, and no-code app development.	1. Apply Generative AI for text and image creation. 2. Use prompt engineering to enhance AI outputs. 3. Build no-code apps with Generative AI. 4. Create digital artwork using AI tools. 5. Utilize AI for research paper writing and content generation.

1. **Prompt Engineering with ChatGPT, Claude, and DeepSeek**: Use ChatGPT, Claude, and DeepSeek-Chat/Coder to explore prompt styles for summarization, transformation, few-shot examples, and chain-of-thought reasoning.
2. **No-Code Web App with GenAI using Glide or GitHub Copilot or Cursor or Replit**: Build a functional web app that uses GenAI to generate content (e.g., writing assistant, idea generator, Q&A bot) using no-code tools.
3. **No-Code Mobile App with Replit + GenAI SDK / Kodular + DeepSeek API**: Build a simple mobile app that uses DeepSeek's language model API to assist users (e.g., daily journal, mood tracker, study helper) using platforms like Replit or Kodular.
4. **Digital Art Generation with Stable Diffusion, Leonardo AI, and Canva Magic Design**: Generate images and digital art using **Stable Diffusion** or **Leonardo AI** with detailed prompts. Use Canva's AI-powered Magic Design for content visualization.
5. **Multimodal Prompting with GPT-4V, Gemini, and DeepSeek-Vision**: Use Gemini and DeepSeek-Vision for image+text or image+audio prompting. Perform tasks like image captioning, scene understanding, and audio transcription + summarization.
6. **AI Blog, News, and Marketing Content Generation using Jasper, Copy.ai, or DeepSeek-Text**: Use Jasper or DeepSeek to write structured

content (headlines, blogs, newsletters, SEO snippets) with iterative prompt refinements.

7. **Research Writing and Assistance using SciSpace, Elicit, and ChatGPT**: Use **SciSpace** to find and summarize papers. Use **Elicit** for generating related work and ChatGPT/DeepSeek to refine abstracts and suggest research questions.
8. **Building a GenAI-Powered Chatbot with LangChain and RAG**: Implement a retrieval-augmented generation (RAG) bot using LangChain, DeepSeek API, and a vector store like FAISS or ChromaDB. Example: Resume Builder or Policy Explainer.
9. **Voice-to-Text and Summarization using Whisper / DeepSeek Speech**: Record audio and convert it to text using **OpenAI Whisper** or DeepSeek-Speech. Summarize and extract tasks using GPT-4 or DeepSeek-Lite.
10. **Ethical Prompt Testing and Hallucination Detection with OpenAI Moderation + DeepSeek**: Run tests with edge-case prompts across models (DeepSeek, GPT, Claude) and evaluate model bias, hallucination, or unsafe outputs using safety tools.

Learning Resources:

1. Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning*. MIT Press.
2. Rothman, D. (2022). *Transformers for Natural Language Processing* (2nd ed.). Packt Publishing.
3. OpenAI (2023). *GPT-4 Technical Report*. https://openai.com/research/gpt-4
4. OpenAI (2022). *Whisper: Speech Recognition System*. https://openai.com/research/whisper
5. DeepSeek AI (2024). *DeepSeek Model Repository*. https://github.com/deepseek-ai
6. LangChain (2024). *LangChain Documentation*. https://docs.langchain.com
7. Hugging Face (2023). *Stable Diffusion Model Card*. https://huggingface.co/CompVis/stable-diffusion-v1-4
8. Google DeepMind (2024). *Gemini Model Overview*. https://deepmind.google/technologies/gemini
9. Microsoft (2024). *Copilot Documentation*. https://copilot.microsoft.com
10. Jasper AI (2024). *Jasper Resources*. https://www.jasper.ai/resources
11. Copy.ai (2024). *AI Writing Assistant*. https://www.copy.ai
12. Elicit (2024). *AI for Literature Review*. https://elicit.org
13. SciSpace (2024). *Research Paper Writing Tool*. https://typeset.io
14. Glide (2024). *Build No-Code AI-Powered Apps*. https://www.glideapps.com
15. Replit (2024). *Ghostwriter AI Tools*. https://replit.com/ghostwriter
16. Softr (2024). *No-Code Web App Builder*. https://www.softr.io
17. Kodular (2024). *No-Code Android App Builder*. https://www.kodular.io
18. Papers with Code (2024). *Model Benchmarks and Code*. https://paperswithcode.com

IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

BLOCKCHAIN LAB

(Professional Elective-II)

SYLLABUS FOR B.E. VII SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks : 50	Course Code : **U23PE761IT**
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hours

Course Objectives	**Course Outcomes**
The Objectives of the course:	At the end of the course student will be able to:
1. Introduce Hyperledger framework and Ethereum blockchains. 2. Provide hands-on experience in designing, implementing, and testing smart contracts	1. Implement the data structures used blockchain technology. 2. Install and configure blockchain development tools such as Ganache, Truffle, Hardhat, MetaMask, Hyperledger Fabric and Hyperledger Indy 3. Develop smart contracts using Ethereum, Solidity, and Truffle 4. Develop and deploy chain code on a permissioned blockchain network using Hyperledger Fabric 5. Analyse real-world case studies and use cases to identify opportunities and challenges associated with blockchain adoption.

List of Experiments

1. Write a program to create Merkel tree data structure. Explore the structure of a block in blockchain.
2. Installing ganache, truffle, hardhat, metamask.
3. Write a solidity program to find the maximum number from the given number by that user.
4. Write a solidity program to sort the numbers given by that user. Two or three users will be giving numbers.
5. Write a smart contract for a lottery. Whoever wins the lottery will get all the amount given by the remaining people.
6. Write a voting program. The person who deployed the contract can start the voting process, register the candidates, announce the winner and stop the voting process.
7. Create a currency and circulate among the participants.
8. Installing Hyperledger Fabric, Hyperledger Indy.
9. Write a sample chain code for tracking fridge purchase, repair and reselling.
10. Write a sample chain code for car servicing, repairs, etc.
11. Case study on supply chain management.
12. Case study on Ubin, GST, cryptoKitties etc.

Suggested Reading:

1. LEE, WM. "Beginning Ethereum Smart Contracts Programming: With Examples in Python." *Solidity, and JavaScripty, Apress, Singapore* (2019).
2. Gaur, Nitin, et al. Blockchain with Hyperledger fabric: Build decentralized applications using Hyperledger fabric 2. Packt Publishing Ltd, 2020.

Online Resources:

https://onlinecourses.nptel.ac.in/noc22_cs44/preview

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: 2 Hours			

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

EMBEDDED SYSTEMS AND IOT LAB

SYLLABUS FOR B.E VI- SEMESTER

L:T:P (Hrs./week):: 0:0:2	SEE Marks : 50	Course Code : **U23PC621IT**
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The Objectives of the course:	*At the end of the course student will be able to:*
1. Learn Programming and interfacing different peripherals with ARM and 8051 microcontrollers and study VxWorks RTO's 2. Design and develop real time embedded system/IOT applications	1. Write Assembly and embedded C language programs for interfacing various peripherals with ARM/8051 microcontroller. 2. Write programs for interfacing various sensors and actuators with Raspberry Pi/Arduino. 3. Develop IoT applications with Wireless technologies like Bluetooth / Zigbee /LoRa. 4. Design and implement embedded system applications with SOC's. 5. Design real time applications using the Real Time Operating Systems concepts.

1. 8051/ARM programming and Interfacing (Using Keil simulator):
    1. Keil introduction and basic programs
    2. 8051 I/O port programming, Serial Communication programming, Timer programming, Interrupt programming
    3. Interfacing different peripherals to 8051 / ARM
2. Internet of Things:
    1. Interfacing different sensors and actuators with Raspberry Pi board/Arduino UNO
    2. Program to operate LED's using push buttons.
    3. Programs demonstrating communication protocol Bluetooth
    4. Programs demonstrating communication protocol Zigbee/LoRa
    5. programs for Publishing data on to cloud and read data from the cloud using MQTT protocol
    6. Data logs using UHF/WiFi
3. Programs with VxWorks RTO's
    1. multi-Tasking

2. Semaphores
3. Message Queues

4. Experiments with SOC's and EDA (Electronic Design Automation) tool:
    1. Designing, Multiplexer, Counters, finite state machines
    2. Programs demonstrating image processing /speech processing /machine learning

Virtual Lab:

5. To simulate interfacing of basic output components (RGB Led, 7 segments and LCD 16*2) with Arduino: https://iotvirtuallab.github.io/vlab/Experiments/to_simulate_interfacing_of_basic_output_components/index.html

Additional Experiments:

Projects on IoT/SOC's

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: 2Hours			

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

PROJECT SEMINAR

SYLLABUS FOR B.E VII- SEMESTER

L : T : P (Hrs./week): 0:0:2	SEE Marks : --	Course Code:**U23PW719IT**
Credits : 1	CIE Marks : 30	Duration of SEE : --

COURSE OBJECTIVES	COURSE OUTCOMES
The Objectives of the course:	*On completion of the course, students will be able to:*
Actively involve the student in the initial work required to undertake the final year project. It may comprise of: 1. Problem definition and specifications. 2. A broad understanding of the available technologies/ tools to solve a problem of interest. 3. Presentation (Oral and Written) of the project.	1. Review the literature relevant to the problem area /selected domain. 2. Define the problem by analysing existing solutions and prepare a synopsis on identified problem. 3. Identify tools and techniques for solving the problem and Setup the environment for implementation. 4. Communicate the work effectively in both oral and written forms.

Seminar topics may be chosen by the students with advice from the faculty members.

First 4 weeks of VII-Semester will be spent on special lectures by faculty members, research scholar speakers from industries and R&D institutions. The objective of these talks is to be expose students to real life ⁄ practical problems and methodologies to solve them.

A seminar schedule will be prepared by the coordinator for all the students. It should be from the 5th week to the last week of the semester and should be strictly adhered to.

Each student will be required to

1. Submit a one page synopsis of the seminar to be delivered for display on notice board.
2. Give a 20 minutes presentation followed by 10 minutes discussion.
3. Submit a technical write up on the talk delivered.

At least two teachers will be associated with the evaluation of the project seminar for the award of the CIE marks which should be on the basis of performance on all the three items stated above.

In the first Semester the student is expected to complete problem definition, requirements specification and analysis, design.

No. of Internal Reviews:	03	Max. Marks for Internal Reviews:	30

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-23)
B.E. – INFORMATION TECHNOLOGY : EIGHTH SEMESTER (2026 - 2027)

B.E (IT) VIII-SEMESTER									
S No.	**Course Code**	**Course Name**	**Scheme of Instruction**			**Scheme of Examination**			
			Hours per week			**Duration in Hrs**	**Maximum Marks**		**Credits**
			L	**T**	**P/D**		**SEE**	**CIE**	
1	U23PE8XXIT	Professional Elective - III	3	-	-	3	60	40	3
2	U23PE8XXIT	Professional Elective -IV	3	-	-	3	60	40	3
PRACTICALS									
3	U23PW819IT	Project / Internship	-	-	12	Viva-Voce	50	50	6
		Total	**6**	**-**	**12**		**170**	**130**	**12**
		Grand Total	**18**			**-**	**300**		

Professional Elective – III	**Professional Elective – IV**
U23PE810IT : Applications of Artificial Intelligence	U23PE840IT: Data Analytics with Visualization
U23PE820IT: Quantum Technologies	U23PE850IT: Digital Forensics
U23PE830IT: Agile Software Development	U23PE860IT: DevOps

With effect from Academic Year 2026-27 (R23)

VASAVI COLLEGE OF ENGINEERING(Autonomous)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

APPLICATIONS OF ARTIFICIAL INTELLIGENCE
(Professional Elective – III)

Syllabus for B.E VIII-SEMESTER

L:T:P (Hrs.jweek): 3:0:0	SEE Marks : 60	Course Code: **U23PE810IT**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of this course is to provide students with a comprehensive understanding of artificial intelligence applications across domains such as healthcare, finance, smart cities, agricwlture, geospatial intelligence, and emerging areas, while also addressing responsible and ethical AI deployment.	1. Identify suitable real-world problems and tools for AI-based solutions. 2. Apply AI techniques to healthcare and financial use cases. 3. Build AI solutions for smart cities and personalized services. 4. Develop AI models for agriculture and geospatial applications. 5. Understand ethical issues and responsible use of AI in emerging domains.

Unit 1: Introduction to Al Applications
Overview of Al paradigms: rule-based systems, machine learning, deep learning, and reinforcement learning; Identifying Al-suitable problem domains; Al lifecycle and data pipeline; Al success cases across industries; Overview of Al tools and frameworks (Python, TensorFlow, PyTorch).

Unit 2: Healthcare and Financial Al Applications
Al in disease diagnosis and prognosis; Medical imaging and NLP in clinical notes; Personalized medicine and patient risk scoring; Al for health informatics and wearable data; Fraud detection using anomaly detection and

supervised learning; Risk modelling and credit scoring; Portfolio optimization and sentiment-based trading systems;
Explainability in financial and healthcare AI.

Unit 3: Smart City and Personalized AI Applications
Computer vision and deep learning for traffic and surveillance; Sensor fusion for energy and waste management; AI for disaster prediction and emergency response; AI for urban mobility and predictive maintenance; Recommendation systems: collaborative filtering, content-based, and hybrid models; Generative AI for content creation; Conversational agents and virtual assistants (NLP and dialogue systems).

Unit 4: Agricultural & Geospatial AI (GeoAI) Applications
AI for precision agriculture and crop monitoring using drone and satellite imagery; Livestock health monitoring using sensors; Disease and pest detection using image classification; Yield prediction using ML regression models; Terrain feature extraction using convolutional networks; Land use and land cover classification; Geospatial data fusion from multi-modal sources; Forecasting and climate modelling using spatiotemporal models.

Unit 5: Emerging Domains and Responsible AI
AI in education: adaptive learning systems and intelligent tutoring; AI in robotics: perception, planning, and autonomous·coritrol; AI in smart manufacturing and predictive maintenance (Industry 4.0); AI for climate science and sustainability analytics; Fairness, accountability, transparency in AI systems; Mitigating algorithmic bias and ensuring explainability; AI ethics frameworks and global governance (OECD, EU AI Act).

Learning Resources:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson
2. Parashar Shah et al., Artificial Intelligence and Machine Learning for Healthcare, Springer
3. Yves Hilpisch, Artificial Intelligence in Finance, O'Reilly Media
4. Mathias Kraus et al., Machine Learning for Finance, Springer
5. John Soldatos et al., Designing Smart and Resilient Cities with AI, Springer

6. Charu Aggarwal, Recommender Systems: The Textbook, Springer
7. Alan Nichol & Joseph J. D., Conversational Al with Rosa, Packt
8. Lammert Kooistra et al., Al and Big Data in Agriculture, Springer
9. Songnian Li et al., Computational and Statistical Methods for GeoAI, CRC Press
10. D. Jensen & K. R. Kamaraj, Al for Earth and Environmental Sciences, Elsevier
11. Virginia Dignum, Responsible Artificial Intelligence, Springer
12. Markus Wagner (Ed.), Al for a Better Future: An Ecosystem Perspective on the Ethics of Al and Emerging Digital Technologies, Springer
13. A. Ravichandiran, Getting Started with Al Ethics, Packt

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

With effect from Academic Year 2026-27 (R23)

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD - 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

QUANTUM TECHNOLOGIES

(Professional Elective – III)
Syllabus for B.E VIII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code: **U23PE820IT**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
To provide a foundation in quantum technologies covering theory, devices, computing, communication, and AI applications.	1. Explain core principles of quantum mechanics relevant to technology. 2. Compare qubit platforms and quantum hardware systems. 3. Apply quantum algorithms to computing and simulation problems. 4. Explore quantum communication, sensing, and cryptography. 5. Analyse emerging trends in quantum AI and integration.

Unit 1: Fundamentals of Quantum Mechanics for Technology
Classical vs. Quantum Systems, Wave-Particle Duality, Postulates of Quantum Mechanics, Dirac Notation, Superposition and Entanglement, Measurement and No-Cloning Theorem, Density Matrices and Mixed States, Bloch Sphere, Basic Quantum Gates.

Unit 2: Quantum Devices and Qubit Platforms
Superconducting Qubits, Quantum Dots, NV Centres, Photonic Qubits, Fabrication and Control of Quantum Devices, Cryogenics and Readout Systems, Josephson Junctions, Coherence Times, Noise Sources and Error Correction, Hybrid Quantum Systems.

Unit 3: Quantum Computation and Algorithms

Quantum Circuits, Quantum Parallelism, Deutsch-Jozsa, Shor's Algorithm, Grover's Algorithm, Quantum Simulation for Chemistry and Materials, Quantum Optimization (QAOA, VQE}, Quantum Machine Learning (QSVM, QNN}, Quantum Data Encoding Techniques.

Unit 4: Quantum Communication and Sensing

Quantum Key Distribution (BB84, E91), Quantum Repeaters and Networks, Post-Quantum Cryptography, Quantum Sensing Principles (NV Centres, Atomic Clocks), Quantum Metrology (Heisenberg Limit}, Applications in Healthcare, Navigation, and Environmental Monitoring.

Unit 5: Emerging Technologies and Quantum-Enhanced AI

Quantum Deep Learning: QNNs, Quantum Backpropagation, Quantum-Inspired Tensor Networks, Hybrid Quantum-Classical Architectures, Quantum Applications in NLP and Vision, System Integration Challenges, Scalability and Commercial Applications, Responsible Innovation in Quantum Tech.

Learning Resources:

1. **Nielsen** & **Chuang,** Quantum Computation and Quantum Information, Cambridge University Press
2. **Griffiths** & **Schroeter,** Introduction to Quantum Mechanics, Cambridge University Press
3. B. E. Kane et al., Quantum Information Processing with Quantum Dots (various journal reviews)
4. G. Wendin, Quantum Information Processing with Superconducting Circuits, Reports on Progress in Physics Michael',1\:'Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press

5. **Eleanor Rieffel & Wolfgang Polak,** Quantum Computing: A Gentle Introduction, MIT Press
6. **Seth Lloyd,** Programming the Universe, Knopf
7. **Schuld & Petruccione,** Supervised Learning with Quantum Computers, Springer
8. **Maria Schuld & Francesco Petruccione,** Machine Learning with Quantum Computers, Springer
9. **Jacob Biamonte et al.,** Quantum Machine Learning, Nature Reviews
10. **Mohammad H. Amin et al.,** Quantum Solutions for Real-World AI Challenges

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

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

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

AGILE SOFTWARE DEVELOPMENT

(Professional Elective-III)

SYLLABUS FOR B.E VIII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code: **U23PE830IT**
Credits : 3	CIE Marks : 40	Duration of SEE: 3 Hrs

Course Objectives	**Course Outcomes**
The Objectives of the course:	At the end of the course student will be able to:
Introduce Agile development methodologies and its practical application to today's software development in delivering the high-quality products /services.	1. Understand Agile Software Development practices and work small teams to create high-quality software. 2. Apply the concepts of Agile scrum process. 3. Apply the concepts of Extreme Programming. 4. Apply the Agile project planning Techniques. 5. Analysing the Agile project progress.

UNIT I

Fundamentals of Agile Process: Introduction and background, Understanding Agile Values - Agile Manifesto, Agile Principles, Overview of Agile Development Models: Scrum, Extreme Programming, Feature Driven Development, Crystal, Kanban, and Lean Software Development.

UNIT II

Introduction to Scrum: Agile Scrum Framework, Scrum Artifacts, Meetings, Activities and Roles, Scrum Team Simulation, Scrum Planning Principles Scrum and self-organizing teams, Scrum Planning and Collective commitment.

Unit-III: Introduction to Extreme Programming (XP)- XP Lifecycle, The XP Team, XP Concepts: Refactoring, Technical Debt, Timeboxing, Stories, Velocity, XP and embracing change, XP Simplicity, and Incremental design.

Unit-IV: Agile Approach to Project Planning - Estimation: Estimating Size with story points, Estimate with Ideal Days, Techniques for estimating, Re-estimating, choosing between stories point and Ideal Days. Planning: Planning for Value – Prioritizing themes, financial prioritization, prioritizing desirability. Splitting user stories.

Unit-V: Agile Scheduling, Tracking and Communicating – Release Planning, Iteration Planning, Estimating Velocity, Monitoring the Release plan, Iteration plan, Communication about plans. Metrics in Agile Projects.

Learning Resources:

Prescribed books:

1. Learning Agile Understanding Scrum, XP,Lean and Kanban – Andrew Stellman and Jennifer Greene. O'reilly. Fourth Indian Reprint Aug 2019, Shroff publishers
2. Cohn, Mike, Agile Estimating and Planning, Pearson Education, 2006.
3. Agile Project Management with Azure DevOps Concepts, Templates and metrics - Joachim Rossberg, Apress, reprint year 2023.

Reference Books:

1. Robert C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall,2013.
2. James Shore and Shane Warden, The Art of Agile Development, O'Reilly Media, 2007.
3. Cohn, Mike, User Stories Applied: For Agile Software Development Addison Wisley, 2004.
4. David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
5. Hazza and Dubinsky, —Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING(Autonomous)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

DATA ANALYTICS WITH VISUALIZATION

(Professional Elective-IV)
SYLLABUS FOR B.E VIII-SEMESTER

L:T:P (Hrs./week):3:0:0	SEE Marks :60	Course Code : **U23PE840IT**
Credits : 3	CIE Marks: 40	Duration of SEE :3 Hrs

Course Objectives	**Course Outcomes**
The Objectives of the course:	**At the end of the course student will be able to:**
1. Introduce the fundamental concepts in Data analytics, visualization and exploration. 2. Find insights from data using R & Python programming.	1. Understand the basics of data, analysis and visualization for data driven decision making. 2. Apply R & Python libraries for data collection, cleaning, and pre-processing. 3. Apply R & Python libraries for visualization to infer insights. 4. Apply exploratory data analysis tools to check assumptions, hypothesis, trends in data. 5. Develop effective data storytelling using visualization techniques for driving change in business scenarios.

UNIT–I

Data Definitions: Elements, Variables, and Data categorization, NOIR classification, Levels of Measurement, Data analytics.

Analytics with Data visualization: introduction, exploration, explanation, insight visualization, insight to action, Data driven decision making, Data story telling – Psychology, anatomy, narrative, visuals structure.

UNIT-II

Introduction to R: Install R studio, R markdown, data structures: Vector, list, matrix, data frame, factors.

Data import/export: read/write csv files, excel files, loading datasets.

Descriptive stats: Central tendency, dispersion measurements.

Data Pre-processing: Tabularizing, cleaning, imputation, scaling, normalizing, selection, filtering, sort, aggregate, joining with Tidyverse, dplyr R libraries, Pandas Python library.

UNIT – III

Visualizations in R: Intro to ggplot2, Basic visualization – Histogram, Bar / Line Chart, Box plot, Scatter plot. Advanced Visualization: Heat Map, Mosaic Map, Map Visualization, 3D Graphs, Correlogram.

Visualization using Seaborn: – Histogram, Bar / Line Chart, Box plot, Scatter plot, Heat Map, 3D Graphs.

UNIT-IV

Hypothesis testing: z-test, t-test, Chi-square test.

Exploratory Data Analysis: univariate, bivariate, multivariate analysis using descriptive and visualization to check assumptions, hypothesis, anomalies and discover trends and patterns in the data.

Interactive Dashboards: Interactive dash boards with shiny library. Intro to Tableau, PowerBI.

UNIT-V

Business case studies: in health, finance, transport, food, and supply chain: Understanding business scenarios, Feature engineering and visualization, creating your own data story, exploration, insight to action, driving change.

Learning Resources :

1. Effective Data Storytelling: How to Drive Change with Data, Narrative, and Visuals by Brent Dykes.
2. The Big Book of Dashboards. Visualize Your Data Using Real-World Business Scenarios by Steve Wexler, Jeffrey Shaffer, and Andy Cotgreave.
3. Data visualizations in R
4. Comprehensive Guide to Data Visualization in R
5. https://www.datacamp.com/
6. https://seaborn.pydata.org/
7. https://www.r-project.org/
8. https://www.ibm.com/in-en/cloud/learn/exploratory-data-analysis

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

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

DIGITAL FORENSICS

(Professional Elective – IV)
Syllabus for B.E VIII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code: **U23PE850IT**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. To understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices. 2. To understand how to examine digital evidences such as the data acquisition, identification analysis.	1. Know how to apply forensic analysis tools to recover important evidence for identifying computer crime. 2. To be well-trained as next-generation computer crime investigators.

Unit -I

Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.

Unit- II

Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

Unit-III

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

Unit-IV

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

Unit-V

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

Outcomes

Text Books:

1. Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.

Reference Books:

- Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

DevOps

Syllabus for B.E VIII-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code: **U23PE860IT**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of this course is to provide foundational understanding in DevOps principles, tools, and practices for continuous integration, delivery, deployment, infrastructure automation, and monitoring in modern software development and operations environments.	1. Explain the principles, practices, and cultural foundations of DevOps and its evolution from traditional models 2. Implement version control workflows and CI pipelines using modern tools for automated builds and testing 3. Apply Infrastructure as Code and configuration management to automate and manage scalable infrastructure 4. Design deployment strategies and implement monitoring and logging solutions using container orchestration 5. Develop and deploy secure, cloud-native DevOps solutions using platform-specific tools and best practices

Unit 1: Introduction to DevOps
Evolution of software development and operations; DevOps principles, culture, and goals; Agile, Lean, and ITIL influences; The Three Ways: Flow, Feedback, Continuous Learning; Value stream mapping and bottleneck analysis; DevOps roles and responsibilities

Unit 2: Version Control, Continuous Integration, and Build Automation
Git fundamentals and branching strategies; Continuous Integration (Cl) concepts; Cl tools: Jenkins, GitLab Cl, GitHub Actions; Build tools: Maven, Gradle, NPM; Code quality and testing (unit testing, static analysis); Artifact repositories: JFrog Artifactory, Nexus

Unit 3: Infrastructure as Code and Configuration Management
Infrastructure as Code (laC) concepts; laC tools: Terraform, AWS CloudFormation; Configuration management: Ansible, Chef, Puppet; Immutable infrastructure and declarative provisioning; Managing secrets and environment variables

Unit 4: Continuous Deployment, Monitoring, and Logging
Continuous Delivery vs Continuous Deployment; Deployment strategies: Blue-Green, Canary, Rolling; Containers and orchestration: Docker, Kubernetes; Monitoring tools: Prometheus, Grafana; Logging stack: Elasticsearch, Logstash, Kibana (ELK); Site Reliability Engineering: Slls, SLOs, SLAs

Unit 5: DevOps on the Cloud and Security
DevOps on AWS, Azure, GCP; Cloud-native DevOps tools: CodePipeline, Azure DevOps, Cloud Build; Serverless computing: AWS Lambda, Azure Functions; DevSecOps practices and policy-as-code; Security, compliance, and cost optimization; Capstone project: End-to-end DevOps pipeline on cloud

Learning Resources:

1. The Phoenix Project by Gene Kim et al.
2. The DevOps Handbook by Gene Kim, Jez Humble, Patrick Debois, and John Willis
3. Sile Reliability Engineering by Google (Betsy Beyer et al.)
4. Accelerate by Nicole Forsgren et al.
5. Online curriculum from **Linux Foundation, AWS DevOps,** and **Microsoft Learn**

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

PROJECT / INTERNSHIP

SYLLABUS FOR B.E VIII-SEMESTER

L:T:P (Hrs./week): 0:0:12	SEE Marks : 50	Course Code: **U23PW819IT**
Credits : 6	CIE Marks : 50	Duration of SEE: VIVA-VOCE

Course Objectives	**Course Outcomes**
The Objectives of the course:	*On completion of the course, students will be able to*
Analyze, Design and implement a system for the identified problem.	1. Apply practical knowledge within the chosen technology for project development. 2. Identify, analyze, design, formulate solution for complex engineering and societal problems with a comprehensive and systematic approach. 3. Apply modern tools and techniques for solving the real-time problems. 4. Develop project management skills effectively as a team or as an individual maintaining ethical values. 5. Demonstrate various stages of project through proper documentation and presentation.

Focus of U.G. Project should be on *Solving a Real Life Problem*.

Faculty members should prepare project briefs well in advance. They should be made available to the students at the departmental library.

A project may be classified as hardware/software/modeling/simulation. It should involve elements of such as analysis, design, coding, testing, etc.,

The department will appoint a project coordinator who will be incharge of the following:

- Grouping of students (a maximum of three in a group)
- Allotment of projects and project guides
- Project monitoring at regular intervals

Project allotments is to be completed by the 4th week of 1st Semester of IV years to that students
get sufficient time for completion of their projects.

All projects are to be based on the grade/marks, awarded by a monitoring committee comprising of faculty members as well as by the supervisor.
Efforts are to be made so that some of the projects are carried out in industries. Projects may also be invited from industries.
Norms for final documentation of the project report are to be provided by the department.
* Excellent / Very Good / Good / Satisfactory / Unsatisfactory.
Note: Three periods of contact load will be assigned to each project guide.

No. of Internal Reviews:	2	Max. Marks for Internal Reviews:	50