GIRIJANANDACHOWDHURYUNIVERSITY
Hatkhowapara, Azara, Guwahati - 781017, Assam

Department of Computer Science and Engineering

Course Structure and syllabus of B.Tech CSE 6th Semester

Sl. No	Course Code	Course Name	Hours per week			Credit
			L	T	P	C
1.	BCS23221T	Theory of Computation	3	1	0	4
2.	BCS23222T	Computer Networks	3	0	0	3
3.	BCS23222P	Computer Networks Lab	0	0	2	1
4.	BCS23223T	Cryptography & Data Security	3	0	0	3
5.	BCS23223P	Cryptography & Data Security Lab	0	0	2	1
6.	BCS23224T	Microprocessor	3	0	0	3
7.	DSE23220T	Image Processing	3	0	0	3
8.	DSE23221T	Speech & Natural Language Processing	3	0	0	3
9.	BCM25102T	Accountancy	2	0	0	2
10.	DCS23201R	Mini Project	0	0	6	3
TOTAL CREDIT			**20**	**1**	**10**	**23**

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BCS23221T	**THEORY OF COMPUTATION**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

Pre-requisite: Discrete Mathematics

Course Objectives: After completing this course, students will be able to:

1. Define and differentiate between various types of formal languages, including regular languages, context-free languages, and context-sensitive languages.
2. Demonstrate an in-depth understanding of different automata models, such as finite automata, pushdown automata, and Turing machines, and analyze their computational capabilities.
3. Apply automata theory to design and analyze algorithms for language recognition, parsing, and other computational tasks.

Course Outcome:

CO1: Design automata and regular expressions to accept a certain word or generate a certain language. − **CREATE**
CO2: Construct context-free grammar and language and their different forms. − **APPLY**
CO3: Create push down automata as acceptors of context free languages. − **CREATE**
CO4: Develop Turing machines performing simple tasks. − **CREATE**

MODULE 1	**10 hours**

Introduction to the concept of Automata, Basics of Strings and Alphabets, Deterministic finite automata (DFA), Transition graphs, Problem solving using various DFAs, Solving various numerical problems on DFAs, Non-deterministic FA, Equivalence of DFA and NDFA, Minimization of finite automata, Mealy and Moore machines

MODULE 2	**6 hours**

Regular grammars & regular expressions, Solving various numerical problems on regular expressions, Equivalence between regular languages, properties of regular languages, Pumping lemma of regular sets, Using different examples prove whether a language is regular or not

MODULE 3	**12 hours**

Concept of context free grammar (CFG), it's importance, Derivation trees and sentential forms, Leftmost and rightmost derivation of strings, Constructing CFG for different languages, Constructing context-free languages for different grammars, Problem solving on different numerical questions on CFG & CFL, Ambiguity in context free grammars.

MODULE 4	**8 hours**

Push down automata (PDA), model definition and basic concepts, Acceptance of CFL by final state and acceptance by empty state and its equivalence, Solving different problems to show whether a language is accepted by PDA, Designing PDA for different languages and solving different problems.

MODULE 5	**9 hours**
Turing Machine (TM), definition, Model, design of TM, Designing TMs for different languages, Solving different problems to show whether a language is accepted by TM, Recursively enumerable languages Church's hypothesis, counter machine, Types of Turing machines, Decidability of problems, Universal Turing Machine	
Total Lecture hours	**45 hours**

Text Book

1. Mishra & Chandrasekharan, Theory of computer science: Automata language and computation, Prentice Hall of India, 3rd Ed, 2007.

2. P. Linz, Introduction to Formal Language and Computation, Narosa, 2nd Edition, 2006.

3. Nasir & Sirmani, A Text Book on Automata Theory, Cambridge University Press, 2008.

4. H. R. Lewis & C. H. Papadimitriou, Elements of the Theory of Computation, Prentice Hall of India, 2nd Edition, 2006.

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BCS23222T	**COMPUTER NETWORKS**	L	T	P	C
		3	0	0	3

Pre-requisite: Basics of Data Communication

Course Objectives:

After completing this course, the student will be able to:

1. **Introduce** the basic concepts of computer networks, network architectures, reference models (OSI and TCP/IP), and common networking terminology used in Internet-based systems.
2. **Explain** the principles of data transmission, including physical media, signal encoding, switching techniques, network topologies, and data link layer protocols for reliable communication.
3. **Develop understanding of** network layer and transport layer functionalities such as routing algorithms, IP addressing schemes, subnetting, congestion control, and transport protocols (TCP and UDP).
4. **Familiarize** students with application layer protocols and services such as HTTP, DNS, e-mail, peer-to-peer systems, and multimedia streaming over best-effort IP networks.

Course Outcome:

After successful completion of the course, the students will learn

CO1 (Understand – Bloom's Level: L2): Explain the fundamental concepts of computer networks, including network types, reference models (OSI and TCP/IP), and basic networking terminology.

CO2 (Apply – Bloom's Level: L3): Apply concepts of the Physical and Data Link layers to analyze transmission media, encoding techniques, error detection and correction methods, and multiple access protocols.

CO3 (Analyze – Bloom's Level: L4): Analyze network layer and transport layer mechanisms such as routing algorithms, IP addressing and subnetting, congestion control, and transport protocols (TCP and UDP).

CO4 (Evaluate – Bloom's Level: L5): Evaluate application layer protocols and services, including HTTP, DNS, e-mail, and peer-to-peer applications, and assess challenges in multimedia streaming over IP networks.

Module 1: Introduction	4 Hours

Network, Uses of Networks, Types of Networks, Reference Models: TCP/IP Model, The OSI Model. Understand basic terminology like browser, web server, URL, domain name.

Module 2: Physical Layer	7 Hours
Guided transmission media, Wireless transmission media, Switching techniques, Network topologies, Network devices. Signal Transmission and Encoding, Network Performance and Devices.	
Module 3: Data Link Layer	10 Hours
Design issues, Error Detection & Correction, Elementary Data Link Layer Protocols, Sliding window protocols Multiple Access Protocols - ALOHA, CSMA,CSMA/CD, CSMA/CA, Collision free protocols.	
Module 4: Network Layer	10 Hours
Network Layer Design issues, store and forward packet switching, connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinity Problem, Link State Routing, Path Vector Routing, Hierarchical Routing; Congestion control algorithms, IP addresses, CIDR, Sub netting, Supernetting, IPv4, Packet Fragmentation, IPv6 Protocol, Transition from IPv4 to IPv6, ARP, RARP.	
Module 5: Transport Layer	8 Hours
Services provided to the upper layers elements of transport protocol addressing connection establishment, Connection release, Error Control & Flow Control, Crash Recovery. The Internet Transport Protocols: UDP, Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Sliding Window, The TCP Congestion Control Algorithm.	
Module 6: Applications layer	6 Hours
Applications layer paradigms: Client server model, HTTP, E-mail, WWW, TELNET, DNS, Peer-to-peer applications. P2P file distribution. Audio and video streaming. Challenges of streaming over best effort IP.	
Total Lecture hours	45 Hours

Text Book

1. Computer Networks - Andrew S Tanenbaum, Pearson Education.
2. Data Communications and Networking - Behrouz A. Forouzan

Reference Books

1. J.F. Kurose and K.F. Ross, Computer networking: a top-down approach.
2. 2. Bhavneet Sidhu, An Integrated Approach to Computer Networks, Khanna Publishing House, 2021.

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BCS23222P	**COMPUTER NETWORKS LAB**	L	T	P	C
		0	0	2	1

Pre-requisite: Basics of Data Communication

Course Objectives:

The objectives of this course are to:

1. **Provide hands-on experience** with networking devices, cabling techniques, and network topology design using simulation tools.
2. **Enable students to implement and test** data link layer protocols, including error detection and correction methods, sliding window protocols, and multiple access techniques.
3. **Develop practical understanding** of network layer operations such as routing algorithms, IP addressing, subnetting, and address resolution protocols through simulations and packet analysis.
4. **Expose students to transport and application layer protocols** by analyzing TCP/UDP behavior, congestion control mechanisms, and implementing basic client–server communication using socket programming.

Course Outcome:

After successful completion of the course, the students will learn

CO1 (Apply – Bloom's Level: L3): Apply fundamental networking concepts to identify network devices, prepare UTP cables, and design basic network topologies using simulation tools.

CO2 (Apply – Bloom's Level: L3): Implement data link layer protocols and mechanisms such as error detection and correction techniques, sliding window protocols, and multiple access protocols.

CO3 (Analyze – Bloom's Level: L4): Analyze network layer functionalities including routing algorithms, IP addressing, subnetting, and address resolution protocols using simulation and packet analysis tools.

CO4 (Analyze / Evaluate – Bloom's Level: L4–L5): Analyze and evaluate transport and application layer protocols by examining TCP/UDP behavior, congestion control mechanisms, and implementing client–server communication using sockets.

Module 1: Network Fundamentals & Physical Layer

1. **Study of Networking Devices and Cables**
   - Identification and working of Hub, Switch, Router, Modem
   - UTP cable preparation (straight-through & crossover)

Question: Study the working principles of networking devices such as **Hub, Switch, Router, and Modem**. Prepare **straight-through and crossover UTP cables**, test their connectivity, and record the observations.

2. **Network Topologies using Simulation Tools**
   - Star, Bus, Ring, Mesh topology using Packet Tracer / NS2 / NS3

Question: Design and simulate **Star, Bus, Ring, and Mesh topologies** using **Packet Tracer / NS2 / NS3**. Analyze the advantages, limitations, and performance of each topology.

3. **Transmission Media and Signal Encoding**
   - Study and simulation of guided and unguided media
   - Digital encoding techniques (NRZ, Manchester, etc.)

Question: Study guided and unguided transmission media. Simulate **digital signal encoding techniques** such as **NRZ and Manchester encoding**, and compare their characteristics.

Module 2: Data Link Layer

4. **Error Detection and Correction Techniques**
   - Implementation of Parity Check, Checksum, CRC, Hamming Code

Question: Implement **Parity Check, Checksum, CRC, and Hamming Code** techniques for error detection and correction. Analyze their effectiveness in detecting transmission errors.

5. **Sliding Window Protocol Simulation**
   - Stop-and-Wait ARQ
   - Go-Back-N ARQ / Selective Repeat ARQ

Question: Simulate **Stop-and-Wait ARQ**, **Go-Back-N ARQ**, and **Selective Repeat ARQ** protocols. Compare their efficiency in terms of throughput and reliability.

6. **Multiple Access Protocols Simulation**
   - ALOHA, Slotted ALOHA
   - CSMA, CSMA/CD, CSMA/CA

Question: Simulate **Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, and CSMA/CA** protocols and analyze their collision handling and channel utilization.

Module 3: Network Layer

7. **Routing Algorithms Implementation**
    - Shortest Path Algorithm (Dijkstra's)
    - Distance Vector Routing Algorithm
    - Link State Routing Algorithm

Question: Implement and analyze **Dijkstra's shortest path algorithm**, **Distance Vector routing**, and **Link State routing** algorithms for packet routing in a network.

8. **IP Addressing and Subnetting**
    - Classful and Classless addressing
    - CIDR and subnet calculations
    - Supernetting problems

Question: Perform **Classful and Classless IP addressing**, **CIDR-based subnetting**, and **supernetting** for a given network scenario and verify the results.

9. **ARP and RARP Protocol Study:** ARP request and reply analysis using packet analyzer (Wireshark)

Question: Capture and analyze **ARP request and reply messages** using **Wireshark**. Study the role of ARP and RARP in IP-to-MAC address resolution.

Module 4: Transport Layer

10. **UDP and TCP Protocol Analysis**

- Study TCP segment and UDP datagram
- Connection establishment and termination (3-way & 4-way handshake)

Question: Analyze **TCP and UDP protocol behavior** by capturing packets using **Wireshark**. Study **TCP 3-way handshake** and **4-way connection termination**.

Module 5: Application Layer

11. **Client–Server Communication using Sockets**

- TCP client-server program
- UDP client-server program

Question: Develop and execute **TCP and UDP client–server programs** using socket programming and analyze data transmission between client and server.

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Course Code	Cryptography and Data Security	L	T	P	C
BCS23223T		3	0	0	3

Pre-requisite:
Strong foundation in Computer Science, Programming Skills, Networking knowledge and Operating System concepts.

Course Objective:

1. Introduce the fundamental principles of cryptography and secure communication
2. Provide in-depth knowledge of symmetric and asymmetric cryptographic algorithms
3. Explain hashing, digital signatures, and public key infrastructure
4. Develop understanding of data security threats and access control mechanisms
5. Familiarize learners with data protection techniques, privacy, and compliance requirements

Course Outcome:

After completion of this course Students will be able to -

1. Explain fundamental concepts and security services of cryptography
2. Apply symmetric key cryptographic algorithms for secure data protection.
3. Make use of asymmetric key cryptography, hashing, and digital signatures to provide secure, authenticated communication
4. Apply Data protection techniques to safeguard sensitive information from damage, loss, theft, and understand legal & ethical issues in data security

Module-1. Introduction	**8 Hours**

Security Goals, Security services: confidentiality, integrity, authentication, non-repudiation, types of security attacks (passive and active attacks), Basic cryptographic concepts: plaintext, ciphertext, encryption, decryption, keys.

Module-2. Symmetric Key Cryptography	**10 Hours**

Classical and Modern Encryption, Data Encryption Standard, The Strength of DES, Triple DES, Advanced Encryption Standard, Principles of Pseudorandom number generation, Key distribution and key management issues.

Module-3. Public Key Cryptography	**10 Hours**

Public Key Infrastructure - Mathematics of Asymmetric Key Cryptography, Encryption, Principles of Public Key Cryptosystems, Key Exchange, Message Integrity and Message Authentication, Cryptographic Hashing & Digital Signature, Public Key Distribution.

Module-4. Data Security Fundamentals	**10 Hours**
Data security concepts; data states including data at rest, data in transit, and data in use; authentication and authorization mechanisms; Role-Based Access Control (RBAC) and Attribute-Based Access Control (ABAC); data security threats including data breaches, insider threats, malware, and ransomware; data security architecture.	
Module-5. Data Protection, Privacy, and Compliance	**10 Hours**
Data protection techniques including encryption, data masking, anonymization, and tokenization; Data Loss Prevention (DLP); backup and recovery strategies; secure data storage; data privacy principles; legal and regulatory frameworks including GDPR and provisions of the Indian IT Act; ethical issues in data security.	

Text / Reference Books:

1) Stallings, Cryptography & Network Security - Principles & Practice, Prentice Hall.
2) Debdeep Mukhopadhyay, Behrouz A Forouzan, Cryptography and Network Security, 3rd Edition, McGraw Hill.
3) Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sunit Belapur and Nina Godbole, Wiley India Pvt. Ltd.
4) Michael E. Whitman & Herbert J. Mattord – *Principles of Information Security*
5) Ravi Sandhu & Latifur Khan – Handbook of Data Security

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Course Code	Cryptography and Data Security Lab	L	T	P	C
BCS23223P		0	0	2	1

List of Experiments – Cryptography and Data Security Lab [Using C Language]

1. Implementation of Caesar cipher.
2. Perform a Brute force attack on a given Ciphertext. You can assume that the cipher text is encrypted using CAESER Cipher algorithm
3. Construct a Playfair Matrix with a given key (Suppose the Key is - OCCURRENCE). Make a reasonable assumption about how to treat redundant letters in the key.
4. Implementation of transposition ciphers.
5. Implement S-Box substitution of DES. Make Necessary assumptions for S-Box table.
6. Implementation on - Mathematics on public key cryptography (Euler's Totient Function / Fermat's Theorem etc.).
7. Generate public and private key using RSA algorithm. Also implement encryption and Decryption for a given plain text using the keys.
8. Implementation of Diffie–Hellman key exchange.
9. Implementation of cryptographic hash functions (MD5, SHA-1, SHA-2).
10. Implementation of digital signature generation and verification.
11. Implementation of authentication and access control mechanisms.

Teaching Cryptography Lab using the C language enables students to understand cryptographic algorithms at the implementation level, ensures industry relevance, improves performance awareness, and strengthens core computer science and security fundamentals.

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BCS23224T	**MICROPROCESSOR**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-requisite: Digital Logic Design, Computer Organization Fundamentals, Programming Fundamentals

Course Objectives: After completing this course, students will be able to:

1.Explain the architecture, register organization, and evolution of the 8086 microprocessor and compare RISC and CISC processors.
2.Apply addressing modes, instruction sets, and assembler directives to develop assembly language programs using 8086.
3.Analyze system bus structure, timing, and system design concepts of 8086-based microprocessor systems.
4.Demonstrate the interfacing of memory, I/O, interrupts, and programmable peripheral devices in microprocessor-based systems.

Course Outcome:

CO1: Describe the architecture, register organization, and functional operation of the 8086 microprocessor and differentiate between RISC and CISC architectures.
CO2: Develop and execute assembly language programs using various addressing modes, stacks, procedures, and string manipulation instructions.
CO3: Analyze the system bus structure, timing diagrams, I/O programming, and multiprocessor configurations of the 8086 microprocessors.
CO4: Design and implement memory and peripheral interfacing, interrupt handling, serial communication, and DMA operations using programmable devices.

MODULE 1	**12hours**

Introduction to 8086 microprocessor, Microprocessor architecture, Salient features of advanced microprocessors, RISC & CISC processors. Review and evolution of advanced microprocessors:8086,8088, 80186/286/386/486/Pentium, Register organization of 8086 , Addressing modes, Instruction set and assembler directives.

Module 2	**12hours**

Assembly language programming, Stacks, Procedures, Byte and String Manipulation,8086 System Bus Structure, Basic configurations, System bus timing, System design using 8086, IO programming, Introduction to Multi-programming, System Bus Structure, Multiprocessor configurations.

Module 3	**12hours**
Introduction to the various interfacing chips like 8155, 8255, Interfacing with Key board, LED, Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine, Serial Communication Standards, Serial Data Transfer Schemes, 8251 USART Architecture and Interfacing.	
Module 4	**9hours**
General purposes programmable peripheral devices (8253), 8254 programmable interval timer, 8259A programmable interrupt controller & 8257 DMA controller, USART, serial I/O & data Communication.	
Total Lecture hours	**45hours**

Text Book

1. Microprocessor Architecture, Programming, and Applications with the 8085 by R.S. Gaonkar

2. Microprocessor and Interfacing – D.V.Hall, McGraw Hill.

3. The Intel microprocessor - Barry B. Brey, Pearson

Reference Books

1. The 8086 & 8088 Microprocessor- LIU and Gibson, Tata McGraw Hill

2.Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007

3. Advance microprocessor and peripheral –A.K. Ray and K. M. Bhurchandi, Tata Mcgraw Hill

4. Micro Computer System 8086/8088 Family Architecture, Programming and Design - Liu and GA Gibson, PHI, 2nd Ed

5. Advanced Microprocessors" – A.K. Gautam

6. "Microprocessor Architecture: Programming and Applications with the 8085/8080A" – R.S. Gaonkar

7. "Microprocessors and Microcontrollers" – Krishna Kant

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DSE23220T	**IMAGE PROCESSING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisite: Basic knowledge of Mathematics/ Statistics

Course Objectives:

The objectives of this course are to enable students to:

1. Explain key concept behind the fundamentals of digital images and visual perception.
2. Comprehend on the analysis of image enhancement, restoration, and compression techniques.
3. To develop skills in image segmentation, feature extraction, and pattern recognition.
4. To apply image processing methods in real-world applications like medical, industrial, and satellite imaging.

Course Outcome:

Learning Outcomes Aligned with Bloom's Taxonomy, this course is designed to measure student outcomes at various cognitive levels. Upon successful completion, students will be able to:

Outcome 1: Explain the fundamentals of digital image representation, visual perception, and basic image processing operations. (Understand level).

Outcome 2: Apply various image enhancement and restoration techniques to improve image quality using mathematical models.

Outcome 3: Analyze different image segmentation and feature extraction methods for object detection and recognition.

Outcome 4: Evaluate image processing algorithms for performance and suitability in real-world applications such as medical, satellite, and surveillance systems by utilizing appropriate image processing tools.

Outcome 5: Design and implement a small application of digital image processing by choosing any real life problems like medicine, forensics, remote sensing , communications etc. with programming skill using Software like Python etc.

MODULE 1:Introduction	**5 Hours**

Light, brightness adaptation and discrimination, pixels, coordinate conventions, Imaging geometry, perspective projection, Sampling and quantization.

MODULE 2:Spatial Domain Filtering	**8 Hours**
Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian	
MODULE 3:Filtering in the Frequency Domain	**7 Hours**
Fourier Transforms and properties, FFT, Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering	
MODULE 4: Image Segmentation	7 hours
Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm	
MODULE 5:Image Restoration	**5 Hours**
Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections	
MODULE 6:**Image Compression**	7 hours
Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an informationsource, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, DCT implementation using FFT, Run length coding, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG,Lossless predictive coding, Lossy predictive coding, Motion Compensation.	
MODULE 7: Wavelet based Image Compression	3 hours
Expansion of functions, Multi-resolution analysis, Scaling functions, Wavelet series expansion, Discrete Wavelet Transform (DWT),Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking	
MODULE 8: Morphological Image Processing	3 hours
Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion	
Case Studies	3 hours
Different case studies on applications of Image Processing	
Total hours	**48 hours**
Text Book	

1.	Digital Image Processing by Rafael C Gonzalez &Richard E Woods, 3rd Edition
2.	Fundamentals of Digital Image Processing by Anil K Jain
Reference Books	
1.	Digital Image Processing by William K Pratt

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DSE23221T	Speech And Natural Language Processing	L	T	P	C
		3	0	0	3

Prerequisite: Machine Learning

Course Objectives:

Students will be able to–

1. Introduce fundamental concepts of speech processing and NLP.
2. Develop understanding of text and speech analysis techniques.
3. Familiarize students with statistical and machine learning approaches for language processing.
4. Enable students to design basic speech and NLP applications.

Course Outcome:

At the end of successful completion of the course, students will be able to :

CO1: Explain fundamentals of speech signals and language structure.

CO2: Apply text preprocessing and linguistic analysis techniques.

CO3: Implement statistical models for NLP tasks.

CO4: Analyze speech recognition and synthesis systems.

CO5: Design simple NLP-based applications.

Module:1	**8 Hours**

Overview of Speech and Natural Language Processing; Phases in speech and natural language processing, applications, Challenges in Speech and Language Understanding, Levels of Linguistic Analysis.

Module:2	**10 Hours**

Introduction to corpus, elements in balanced corpus, TreeBank, PropBank, WordNet, VerbNet etc. Resource management with XML, Management of linguistic data with the help of GATE, NLTK.

Module:3	**10 Hours**

Text Processing, Tokenization, Normalization, Stemming, Lemmatization, Stop-word

Removal, Part-of-Speech Tagging, Syntax and Parsing, Named Entity Recognition.	
Module:4	**10 Hours**
N-gram Language Models, Hidden Markov Models (HMM), Naïve Bayes Classifier Machine Learning Approaches, Word Embeddings: Word2Vec, GloVe, Deep Learning Techniques.	
Module:5	**8 Hours**
Automatic Speech Recognition (ASR), Text-to-Speech (TTS) Systems, Machine Translation Sentiment, Analysis, Question Answering, Systems Chatbots and Virtual Assistants.	
Total Lecture hours	**46 hours**

Text Book	
1	Daniel Jurafsky and James H. Martin. Speech and Language Processing, 2e, Pearson Education, 2009.
2	Christopher D. Manning and Hinrich Schütze, Foundations of Statistical Natural Language Processing. MIT Press, 1999.
Reference Books	
1	James Allen, Natural language Understanding 2e, Pearson Education, 1994.
2	Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with Python – Analyzing Text with the Natural Language Toolkit.
3	Bharati A., Sangal R., ChaitanyaV., Natural language processing: a Paninian perspective, PHI, 2000.
4	Siddiqui T., Tiwary U. S., Natural language processing and Information retrieval, OUP, 2008.
5	Bing Liu. Sentiment Analysis and Opinion Mining, Morgan & Claypool Publishers
6	Jacob Perkins, Python Text Processing with Nltk 2.0 Cookbook

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BCM25102T	ACCOUNTANCY	L	T	P	C
		2	0	0	2

Course Objectives:

1. Explain basic accounting concepts and apply relevant accounting standards.
2. Demonstrate the process of recording business transactions and preparing financial statements.
3. Explore and evaluate new and emerging practices in the preparation and presentation of final accounts.

Course Outcomes:

After successful completion of the course, the students will be able to:

CO1: Understand the meaning, objectives, and principles of accounting including the double-entry system of bookkeeping.

CO2: Apply the process of journalizing transactions and posting them to the ledger.

CO3: Identify and prepare various types of subsidiary books, including cash books.

CO4: Analyze the trial balance and prepare financial statements including Trading Account, Profit & Loss Account, and Balance Sheet.

CO5: Evaluate and apply methods for calculating depreciation under SLM and WDVM.

Module 1: Theory Base of Accounting	**06 hours**

Meaning of Accounting, Objectives, Advantages of Accounting, Generally Accepted Accounting Principles , Basic accounting concepts, Accounting Standards, Double Entry system of Book Keeping, Golden rules of Debit and Credit

Module 2: Recording of transaction I	**06 hours**

Journal: Definition, advantages, Procedure of Journalising, Ledger: advantages, rules regarding Posting, Balancing of Ledger account

Module 3: Recording of Transaction II	**06 hours**

Name of Subsidiary Books, Cash Book- definition, advantages, objectives, types of Cash Book, preparation of different types of cash books

Module 4: Trial Balance and Financial Statements	**06 hours**

Trial Balance: Definition and preparation of Trial Balance, Final Account: Preparation of

Trading Account, Profit and Loss Account with adjustments, preparation of Balance Sheet	
Module 5: Depreciation Accounting	**06 hours**
Meaning, Causes, Factors, Methods of calculating depreciation under SLM and WDVM.	
Total Lecture hours	**30 hours**
Suggested Readings:	

Text Books:

1. B.B.Dam, R. a. (2012). *Theory and Practice of Accountancy.* Capital Publishing Company.

Reference Books:

1. Grewal, T. (2018). *Accountancy Theory and Practice.* Sultan Chand & Sons Pvt Ltd.
2. Das, A. (2015). *Theory and Practice of Accountancy.* Navyug Publicatins