SCHEME FOR EXAMINATION B.TECH (FOUR YEAR) DEGREE COURSE
COMPUTER SCIENCE AND ENGINEERING
SCHOOL OF STUDIES IN ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA
SEMESTER - VII & VIII [NEP]
W.E.F. SESSION 2025-26

Branch: - Computer Science & Engg. **Year: IV** **Sem: - VII**

S.No	Code no.	Subject	Periods/Week			Evaluation Scheme			Credits
			L	T	P	IA	ESE	Total	
1.	CSUGTT1	Compiler Design	3	0	0	40	60	100	3
2.	CSUGTT2	Cloud Computing	3	1	0	40	60	100	4
3.	CSUGTKX	----------	3	0	0	40	60	100	3
4.	CSUGTKX	----------	3	0	0	40	60	100	3
5.	MOOC Course-I	----------	3	0	0	40	60	100	3
6.	CSUGST1	Seminar on Industrial Training	--	--	--	50	--	50	0
PRACTICAL									
1.	CSUGLT1	Compiler Design Lab	0	0	3	25	25	50	1.5
2.	CSUGLT2	Cloud Computing Lab	0	0	3	25	25	50	1.5
3.	CSUGPV1	Minor Project	0	0	08	50	50	100	4
Total			**15**	**1**	**14**	**350**	**400**	**750**	**23**

Department Electives I&II			
S.No.	**Course Code**	**Subject Name**	**Credits**
1.	CSUGTK1	Network Security	3
2.	CSUGTK2	Wireless Sensor Network	3
3.	CSUGTK3	TCP/IP Internetworking	3
4.	CSUGTK4	Enterprise Resource Management	3
5.	CSUGTK5	Soft Computing	3
6.	CSUGTK6	Data Mining	3
7.	CSUGTK7	Machine Learning	3

Branch: - Computer Science & Engg. **Year: IV** **Sem: - VIII**

S.No	Code no.	Subject	Periods			Evaluation Scheme			Credits
			L	**T**	**P**	**IA**	**ESE**	**Total**	
	PRACTICAL								
1.	CSUHPV1	Major Project	0	0	16	200	200	400	8
Total				**00**	**16**	200	200	400	8

Sub Title: COMPILER DESIGN		
Sub Code: CSUGTT1	**No. of Credits : 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. Learn Basic Concept of compiler design.
2. To Discuss Parser.
3. To Learn Intermediate code generation and optimization of code.
4. Knowledge of Code generation phase of compiler.
5. To Learn Functions of Symbol Table and Error Handler

Unit No.	Syllabus Content	Number of Hours
1	Overview of translation process, Definition, Phases of Compiler, Lexical analysis: Introduction, Functions of lexical Analysis.	**8**
2	**Parsing Theory**: Introduction, Difference between Top Down and bottom up parser, Computation of FIRST and FOLLOW, Different Types of Parsers: Predictive Parser, Shift-Reduce Parser, LR Parsers (SLR, CLR, LALR), Operator Precedence Parser Automatic generation of parsers.	**7**
3	**Intermediate Code Generation:** Different intermediate forms: Syntax tree, TAC, Quadruples, Triples. Indirect Triples, Syntax directed translation mechanism and attributed definition. **Code Optimization:** Types of Optimization: -Constant folding common sub expression removal, reduction in strength and Loop Optimization (Elimination of induction variables, loop unrolling and loop jamming)	**7**
4	**Code Generation:** DAG, Machine model, order of evaluation, registers allocation and code selection, Code generation algorithm.	**7**
5	**Run Time Theory Management:** static memory allocation and stack based memory allocation schemes. Symbol table management.	**7**

COURSE OUTCOMES: The students would have learnt

CO 1: Fundamentals of Compiler Design.
CO 2: Concepts of Parser.
CO 3: About intermediate code generation techniques and how to optimize code.
CO 4: About DAG and code generation phase of Compiler.
CO 5: Concepts of Run Time Environment .

Text Books:

1. Gulshan Goyal, Compiler Design, sun India publication.
2. Anamika Jain, compiler Design.

Reference Books:

1. A.V.Aho, Ravi Sethi, J.D.Ullman, Compilers tools and Techniques, Addison Wesley, 1987.
2. Waite W.N. and Goos G., Compiler construction' springer verlag, 1983.
3. Tremblay J.P. and Sorenson, P.G. the theory and practice of compiler writing, Mc Graw Hil, 1984.

Sub Title: CLOUD COMPUTING		
Sub Code: CSUGTT2	**No. of Credits : 4=3: 1: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To introduce the fundamental concepts and definitions of cloud computing.
2. To study the architecture of cloud computing, its components.
3. To understand the features, components, and composability of the cloud computing stack, and the concepts of abstraction and virtualization.
4. To examine the need for load balancing in cloud environments, various load balancing algorithms, and to explore cloud security concepts, threats, and solutions.
5. To delve into different cloud service models and deployment models.

Unit No.	Syllabus Content	Number of Hours
1	**Introduction to Cloud Computing:** NIST Definition, Types of Cloud & Services, Evolution of Cloud Computing, Cloud Computing vs Cluster Computing vs Grid Computing, Benefits and Challenges of Cloud Computing, Usage scenario and Applications, Characteristics of Cloud, Cloud Computing Architecture, Components of Cloud Computing Architecture.	**6**
2	**Cloud Computing Stack:** Features & Components of Open Stack, Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols and Applications. **Abstraction and Virtualization:** Difference between Abstraction & Virtualization, Mapping of Virtual Machine to Physical Machine, Concept behind the Virtualization, Benefits & Types of Virtualizations.	**8**
3	**Load Balancing in Cloud:** Need of Load Balancing, Working of load balancing, Different Load Balancing Algorithms.	**6**
4	**Cloud Security:** Cloud security concepts, Threats to cloud computing, Attacks on cloud security, Data centre security, Cloud Security Issues: Data storage and computing security issues, Virtualization security issues, Internet and services related security issues, Network security issues, Access control issues, Software security issues, Trust management issues, Compliance and legal security issues.	**6**
5	**Cloud Services Models:** Infrastructure as a Service, Platform as a Service, Software as a Service. Cloud service providers vendors. **Cloud Deployment Models:** Public, Private, Community and Hybrid Cloud Model, Architecture of Public, Private, Community and Hybrid Cloud, Advantages and Disadvantages. **Case Study:** Amazon Web Services: EC2, Amplify & S3, Microsoft Azure, Google Cloud	**10**

COURSE OUTCOMES: The students would have learnt

CO 1: Define and explain key concepts of cloud computing, including its evolution, benefits, challenges, and architecture.

CO 2: Understand and apply virtualization techniques, mapping virtual machines to physical machines, and distinguish between abstraction and virtualization.

CO 3: Analyze the need for load balancing in cloud environments and evaluate different load balancing algorithms for their effectiveness.

CO 4: Identify the security issues related to cloud and security counter measure, cloud security issues, including data, network, and virtualization security.

CO 5: Apply the fundamental concepts in data centers to understand the service and deployment models and understand many existing cloud computing solutions.

Text Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley.
2. Cloud Computing by M. N. Rao, PHI.
3. Cloud Computing: A Practical Approach by Toby Velte, Anthony Vote and Robert Elsenpeter, McGraw Hill.

Reference Books:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley India Edition.
2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India.

Sub Title: NETWORK SECURITY		
Sub Code: CSUGTK1	**No. of Credits : 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. Learn the concepts of classical encryption techniques and concepts of finite fields and number theory.
2. Explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms.
3. Explore the design issues and working principles of various authentication protocols, PKI standards.
4. Explore various secure communication standards including Kerberos, IPsec, and SSL/TLS and email.
5. Understand the ability to use existing cryptographic utilities to build programs for secure communication.

Unit No.	Syllabus Content	Number of Hours
1	Services, Mechanisms and Attacks, The OSI Security Architecture, A Model for Network Security, symmetric cipher model, substitution techniques Transposition techniques, Steganography.	**8**
2	Block ciphers and the data encryption standard, Simplified DES, Block cipher principles, The data Encryption Standard, The Strength of DES. Differential and Linear Cryptanalysis, Block Cipher Design principles, Block Cipher Modes of Operation, Evaluation Criteria for AES The AES cipher, Triple DES, blowfish, RC5, Rc4 Stream Cipher.	**7**
3	**Principles of public:** Key Cryptosystems, Public–Key cryptosystems, Applications for public –Key Cryptosystems, Requirements for public–Key Cryptosystems, Public–Key Cryptosystems, The RSA Algorithm, Computational Aspects, The Security of RSA, Key management, Distribution of public keys, Public –Key Distribution of Secret Keys, Differ–Hellmann Key Exchange.	**7**
4	**Web Security:** Web Security Threats, Web Traffic Security Approaches, SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, Cryptographic Computations, Transport Layer Security, Secure Electronic Transaction.	**7**
5	**Intruders:** Intrusion Techniques, Intrusion Detection, Audit Records, Statistical Anomaly Detection, Rule –Based Intrusion Detection, The Base – Rate Fallacy, Distributed Intrusion Detection, Honeypots, Intrusion Detection Exchange Format Firewall Design principles, Firewall Characteristics, Types of Firewalls, Firewall Configurations.	**7**

COURSE OUTCOMES: The students would have learnt

CO1: Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory.
CO2: Understand, compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication.
CO3: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
CO4: Apply different digital signature algorithms to achieve authentication and create secure applications.
CO5: Identify the different Security risks and breach.

Text Books:

1. Cryptography and Network Security, Principles And Practice Sixth Edition, William Stallings, Pearson.
2. Information Security Principles and Practice By Mark Stamp, Willy India Edition.
3. Cryptography & Network Security, Forouzan, Mukhopadhyay, McGrawHill.

Reference Books:

1. Cryptography and Network Security AtulKahate, TMH.
2. Cryptography and Security, C K Shyamala, N Harini, T R Padmanabhan, Wiley-India.
3. Information Systems Security, Godbole, Wiley-India.
4. Information Security Principles and Practice, Deven Shah, Wiley-India.
5. Security in Computing by Pfleeger and Pfleeger, PHI.
6. Build Your Own Security Lab: A Field Guide for network testing, Michael Gregg, Wiley India.

Sub Title: WIRELESS SENSOR NETWORK		
Sub Code: CSUGTK2	**No. of Credits : 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. Understand the fundamentals of wireless networks.
2. Understand deployment of sensor in Wireless Sensor Network.
3. Understand design considerations for wireless networks.
4. Understand the different routing techniques of Wireless Sensor Network.
5. Understand the different challenges of Wireless Sensor Network.

Unit No.	Syllabus Content	Number of Hours
1	**Introduction:** Wireless Sensor Network: Introduction, Architecture, Hardware and Software used in Wireless Sensor Network.	**8**
2	**Applications:** Sensor network application: Motion monitoring, Environmental monitoring, Generic Architecture, Sensor network Evolution.	**7**
3	**Design And Deployment:** Wireless Sensor Network : Design , Goals and Issues , Sensor deployment, Scheduling and coverage issues, self-configuration and topology control, Querying, data collection and processing, Collaborative information processing and group connectivity.	**7**
4	**Routing:** Wireless Sensor Routing Protocols: Data Centric, Hierarchical, Location based, Energy efficient routing.	**7**
5	**Challenges:** Sensor Network Challenges-Miniaturization, Power management, Scalability, Remote management, Usability, Standardization and security, System Challenges- Tiny OS, Network Sensor Platforms.	**7**

COURSE OUTCOMES: The students would have learnt

CO1: Understand the basic concepts of wireless network.
CO2: Understand the different applications of Wireless sensor network.
CO3: Understand the designing concept of Wireless Sensor Network.
CO4: Understand the different challenges of Wireless Sensor Network.
CO5: Services and layer wise security considerations.

Text Books:

1. Building Wireless Sensor Networks by Robert Faludi Binding: Paperback Publisher: O'reilly Released: 2011.
2. Wireless Sensor Networks by Zhao Feng, Guibas Leonidas Binding: Paperback Publisher: Elsevier India Released: 2004.

Reference Books:

1. Wireless Sensor Networks by C. S Raghavendra, Krishna M. Sivalingam, Taieb Znati Binding: Paperback Publisher: Springer/bsp Books Released: Rpt.2010.

Sub Title: TCP/IP INTERNETWORKING		
Sub Code: CSUGTK3	**No. of Credits : 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. Analyse and differentiate networking protocols used in TCP/IP protocol suite.
2. Implement the concepts of naming and addressing to IPv4 and their extension to IPv6.
3. Categorize problems such as reliable transport, data delay, congestion and flow control and describe congestion control schemes used in TCP.
4. Discuss the Internet best-effort type of service and its improvements.
5. Discuss the functionality of ATM network and ISDN.

Unit No.	Syllabus Content	Number of Hours
1	**Introduction:** Introduction to internetworking, Overview of OSI Model TCP/IP protocol suite, Basics of switching technologies and switches, Comparisons of different models, Gateways.	**8**
2	**Internet Protocol:** Purpose of Internet Protocol, Internet datagram, Options, Checksum, ARP and RARP Routing Methods: Routing Table, ICMP, IGMP. **IP Addresses:** Introduction, Address Classification, A sample internet with classful addressing, Subnetting, Supernetting, Classless addressing, Security at the IP Layer, IPSec, IPv4 and IPv6 packet formats.	**7**
3	**Routing Protocols:** Unicast Routing Protocols: Interior and Exterior routing, RIP, OSPF, BGP, **Multicasting:** Introduction, Multicast Routing, Multicast Routing Protocols, Multicast Trees, DVMRP, MOSPF, CBT, PIM, MBONE.	**7**
4	**Transmission Control Protocol:** **TCP:**TCP operation, Segment, Sliding window, Silly window, Options, TCP state machine, Karn's Algorithm, Congestion control- Leaky bucket and Token bucket algorithms. **UDP:** User Datagram, UDP operations, Checksum calculation.	**7**
5	**TCP/IP Over ATM Networks:** ATM reference model, ATM Switch, Interconnection Network, Virtual circuit in ATM, Paths, Circuits and identifiers, ATM cell transport and adaptation layers, packet type and multiplexing, IP Address binding in an ATM Network, Logical Subnet Concept and Connection Management. ISDN and B-ISDN.	**7**

COURSE OUTCOMES: The students would have learnt

CO1: Understand the functions of each layer of TCP/IP model.
CO2: Understand the functions of different Protocols.
CO3: Understand the congestion control provided by the protocols.
CO4: Understand the Quality of Services mechanism provided by protocol.
CO5: Understand the concept of ATM and ISDN Network.

Text Books:

1. Internetworking with TCP/IP by Comer, Vol. 1, PHI Pub.
2. TCP/IP Protocol suite by Behrouz A. Forouzan.,TMH Pub.

Reference Books:

1. Computer Networking by James F. Kurose, Keith W. Ross, Pearson Education
2. TCP/IP Illustrated By Wright and Stevens, Vol.2, Pearson Education.
3. An Introduction to Computer Networks by Kenneth C. Mansfield Jr. James L.

Sub Title: ENTERPRISE RESOURCE MANAGEMENT		
Sub Code: CSUGTK4	**No. of Credits : 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVE:

1. To discuss the fundamental concepts an enterprise and its integration of major functions
2. To discuss the various technologies used for an ERP.
3. To discuss importance of information in an organization.
4. To discuss Material resource management, forecasting and job scheduling
5. To discuss Software implementation methods and various other related issues

UNIT No	Syllabus Content	No of Hours
1	**Function of Business Organizations:** Personnel management, Financial management, marketing management, Sales order Processing , Manufacturing managements , Human Resource Management etc , data and information , Operation of functional areas. Integrated view of ERP	8
2	**Technologies of ERP:** knowledge based system , Decision support system , Executive information system , Electronic commerce, , Databases system , Business Engineering , Business process Engineering , Networking , 3 tier and 2 tier architecture.	7
3	**Management information system:** MIS, data & information, levels of Management , information requirement , objectives of information channels, information strategies	7
4	**Information and planning:** Resource management benefit of management planning process objective and its characteristic , policy and procedures ,forecasting and its varies aspects . Scheduling , MRP , MRP-II.	7
5	**ERP implement issues:** software development life cycle , pre Evaluation schemes , post implement issues, case studies.	7

COURSE OUTCOMES: The students would have learnt

CO1: Basic concepts of an enterprise functions and its integration for ERP.
CO2: Introduction of different technologies related to ERP.
CO3: Importance of an information for all levels of organization.
CO4: Concepts of ERP for the manufacturing perspective
CO5: The implementation strategies of the ERP life cycle.

Text Books:

1. Enterprise resource planning by Alixis Leon TMH 2020
2. Management Information System by Jawardekar 2020

Reference Books:

1. ERP by Garg and Ravichandran, 2016
2. Management Information Systems : Louden & Louden 2020
3. Information System and MIS : J Kanter 2007

Sub Title: SOFT COMPUTING		
Sub Code: CSUGTK5	**No. of Credits : 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To understand the Basics of Soft Computing
2. To study the Artificial Neural Network
3. To understand Learning Techniques
4. To understand Fuzzy Logic
5. To study Expert System, ACO, PSO, Genetic Algorithm

UNIT NUMBER	SYLLABUS CONTENT	NUMBER OF HOURS
1	**Overview of Soft Computing:** Introduction to Soft Computing, Difference between Data and Information, Difference between Hard Computing and Soft Computing, Artificial Intelligence and Neural Network, Introduction to various Soft Computing Techniques, Algorithm Assessment Parameters, Major Objectives of Soft Computing, Confusion Matrix, Machine Learning, Computer Vision, Evolutionary Strategies, Genetic Programming, Data Mining, Big Data Analytics.	10
2	**Artificial Neural Network:** Introduction to ANN, Biological Neuron, Difference between ANN and BNN, MP Model, ADALINE and MADALINE, Rosenblatt Perceptron Model, Convex Sets, Convex Hull, Linear and Non Linear Separability, Support Vector Machine, RBF, Associative Network, Hopfield Network, BSB, Self-Organizing Map, GNG, Boltzman Machine, Bidirectional Associative Memory.	10
3	**Learning Techniques:** Bayesian Belief Network (BBN), Inference with BBN, Dempster-Shafer Theory, Perceptron Learning, Backpropagation Algorithm, Non monotonic reasoning: Dependency directed backtracking, Truth maintenance systems. Learning: Concept of learning, Learning model, learning decision tree, Paradigms of machine learning, Supervised & Unsupervised learning, Example of learning, Learning by induction, Learning using Neural Networks, Error Correction Learning, Memory Based Learning, Competitive Learning, Hebbian Learning, Boltzman Learning, KNN, K Means Clutering.	10
4	**Fuzzy Logic:** Crisp Sets, Properties of Crisp Sets, Introduction to Fuzzy Sets, Difference between Fuzzy and Crisp Sets, Properties of Fuzzy Set, Fuzzy Set Operations, Examples of Fuzzy Logic, Introduction to Adaptive Fuzzy System, Fuzzy Associative Memory, Fuzziness in Neural Network, Neural Truck Backer upper control system, Fuzzy Truck Backer upper control network, Difference between Fuzzy and Neural Truck backer upper control system.	10

5	**Expert System, PSO, ACO:** Need & Justification for expert systems- cognitive problems, Expert System Architectures, Rule based systems, Non production system, knowledge acquisition, Expert System Life Cycle, Advantages of Expert System, Characteristics of Expert System, Limitations of Expert System, Case studies of expert system. Evolutionary computing, Genetic Algorithm, Ant Colony Optimization, Particle Swarm Optimization.	10

COURSE OUTCOMES:

1. Describe the basics of Soft Computing.
2. Understand the Artificial Neural Network Paradigm
3. Evaluate the Handling Uncertainty and Learning
4. Identify the Fuzzy Logic Techniques.
5. Identify the Expert System and other Soft Computing Techniques.

Text Books:

1.E. Rich and K. Knight, Artificial Intelligence, Forty Sixth Edition, Tata McGrawHill,2007.
2.D.W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Tenth Edition, Prentice Hall of India, 2001.
3.S. Kaushik and Sunita Tiwari, Soft Computing Fundamental Techniques and Application,McGraw Hill Publication, 2018.

Reference Books:

1.S. Kaushik, Logic and Prolog Programming, New Age International Limited, 2006.
2.S. Haykin, Neural Network and Learning Machines, Pearson, 2009.

Sub Title: DATA MINING		
Sub Code: CSUGTK6	**No. of Credits : =3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To introduce the concept of data Mining as an important tool for enterprise data management and as a cutting edge technology for building competitive advantage.
2. To enable students to effectively identify sources of data and process it for data mining using association rules.
3. To make students well versed in all clustering techniques.
4. To impart knowledge of designing decision trees.
5. To provide knowledge about the Web Mining.

Unit No.	Syllabus Content	Number of Hours
1	**Data Ware Housing:** Introduction, Multidimensional data model, OLAP Operation, Warehouse schema, Data Ware Housing Architecture, Warehouse Server. **Data Mining:** Introduction, KDD Vs Data mining, DBMS Vs DM, DM Techniques, Other mining problem, Issues & Challenges in DM, DM Application Areas.	**8**
2	**Association Rules:** Introduction, Methods to discover association rules, A Priori Algorithm, Partition Algorithm, Pincer –Search algorithm, Dynamic Item set counting algorithm, FP-tree Growth algorithm, Incremental algorithm, Border algorithm.	**7**
3	**Clustering Techniques:** Introduction, Clustering paradigms, Partitioning algorithms, k-Medoid Algorithm, CLARA, CLARANS, Hierarchical clustering, DBSCAN, BIRCH, CURE, Categorical clustering algorithms, STIRR, ROCK, CACTUS.	**7**
4	**Decision Trees:** Introduction, Tree construction principal, Best spilt splitting indices, Splitting criteria, Decision tree construction algorithm, CART, ID3, C4.5, CHAID, Rainforest, CLOUDS, BOAT.	**7**
5	**Web Mining:** Web mining, Web content mining, Web structure mining, Web usage mining, Text mining, Episode rule discovery for texts, Hierarchy of categories, Text clustering.	**7**

COURSE OUTCOMES: The students would have learnt

CO1: Understand the concept of data mining as an important tool for enterprise data management.
CO2: Understanding the effective implementation of data mining algorithms using association rules.
CO3: Understand the concept of all clustering techniques.
CO4: Understand the concept of designing decision trees.
CO5: Understand the concept the Web Mining.

Text Books:

1. Data Mining techniques, Arun K Pujari Universities press.
2. Data Mining concepts & techniques, Jiawei han , Micheline kamber Morgan Kaufmann publisher Elsevier India.

Reference Books:

1. Data Mining methods for knowledge Discovery, Cios , Pedrycz , swiniarski Kluwer academic publishers London.

Sub Title: MACHINE LEARNING		
Sub Code: CSUGTK7	**No. of Credits : 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVE

1. **Fundamental Understanding of Machine Learning:** Equip students with a solid foundation in fundamental machine learning principles and techniques.
2. **Proficiency in Supervised Learning Algorithms:** Enable students to implement and evaluate various supervised learning algorithms for different problem scenarios.
3. **Expertise in Unsupervised Learning Techniques:** Develop students' skills in applying unsupervised learning methods for data analysis and interpretation.
4. **Advanced Machine Learning and Deep Learning Competence:** Introduce advanced machine learning concepts and deep learning methodologies to solve complex problems.
5. **Application and Ethical Considerations in Machine Learning:** Prepare students to apply machine learning in real-world contexts, emphasizing ethical considerations and societal impacts.

Unit No.	Syllabus	No. of Hours
1	Introduction to Machine Learning Introduction to Machine Learning: Definition and scope of Machine Learning Applications and examples of Machine Learning Types of Machine Learning: Supervised Learning Unsupervised Learning Reinforcement Learning Mathematical Foundations: Linear Algebra for Machine Learning Probability and Statistics Evaluation Metrics: Accuracy, Precision, Recall, F1 Score Confusion Matrix ROC and AUC	8
2	Supervised Learning Linear Regression: Simple and Multiple Linear Regression Gradient Descent Classification Algorithms: Logistic Regression Support Vector Machines (SVM) Decision Trees Random Forests K-Nearest Neighbors (KNN) Model Evaluation and Selection: Cross-Validation Bias-Variance Tradeoff Overfitting and Underfitting	7
3	Unsupervised Learning Clustering: K-Means Clustering Hierarchical Clustering DBSCAN Dimensionality Reduction: Principal Component Analysis (PCA) Linear Discriminant Analysis (LDA) t-SNE Association Rule Learning: Apriori Algorithm Eclat Algorithm	7
4	Advanced Machine Learning Ensemble Methods: Bagging and Boosting AdaBoost Gradient Boosting Machines (GBM) XGBoost Neural Networks and Deep Learning: Introduction to Neural Networks Forward and Backward Propagation Convolutional Neural Networks (CNN) Recurrent Neural Networks (RNN) Natural Language Processing (NLP): Text Preprocessing Bag of Words TF-IDF Word Embeddings (Word2Vec, GloVe)	7
5	Practical Applications and Case Studies Case Studies: Real-world applications of Machine Learning in various industries Analysis and discussion of successful ML projects Ethics and Future of Machine Learning: Ethical considerations in Machine Learning Bias in Machine Learning Future trends in Machine Learning Capstone Project Proposal: Guidelines for selecting and proposing a capstone project Presentation skills and report writing	7

Course Outcomes

By the end of this course, the students would have learned:

1. **CO1:** The ability to understand and explain the fundamental principles and various types of machine learning algorithms.
2. **CO2:** Proficiency in implementing and evaluating supervised learning algorithms such as linear regression, logistic regression, SVM, decision trees, and ensemble methods.
3. **CO3:** Expertise in applying unsupervised learning techniques, including clustering, dimensionality reduction, and association rule learning, to analyze and interpret data.
4. **CO4:** Competence in advanced machine learning concepts and deep learning methodologies, including neural networks, CNNs, and NLP techniques.
5. **CO5:** Practical application of machine learning techniques to real-world problems and an understanding of the ethical considerations and societal impacts of machine learning models.

References and Resources

- **Books:**
  - "Pattern Recognition and Machine Learning" by Christopher Bishop
  - "Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy
  - "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville
- **Online Courses:**
  - SWAYAM Machine Learning Course
  - Coursera: Machine Learning by Andrew Ng
  - edX: Principles of Machine Learning by Microsoft
  - Udacity: Intro to Machine Learning
- **Research Papers and Journals:**
  - Journal of Machine Learning Research (JMLR)
  - IEEE Transactions on Neural Networks and Learning Systems
  - Pattern Recognition Journal

Sub Title: COMPILER DESIGN LAB	
Sub Code: CSUGLT1	**No. of Credits : 1.5=0: 0: 1.5(L-T-P)**
Exam Duration : 3 hours	**IA+ESE =25+25**

LAB OBJECTIVES:

1. The understanding of compiler design.
2. To learn different phases of compiler and how to implement them.
3. To develop an awareness of the function and complexity of modern compilers.
4. Provide practical Knowledge and Skills for developing a compiler.
5. Develop ability to design and analyze a compiler.

Unit No.	Syllabus Content	Number of Hours
I, II, III, IV and V	• Write a C/C++ program to implement the design of a Lexical analyzer to recognize the tokens defined by the given grammar. • Write a program to find string is identifier or not. • Write a program for NFA. • Write a program to find all terminal s and non-terminal in a given grammer. • Write a program to find the FIRST of all Non Terminal of Given Grammer. • Write a program to find the FOLLOW of all Non Terminal of Given Grammer. • Write a C program to implement Type Checking • Write a Program to implement intermediate Code. • Write a program to optimize an Intermediate code Using Deadcolde Elimination • Write a program to optimize an Intermediate code Using Common Sub Expression Elimination	18

LAB OUTCOMES: The students would have learnt

CO1: Understanding of basic Concept of Compiler Design.
CO2: Students will understand the practical approach of Working of compiler.
CO3: To know about compiler generation tools and techniques.
CO4: To understand the importance of code optimization.
CO5: Design a compiler for a simple programming language.

Text Books:

1. Compiler Design, Gulshan Goyal, Sun India publication.
2. Compiler Design, Anamika Jain.

Reference Books:

1. Object Oriented Programming with C++ by M P Bhave S,A. Patekar, Pearson Education.
2. Compilers tools and Techniques, A.V.Aho, Ravi Sethi, J.D.Ullman, Addison Wesley, 1987.
3. Compiler construction, Waite W.N. and Goos G., springer verlag, 1983.
4. P.G. the theory and practice of compiler writing, Tremblay J.P. and Sorenson, Mc Graw Hil, 1984.

Sub Title: CLOUD COMPUTING LAB	
Sub Code: CSUGLT2	**No. of Credits : 1.5=0: 0: 1.5(L-T-P)**
Exam Duration : 3 hours	**IA+ESE =25+25**

LAB OBJECTIVES:

1. To familiarize with cloud services and collaborative learning environments using Google Apps and AWS.
2. To develop skills in creating and managing virtual machines using VirtualBox/VMware.
3. To introduce cloud simulation tools like CloudSim and enable students to implement custom scheduling algorithms.
4. To provide practical experience with AWS services, including EC2, S3, RDS, and Lambda.
5. To equip with the ability to deploy and manage web applications on cloud platforms.

Unit No.	Syllabus Content	Number of Hours
1.	Create a Collaborative learning environment for a particular learning topic using Google Apps. Google Drive, Google Docs and Google Slides must be used for hosting e-books, important articles and presentations respectively.	18
2.	Install Virtual box/VMware and create a windows/linux virtual image and analyse the virtual configuration.	
3.	Install a C compiler in the virtual machine created using virtual box/VMware and execute Simple Programs.	
4.	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.	
5.	Create a free tier account on AWS and list the services provided by AWS and manage the IAM.	
6.	Create an AWS EC2 instance (linux) and connect to the instance using SSH, Install and run software on the instance.	
7.	Create a web application and host in the AWS EC2 instance and mention the URL of the home page of the web application.	
8.	Create an Amazon S3 bucket to store and retrieve objects, experiment with uploading, downloading, and managing objects in the bucket also set up permissions and lifecycle policies.	
9.	Launch a managed relational database instance using Amazon RDS and connect to the database and perform basic SQL operations.	
10.	Create and deploy serverless functions using AWS Lambda and trigger the functions with events from other AWS services, such as S3 or DynamoDB.	

LAB OUTCOMES: The students would have learnt

1. Create and manage collaborative learning environments using Google Drive, Docs, and Slides.
2. Demonstrate the ability to install virtual machines and configure them with necessary software and settings.
3. Simulate cloud environments using CloudSim and run custom scheduling algorithms.
4. Gain hands-on experience in managing various AWS services, including EC2 instances, S3 buckets, IAM, and RDS.
5. Create, deploy, and manage serverless functions using AWS Lambda and integrate them with other AWS services.

Textbooks:

1. "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Zaigham Mahmood and Ricardo Puttini.
2. "Mastering AWS Lambda: Learn how to build and deploy serverless applications on AWS" by Yohan Wadia.

Reference Books:

1. "Cloud Computing for Dummies" by Judith S. Hurwitz, Robin Bloor, Marcia Kaufman, and Fern Halper.
2. "Amazon Web Services in Action" by Andreas Wittig and Michael Witti.