UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH., (CBCS) 4-YEARS (8-SEMESTERS) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (CSE)

(Applicable for the batch admitted from the Academic Year 2023-24 onwards)

Faculty Of Engineering & Technology

Scheme of Instruction and Syllabus

For

B. Tech (CBCS) – V & VI Semester

Of

Regulation : R-23 (2023-24)

In

COMPUTER SCIENCE & ENGINEERING

With effect from Academic Year 2023 – 2024

UNIVERSITY COLLEGE OF ENGINEERING &TECHNOLOGY

Mahatma Gandhi University

Nalgonda– 500 254, TS, INDIA

w.e.f Academic year 2025-26

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY
B.TECH., (CBCS) 4-YEARS (8-SEMESTERS) REGULAR PROGRAMME
DEPARTMENT OF COMPUTER SCIENCE &ENGINEERING (CSE)
(Applicable for the batch admitted from the Academic Year 2023-24 onwards)

SEMESTER-V

S. NO	CODE	COURSE TITLE	Scheme of Instructions				Scheme of Examinations			Credits
			L	T	P/D	CONTACT Hrs/Week	Hrs	CIE	SEE	
Theory										
1	PC501CS	Machine Learning	3	0	-	3	3	30	45	3
2	PC502CS	Database Management Systems	3	0	-	3	3	30	45	3
3	PC503CS	Computer Networks	3	0	-	3	3	30	45	3
4	PC504CS	Software Engineering	3	0	-	3	3	30	45	3
5	PC505CS	Distributed Systems	3	0	-	3	3	30	45	3
6	PE-II	Professional Elective-II	3	0	-	3	3	30	45	3
Practical										
7	PC551CS	Machine Learning Lab	-	-	~~2~~	~~3~~ 2	~~3~~	20	30	~~1.5~~ 1
8	PC552CS	Database Management Systems Lab	-	-	~~2~~	~~3~~ 2	3	20	30	1.5 1
9	PC553CS	Computer Networks Lab	-	-	2	2	3	20	30	1
			18	0	8	26	27	240	360	~~22~~ 21

Professional Elective-II

PE 511 CS Image Processing

PE 512 CS Data Mining

PE 513CS Computer Graphics

PE 514 CS Digital Forensics

L: Lectures

T: Tutorials

P/D : Practicals / Drawing

CIE : Continuous Internal Evaluation

SEE: Semester End Examination

BSC: Basic Science Course

HS: Humanities and Social Sciences

ESC: Engineering Science Course

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Professional Elective-III

PE 611 CS Virtual & Augmented Reality

PE 612 CS Information Retrieval System

PE 613CS Block Chain Technologies

PE 614 CS Human Computer Interaction

Open Elective-I

OE 601 CE Disaster Management

OE 602 CE Road Safety Engineering

OE 601 CS Python Programming

OE 602 CS Cyber Security

L: Lectures

T: Tutorials

P: Practicals

HS: Humanities and Social Sciences

CIE: Continuous Internal Evaluation

SEE: Semester End Examination

BSC: Basic Science Course

ESC: Engineering Science Course

OE 601 EC Verilog HDL

OE 602 EC Principles of Electronic Communication System

OE 601 EE Applications of Electrical Energy

OE 602 EE Electrical Safety Management

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DEPARTMENT OF COMPUTER SCIENCE& ENGINEERING (CSE)
(Applicable for the batch admitted from the Academic Year 2023-24 onwards)

SEMESTER-VI

S. NO	CODE	COURSE TITLE	Scheme of Instructions				Scheme of Examinations			Credits
			L	T	P/D	CONTACT Hrs/Week	Hrs	CIE	SEE	
		Theory								
1	PC601CS	Compiler Design	3	0	-	3	3	30	45	3
2	PC602CS	Web Programming	3	0	-	3	3	30	45	3
3	PC603CS	Deep Learning	3	0	-	3	3	30	45	3
4	PC604CS	Artificial Intelligence	3	0	-	3	3	30	45	3
5	Professional Elective-III		3	0	-	3	3	30	45	3
6	Open Elective-I		3	0	-	3	3	30	45	3
		Practical								
7	PC651CS	Compiler Design Lab	-	-	2	2	3	20	30	1
8	PC652CS	Web Programming Lab	-	-	2	2	3	20	30	1
9	PC653CS	Deep Learning Lab	-	-	2	2	3	20	30	1
10	PW656CS	Mini-Project			6	-	-	50	-	3
11	PW961 CS	Summer Internship Six Weeks during summer vacation	Evaluation will be done in VII Semester.							
			18	0	12	26	27	290	360	24

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PC501CS	MACHINE LEARNING					
Prerequisites	PROGRAMMING LANGUAGES		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To introduce the basic concepts of machine learning and range of problems that can be handled by machine learning
2. To introduce the concepts of instance based learning and decision tree induction
3. To introduce the concepts of linear separability, Perceptron and SVM
4. To learn the concepts of probabilistic inference, graphical models and evolutionary Learning.
5. To learn the concepts of ensemble learning, dimensionality reduction and Clustering

Course Outcomes : On completion of this course, the student will be able to :

1. Explain strengths and weakness of different machine learning techniques
2. Select suitable model parameter for different machine learning technique
3. Design & implement various machine learning algorithms to a wide range of real world applications
4. Evaluate available learning methods to develop the research based solutions in different domains.

UNIT – I

Introduction: Learning, Types of Machine Learning, Machine Learning Examples , Decision Tree Learning Concept learning: Introduction, Version Spaces and the Candidate Elimination Algorithm. Learning with Trees: Decision Tree Learning, the Big Picture Linear Discriminants: Learning Linear Separators , The Perceptron Algorithm , Margins.

UNIT – II

Estimating Probabilities from Data, Bayes Rule, MLE, MAP

Naive Bayes: Conditional Independence, Naive Bayes: Why and How, Bag of Words

Logistic Regression : Maximizing Conditional likelihood ,

Gradient Descent Kernels: Kernalization Algorithm, Kernalizing Perceptron.

Discriminants: The Perceptron, Linear Separability, Linear Regression .

Multilayer Perceptron (MLP): Going Forwards, Backwards, MLP in practices, Deriving back Propagation.

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UNIT– III

Support Vector Machines: Geometric margins, Primal and Dual Forms, Kernalizing SVM Generalization & Overfitting: Sample Complexity, Finite Hypothesis classes, VC Dimension **Based Bounds Some Basic Statistics**: Averages, Variance and Covariance, The Gaussian, **The Bias-Variance Tradeoff Bayesian learning**: Introduction, Bayes theorem. Bayes Optimal Classifier, Naive Bayes Classifier.Graphical Models: Bayesian networks, Approximate Inference, Making Bayesian Networks, Hidden Markov Models, The Forward Algorithm.

UNIT – IV

Model Selection & Regularization: Structural Risk Minimization, Regularization, k-Fold Cross validation Linear Regression: Linear regression, minimizing squared error and maximizing data Likelihood

Neural Networks: Back Propagation, Deep Neural Networks: Convolution, Convolution Neural Networks, LeNet-5 architecture

Boosting: Boosting Accuracy, Ada Boosting, Bagging

UNIT –V

Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison. Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis

Interactive Learning: Active Learning, Active Learning, Common heuristics, Sampling bias , Safe Disagreement Based Active Learning Schemes Semi-Supervised Learning: Semi-supervised Learning, Transductive SVM, Co-training Reinforcement Learning: Markov Decision Processes, Value Iteration, Q-Learning

Suggested Reading:

1. Tom M. Mitchell, ***Machine Learning,*** Mc Graw Hill, 1997
2. Chistopher Bishop, ***Pattern recognition & Machine Learning,*** Springer 2006.
3. Stephen Marsland, ***Machine Learning - An Algorithmic Perspective***, CRC Press, 2009.
4. Margaret H Dunham, ***Data Mining,*** Pearson Edition., 2003.
5. Galit Shmueli, Nitin R Patel, Peter C Bruce, ***Data Mining for Business Intelligence,*** Wiley India Edition, 2007
6. Rajjan Shinghal, ***Pattern Recognition***, Oxford University Press, 2006.

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PC502CS	DATABASE MANAGEMENT SYSTEMS					
Prerequisites	ER Model, SQL		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To introduce three schema architecture and DBMS functional components
2. To learn formal and commercial query languages of RDBMS
3. To understand the principles of ER modeling and theory of normalization
4. To study different file organization and indexing techniques
5. To familiarize theory of serializablity and implementation of concurrency control and recovery

Course Outcomes: At the end of the course the student will be able to:

1. Understand the mathematical foundations on which RDBMS are built
2. Model a set of requirements using the Extended Entity Relationship Model (EER), transform an EER model into a relational model, and refine the relational model using theory of Normalization.
3. Develop Database application using SQL and Embedded SQL
4. Use the knowledge of file organization and indexing to improve database application Performance.
5. Understand the working of concurrency control and recovery mechanisms in RDBMS.

UNIT – I

Introduction: Data, File systems, Database, Database System Applications, Purpose of Database Systems, View of data, Database Languages, Database Design, Database Architecture, Database Users and Administrators, History of database systems.

Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity-Relationship Diagrams, Entity – Relationship Design Issues, Weak Entity Sets, Extended E-R Features, Database Design for Banking Enterprise, Reduction to Relational Schemas, Other Aspects of Database Design.

UNIT – II

Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query languages, Relational-Algebra Operations, Additional Relational – Algebra Operations, Extended Relational - Algebra Operations, Null Values, Modification of the Databases.

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Structured Query Language: Overview of SQL Query language, SQL Data Definition, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null Values, Nested Sub-queries, Complex Queries, Views, Modification of the Database.

UNIT – III

Intermediate SQL: Join Expressions, Views, Transactions, Integrity Constraints, SQL data Types and Schemas

Advanced SQL: Functions and Procedural Constructs, Triggers, Recursive Queries, Advanced SQL Features.

Relational Database Design: Features of Good Relational Design, Atomic Domains and Normal Forms, Functional-Dependency Theory, Decomposition using Functional Dependencies.

UNIT – IV

Indexing and Hashing: Basic Concepts, Ordered Indices, B+-tree Index Files, B-tree Index Files, Multiple Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices.

UNIT – V

Transactions: Transaction Concepts, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability.

Concurrency Control: Lock-based Protocols, Timestamp-based Protocols, Validation-based Protocols, Multiple Granularity, Multi-version Schemes, Deadlock Handling, Insert and Delete Operations, Weak Levels of Consistency, Concurrency of Index Structures.

Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, Advanced Recovery Techniques, Remote Backup Systems.

Suggested Reading:

1. Elmasri, Navathe, Somayajulu, ***Fundamentals of Database Systems***, Pearson Education, 4th Edition, 2004.

References:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, ***Database System Concepts***, McGraw-Hill International Edition, 7th Edition, 2019
2. Ramakrishnan, Gehrke, ***Database Management Systems***, McGraw-Hill International Edition, 3rd Edition, 2003.

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PC503CS	COMPUTER NETWORKS					
Prerequisites	DATA STRUCTURES AND PROGRAMMING CONCEPTS		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE			45

Course Objectives :

1. To study the design issues in network layer and various routing algorithms.
2. To introduce internet routing architecture and protocols.
3. To learn the flow control and congestion control algorithms in Transport Layer.
4. To introduce the TCP/IP suite of protocols and the networked applications supported by it.
5. To learn basic and advanced socket system calls.

Course Outcomes : At the end of the course the student will be able to:

1. Apply the function of each layer of OSI and trace the flow of information from one node
1. to another node in the network.
2. Understand the principles of IP addressing and internet routing.
3. Analyze the working of networked applications such as DNS, mail file transfer and www.
4. Implement client-server socket-based networked applications.

UNIT – I

Data Communications: Components, analog and digital signals and Encoders, Modems, RS232 Interfacing.

Switching: Circuit Switching, Message Switching and Packet Switching.

Topologies – Concept of layering.-Protocols and Standards – ISO / OSI model, TCP/IP.

UNIT – II

Data Link Layer: Error Control: Error detection and correction (CRC and Hamming code for single bit correction).

Flow Control: stop and wait – - sliding window protocols-go Back-N ARQ – selective repeat ARQ.

MAC LAYER: Ethernet IEEE 802.3LAN, Manchester encoding, Binary exponential algorithm, Efficiency calculation, ARP and RARP.

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UNIT – III

Network Layer : Inter networks – virtual circuit and Datagram approach Routing – Distance Vector Routing ,Link State Routing , OSPF and BGP IPv4 , addressing, Sub-netting, IPv6, CIDR, ICMP and IGMP protocols.

UNIT – IV

Transport Layer: Services of transport layer, Multiplexing and crash recovery.

Transmission Control Protocol (TCP) – TCP window management Congestion Control, timer management and User Datagram Protocol (UDP).

UNIT – V

Socket Programming: Primitive and advanced system calls, client/server iterative and concurrent programs IO multiplexing, Asynchronous IO and select system call.

Application Layer: Domain Name Space (DNS) – SMTP – FTP – HTTP.

Suggested Readings:

1. ***Computer Networking: A Top-Down Approach***, 6th Edition, James F. Kurose , Keith W. Ross, Pearson , 2022.

References:

1. ***Computer Networks,*** 5th Edition, Andrew S. Tanenbaum , David J. Wetherall , Pearson Education, 2021.
2. ***Computer Networks: A Systems Approach,*** Larry Peterson and Bruce Davie, Elsevier , 5th Edition, 2021.

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PC504CS	SOFTWARE ENGINEERING					
Prerequisites	FUNDAMENTALS OF IT		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To introduce students to the fundamental nature of software and the discipline of software engineering.
2. To teach students about different software process models and their roles in guiding software development.
3. To emphasize the importance of achieving and managing software quality through systematic approaches,
4. To introduce students to software process improvement frameworks and emerging trends in software engineering.

Course Outcomes: At the end of the course the student will be able to:

1. Understand the evolving nature of software and the basic principles of software engineering.
2. Gain knowledge of various software process models, including traditional and agile approaches.
3. Apply key software engineering principles to requirements gathering and software design.
4. Implement quality assurance techniques to ensure the delivery of reliable and high-quality software.
5. Understand and apply software process improvement methodologies while staying informed about current trends in the field.

UNIT – I

The Nature of Software: Defining Software, Software Application Domains, Legacy Software. The Changing Nature of Software: WebApps, Mobile Applications, Cloud Computing, Product Line Software.

Software Engineering: Defining the discipline, The software process, software engineering practice, Software Development Myths.

UNIT – II

Software Process Structure: A Generic Process Model, Defining A Framework Activity, Identifying a Task Set, Process Patterns, Process Assessment and Improvement.

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Process Models: Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process T

UNIT – III

Principles That Guide Practice Software Engineering Knowledge, Core Principles, Principles that Guide Each Framework Activity

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Analysis Model.

Design Concepts: Design with the Context of Software Engineering, The Design Process, Design Concepts, The Design Model.

UNIT _ IV

Quality Management: Quality Concepts: What is Quality, Software Quality, The Software Quality Dilemma, Achieving Software Quality.

Review Techniques: Cost Impact of Software, Defect Amplification and Removal, Review Metrics and Their Use, Reviews: A Formality Spectrum, Informal Reviews, Formal Technical Reviews,Post-Mortem Evalnations.

Software Quality Assurance: Elements of Software Quality Assurance, SQA Processes and Product Characteristics, SQA Tasks, Goals and Metrics, Software Reliability.

UNIT_V

Software Process Improvement:

What is SPI? The SPI Process, The CMMI, The People CMM, Other SPI Frameworks, SPI Return on Investment, SPI Trends.Emerging Trends In Software Engineering Technology Evolution, Prospects for a True Engineering Discipline, Observing Software Engineering Trends, Identifying "Soft Trends", Technology Directions, Tools-Related Trends.

Suggested Readings:

1. ***Software Engineering: Principles and Practice***, Hans van Vliet

References:

1. ***Software Engineering: A Practitioner's Approach***, 8th Edition, Roger S. Pressman and Bruce R. Maxim.

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PC505CS	DISTRIBUTED SYSTEMS					
Prerequisites	OPERATING SYSTEMS		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE			45

Course Objectives :

1. To acquire an understanding of the issues in distributed systems.
2. To study architectures and working of distributed file systems.
3. To expose the students to distributed transaction management and replication.
4. To explore knowledge on Distributed fault tolerant Systems
5. To understand map-reduce algorithms..

Course Outcomes : At the end of the course the student will be able to:

1. Describe the problems and challenges associated with distributed systems.
2. Implement small scale distributed systems.
3. Understand design tradeoffs in large-scale distributed systems.
4. Gain knowledge on Consistency and Replication
5. Familiar with Distributed Fault Tolerant systems

UNIT – I

Introduction: From networked systems to distributed systems , Design goals, A simple classification of distributed ystems , Pitfalls

Architectures: Architectural Styles, Middleware and distributed systems, Layered-system architectures, Symmetrically distributed system architectures , Hybrid system architectures

Processes: Threads, Virtualization, Clients, Servers, and Code Migration.

Communication: Foundations, Remote Procedure Call, Message-Oriented Communication, Stream-Oriented Communication, and Multicast Communication

UNIT – II

Coordination : Clock Synchronization, Logical Clocks, Mutual Exclusion, Election Algorithms, Gossip based Coordination, Distributed Event Matching, Location Systems.

Transactions- The Slippery Concept of a Transaction, Weak Isolation Levels, serializability

Naming: Names, Identifiers and Addresses, Flat Naming, Structured Naming, and Attribute-Based Naming, Named Data Networking

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UNIT – III

Consistency and Replication: Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, and Consistency Protocols.

Replication- Leaders & Followers, Problems with Replication Lag, Multi-Leader Replication, Leaderless Replication

Partitioning - Partitioning and Replication, Partitioning of Key- Value Data, Partiotining and Secondary Indexes, Rebalancing Partitions, Request Routing

Consistency And Consensus- Consistency Guarantees, Linearizability, Ordering Guarantees, Distributed Transactions and Consensus

UNIT – IV

The Trouble with Distributed Systems- Faults and Partial Failures, Unreliable Networks, Unreliable Clocks, Knowledge, Truth and Lies

Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, and Recovery

UNIT – V

Map-Reduce and Distributed File Systems : Example, Scaling, programming model, Apache Hadoop, Amazon Elastic Map Reduce, Mapreduce.net, Pig and Hive.

Beyond Map Reduce

Suggested Readings:

1. Maarten Van Steen, and Andrew S. Tanenbaum, ***Distributed Systems***, PHI 4nd Edition, 2023

2. Martin Kleppman , ***Designing Data Intensive Systems***, O'Reilly, 2017

References:

1. R.Hill, L.Hirsch, P.Lake, S.Moshiri, ***Guide to Cloud Computing, Principles and Practice***,Springer, 2013.

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PE511CS	IMAGE PROCESSING					
Prerequisites	SIGNALS & SYSTEMS		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To introduce students to the Basic concepts and analytical methods of analysis of digital images
2. To Study fundamental concepts of Digital Image Processing and basic relations among pixels
3. To Study different Spatial and Frequency domain concepts.
4. To understand Restoration process of degraded image and Multi resolution processing.
5. To understand image compression and Segmentation Techniques.

Course Outcomes: At the end of the course the student will be able to:

1. Understand different components of image processing system
2. Describe various image transforms, enhancement techniques using various processing methods
3. Illustrate the compression and segmentation techniques on a given image
4. Demonstrate the filtering and restoration of images(pixels) with examples
5. Illustrate the various schemes for image representation and edge detection techniques with examples

UNIT – I

Introduction: Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals: Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships between Pixels

UNIT – II

Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformation, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing spatial Filters, Sharpening spatial Filters.

Image Enhancement in the Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain, Smoothing frequency-domain Filters, Sharpening Frequency-domain Filters, Homomorphic Filtering, Implementation.

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UNIT – III

Image Restoration: A Model of the Image Degradation/Restoration Process,Linear, Position Invariant Degradations, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering. Wavelets and Multi resolution Processing: Multi resolution Expansions, Wavelet Transforms in one Dimension, The Fast Wavelet Transform, Wavelet Transforms in Two Dimensions.

UNIT – IV

Image Compression: Image Compression Models, Error-free Compression, Lossy Compression, mage Compression Standards. Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation

UNIT – V

Representation and Description: Various schemes for representation, boundary descriptors, and regional descriptors.

Suggested Readings:

1. Madhuri.A.Joshi, ***Digital Image Processing,*** PHI.
2. Sonka, ***Image Processing, Analysis and Machine Vision.*** Cengage Publications.

References:

1. Rafael C. Gonzalez an d Richard E. Woods, ***Digital Image Processing***. Prentice Hall India/Pearson Education.
2. A.K.Jain, ***Fundamentals of Digital Image Processing***. Prentice Hall India.

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PE512CS	DATA MINING					
Prerequisites	DATABASES		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To understand the importance of data mining and explore major issues
2. To Learn the fundamental concepts and methods for mining frequent patterns,
3. associations, and correlations.
4. To understand and apply basic and advanced classification techniques,
5. To explore and apply cluster analysis techniques and evaluate the effectiveness of clustering results.

Course Outcomes:: At the end of the course the student will be able to:

1. Analyze and describe datasets using basic statistical techniques and data visualization, and apply methods.
2. Evaluate patterns to uncover meaningful associations and correlations in large datasets
3. Implement and evaluate various classification algorithms to effectively classify and predict data patterns
4. Perform cluster analysis using various methods; assess the quality of clustering outcomes.
5. Identify and analyze emerging trends in data mining, apply advanced methodologies to complex data types

UNIT – I

Introduction: Importance of Data Mining, Major issues in Data Mining, Getting to know your data: Data objects and attributed types. Basic statistical descriptions of data. Data visualization, Measuring data similarity and dissimilarity

UNIT – II

Mining frequent patterns, Associations and correlations: Basic concepts and methods, Frequent Item set Mining Methods, Pattern evaluation methods

UNIT – III

Classification: Basic concepts, Decision tree induction, Bayes classification methods, Advance methods, Bayesian Belief Network, Classification by back propagation, Support vector machines.

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UNIT – IV

Cluster Analysis: Concepts and Methods: Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering.

UNIT – V

Data Mining Trends and Research Frontiers: Mining Complex Data Types, Other Methodologies of Data Mining, Data Mining Applications, Data Mining and Society, Data Mining trends.

Suggested Reading:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar," ***Introduction to Data Mining***", Pearson Education, 2008

References:

1. Jiawei Han, Micheline Kamber, Jin Pei, "***Data Mining: Concepts & Techniques***", 3rd Edition.,Morgon Kauffman, 2011.
2. Vikram Pudi, P.Radha Krishna, "***Data Mining***", Oxford University Press, 1st Edition, 2009.

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PE513 CS	COMPUTER GRAPHICS					
Prerequisites	PROGRAMMING, MATHEMATICs		L	T	P	C
			3	0	0	3
Evaluation	CEE	30	SEE			45

Course Objectives :

1. To introduction of fundamental concepts and theory of computer graphics.
2. To learn the 2D and 3D object transformations and algorithms
3. To understand the computer animation sequence and its methods
4. To impart knowledge on 3D Geometric transformation.
5. To gain skills on detection methods.

Course Outcomes : At the end of the course the student will be able to:

1. Acquire familiarity with the relevant mathematics of computer graphics.
2. Design basic graphics application programs, including animation
3. Design applications that display graphic images to given specifications
4. Implement 3D Transformations.
5. Work with different computer animation applications.

UNIT – I

Introduction: Application areas of Computer Graphics, overview of graphics systems, video display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices Output primitives: Points and lines, line drawing algorithms (Bresenham's and DDA Algorithm), midpoint, Circle and ellipse algorithms, Polygon Filling: Scan-line algorithm, boundary fill and flood-fill algorithms.

UNIT – II

2-D Geometrical Transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems. 2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland algorithms, Sutherland – Hodgeman polygon clipping algorithm.

UNIT – III

3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basicillumination models, polygon rendering methods.

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UNIT – IV

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations. viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT – V

Computer Animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.

Visible surface detection methods: Classification, back-face detection, depth-buffer, BSP-tree methods and area sub-division methods.

Suggested Readings:

1. Computer Graphics- A programming Approach, Steven Harrington, TMH, 1987.

References:

1. ***Computer Graphics C version***, Donald Hearn and M. Pauline Baker, Pearson Education, 2nd Edition, 1997.
2. ***"Computer Graphics Principles & Practice"***, 2nd Edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education, 1996.

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PE514CS	DIGITAL FORENSICS					
Prerequisites	BASIC KNOWLEDGE OF OPERATING SYSTEMS,NETWORKING		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. Understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices.
2. Understand how to examine computing investigations
3. Understand data acquisition
4. Understand processing crimes
5. Understand forensics tools

Course Outcomes : At the end of the course the student will be able to:

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.
3. Learn data acquisition
4. Learn processing crimes
5. Learn forensics tools

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.

CSE.UCET.MGU.NLG.TS

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Board of Studies in
Computer Science
Mahatma Gandhi University, NLG-508 254.

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.

Suggested Readings

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

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PC551CS	MACHINE LEARNING LAB					
Prerequisites	PYTHON		L	T	P	C
			3	0	0	3
Evaluation	CIE	20	SEE		30	

Course Objectives :

1. To understand different searching algorithms.
2. To build and train the datasets with respect to suitable models.
3. To gain knowledge on clustering algorithms.

Course Outcomes : At the end of the course the student will be able to:

1. Apply knowledge on small and large datasets.
2. Build a model to mimic real time applications.
3. Impart knowledge on Artificial Neural Networks.
4. Work with clustering algorithms with real time scenarios.
5. Use python libraries for data preprocessing POS tagging.

List of Experiments:

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
2. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
3. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
4. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
5. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

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Board of Studies in
Computer Science
CSE,UCET,MGU,NLG,TS

6. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set.Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
7. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
8. Write a program to implement data preprocessing and text cleaning using python.
9. Write a program to demonstrate parts-of-speech tagging and named entity recognition.

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Computer Science
Mahatma Gandhi University, NLG-508 254.

PC552CS	DATABASE MANAGEMENT SYSTEMS LAB					
Prerequisites	SQL		L	T	P	C
			3	0	0	3
Evaluation	CIE	20	SEE		30	

Course Objectives :

1. To practice various DDL. commands in SQL
2. To write simple and Complex queries in SQL
3. To familiarize PL/SQL

Course Outcomes : At the end of the course the student will be able to:

1. Design and implement a database schema for a given problem
2. Populate and query a database using SQL and PL/SQL
3. Develop multi-user database application using locks
4. Understand locking system.
5. Developing full-fledged database applications.

List of Experiments:

1. Simple to Complex condition query creation using SQL Plus.
2. Usage of Triggers and Stored Procedures.
3. Creation of Forms for Student information, Library information, Pay roll etc.
4. Writing PL/SQL procedures for data validation.
5. Report generation using SQL reports.
6. Creating password and security features for applications
7. Usage of File locking. Table locking facilities in applications.
8. Creation of small full-fledged database application spreading over 3 sessions.

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PC 553 CS	COMPUTER NETWORKS LAB					
Prerequisites	FUNDAMENTALS OF CN ,OS COMMANDS		L	T	P	C
			3	0	0	3
Evaluation	CIE	20	SEE		30	

Course Objectives :

1. Intended to provide practical exposure of the concepts in Computer Networks.
2. Provide hands on experience of designing modeling and evaluation of Computer Networks.

Course Outcomes :

1. Imlement data link layer framing methods
2. Implement error correction and error detection techniques
3. Implement data link layer protocols
4. Implement routing and congestion algorithms
5. Able to create a scenario and study of the performance of the computer networks and protocols.

List of Experiments:

1. Implement data link layer framinig methods such as character_stuffing and bit stuffing.
2. Write a program to compute CRC code for polynomials CRC-12, crc-16 and CRC CCIP.
3. Develop a simple data link Layer that performs the flow control using the sliding window protocol,and loss recovery using Go-Back-N mechanism.
4. Implement Dijkstra's algorithm to compute the shortest path through a network.
5. Take an example sub-net of hosts and obtain a broadcast tree for sub-net.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Using a simulation software
   i. Create a scenario and study the performance of CSMA/CD protocol.
   ii. Create a scenario and study the performance of token bus and token ring.
   iii. Study Transmission Control Protocol.

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Mahatma Gandhi University, NLG-508 254.

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY
B.TECH., (CBCS) 4-YEARS (8-SEMESTERS) REGULAR PROGRAMME
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (CSE)
(Applicable for the batch admitted from the Academic Year 2023-24 onwards)

SEMESTER-VI

S. NO	CODE	COURSE TITLE	Scheme of Instructions				Scheme of Examinations			Credits
			L	T	P/D	CONTACT Hrs/Week	Hrs	CIE	SEE	
Theory										
1	PC601CS	Compiler Design	3	0	-	3	3	30	45	3
2	PC602CS	Web Programming	3	0	-	3	3	30	45	3
3	PC603CS	Deep Learning	3	0	-	3	3	30	45	3
4	PC604CS	Artificial Intelligence	3	0	-	3	3	30	45	3
5	Professional Elective-III		3	0	-	3	3	30	45	3
6	Open Elective-I		3	0	-	3	3	30	45	3
Practical										
7	PC651CS	Compiler Design Lab	-	-	2	2	3	20	30	1
8	PC652CS	Web Programming Lab	-	-	2	2	3	20	30	1
9	PC653CS	Deep Learning Lab	-	-	2	2	3	20	30	1
10	PW656CS	Mini-Project			6	-	-	50	-	3
11	PW961 CS	Summer Internship Six Weeks during summer vacation	Evaluation will be done in VII Semester.							
			18	0	12	26	27	290	360	24

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Professional Elective-III

PE 611 CS Virtual & Augmented Reality

PE 612 CS Information Retrieval System

PE 613CS Block Chain Technologies

PE 614 CS Human Computer Interaction

L: Lectures

T: Tutorials

P: Practicals

HS: Humanities and Social Sciences

CIE: Continuous Internal Evaluation

BSC: Basic Science Course

Open Elective-I

OE 601 CE Disaster Management

OE 602 CE Road Safety Engineering

OE 601 CS Python Programming

OE 602 CS Cyber Security

OE 601 EC Verilog HDL

OE 602 EC Principles of Electronic Communication System

OE 601 EE Applications of Electrical Energy

OE 602 EE Electrical Safety Management

SEE: Semester End Examination

ESC: Engineering Science Course

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PC601CS	COMPILER DESIGN					
Prerequisites	AUTOMATA THEORY AND DATA STRUCTURES AND ALGORITHMS		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To introduce the steps in language translation pipeline and runtime data structures used in translation.
2. To learn about Scanning (lexical analysis) process using regular expressions and use of LEX to generate scanner.
3. To introduce different Parsing strategies including top-down (e.g., recursive descent, Earley parsing, or LL) and bottom-up (e.g., backtracking or LR) techniques.
4. Describe semantic analyses using an attribute grammar.
5. To learn how to build symbol tables and generate intermediate code.

Course Outcomes : At the end of the course the student will be able to:

1. Create lexical rules and grammars for a given language
2. Generate scanners and parsers from declarative specifications.
3. Describe an abstract syntax tree for a small language.
4. Use program analysis techniques for code optimization.
5. Develop the compiler for a subset of a given language.

UNIT – I

Introduction: Compilers, The translation process, Data structures and issues in compiler structure, Bootstrapping and Porting.

Scanning: The scanning process, Regular expressions, Finite Automata, Regular expressions to DFA,,s, use of LEX to generate scanner.

UNIT – II

Context Free Grammars & Parsing: The parsing process, Context free grammars, Parse tree & Abstract sy ntax trees, EBNF and syntax diagrams, and Properties of CFLs.

Top Down Parsing: Recursive descent parsing, LL (1) parsing, First and follow sets, Recursive descent parser, and Error recovery in top down parsers.

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Mahatma Gandhi University, NLG-508 254.
CSE,UCET,MGU,NLG.TS

UNIT – III

Bottom-up Parsing: Overview, LR (0) items and LR (0) Parsing, SLR (1) Parsing, general LR(1) and LALR(1) parsing, YACC, and Error recovery in bottom-up parsers.

UNIT – IV

Semantic Analysis: Attributes and attribute grammars, Algorithms for attribute computation, Symbol table, Data types and Type checking.

Runtime Environments: Memory organization during program execution, Fully static runtime environments, Stack-based runtime environments, Dynamic memory, and Parameter parsing mechanisms.

UNIT – V

Code Generation: Intermediate code and data structures for code generation, Basic code generation techniques, Code generation of data structure references, Code generation of control statements and logical expressions, Code generation of procedure and function calls, Code generation in commercial compilers, Code optimization techniques, and Data flow equation.

Suggested Readings: J.P. Tremblay and P.S. Sorenson, —***The Theory and Practice of Compiler Writing***, TMH- 1985.

References:

1. Kenneth C. Louden, —***Compiler Construction: Principles and Practice***‖, Thomson Learning Inc., 1997.
2. Ravi Sethi, Aho & Ullman JP, —***Compilers: Principles, Techniques and Tools***, Addison Wesley publishing co., 1986.

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PC602CS	WEB PROGRAMMING					
Prerequisites	FUNDAMENTALS OF PROGRAMMING CONCEPTS		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To learn HTML5 and JavaScript
2. To familiarize the tools and technologies to process XML documents.
3. To learn various server-side and database connectivity technologies.
4. To gain knowledge on Servlets .
5. To work with PHP.

Course Outcomes: At the end of the course the student will be able to:

1. Design a website with static and dynamic web pages.
2. Develop a web application with session tracking and client side data validations.
3. Develop web content publishing application that accesses back-end data base and publishes data in XML format.
4. Build an application with PHP.
5. Understand database design.

UNIT – I

Introduction to World Wide Web: Web Browsers, Web Servers, Uniform Resource Locators, HTTP.

HTML5: Introduction, Links, Images, Multimedia, Lists, Tables, Creating Forms, Styling Forms.

UNIT – II

Introduction to XML, XML document structure, Document Type Definition, Namespaces, XML Schemas, Displaying XML documents with CSS, XPath Basics, XSLT, XML Processors.

UNIT – III

Introduction to Java script: Java Script and Forms Variables, Functions, Operators, Conditional Statements and Loops, Arrays , Strings, Event and Event Handling, Java Script Closures.

Introduction to Ajax: Pre-Ajax Java Script Communication Techniques, XML HTTP Request Object, Data Formats, User Interface Design for Ajax.

UNIT – IV

Java Servlets: Java Servlets and CGI Programming, Benefits of Java Servlet, Life Cycle of Java Servlet, Reading data from client, HTTP Request Header, HTTP Response Header, working with Cookies, Tracking Sessions.Introduction to MERN stack and LAMP stack.

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Board of Studies in
Computer Science
Mahatma Gandhi University, NLG-508 254.

UNIT – V

Introduction to PHP: Overview of PHP, General Syntactic Characteristics, Primitives, Operations, Expressions, Control Statements, Arrays, Functions, , Form handling, Files, Cookies, Session Tracking.

Database access through Web: Architectures for Database Access- **Database access with Mongo DB** - Database access with PHP-Database access with JDBC.

Suggested Reading:

1. Thomas Powell, ***The Complete Reference: Ajax***, Tata-McGraw-Hill, 2011.
2. John Pollock, ***Java Script,*** 4th Edition, McGraw Hill Education (India) Edition, 2013.
3. Jim Keogh, ***J2EE : The Complete Reference***, Tata-McGraw-Hill, 2002.

References:

1. Robert W.Sebesta, ***Programming the World Wide Web***, 3rd Edition, Pearson Education, 2006.
2. Wendy Willard, ***HTML5***, McGraw Hill Education (India) Edition, 2013

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Computer Science
Mahatma Gandhi University, NLG-508 254.

PC603CS	DEEP LEARNING					
Prerequisites	MACHINE LEARNING		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To understand complexity of Deep Learning algorithms and their limitations.
2. To understand modern notions in data analysis oriented computing.
3. To apply Deep Learning algorithms in practical applications.
4. To perform experiments in Deep Learning using real-world data.
5. To impart skills on autoencoders.

Course Outcomes : At the end of the course the student will be able to:

1. Understand the concepts of TensorFlow, its main functions, operations and the execution pipeline.
2. Implement deep learning algorithms, understand neural networks and traverse the layers of data abstraction..
3. Learn topics such as convolutional neural networks, recurrent neural networks, training deep networks and high-level interfaces.
4. Build deep learning models in TensorFlow and interpret the results.
5. Understand the language and fundamental concepts of artificial neural networks.

UNIT – I

Artificial Neural Networks: Introduction, Perceptron, XOR Gate ,Perceptron Training Rule, Activation Functions.

Linear Neural Networks: Linear Regression, Implementation of Linear Regression, Softmax Regression, The Image Classification Dataset , Implementation of Softmax Regression.

UNIT – II

Multilayer Perceptrons, Implementation of Multilayer Perceptrons, Model Selection, Underfitting and Overfitting, Weight Decay, Dropout, Forward Propagation, Backward Propagation, and Computational Graphs, Numerical Stability and Initialization, Considering the Environment, Predicting House Prices on Kaggle.

Optimization Algorithms: Optimization and Deep Learning, Convexity, Gradient Descent, Stochastic Gradient Descent, Mini batch Stochastic Gradient Descent,Momentum, Adagrad, RMS Prop, Ada delta, Adam, Learning Rate Scheduling.

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CSE,UCET,MGU,NLG,TS
Mahatma Gandhi University, NLG-508 254.

UNIT – III

Introduction to Convolutional Neural Networks: Introduction to CNNs, Kernel filter, Principles behind CNNs, Multiple Filters,

Modern Convolutional Neural Networks Deep Convolutional Neural Networks (AlexNet), Networks Using Blocks (VGG), Network in Network (NiN), Networks with Parallel Concatenations (GoogLeNet), Batch Normalization, Residual Networks (ResNet), Densely Connected Networks (DenseNet).

UNIT – IV

Recurrent Neural Networks: Sequence Models, Text Preprocessing, Language Models and the Dataset, Recurrent Neural Networks, Implementation of Recurrent Neural Networks from Scratch, Concise Implementation of Recurrent Neural Networks, Back propagation Through Time.

Modern Recurrent Neural Networks: Gated Recurrent Units (GRU), Long Short Term Memory (LST), Deep Recurrent Neural Networks, Bidirectional Recurrent Neural Networks, Machine Translation and the Dataset, Encoder-Decoder Architecture, Sequence to Sequence, Beam Search.

UNIT – V

Auto Encoders : Types of Auto Encoders and its applications. **Generative Adversarial Networks:** Generative Adversarial Network, Deep Convolutional Generative Adversarial Networks.

Suggested Readings:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron

References:

1. Goodfellow, I., Bengio,Y., and Courville, A., "Deep Learning", MIT Press, 2016
2. Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola, "Dive into Deep Learning", 2020.

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Computer Science
Mahatma Gandhi University, NLG-508 254.

PC604CS	ARTIFICIAL INTELLIGENCE					
Prerequisites	PROGRAMMING LANGUAGES		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives:

1. Gain a historical perspective of AI and its foundations.
2. Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
3. Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4. Experience AI development tools such as an „AI language", expert system shell, and/or data mining tool.
5. Experiment with a machine learning model for simulation and analysis.
6. Explore the current scope, potential, limitations, and implications of intelligent systems

Course Outcomes: Upon successful completion of this course, student will be able to

1. Compare AI with human intelligence and traditional information processing and discuss its strengths and limitations as well as its application to complex and human-centred problems.
2. Discuss the core concepts and algorithms of advanced AI, including informed searching, CSP, logic, uncertain knowledge and reasoning, dynamic Bayesian networks, graphical models, decision making, multi agent, inductive learning, statistical learning, reinforcement learning, deep learning, natural language processing, robotics, and so on.
3. Apply the basic principles, models, and algorithms of AI to recognize, model, and solve problems in the analysis and design of information systems.
4. Analyze the structures and algorithms of a selection of techniques related to searching, reasoning, machine learning, and language processing.
5. Design AI functions and components involved in intelligent systems such as computer games, expert systems, semantic web, information retrieval, machine translation, mobile robots, decision support systems, and intelligent tutoring systems.
6. Review research articles from well-known AI journals and conference proceedings regarding the theories and applications of AI.
7. Carry out a research project and write a research proposal, report and paper.

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Board of Studies in Computer Science
Mahatma Gandhi University, NLG-508 254.

UNIT -I

Introduction: History Intelligent Systems, Foundations of Artificial Intelligence, Sub areas of Al, Applications.

Problem Solving - State - Space Search and Control Strategies: Introduction, General Problem Solving Characteristics of problem, Exhaustive Searches, Heuristic Search Techniques, Iterative - Deepening A*, Constraint Satisfaction.

Game Playing, Bounded Look - ahead Strategy and use of Evaluation Functions, Alpha Beta Pruning

UNIT – II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Table, A System in Propositional Logic, Resolution, Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT - III

Expert System and Applications: Introduction, Phases in Building Expert Systems Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and tools.

Uncertainity Measure - Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainity Factor Theory, Dempster - Shafer Theory.

UNIT - IV

Machine - Learning Paradigms: Introduction, Machine learning System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, Deductive Learning, Clustering, Support Vector Machines.

Artificial Neural Networks: Introduction Artificial Neural Networks, Single - Layer Feed Forward Networks, Multi - Layer Feed Forward Networks, Radial - Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks

UNIT - V

Reinforcement Learning: Overview of reinforcement learning: the agent environment framework, successes of reinforcement learning, Bandit problems and online learning, Markov decision processes, Returns, and value functions, Solution methods: dynamic programming,

CSE,UCE,MGU,NLG

Board of Studies in Computer Science
Mahatma Gandhi University, NLG-508 254.

Solution methods: Monte Carlo learning, Solution methods: Temporal difference learning learning, Eligibility traces, Value function approximation (function approximation), Models and planning (table lookup case), Case studies: successful examples of RL systems, Frontiers of RL research.

Suggested Reading:

1. Saroj Kaushik, ***Artificial Intelligence***, Cengage Learning India, First Edition, 2011.
2. Russell, Norvig, ***Artificial Intelligence: A Modern Approach***, Pearson Education, 2nd Edition,2004.

References:

1. Rich, Knight, Nair , ***Artificial Intelligence***, Tata McGraw Hill, 3rd Edition 2009.

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Board of Studies in
Computer Science
Mahatma Gandhi University, NLG-508 254.

PE611CS	VIRTUAL & AUGMENTED REALITY					
Prerequisites	MATHEMATICS, PROGRAMMING		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction Techniques related to VR/AR.
2. Review the Geometric Modeling Techniques
3. Discuss and Examine VR/AR Technologies.
4. Use of various types of Hardware and Software in Virtual Reality systems.
5. Simulate and Apply Virtual/Augmented Reality to varieties of Applications

Course Outcomes : At the end of the course the student will be able to:

1. Understand fundamental Computer Vision, Computer Graphics and Human Computer Interaction Techniques related to VR/AR.
2. Understand Geometric Modeling Techniques.
3. Understand the Virtual Environment.
4. Apply various types of Hardware and Software in Virtual Reality systems.
5. Design and Formulate Virtual/Augmented Reality Applications.

UNIT – I

Introduction to Virtual Reality (VR) : Virtual Reality and Virtual Environment, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.

UNIT – II

Computer Graphics and Geometric Modelling : The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms, Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.

UNIT – III

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Board of Studies in
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Maharaja Gandhi University, NLG-508

Virtual Environment Input/Output Devices: Input (Tracker, Sensor, Digital Gloves, Movement Capture, Videobased Input, 3D Menus & 3D Scanner, etc.), Output (Visual/Auditory/Haptic Devices) Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system

Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles,simple pendulum, springs, Flight dynamics of an aircraft.

UNIT – IV

Augmented Reality (AR) : Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments, Evaluating AR systems

UNIT – V

Development Tools and Frameworks : Human factors: Introduction, the eye, the ear, the somatic senses Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML.

AR / VR Applications: Introduction, Engineering, Entertainment, Science, Training, Game Development.

Suggested Readings:

1. Norman, K., Kirakowski, J., (2018), " ***Wiley Handbook of Human Computer Interaction***," Wiley-Blackwell, ISBN: 9781118976135.
2. LaViola Jr., J. J., Kruijff, E., McMahan, R. P., Bowman, D. A., Poupyrev, I., (2017), "***3D User Interfaces: Theory and Practice,***" Pearson, ISBN: 9780134034324.

References:

1. Coiffet, P., Burdea, G. C., (2003), "***Virtual Reality Technology,***" Wiley-IEEE Press, ISBN: 9780471360896.
2. Schmalstieg, D., Höllerer, T., (2016), "***Augmented Reality: Principles& Practice,***"Pearson, ISBN: 9789332578494.

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Board of Studies in
Computer Science
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PE612CS	INFORMATION RETRIEVAL SYSTEM					
Prerequisites	MACHINE LEARNING		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE			45

Course Objectives :

1. 1.To understand indexing and querying in information retrieval systems.
2. To learn the different models for information retrieval.
3. To expose the students to text classification and clustering.
4. To learn about web searching.
5. To understand Web crawling and Indexes

Course Outcomes: At the end of the course the student will be able to:

1. Understand the algorithms and techniques for information retrieval (document indexing
1. and retrieval, query processing).
2. Quantitatively evaluate information retrieval systems.
3. Classify and cluster documents.
4. Understand the practical aspects of information retrieval such as those in web search engines.
5. Expertise in matrix decompositions and latent semantic indexing.

UNIT – I

Boolean Retrieval: example information, Building an inverted index, processing Boolean queries,the extended Boolean model versus ranked retrieval.

The term vocabulary and postings lists: Document delineation and character sequence decoding, determining the vocabulary of terms, faster postings list intersection via skip pointers, Positional postings, and Phrase queries.

Dictionaries and tolerant retrieval: Search structures for dictionaries, Wildcard queries, spelling correction.

Index Construction: Hardware basics, Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, dynamic indexing, Other types of indexes.

UNIT – II

Index Compression: Statistical properties of terms in information retrieval, Dictionary compression, Postings file compression.

CHAIRPERSON
CSE,UCET,MG Board of Studies in Computer Science
Mahatma Gandhi University, NLG-50

Scoring, term weighting and the vector space model: Parametric and zone indexes, Term frequency and weighting, The vector space model for scoring, and Variant tf-idf functions.

Computing scores in a complete search system: Efficient scoring and ranking, Components of an information retrieval system, Vector space scoring and query operator interaction.

Evaluation in information retrieval: Information retrieval system evaluation, Standard test collections, Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results, Assessing relevance.

UNIT – III

Index Compression: Statistical properties of terms in information retrieval, Dictionary compression, Postings file compression.

Scoring, term weighting and the vector space model: Parametric and zone indexes, Term frequency and weighting, The vector space model for scoring, and Variant tf-idf functions.

Computing scores in a complete search system: Efficient scoring and ranking, Components of an information retrieval system, Vector space scoring and query operator interaction.

Evaluation in information retrieval: Information retrieval system evaluation, Standard test collections, Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results, Assessing relevance.

UNIT – IV

Text classification and Naive Bayes: The text classification problem, Naive Bayes text classification, The Bernoulli model, Properties of Naive Bayes, and Feature selection.Vector space classification: Document representations and measures of relatedness in vector spaces, Rocchio classification, k- nearest neighbour, Linear versus nonlinear classifiers.

Flat clustering: Clustering in information retrieval, Problem statement, Evaluation of clustering, kmeans.

Hierarchical clustering: Hierarchical agglomerative clustering, Single-link and complete- link clustering, Group-average agglomerative clustering, Centroid clustering, Divisive clustering

UNIT – V

Matrix decompositions and latent semantic indexing: Linear algebra review, Term- document matrices and singular value decompositions, Low-rank approximations, Latent semantic indexing.

Web search basics: Background and history, Web characteristics, Advertising as the economic model, The search user experience, Index size and estimation, Near-duplicates and shingling.

Web crawling and Indexes: Overview, Crawling, Distributing indexes, Connectivity servers. Link analysis: The Web as a graph, Page Rank, Hubs and Authorities.

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Computer Science
Mahatma Gandhi University, NLG-50

Suggested Reading:

1. 1.Gerald J Kowalski, Mark T Maybury. ***Information Storage and Retrieval Systems***, Springer, 2000.
2. Soumen Chakrabarti,***Mining the Web: Discovering Knowledge from Hypertext Data***, Morgan-Kaufmann Publishers, 2002.

References:

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, ***An Introduction to Information Retrieval,*** Cambridge University Press, Cambridge, England, 2008.
2. David A. Grossman, Ophir Frieder, ***Information Retrieval – Algorithms and Heuristics***, Springer, 2 nd Edition (Distributed by Universities Press), 2004.

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Computer Science
Mahatma Gandhi University, NLG-508 254.

PE613CS	BLOCKCHAIN TECHNOLOGIES					
Prerequisites	DISTRIBUTED SYSTEMS, CRYPTOGRAPHY, NETWORKING		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To Introduce the Theoretical Foundations of blockchain through bitcoin.
2. To Introduce the Theoretical Foundations of blockchain through bitcoin.
3. To Study Algorithms for Mining and Consensus implementation.
4. To Study Ethereum and Smart contracts concepts.
5. To Learn the concepts of Oracles and Decentralized Applications (DApps).

Course Outcomes: At the end of the course the student will be able to:

1. Understand the principles of blockchain technologies and bitcoin.
2. Be familiar with hash functions with wallets.
3. Understand mining and consensus strategies.
4. Understand Ethereum and tockens.
5. Understand smart contracts of ethereum

UNIT – I

Introduction: Bitcoin Uses, Users ,Getting Started ,Getting your first bitcoins ,Sending and receiving bitcoins, Transactions, Blocks, Mining, The Genesis Block,Merkle Trees,Block Header Hash and the Blockchain.

Keys, Addresses, Wallets: Introduction of Cryptography, Public key cryptography and crypto-currency ,Private and Public Keys ,Elliptic Curve Cryptography Explained Generating a public key ,Bitcoin Addresses, Base58 and Base58Check Encoding Key Formats, Implementing Keys and Addresses ,Wallets,Non-Deterministic (Random) Wallets, Deterministic (Seeded) Wallets, Mnemonic Code Words,Hierarchical Deterministic Wallets (BIP0032/BIP0044), Advanced Keys and Addresses ,Encrypted Private Keys (BIP0038) ,Pay To Script Hash (P2SH) and Multi-Sig Addresses ,Vanity Addresses ,Paper Wallets.

UNIT – II

Transactions: Introduction of Transaction Lifecycle ,Creating Transactions ,Broadcasting Transactions to the Bitcoin Network ,Propagating Transactions on the Bitcoin Network ,Transaction Structure,Transaction Outputs and Inputs ,Transaction Outputs ,Transaction Inputs , Transaction fees ,Adding Fees to Transactions.Transaction

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Board of Studies in
Computer Science
Mahatma Gandhi University, NLG-5

Chaining and Orphan Transactions ,Transaction Scripts and Script Language, Script Construction (Lock + Unlock) ,Scripting Language ,Turing Incompleteness ,Stateless Verification,Standard Transactions ,Pay to Public Key Hash (P2PKH) ,Pay-to-Public-Key,Multi-Signature ,Data Output (OP_RETURN) Pay to Script Hash (P2SH)

Mining and Consensus De-centralized Consensus, Independent Verification of Transactions, Mining Nodes, Aggregating transactions into Blocks, Transaction Age, Fees, and Priority, The Generation Transaction,Coinbase Reward and Fees ,Structure of the Generation Transaction, Coin base Data, Constructing the Block Header ,Mining the Block ,Proof-of-Work Algorithm ,Difficulty Representation,Difficulty Target and ReTargeting ,Successfully Mining the Block ,Validating a New Block,Assembling and Selecting Chains of Blocks, Blockchain Forks, Mining and the Hashing Race ,The Extra Nonce Solution ,Mining Pools ,Consensus Attacks.

UNIT – III

What Is Ethereum : Compared to Bitcoin , Ether Currency Units ,Choosing an Ethereum Wallet Control and Responsibility ,Getting Started with Meta Mask ,Creating a Wallet Switching Networks ,Getting Some Test Ether ,Sending Ether from Meta Mask Exploring the Transaction History of an Address,Introducing the World Computer

Externally Owned Accounts (EOAs) and Contracts ,A Simple Contract: A Test Ether Faucet.

Cryptography : Ethereum's Cryptographic Hash Function: Keccak-256 , Ethereum Addresses , Ethereum Address Formats ,Inter Exchange Client Address Protocol, Hex Encoding with Checksum in Capitalization(EIP-55)

The Ethereum Virtual Machine : What Is the EVM? Comparison with Existing Technology ,The EVM Instruction Set (Bytecode Operations) , Ethereum State ,Compiling Solidity to EVM Bytecode ,Contract Deployment Code,Disassembling the Bytecode.

UNIT – IV

Transactions : Transmitting Value to EOAs and Contracts, Transmitting a Data Payload to an EOA or Contract,Special Transaction: Contract Creation ,Digital Signatures ,The Elliptic Curve Digital Signature Algorithm ,How Digital Signatures Work ,Verifying the Signature ,ECDSA Math,Transaction Signing in Practice ,Raw Transaction Creation and Signing ,Raw Transaction Creation with EIP-155 ,The Signature Prefix Value (v) and Public Key Recovery, Separating Signing and Transmission (Offline Signing) ,Transaction Propagation ,Recording on the Blockchain ,Multiple-Signature (Multisig) Transactions

Tokens : How Tokens Are Used, Tokens and Fungibility ,Counterparty Risk ,Tokens and Intrinsicality,Using Tokens: Utility or Equity ,ERC223: A Proposed Token Contract Interface

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Board of Studies in Computer Science
Mahatma Gandhi University, NLG-506

Standard,ERC777: A Proposed Token Contract Interface Standard, ERC721: Non-fungible Token (Deed)Standard.

UNIT – V

Oracles: Why Oracles Are Needed ,Oracle Use Cases and Examples ,Oracle Design,Patterns Data Authentication ,Computation Oracles ,Decentralized Oracles, Oracle Client Interfaces in Solidity

Decentralized Applications (DApps): Introduction, Backend (Smart Contract), Frontend (WebUser Interface) ,Data Storage, Decentralized Message Communications Protocols, A Basic DAppExample: Auction DApp ,Auction DApp: Backend Smart Contracts ,Auction DApp: Frontend UserInterface, Further Decentralizing the Auction DApp, Storing the Auction DApp on Swarm,Preparing Swarm ,Uploading Files to Swarm ,The Ethereum Name Service (ENS) ,History of Ethereum Name Services ,The ENS Specification ,Bottom Layer: Name Owners and Resolvers,Middle Layer: The .eth Nodes ,Top Layer: The Deeds, Registering a Name, Managing Your ENSName ,ENS Resolver,Resolving a Name to a Swarm Hash (Content) ,From App to DApp

Suggested Reading:

1. Dr. Gavin Wood, Andreas M. Antonopoulos, ***Mastering Ethereum: Building Smart Contracts and Dapps***, O'Reilly, 2018.

References:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder,***Bitcoin and Cryptocurrency Technologies***, Princeton University Press and Oxford, 2016
2. Andreas M. Antonopoulos, ***Mastering Bitcoin: Programming the Open Blockchain***, O'Reilly,2017.

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Board of Studies in
Computer Science
Mahatma Gandhi University, NLG-508 254.

PE614CS	HUMAN COMPUTER INTERACTION					
Prerequisites	BASICS OF COMPUTERS		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. 1.To introduce the concepts of user goals , conceptual models and process of interaction
2. Design.
3. To study cognitive, social and emotional aspects of interaction.
4. To learn Data Analysis, Interpretation, and Presentation techniques.
5. To learn the concepts of prototyping and discovering user requirements.
6. To introduce the concepts of controlled evaluation and Walk-Throughs.

Course Outcomes: At the end of the course the student will be able to:

1. Understand the concept of user experience design, interaction types , and frameworks.
2. Use cognitive frameworks, principles of social interaction in the design of Interfaces.
3. Gather data and use various quantitative and qualitative analytic techniques.
4. Design prototypes and Use predictive models and conduct usability testing.
5. Understand evaluation studies in detail.

UNIT – I

Interaction Design: Introduction, Good and Poor Design, what is Interaction Design, The User Experience, Understanding Users Accessibility and Inclusiveness, Usability and User Experience Goals.

Process of Interaction Design: Introduction, What is Involved in Interaction Design, Practical Issues.

Conceptualizing Interaction: Introduction, Conceptualizing Interaction, Conceptual Models, Interface Metaphors, Interaction Types, Paradigms, Visions, Theories, Models, and Frameworks.

UNIT – II

Cognitive Aspects: Introduction, What is Cognition, Cognitive Frameworks.

Social Interaction: Introduction, Being Social, Face-to-Face Conversations, Remote Conversations,Co-presence, Social Engagement.

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Mahatma Gandhi University, NLG-50

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Emotional Interaction: Introduction, Emotions and the User Experience, Expressive Interfaces and Emotional Design, Annoying Interfaces, Affective Computing and Emotional AI, Persuasive Technologies and Behavioural Anthropomorphism Change.

UNIT – III

Interfaces: Introduction, Interface Types, Natural User Interfaces and Beyond, Which Interface.

Data Gathering: Introduction, Five Key Issues, Data Recording, Interviews, Questionnaires,Observation, Choosing and Combining Techniques.

Data Analysis, Interpretation, and Presentation : Introduction, Quantitative and Qualitative, Basic Quantitative Analysis, Basic Qualitative Analysis, Kind of Analytic Framework to Use, Tools to Support Data Analysis, Interpreting and Presenting the Findings.

UNIT – IV

Discovering Requirements: Introduction, Data Gathering for Requirements, Bringing Requirements to Life: Personas and Scenarios, Capturing Interaction with Use Cases.

Design,Prototyping, and Construction: Introduction, Prototyping, Conceptual Design, Concrete Design,Generating Prototypes, Construction. **Interaction Design in Practice:** Introduction, Agile UX,Design Patterns ,Open Source Resources, Tools for Interaction Design.

UNIT – V

Introducing Evaluation: Introduction, Types of Evaluation, Evaluation Case Studies, Case Studies,Other Issues to Consider in Evaluation.

Evaluation Studies: From Controlled to Natural Settings: Introduction, Usability Testing,Conducting Experiments, Field Studies.

Evaluation: Inspections, Analytics, and Models: Introduction, Inspections: Heuristic Evaluation and Walk-Throughs, Analytics and A/B Testing,Predictive Models.

Suggested Reading:

1. Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel, ***About Face: The Essentials of Interaction Design*** Wiley, 4th Edition 2014.
2. Elizabeth Goodman, Mike Kuniavsky, ***Observing the User Experience***, Elsevier 2nd Edition2012
3. Jesmond Allen, James Chudley,***Smashing UX Design***,Wiley ,1st Edition 2012.

References:

1. Helen Sharp, Jennifer Preece, Yvonne Rogers ***Interaction Design: Beyond Human-Computer Interaction*** wiley Publishing 5th Edition 2019
2. .Jenifer Tidwell, Charles Brewer, Aynne Valencia, ***Designing Interfaces***, O'REIIIEY 3rd Edition 2020.

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OE601CE	DISASTER MANAGEMENT					
Prerequisites	COMPUTER LITERACY, COMMUNICATION SKILLS		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To introduce basic conceptual understanding of natural & man-made hazards and different contextual aspects.
2. To develop the knowledge and understanding of the International and national strategy for disaster reduction (UN-ISDR).
3. To ensure skills and abilities to analyze potential effects of disasters.
4. To promote the use of science and technology for implementing the disaster risk reduction (DRR) plans and policies.
5. To understand the strategies and methods to deliver public health response to avert theseeffects.

Course Outcomes: At the end of the course the student will be able to:

1. Aptitude to link hazards, risk, vulnerability, differential impacts and capacity building to the life and property loss during disasters and its impacts on the society and sustainability.
2. Ability to understand various aspects of natural and man-made hazards and emerging trends.
3. Acquaintance with different steps involved in disaster risk reduction (DRR) and international initiatives for prevention, mitigation and preparedness.
4. Knack to appreciate the national policy and role of individuals, communities, and government organizations in disaster management.
5. Capacity to identifying current technological constraints and hazard specific solutions,particularly construction codes etc.

UNIT – I

Understanding the Concepts, Definitions and Terminologies used in the field of DisasterManagement (i.e. Hazard, Risk, Vulnerability, Resilience, and Capacity Building).Differential impacts of Disasters in terms of Gender, Age, Social Status, Location, Prosperity,Disabilities.Disaster- Development Nexus

UNIT – II

Classification, Causes, Consequences and Controls of Geophysical hazards-Earthquakes, Landslides,Tsunami Weather related hazards- Meteorological (Cyclones, Storm-surge and Lighting)Hydrological (Floods, Droughts, Avalanches) Climatological (Wildfire, Cold & Heat

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Board of Studies in
Computer Science
Mahatma Gandhi University, NLG

Waves)Biological hazards-Epidemic & Pandemics, Technological hazards-Chemical, Industrial, NuclearMan-made hazards-Structural Failure, Fire, Transportation accidents, Terrorism andWars Emerging Disasters- Urban Areas, Climate Change. Regional and Global Trends-lossof life & Property in various hazards.

UNIT – III

DISASTER MANAGEMENT CYCLE AND INTERNATIONAL FRAMEWORK

Disaster Management Cycle Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonationand Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness,Capacity Development; Awareness During Disaster – Evacuation – Disaster Communication –Search and Rescue– Emergency Operation Centre – Incident Command System – Relief andRehabilitation Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure– Early Recovery – Reconstruction and Redevelopment Paradigm Shift in Disaster Management:International Decade for Natural Disaster Reduction; Yokohama Strategy; Hyogo Framework ofAction

UNIT – IV

DISASTER RISK MANAGEMENT IN INDIA

Disaster Profile of India – Mega Disasters of India and Lessons Learnt, Disaster Management Act2005 – Institutional and Financial Mechanism, National Policy on Disaster Management, NationalGuidelines and Plans on Disaster Management; Role of Government (local, state and national),Non-Government and Inter- governmental Agencies.

UNIT – V

TECHNOLOGICAL APPROACHES TO DISASTER RISK REDUCTION

Geo-informatics in Disaster Management (RS, GIS, GPS and RS), Disaster Communication System(Early Warning and Its Dissemination), Land Use Planning and Development Regulations, DisasterSafe Designs and Constructions, Structural and Non Structural Mitigation of Disasters, Science&Technology Institutions for Disaster Management in India

Suggested Reading:

1.World Disasters Report, 2009. International Federation of Red Cross and Red Crescent,Switzerland.

References:

1. Coppola D P, 2007. Introduction to International Disaster Management, Elsevier Science (B/H), London.

2. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi.

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OE602CE	ROAD SAFETY ENGINEERING					
Prerequisites	KNOWLEDGE OF SAFETY SCHEMES AND ROAD DESIGNS		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To introduce the fundamentals of road safety and road safety audit
2. To get familiarized with various road safety techniques, measures and their applications
3. To be able to understand and evaluate various traffic control devices
4. Familiarize with traffic management techniques
5. To examine and analyze the incident management process

Course Outcomes : At the end of the course the student will be able to:

1. Analyze Accident data
2. Plan and design of road safety improvement programs
3. Apply the principles of road safety in urban transport
4. Apply traffic management techniques
5. Able to plan effective incident management program

UNIT – I

Road accidents: Causes, scientific investigations and data collection, analysis of individual accidents to arrive at real causes, statistical methods of analysis of accident data, Basic concepts of road accident statistics, safety performance function: The empirical Bayes method identification of hazards road location. Application of computer analysis of accident data.

UNIT – II

Safety in Road Design: Operating the road network for safety, highway operation and counter measures, road safety audit, principles-procedures and practice, code of good practice and checklists, vehicle design factors & driver characteristics influencing road safety.

UNIT – III

Road Signs and Traffic Signals: Classification, Location of signs, measures of sign effectiveness, Types of visual perception, sign regulations, sign visibility, sign variables, Text

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CHAIRPERSON
Board of Studies in
Computer Science
Mahatma Gandhi University, NLG-508

versus symbols, Road marking: Role of road marking, classification, visibility. Traffic signals: Need, Signal face illumination and location of signals, factors affecting signal design, pedestrian's safety, fixed and vehicle actuated signals. Design of signals, area traffic control, Delineators, traffic impact attenuators, road side rest areas, safety barriers, traffic aid posts.

UNIT – IV

Traffic Management Techniques: Integrated safety improvement and traffic calming schemes, speed and load limit, traffic lights, safety cameras, tests on driver and vehicles, pedestrian safety issues, parking, parking enforcement and its influence on accidents, travel demand management,methods of traffic management measures: restriction of turning movements, One way streets, tidal flow operation methods, exclusive bus lanes and closing side-streets; latest tools and techniques used for road safety; legislation, enforcement, education and propaganda.

UNIT – V

Incident Management: Introduction, characteristics of traffic incidents types of incidents, impacts, incident management process, incident traffic management; application of ITS: Motorist information, equipment used; planning effective incident management program, best practice in incident management programs. National importance of survival of transpiration systems during and after all natural disasters especially cyclones, earthquakes, floods etc and manmade disasters like sabotage, terrorism etc.

References:

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017.

2. KadiyaliL.R, Lal, N.B., 'Principles and Practices of Highway Engineering' Khanna

Publishers, 7e, 2017.

Suggested Readings:

1. IRC 93 ' Guidelines for the design of road traffic signals' IRC, New Delhi.

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Board of Studies in
Computer Science
CSE,UCET,MGU,NLG.TS
Mahatma Gandhi University, NLG-508 254.

OE601CS	PYTHON PROGRAMMING					
Prerequisites	BASIC UNDERSTANDING OF PROGRAMMING CONCEPTS		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To know the basics of Programming.
1. To convert an algorithm into a Python program.
2. To construct Python programs with control structures.
3. To structure a Python Program as a set of function.
4. To use Python data structures-lists, tuples, dictionaries.

Course Outcomes: At the end of the course the student will be able to:

1. Develop algorithmic solutions to simple computational problems.
2. Develop and execute simple Python programs.
3. Develop simple Python programs for solving problems.
4. Structure a Python program into functions.
5. Represent compound data using Python lists, tuples, dictionaries.

UNIT – I

Introduction to Computing and Problem Solving: Fundamentals of Computing – Computing Devices – Identification of Computational Problems – Pseudo Code and Flowcharts – Instructions –Algorithms Building Blocks of Algorithms.

Introduction to Python Programming: Python Interpreter and Interactive Mode– Variables and Identifiers – Arithmetic Operators – Values and Types – Statements, Reading Input, Print Output,Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: The if, The if...else, The if...elif...else Decision Control Statements,Nested if Statement, The while Loop, The for Loop, The continue and break Statements.

UNIT – II

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Charactersin String byIndex Number, String Slicing and Joining, String Methods, Formatting Strings.

CSE.UCEK.MGU.NLG.IN

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Board of Studies in
Computer Science
Mahatma Gandhi University, NLG

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters;

Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort,histogram.

UNIT – III

Files and Exception: Text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs:word count, copy file. Strings: Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings Dictionaries and Sets: Dictionaries, Sets, Serializing Objects.

UNIT – IV

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance The Polymorphism.

Functional Programming: Lambda. Iterators, Generators, List Comprehensions

UNIT – V

GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Suggested Readings:

1. Gowrishankar S., Veena A, "***Introduction to Python Programming***", CRC Press, Taylor &Francis Group, 2019.

References:

1. Richard L. Halterman, "***Learning To Program With Python***", Copyright © 2011.
2. Dr. Charles R, "***Python for Everybody, Exploring Data Using Python 3***", Severance. 2016.

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Board of Studies in
Computer Science
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CSE,UCET,MGU,NLG,TS

OE602CS	CYBER SECURITY					
Prerequisites	OS,CN		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To learn the various threats in networks and security concepts.
2. To apply authentication applications in different networks.
3. To understand security services for email.
4. To awareness of firewall and IT laws and policies.
5. To understand different IT Policies.

Course Outcomes : At the end of the course the student will be able to:

1. Understand the various network threats.
2. Analyze the forensic tools for evidence collection.
3. Apply the firewalls for threat analysis.
4. Understand OS artifact.
5. Evaluate Different IT Acts.

UNIT – I

Ethical hacking, Attack Vectors, Cyberspace and Criminal Behaviour, Clarification of Terms,Traditional Problems associated with Computer Crimes, Realms of Cyber world, brief history of the internet, contaminants and destruction of data, unauthorized access, computer intrusions, white-collar crimes, viruses and malicious code, virus attacks, pornography, software piracy, mail bombs,exploitation, stalking and obscenity in internet, Cyber psychology, Social Engineering.

UNIT – II

Introduction to Digital forensics, Forensic software and handling, forensic hardware and handling,analysis and advanced tools, forensic technology and practices, Biometrics: face, iris and finger print recognition, Audio-video evidence collection, Preservation and Forensic Analysis

UNIT – III

Investigation Tools, e-discovery, EDRM Models, digital evidence collection and preservation, email investigation, email tracking, IP tracking, email recovery, search and seizure of computer systems,password cracking.

CHAIRPERSON
Board of Studies in
Computer Science
Mahatma Gandhi University, NLG-5

CSE,UCET,MGU,NLG,TS

UNIT – IV

Forensic Analysis of OS artifact, Internet Artifacts, File System Artifacts, Registry Artifacts,Application Artifacts, Report Writing, Mobile Forensic- identification, collection and preservation of mobile evidences, social media analysis, data retrieval, Email analysis from mobile phones.

UNIT – V

Ethics, Policies and IT Act.: Basics of Law and Technology, Introduction to Indian Laws, Scope and Jurisprudence, Digital Signatures, E Commerce-an Introduction, possible crime scenarios, law coverage, data interchange, mobile communication development, smart card and expert systems Indian Laws, Information Technology Act 2000, Indian Evidence Act, India Technology Amendment Act 2008, Indian Penal Code, Computer Security Act 1987, National Information Infrastructure Protection Act 1996, Fraud Act 1997, Children Online Protection Act 1998, Computer Fraud and Abuse Act 2001, Intellectual Property, IP Theft, Copyright, Trademark, Privacy and Censorship, ,Introduction to Cyber Ethics,rights over intellectual property, Corporate IT Policy Formulations, Compliance Auditing.

Suggested Readings:

1. William Stallings, "***Cryptography and Network Security***", Prentice Hall, New Delhi, 2006.

References:

1. Charles P. Fleeger, "***Security in Computing***", Prentice Hall, New Delhi, 2009.
2. BehrouzA.Forouzan, "***Cryptography & Network Security***", Tata McGraw Hill, India, New Delhi, 2009.

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OE601EC	VERILOG HDL					
Prerequisites	BASIC DIGITAL ELECTRONIC KNOWLEDGE		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To familiarize with various modeling styles: structural, data flow and behavioral of Verilog HDL.
2. To develop combinational and sequential circuits using various modeling styles of Verilog HDL.
3. To design and develop Verilog HDL models of combinational and sequential circuits.
4. To learn Synthesis and FPGA design flow To design and develop real time applications:Booth's multiplier, Divider, hardwired control for basic CPU, FIR filter.
5. To design and develop real time applications: Booth's multiplier, Divider, hardwired control for basic CPU, FIR filter.

Course Outcomes: At the end of the course the student will be able to:

1. Implement and distinguish different Verilog HDL modeling styles.
2. Construct and analyze Verilog HDL models of combinational and sequential circuits
3. Design and develop Verilog HDL modeling and test bench for digital systems for the given specifications.
4. Outline FPGA design flow and timing analysis.
5. Understand implementation of real time applications.

UNIT – I

Introduction to HDL: Overview and Importance of HDLs, Differences between HLL, HDL and ALP. Design methodologies, Modules, Lexical Conventions, Number Specifications, Strings,Identifiers and Keywords Data types, System task and compiler Directives, Port declaration and portconnection rules.

UNIT – II

Structural and Dataflow modeling: gate-level modeling, delays, hazards, dataflow modeling:Continuous Assignments, Delays, Expressions, Operators and Operands, Operator Types and Design Examples.

UNIT – III

Behavioral Modeling: Structured Procedures, Procedural Assignments, Timing Controls,Conditional Statements, multi-way branching, Loops, Sequential and Parallel blocks,

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Board of Studies in
Computer Science
Mahatma Gandhi University, NLG-5

Generate blocks. Combinational, sequential logic modules Simulation: Types of Simulation, Event driven Simulation and Cycle Based Simulation; design examples.

UNIT – IV

Synthesis and Verification: Tasks and Functions: Differences between Tasks and Functions, Tasks and Functions. Verilog HDL synthesis, synthesis, Application Specific IC (ASIC) and Field Programmable Gate Array (FPGA) design flow. Verification: Timing analysis and Test bench design. Design examples.

UNIT – V

Real time implementations: Fixed-Point Arithmetic modules: Addition, Multiplication, Division,Arithmetic and Logic Unit (ALU), Timer, Universal Asynchronous Receiver and Transmitter(UART), DSP modules: FIR and IIR filters, CPU design: Data path and control units.

Suggested Readings:

1. Bhasker, —*A Verilog HDL Primer*, 2nd Edition, BS Publications, 2001.

References:

1. Samir Palnitkar, —*Verilog HDL A Guide to Digital Design and Synthesis*, 2nd Edition, Pearson Education, 2006.
2. Ming-Bo Lin, —*Digital System Designs and Practices: Using Verilog HDL and FPGA*, Wiley India Edition, 2008.

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OE602EC	PRINCIPLES OF ELECTRONIC COMMUNICATION SYSTEMS					
Prerequisites	S&S		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. Provide an introduction to fundamental concepts in the understanding of Electronic communications systems
2. Provide an introduction to network model and some of the network layers including physical layer, data link layer, network layer and transport layer
3. Provide an introduction to the evolution of wireless systems and current wireless technologies
4. Provide an introduction to fundamental concepts in the understanding of Telecommunication and optical communications systems
6. Provide an introduction to fundamental concepts in Analog and Digital Communications

Course Outcomes: At the end of the course the student will be able to:

1. Understand the working of analog and digital communication systems.
2. Understand the Data Communication and Networking
3. Understand the concepts of modulation and demodulations Understand the evolution of communication technologies from traditional telephony systems to modern wireless communication systems
4. Understand the principles of optical communications systems

UNIT – I

Introduction to communication systems: Electromagnetic Frequency Spectrum, Signal and its representation, Elements of Electronic Communications System, Types of Communication Channels, Signal Transmission Concepts-Baseband transmission and Broadband transmission,Communication parameters-Transmitted power, Channel bandwidth and Noise, Need for modulation Signal Radiation and Propagation-Principle of electromagnetic radiation, Types of Antennas, Antenna Parameters and Mechanisms of Propagation.

UNIT – II

Analog and Digital Communications: Amplitude modulation and demodulation, FM modulation and demodulation, Digital converters, Digital modulation schemes – ASK, FSK, PSK, QPSK,Digital demodulation.

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Board of Studies in
Computer Science
Acharya Nagarjuna University, NLG-5

UNIT – III

Data Communication and Networking: Network Models, OSI Model, Data Link Layer – MediaAccess control, Ethernet, Network Layer – Internet Protocol (IPv4/IPv6), Transport Layer – TCP,UDP

UNIT – IV

Telecommunication Systems: Telephones, Telephone system, Paging systems, Internet Telephony.

Optical Communications: Optical Principles, Optical Communication Systems, Fiber –Optic Cables,Optical Transmitters & Receivers, Wavelength Division Multiplexing

UNIT – V

Wireless Communications: Evolution of Wireless Systems: AMPS, GSM, CDMA, WCDMA, And OFDM. Current Wireless Technologies: Wireless LAN, Bluetooth, PAN and ZigBee, Infrared wireless, RFID communication, UWB, Wireless mesh networks, Vehicular adhoc networks.

Suggested Readings:

1. Kennady, Davis, "***Electronic Communications systems***", 4e, TMH, 1999.

References:

1. Louis E. Frenzel, "***Principles of Electronic Communication Systems***", 3e, McGraw Hill publications, 2008.
2. Behrouz A. Forouzan,"***Data Communications and Networking***", 5e TMH, 2012.

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OE601EE	APPLICATIONS OF ELECTRICAL ENERGY					
Prerequisites	BEE		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To introduce the students and understand Utilization of electrical energy for various applications like industrial heating.
2. To understand various techniques of electric welding and types of batteries.
3. To understand the concept of illumination and study about the laws of illumination.
4. To know the applications of various lamps to factory lighting, street lighting etc.
5. To understand the concept of electric traction including speed – time curves of different traction services.

Course Outcomes: At the end of the course the student will be able to:

1. Identify a suitable heating scheme for a given application.
2. Identify proper welding technique and various characteristics of batteries.
3. Study the nature and production of light and laws related to illumination.
4. Classify types of electric light sources based on nature and operation and their objectives,performance and reliability.
5. Determine the speed-time characteristics of various traction services and also estimate the energy consumption levels at various modes of operation.

UNIT – I

Industrial Heating: Advantages and methods of electric heating. Description, operation and performance of resistance ovens, Design of heating element. High frequency heating, Induction Heating, Induction furnaces, Core type, Coreless furnaces, Dielectric heating. Electric Arc furnaces,Direct Arc furnace, Indirect Arc furnaces

UNIT – II

Electric welding: Classification of electric welding, welding transformer and its rating, various types of Electric arc welding and electric resistance welding.

Batteries: Lead acid batteries, SMF batteries, Construction and maintenance, Charging and rating of batteries.

UNIT – III

Illumination: Introduction, nature and production of light, Sensitivity of the eye, Units of light. The inverse square law and cosine law, Solid angle, Lighting calculations, Determination of M.S.C.P,Rousseau"s construction.

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UNIT – IV

Types of lamps - Discharge lamps, Sodium vapour lamps, Mercury vapour lamps, Fluorescentlamp. Starting and power factor corrections, stroboscopic effects, Neonsigns, Application to factory lighting, Street lighting and Flood lighting.

UNIT – V

Electric Traction: System of Electric Traction, Transmission of drive, Systems of track electrification, Traction mechanics, Speed time curves, Tractive effort, Power of Traction motor,Specific energy consumption, Mechanics of train movement, Coefficient of adhesion.

Suggested Readings:

1. Partab H, ***Modern Electric Traction***, Dhanpat Rai & Sons, 2000.

References:

1. Partab H, ***Art and Science of Utilization of Electric Power***, Dhanpat Rai & Sons, 1997.
2. K.B. Raina & S.K. Bhattacharya, ***Electrical Design, Estimating and Costing***, Wiley Eastern Ltd., 1991.

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OE602EE	ELECTRICAL SAFETY MANAGEMENT					
Prerequisites	BEE		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. Understand electrical safety measures, the hazards associated with electric current, and voltage identify different types of electrical shocks
2. Understand installation work of electrical plant and equipment. Safety during installation of outdoor switch yard equipment, safety during installation of electrical rotating machines.
3. Understand procedure of domestic wirings, to handle different domestic electrical appliances, Procedure of Agricultural pump installation
4. Identifies different hazardous zones, classification of equipment enclosure for various hazardous gases, importance of earthing system. Understand Management Safety Policy
5. Understand standards on electrical safety, different IE Rules and Acts

Course Outcomes: At the end of the course the student will be able to:

1. Explain the objectives and precautions of Electrical safety, effects of shocks and their prevention.
2. Summarize the safety aspects during installation of plant and equipment.
3. Describe the electrical safety in residential, commercial and agricultural installations.
4. Describe the various Electrical safety in hazardous areas, Equipment earthing and system neutral earthing.
5. State the electrical systems safety management and IE rules.

UNIT – I

Introduction To Electrical Safety, Shocks And Their Prevention: Terms and definitions, objectives of safety and security measures, Hazards associated with electric current, and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shops.

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UNIT – II

Safety During Installation Of Plant And Equipment: Introduction, preliminary preparations, preconditions for start of installation work, during, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection, personal protective equipment for erection personnel, installation of a large oil immersed power transformer, installation of outdoor switch yard equipment, safety during installation of electrical rotating machines, drying out and insulation resistance measurement of rotating machines.

UNIT – III

Electrical Safety In Residential, Commercial And Agricultural Installations: Wiring and fitting – Domestic appliances – water tap giving shock – shock from wet wall – fan firing shock – multi-storied building – Temporary installations – Agricultural pump installation – Do's and Don'ts for safety in the use of domestic electrical appliances.

UNIT – IV

Electrical Safety In Hazardous Areas: Hazardous zones – class 0,1 and 2 – spark,flashovers and corona discharge and functional requirements – Specifications of electrical plants,equipment for hazardous locations – Classification of equipment enclosure for various hazardous gases and vapours – classification of equipment/enclosure for hazardous locations.

UNIT – V

Safety Management Of Electrical Systems: Principles of Safety Management,Management Safety Policy, Safety organization, safety auditing, Motivation to managers,supervisors, employees.

Review Of Ie Rules And Acts And Their Significance: Objective and scope – ground clearances and section clearances – standards on electrical safety -safe limits of current, voltage –Rules regarding first aid and firefighting facility.The Electricity Act, 2003, (Part1, 2, 3, 4 & 5).

Suggested Readings:

1. Pradeep Chaturvedi, "***Energy management policy, planning and utilization***", Concept Publishing company, New Delhi, 1997.

References:

1. S.Rao, Prof. H.L.Saluja, "***Electrical safety, fire safety Engineering and safety management***", 1st edition Khanna Publishers. New Delhi, 2016 Reprint.

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PC651CS	COMPILER DESIGN LAB					
Prerequisites	ALC,PROGRAMMING LANGUAGES		L	T	P	C
			3	0	0	3
Evaluation	CIE	30	SEE		45	

Course Objectives :

1. To learn usage of tools LEX, YAAC
2. To develop a code generator
3. To implement different code optimization schemes

Course Outcomes : At the end of the course the student will be able to:

1. Generate scanner and parser from formal specification
2. Design a compiler for a subset of any High level language

List of Experiments:

1. Construction of DFA from NFA.
2. Scanner program using LEX.
3. Construction of a Predictive parsing Table.
4. SLR Parser table generation.
5. Implement unification Algorithm.
6. LR Parser table generation.
7. Parser Generation using YACC.
8. Write a program on code generation.
9. Write a program on code optimization

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Mahatma Gandhi University, NLG-508 254.

PC 652 CS	WEB PROGRAMMING LAB					
Prerequisites	HTML, JAVA		L	T	P	C
			3	0	0	3
Evaluation	CIE	20	SEE			30

Course Objectives :

1. To develop an ability to design and implement static and dynamic website
2. To understand, analyze and create XML documents and XML Schema
3. To understand, analyze and build web applications using PHP

Course Outcomes : At the end of the course the student will be able to:

1. Create web pages using HTML and Cascading Styles sheets
2. Create dynamic web pages using JavaScript
3. Understand, analyze and apply the role of languages like HTML, CSS, XML, JavaScript, PHP, SERVLETS, JSP and protocols in the workings of the web and web applications
4. Build web applications using PHP
5. Analyze a web page and identify its elements and attributes

List of Experiments:

1. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
2. Write JavaScript to validate the following fields of the Registration page.
   - First Name (Name should contains alphabets and the length should not be less than 6 characters).
   - Password (Password should not be less than 6 characters length).
   - E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
   - Mobile Number (Phone number should contain 10 digits only).
   - Last Name and Address (should not be Empty).
3. Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.
4. Develop and demonstrate PHP Script for the following problems:
   a) Write a PHP Script to find out the Sum of the Individual Digits.
   b) Write a PHP Script to check whether the given number is Palindrome or not
5. Write an HTML page including any required JavaScript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the

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Board of Studies in Computer Science
Mahatma Gandhi University, NLG-508

number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.

6. Write a HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, words and lines in the text entered using an alert message. Words are separated with white spaces and lines are separated with new line character.
7. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
8. Create and save an XML document at the server, which contains 10 users information. Write a program which takes User Id as input and returns the user details by taking the user information from the XML document. Install the following on the local machine: Apache Web Server, Tomcat Application Server locally, Install MySQL and install PHP and configure it to work with Apache web server and MySQL.
9. Implement the following web applications using PHP,

a. A simple calculator application that takes two numbers and an operator (+,-,*,/,%) from an HTML page and returns the result page with the operation performed on the operands.

b. A web application takes a name as input and on submit it shows a hello<name>page where <name> is taken from the request. It shows the start time at the right top corner of the page and provides the logout button. On clicking this button, it should show a logout page with Thank You<name> message with the duration of usage.(Use session to store name and time)

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PC653CS	DEEP LEARNING LAB					
Prerequisites	PYTHON		L	T	P	C
			0	0	2	1
Evaluation	CIE	20	SEE		30	

Course Objectives :

1. Implement RNN and CNN for multiple problems
2. Implement Auto encoders and GAN

Course Outcomes : At the end of the course the student will be able to:

1. Make use of deep learning APIs like Keras
2. Implement multiple conversions for Analysis
3. Apply deep learning techniques for object identification and segmentation

List of Experiments:

1. Build a deep neural network model start with linear regression using a single variable
2. Build a deep neural network model start with linear regression using multiple variables.
3. Write a program to convert speech into text.
4. Write a program for Time-Series Forecasting with the LSTM Model.
5. Write a program to predict a caption for a sample image using LSTM.
6. Write a program for character recognition using CNN.
7. Write a program to predict a caption for a sample image using CNN
8. Write a program for character recognition using RNN and compare it with CNN.
9. Write a program to detect Dog image using YOLO Algorithm.
10. Write a program to develop a GAN for Generating MNIST Handwritten Digits.

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w.e.f Academic year 2025-26

PW656CS	MINI PROJECT					
Prerequisites	FUNDAMENTAL TECHNICAL & RESEARCH SKILLS		L	T	P	C
			0	0	6	3
Evaluation	CIE	-	SEE		45	

Course Objectives :

1. To develop capability to analyze and solve real world problems with an emphasis on Applying integrating knowledge acquired.
2. To learn the communication and presentation of the project work

Course Outcomes : At the end of the course the student will be able to:

1. Analyze and solve real world problems.
2. Implement the system using SQL, data structures, C/C++, JAVA, Python and different software engineering models.

The Department can initiate the project allotment procedure at the end of V semester and finalize it in the first two weeks of VI semester. The department will appoint a project coordinator who will coordinate the following: Collection of project topics/ descriptions from faculty members (Problem scan also be invited from the industries) Grouping of students (max 3 in a group) Allotment of project guides The aim of mini project to develop solutions to realistic problems applying the knowledge and skills

Obtained in different courses, new technologies and current industry practices. This requires students to understand current problems in their domain and methodologies to solve these problems. To get awareness on current problems and solution techniques, the first Two (2) weeks of VI semester will be spent on special lectures by faculty members, research scholars, post graduate students of the department and invited lectures by engineers from industries and R&D institutions.

After completion of these seminars each group has to formalize the project proposal based on their own ideas or as suggested by the project guide. Seminar schedule will be prepared by the coordinator for all the students from the 5th week to the last week of the semester which should be strictly adhered to. Each group will be required to:

1. Submit a one page synopsis before the seminar for display on notice board.
2. Give a 30 minutes presentation followed by 10 minutes discussion.
3. Submit a technical write-up on the talk.

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Mahatma Gandhi University, NLG-508

At least two teachers will be associated with the Mini Project to evaluate students for the award of sessional marks which will be on the basis of performance in all the 3 items stated above.

The seminar presentation should include the following components of the project:

- Problem definition and specification
- Literature survey
- Broad knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of bar (activity) charts
- Presentation- oral and written.

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PW 961 CS	SUMMER INTERNSHIP					
Prerequisites	TECHNICAL SKILLS & KNOWLEDGE		L	T	P	C
			0	0	6	3
Evaluation	CIE	-	SEE			50

Course Objectives :

1. To train and provide hands-on experience in analysis, design, and programming of information systems by means of case studies and projects.
2. To expose the students to industry practices and team work.
3. 3.To provide training in soft skills and also train them in presenting seminars and technical report writing.

Course Out comes : At the end of the course the student will be able to:

1. Get Practical experience of software design and development, and coding practices within Industrial/R&D Environments.
2. Gain working practices within Industrial/R&D Environments.
3. Prepare reports and other relevant documentation.

Summer Internship is introduced as part of the curricula of encouraging students to work on problems of interest to industries. A batch of three students will be attached to a person from the Computer Industry/Software Companies/R&D Organization for a period of 8 weeks. This will be during the summer vacation following the completion of the III year Course. One faculty coordinator will also be attached to the group of Three (3) students to monitor the progress and to interact with the industry co-ordinate (person from industry). After the completion of the project, student will submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the Department. Award of sessionals are to be based on the performance of the students, to be judged by a committee constituted by the department. One faculty member will co-ordinate the overall activity of Industry Attachment Program. Students have to undergo summer internship of Six Weeks duration at the end of semester VI and the credits will be awarded after evaluation in VII semester.

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Computer Science
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